

**Developing musical listening according to the
principles of the Tomatis Method: An application in
the Arts and Culture learning area**

M. Krügel

20244525

Dissertation submitted in fulfillment of the requirements for the degree

Doctor Musicae

in the

Faculty of Humanities

at the Potchefstroom Campus of the North-West Universtiy

Supervisor: Dr. D.J. Taljaard

Co-supervisor: Prof. W.F. Du Plessis

November 2011

Potchefstroom

ACKNOWLEDGEMENTS

I wish to express my sincere gratitude and appreciation to:

- God, my Savior and my Guide for the strength, wisdom and perseverance and for accompanying me on this eventful journey
- Pieter-Schalk, Rianke, Wilmar and Imre, my children, for their sacrifice, understanding, tolerance, love, encouragement and faith in their mother
- Pieter and Loezan, my parents, for their unconditional love, support and continued interest
- Dr. Hannes Taljaard, my supervisor and mentor, for sound academic guidance, advice, encouragement, patience and continued support
- Prof. Wynand du Plessis, my co-supervisor, for sharing expertise, wisdom and attention to detail
- Dr Petrus Krige, for assistance in obtaining the Musat Test
- Dr Suria Ellis of the Statistical Consultation Services at the North-West University (Potchefstroom Campus) for the statistical analysis and guidance with numbers
- The learners from the Christian School on the Potchefstroom Campus of the North-West University for their willingness to partake in this study
- Mrs. Erica Roodt of the Ferdinand Postma Library of the North-West University for her continued assistance and patience during the literature research
- Mrs. Hendrine Krieg for the language editing, help and kindness
- Inge, Elizma, Charlotte and Gúte who contributed greatly in completing this study
- My family and friends, especially Angie Arpin, Antoinette van der Walt and Willem Krugel without whom this study would not have been possible

History has proven that people are successful not because of brilliance, but because of persistence and desire (Maxwell, 2001:52)

SUMMARY

Developing musical listening according to the principles of the Tomatis Method: an application in the Arts and Culture learning area

This thesis reports on an interdisciplinary empirical study that used mainly quantitative methods combined with qualitative and descriptive methods to illustrate that didactic methods in the Arts and Culture learning area can be aligned with the principles of the Tomatis Method in order to improve musical listening.

The research question was formulated on the basis of perceived problems regarding the teaching-learning processes in South African schools, and especially in terms of the South African curriculum as it pertains to music. It was deemed necessary to identify the problems which are impacting on the development of skilful musical listening in music teaching within the Arts and Culture Learning Area, and attempt to find solutions. The point is made that it is the curriculum – poorly assembled, vaguely formulated and containing insufficient information on didactic methods regarding the teaching of proper listening skills – that causes some of the problems.

The purpose of this study was thus to determine **how** didactic methods in the Arts and Culture programme can be aligned with the principles of the Tomatis Method in order to develop musical listening. The Tomatis Method is a multi-disciplinary approach applied as a therapeutic intervention which led to a new outlook on the concept of hearing. Significant breakthroughs in areas such as learning, self-esteem, communication, language, music and creativity are indicated through clinical observations and research findings. Elliott's praxial philosophy of music education is used as the intermediary between the principles of the Tomatis Method and the alignment of didactic methods, because the theory is widely known in music education, and because it is clearly documented and debated. The use of the praxial philosophy as a frame for increasing didactic understanding follows a suggestion by Elliott (1995:vii) to use the philosophy as "a tool – as a means of initiating, simulating, guiding and supporting the efforts of music teachers (administrators, parents and others) as they tackle the many theoretical and practical issues involved in music education."

The research design and methodology were discussed together with measures to ensure validity and reliability. In this study both quantitative and qualitative approaches (descriptive case studies and interviews) were followed to answer the research question. These approaches represent complementary components of the research process. A quantitative approach in the current research is employed to study relationships among measured variables in order to explain, predict, and control phenomena. The qualitative research investigated the complex nature of the phenomena in this study. The case studies were discussed accordingly.

The participants were carefully selected and the current researcher is of the opinion that the measuring instruments are sensitive enough to measure the listening ability, creativity and the psychological phenomena involved in this study and that they are also equipped to reflect the effects of the intervention programmes.

To test the hypothesis of this research a four-group (experimental group A and three control groups B, C and D) pre-post assessment design was used in order to eliminate any deficiencies that may have occurred in comparative studies. The procedures that were followed used measuring instruments to evaluate the identified dependent variables tested in the hypothesis. The measuring instruments included the Musat Test, Tomatis Listening Test, Tennessee Self-Concept Test and Torrance Creativity Test.

The empirical results confirm the theories of Tomatis and the philosophy of Elliott: the results show that active listening-for (Elliott's term) during the Tomatis intervention enhanced not only musical listening but also other characteristics such as integration (Tomatis's term of which the equivalent in Elliott's philosophy will be consciousness), self-concept and creativity which are concepts in both Tomatis' theories and Elliott's philosophy. Therefore it is clear that didactic methods in the Arts and Culture learning area can indeed be aligned with the methods of Alfred Tomatis in order to improve musical listening. Recommendations for further studies are provided.

Keywords: Musical listening, Tomatis Method, Arts and Culture curriculum, auditory stimulation, musical proficiency, aural training, music education.

OPSOMMING

Die ontwikkeling van musikale luister volgens die beginsels van die Tomatis-metode: 'n toepassing in die Kuns en Kultuur-leerarea

Hierdie verhandeling dokumenteer 'n interdisiplinêre, empiriese studie wat hoofsaaklik kwantitatiewe metodes in kombinasie met kwalitatiewe metodes gebruik het om te illustreer dat die didaktiese metodes in die Kuns en Kultuur-leerarea gerig kan word na die metodes van Alfred Tomatis om sodoende musikale luister te verbeter.

Die navorsingsvraag is geformuleer op grond van 'n waargenome probleem in terme van die onderrig-leer-prosesse wat in Suid-Afrikaanse skole bestaan, veral in terme van die Suid-Afrikaanse kurrikulum met betrekking tot musiek. Dit is dus nodig geag om die probleme te identifiseer wat 'n impak het op die ontwikkeling van vaardige musikale luister in musiekonderrig binne die Kuns en Kultuur-leerarea, en om oplossings te probeer vind. Die punt word gemaak dat die kurrikulum – swak saamgestel, vaag geformuleer en met ontoereikende inligting oor didaktiese metodes met betrekking tot die onderrig van behoorlike luistervaardighede – sommige van die probleme veroorsaak.

Die doel van die studie was dus om te bepaal hoe didaktiese metodes in die Kuns en Kultuur-program gerig kan word na die metodes van Alfred Tomatis om sodoende musikale luister te ontwikkel. Die Tomatis-metode is 'n multidisiplinêre benadering aangewend as 'n terapeutiese ingryping wat gelei het tot 'n nuwe siening ten opsigte van die konsep van gehoor. Buitengewone deurbrake in areas soos leer, selfbeeld, kommunikasie, taal, musiek en kreatiwiteit word aangedui deur kliniese waarnemings en navorsingsresultate. Elliot se praksiale filosofie van musiekonderrig is gebruik as die tussenganger tussen die beginsels van die Tomatis-metode en die rig van didaktiese metodes omdat die teorie wyd bekend is in musiekonderrig en omdat dit deeglik gedokumenteer en gedebatteer is. Die gebruik van die praksiale filosofie as 'n raamwerk vir toenemende didaktiese begrip volg op 'n voorstel van Elliot (1995:viii) om die filosofie te gebruik as 'n instrument wat die pogings van musiekonderwysers (administreerders, ouers en ander) kan help inisieer, stimuleer, lei en ondersteun soos wat hulle die vele teoretiese en praktiese kwessies in musiekonderrig takel.

Die navorsingsontwerp en metodologie is geskilder saam met maatreëls wat die geldigheid en betroubaarheid verseker. Beide kwantitatiewe en kwalitatiewe benaderings word gevolg om die navorsingsvraag aan te spreek. Hierdie benaderings verteenwoordig komplimenterende komponente van die navorsingsproses. 'n Kwantitatiewe benadering word in hierdie navorsing gevolg om vrae oor verhoudinge tussen gemete veranderlikes te beantwoord met die doel om verskynsels te verduidelik, voorspel en beheer en kwalitatiewe navorsing is gebruik om vrae oor die komplekse aard van verskynsels te beantwoord. Gevallestudies word dienooreenkomstig bespreek.

Die deelnemers is sorgvuldig uitgesoek en wat die meetinstrumente betref, is die huidige navorser van mening dat hulle sensitief genoeg is om die luistervermoë, kreatiwiteit en die sielkundige verskynsels betrokke in hierdie studie te meet en dat hulle toegerus is om die effek van die ingrypingsprogramme te kan reflekteer.

Om die hipotese van hierdie navorsing te toets, is 'n vier-groep (eksperimentele groep A en drie kontrolegroepe B, C en D), voor- en natoets ontwerp gebruik ten einde te kortte wat in vergelykende studies mag voorkom uit te skakel. Die prosedures wat gevolg is, het meetinstrumente gebruik om die geïdentifiseerde, afhanklike veranderlikes waarvolgens die hipotese getoets word, te evalueer. Die meetinstrumente was die Musat-toets, die Tomatis-luistertoets, die Tennessee-selfbeeldtoets en die Torrance-kreatiwiteitstoets.

Die empiriese resultate van hierdie navorsing bevestig die teorieë van Tomatis en die filosofie van Elliot: die resultate wys dat aktiewe luister-na (Elliot se term) gedurende die Tomatis-ingryping wel nie net musikale luister versterk het nie, maar ook ander eienskappe soos integrasie (Tomatis se term waarvan Elliot se ekwivalent bewussyn is), en ook selfbeeld en kreatiwiteit, wat konsepte in beide Tomatis se teorieë en Elliot se filosofie is. Dit is dus duidelik dat die didaktiese metodes in die Kuns en Kultuur-leerarea wel gerig kan word na die metodes van Alfred Tomatis om sodoende musikale luister te verbeter.

Sleutelwoorde: Musikale luister, Tomatis-metode, Kuns en Kultuur- kurrikulum, ouditiewe stimulering, musikale vaardigheid, ouditiewe opleiding, musiekonderrig.

CONTENTS

ACKNOWLEDGEMENTS	i
SUMMARY	ii
OPSOMMING	iv
CONTENTS	vi
LIST OF TABLES	xvii
LIST OF FIGURES	xx
LIST OF ANNEXURES	xxii
CHAPTER 1	1-1
INTRODUCTION	1-1
1.1 INTRODUCTION	1-1
1.2 RATIONALE OF THE RESEARCH	1-2
1.3 BACKGROUND TO THE RESEARCH	1-4
1.4 SITUATING THE RESEARCH PROBLEM	1-5
1.5 PROBLEM STATEMENT	1-6
1.6 RESEARCH QUESTION	1-8
1.7 OBJECTIVES OF THE STUDY	1-9
1.7.1 General Objective	1-9
1.7.2 Specific Objective	1-9
1.8 HYPOTHESIS	1-9
1.9 METHOD OF INVESTIGATION	1-10
1.9.1 Research Design	1-10
1.9.2 Participants	1-10
1.9.3 Procedure	1-11
1.9.4 Measuring Instruments	1-11
1.9.5 Analysis of Results	1-12
1.10 STRENGTHS AND LIMITATIONS OF THE RESEARCH	1-12
1.11 OVERVIEW OF THE RESEARCH REPORT	1-13

CHAPTER 2	2-1
MUSICAL LISTENING IN ARTS AND CULTURE EDUCATION IN SOUTH AFRICA	2-1
2.1 INTRODUCTION	2-1
2.2 ARTS AND CULTURE EDUCATION IN SOUTH AFRICA	2-4
2.2.1 Background.....	2-5
2.2.2 Curriculum 2005.....	2-6
2.2.3 Arts and Culture.....	2-10
2.3 PROBLEMS IN THE NATIONAL CURRICULUM STATEMENT (NCS) FOR ARTS AND CULTURE (MUSIC)	2-12
2.3.1 Evaluating the NCS according to Musical Listening	2-12
2.3.2 Evaluating the NCS according to the Design Dimension of Musical Works	2-19
2.3.3 Evaluating the NCS According to Conceptual Progression	2-24
<i>Learning Sequence of Rhythm (Elliott's Duration: Rhythmic Patterns)</i>	2-27
<i>Learning Sequence of Timbre</i>	2-28
2.4 THE PRAXIAL PHILOSOPHY OF MUSIC EDUCATION OF DAVID ELLIOTT	2-30
2.4.1 Musicianship.....	2-35
2.4.1.1 Procedural Knowledge	2-37
2.4.1.2 Formal Musical Knowledge	2-37
2.4.1.3 Informal Musical Knowledge	2-38
2.4.1.4 Impressionistic Musical Knowledge	2-38
2.4.1.5 Supervisory Musical Knowledge	2-39
2.4.2 Consciousness, Knowledge and Thought	2-39
<i>Self-Esteem</i>	2-41
<i>Creativity</i>	2-41
2.5 THE FUNDAMENTALS OF MUSIC LISTENING STRUCTURED ACCORDING TO ELLIOTT	2-43
2.5.1 Musicianship and Listenership.....	2-44
2.5.1.1 Procedural Essence of Music Listening	2-44
2.5.1.2 Formal Musical Knowledge and Listening	2-45
2.5.1.3 Informal Musical Knowledge and Listening	2-45
2.5.1.4 Impressionistic Musical Knowledge and Listening	2-46
2.5.1.5 Supervisory Musical Knowledge and Listening	2-46
2.5.2 Analysing the NCS According to Listenership	2-48

2.5.2.1	Category 1 Assessment Standards (no Musical Listening)	2-49
	<i>Category 1 Assessment Standards for Outcome 1:</i>	
	<i>Creating, Interpreting and Presenting</i>	2-49
	<i>Category 1 Assessment Standards for Outcome 2: Reflecting</i>	2-50
	<i>Category 1 Assessment Standards for Outcome 3:</i>	
	<i>Participating and Collaborating</i>	2-50
	<i>Category 1 Assessment Standards (no musical listening) –</i>	
	<i>Outcome 4: Expressing and Communicating</i>	2-50
2.5.2.2	Category 2 Assessment Standards	
	(role of Musical Listening unclear)	2-51
	<i>Category 2 Assessment Standards for Outcome 1:</i>	
	<i>Creating, Interpreting and Presenting</i>	2-51
	<i>Category 2 Assessment Standards for Outcome 2:</i>	
	<i>Reflecting</i>	2-51
	<i>Category 2 Assessment Standards for Outcome 3:</i>	
	<i>Participating and Collaborating</i>	2-52
	<i>Category 2 Assessment Standards for</i>	
	<i>Outcome 4: Expressing and Communicating</i>	2-52
2.5.2.3	Category 3 Assessment Standards	
	(depend upon Musical Listening)	2-52
	<i>Category 3 Assessment Standards for Outcome 1:</i>	
	<i>Creating, Interpreting and Presenting</i>	2-52
	<i>Category 3 Assessment Standards for Outcome 2: Reflecting</i>	2-53
	<i>Category 3 Assessment Standards for Outcome 3:</i>	
	<i>Participating and Collaborating</i>	2-53
	<i>Category 3 Assessment Standards (no musical listening) –</i>	
	<i>Outcome 4: Expressing and Communicating</i>	2-54
	<i>Discussion</i>	2-54
2.6	IMPLICATIONS FOR MUSIC EDUCATION	2-59

CHAPTER 3	3-1
THE TOMATIS METHOD	3-1
3.1 INTRODUCTION	3-1
3.2 WHAT IS MUSICAL HEARING?	3-2
3.2.1 The Musical Ear	3-3
3.2.1.1 An Audiometric Description of the ‘Musical Ear’	3-3
3.2.1.2 Variances in the Curve of the ‘Musical Ear’ and Implications thereof	3-5
3.2.2 The Tomatis Listening Test	3-8
3.2.3 Auditory Lateralisation	3-8
3.3 WHAT IS THE TOMATIS METHOD?	3-12
3.3.1 Historical Overview and Experimental Foundation of the Tomatis Method	3-12
3.3.2 Important theoretical concepts and assumptions of the Tomatis Method	3-14
3.3.3 The Tomatis Laws	3-15
3.3.4 The Development of Hearing Loss	3-16
3.3.5 Sound Stimulation: The Tomatis Method (TM)	3-18
3.3.5.1 Filtered Sounds	3-18
<i>The Functional Level</i>	3-18
<i>The Emotional Level</i>	3-19
<i>The Rational Level</i>	3-19
3.3.5.2 The Music	3-20
<i>Music by Mozart</i>	3-20
<i>Gregorian Chant</i>	3-20
3.3.6 Sound Stimulation: The Apparatus: The Electronic Ear	3-21
<i>The Headphones</i>	3-21
<i>The Filters</i>	3-21
<i>The Electronic Gate</i>	3-22
<i>The Balance</i>	3-23
3.4 WHAT IS SOUND?	3-24
3.4.1 The Perception of Sound	3-24
3.4.2 Perception through Hearing	3-25

3.4.3	Anatomy and Functions of the Ear	3-29
3.4.3.1	The Inner Ear	3-30
3.4.3.2	The Middle Ear	3-32
3.4.3.3	The External Ear.....	3-33
3.5	THE EAR AND THE NERVOUS SYSTEM	3-33
3.5.1	Cybernetic Loops	3-33
3.5.2	The Vestibular/Somatic Integrator	3-34
3.5.3	The Visual and Auditory Integrators	3-36
3.5.4	The Cochlear/Linguistic Integrator	3-37
3.6	WHAT IS PRENATAL SOUND PERCEPTION?	3-40
3.6.1	The Human Auditory System and the Origin of the Listening Function	3-40
3.6.2	The Desire to Communicate	3-42
3.6.3	The Ear as an Energy Source for the Brain	3-43
3.7	WHAT IS THE RELEVANCE OF THE TOMATIS METHOD TO THE CURRENT STUDY?	3-45
3.7.1	The Sequence of the Phases as it Manifested via the Tomatis Method	3-45
3.7.1.1	The Passive Phase (Auditory Training)	3-46
	<i>Sonic Return /Reversed Musical Birth</i>	3-46
	<i>Sonic/Musical Birth</i>	3-48
3.7.1.2	The Active Phase (Audio Vocal Phase)	3-48
	<i>Linguistic/Language Integration Phase</i>	3-49
3.8	BENEFITS OF THE TOMATIS METHOD	3-50
3.8.1	Establishment of Right-Ear Dominance	3-51
3.8.2	Academic Performance	3-51
3.8.3	Communication	3-51
3.8.4	Control Over Sound Production	3-52
3.9	CRITICISMS OF THE TOMATIS METHOD	3-52

CHAPTER 4	4-1
EMPIRICAL INVESTIGATION AND METHODOLOGY	4-1
4.1 INTRODUCTION	4-1
4.2 RESEARCH DESIGN AND METHODOLOGY	4-2
4.3 COMPARING QUANTITATIVE AND QUALITATIVE APPROACHES	4-7
4.4 HYPOTHESES AND/OR RESEARCH QUESTIONS	4-11
4.5 TECHNIQUES	4-12
4.5.1 Compilation of the Groups	4-12
4.5.2 Measuring Instruments	4-13
4.6 Determining the Validity and Reliability of Measurement Instruments	4-15
4.6.1 Junior Musical Aptitude Test (Musat J)	4-17
4.6.1.1 Background	4-17
4.6.1.2 Description	4-17
4.6.1.3 Rationale	4-17
4.6.1.4 Reliability and Validity	4-18
4.6.1.5 Motivation for Inclusion in this Research	4-18
4.6.1.6 Application	4-19
4.6.2 Tennessee Self-Concept Test (TSCS)	4-20
4.6.2.1 Background	4-20
4.6.2.2 Description	4-20
4.6.2.3 Rationale	4-23
4.6.2.4 Motivation for Inclusion in this Research	4-23
4.6.2.5 Reliability and Validity	4-24
4.6.2.6 Application	4-24
4.6.3 The Torrance Creativity Test	4-25
4.6.3.1 Background	4-25
4.6.3.2 Description	4-25
4.6.3.3 Rationale	4-26
4.6.3.3.1 Rationale of the <i>Verbal Test Battery</i>	4-27
4.6.3.3.2 Rationale of the <i>Figural Test Battery</i>	4-28
4.6.3.4 Motivation for Inclusion in this Research	4-28
4.6.3.5 Reliability and Validity	4-29
4.6.3.6 Application	4-30

4.7	ADDITIONAL TESTS	4-30
4.7.1	Tomatis Listening Test	4-30
4.7.1.1	Background	4-30
4.7.1.2	Description	4-32
	1. Threshold Evaluation	4-33
	2. Selectivity Evaluation	4-33
	3. Spatialization Evaluation	4-33
	4. Leading Ear Evaluation	4-33
	4.7.1.2.1 Air Conduction Curve (AC)	4-34
	4.7.1.2.2 Bone Conduction Curve (BC)	4-34
	4.7.1.2.3 The Relationship between AC and BC within each Ear	4-35
	4.7.1.2.4 The Relationship between AC and BC from one Ear to the Other	4-35
	4.7.1.2.5 The Importance of the Left and the Right Diagram	4-35
	4.7.1.2.6 Important Information About the Different Areas of the Same Diagram	4-36
	4.7.1.3 Rationale	4-36
	4.7.1.4 Motivation For Inclusion In This Research	4-36
	4.7.1.5 Reliability and Validity	4-37
	4.7.1.6 Application	4-38
4.7.2	Self-Designed Biographical Questionnaire	4-38
4.8	RESEARCH PROCEDURE	4-38
4.8.1	Selection of Participants	4-38
4.8.2	The Experimental Research	4-39
4.8.3	Comparability and Consistency	4-41
4.9	SUMMARY	4-42

CHAPTER 5	5-1
PRESENTATION AND ANALYSIS OF EMPIRICAL DATA	5-1
5.1 INTRODUCTION	5-1
5.2 STATISTICAL TECHNIQUES	5-2
5.2.1. Internal Consistency / Reliability of Measuring Instruments:	
Cronbach Alpha	5-3
5.2.2. Validity	5-5
5.2.1.1 Content Validity	5-5
5.2.1.2 Construct Validity	5-6
5.2.1.3 Factor Analysis	5-7
5.3 STATISTICAL SIGNIFICANCE IN HYPOTHESIS TESTING	5-12
5.3.1 ANOVA	5-13
5.3.2 The dependent <i>t</i>-test	5-14
5.3.3 ANCOVA	5-15
5.4 RESULTS	5-16
5.4.1 ANOVA	5-16
5.4.1.1 Tennessee Self-Concept Test	5-16
5.4.1.2 Musat Test	5-18
5.4.1.3 Torrance Creativity Test	5-20
5.4.1.3.1 Picture Test	5-20
5.4.1.3.2 Circle Test	5-21
5.4.1.3.3 Elephant Test	5-22
5.4.1.3.4 Boxes Test	5-23
5.4.1.3.5 Totals	5-24
5.4.2 PAIRED <i>T</i>-TEST	5-26
5.4.2.1 Group A	5-26
5.4.2.1.1 Tennessee Self-Concept Test	5-27
5.4.2.1.2 Musat Test	5-27
5.4.2.1.3 Torrance Creativity Test	5-27
5.4.2.2 Group B	5-29
5.4.2.2.1 Tennessee Self-Concept	5-30
5.4.2.2.2 Musat	5-30
5.4.2.2.3 Torrance Creativity	5-30
5.4.2.3 Group C	5-32
5.4.2.3.1 Tennessee Self-Concept Test	5-33
5.4.2.3.2 Musat	5-33
5.4.2.3.3 Torrance Creativity	5-33

5.4.2.4	Group D	5-35
5.4.2.4.1	Tennessee Self-Concept Test	5-36
5.4.2.4.2	Musat	5-36
5.4.2.4.3	Torrance Creativity Test	5-36
5.4.3	ANCOVA	5-37
5.4.3.1	Tennessee Self-Concept Test	5-37
5.4.3.2	Musat Test	5-39
5.4.3.3	Torrance Creativity Test	5-40
5.4.3.3.1	Picture	5-40
5.4.3.3.2	Circle	5-42
5.4.3.3.3	Elephant	5-43
5.4.3.3.4	Boxes	5-44
5.4.3.3.5	Totals	5-44

CHAPTER 6 6-1

DISCUSSION OF RESULTS 6-1

6.1 INTRODUCTION 6-1

6.2 SAMPLING AND SUMMARY OF RESEARCH PROCEDURES 6-3

6.3 STATISTICAL TECHNIQUES 6-4

6.3.1 Cronbach Alpha 6-4

6.3.2 Factor Analysis 6-5

6.3.3 Analysis of Variance (ANOVA) 6-6

6.4 IN-PROGRAMME AND POST-PROGRAMME RESULTS 6-7

6.4.1 Pre-Post Differences within Groups: The Dependent *T*-Test 6-7

6.4.2 Analysis of Co-Variance (ANCOVA) 6-8

6.4.3 Research Sub-Question (1a) 6-8

6.4.3.1 Pre-Post Differences within Groups: The Dependent *T*-Test 6-9

6.4.3.2 Pre-post differences between groups: Analysis of Co-Variance (ANCOVA) 6-10

6.4.3.3 Summary of Research Sub-Question (1a) 6-10

6.4.4 Research Sub-Question (1b¹) 6-11

6.4.4.1 Pre-Post Differences within Groups: The Dependent *T*-Test 6-11

6.4.4.2	Pre-Post Differences between Groups: Analysis of Co-Variance (ANCOVA)	6-12
6.4.4.3	Summary of Research Sub-Question (1b ¹)	6-12
6.4.5	Research Sub-Question (1b ²)	6-13
6.4.5.1	Pre-Post Differences within Groups: The Dependent T-Test	6-13
6.4.5.2	Pre-Post Differences between Groups: Analysis of Co-Variance (ANCOVA)	6-15
6.4.5.3	Summary of Research Sub-Question (1b ²)	6-16
6.5	EFFECTS ASSOCIATED WITH THE TOMATIS METHOD IN THIS RESEARCH	6-16

CHAPTER 7		7-1
DISCUSSION OF CASE STUDIES		7-1
7.1	INTRODUCTION	7-1
7.2	CRITERIA FOR THE SELECTION OF CANDIDATES FOR CASE STUDIES	7-4
	<i>The Tomatis Listening Test</i>	7-7
	<i>Musat Test</i>	7-7
	<i>Tennessee Self-Concept Test</i>	7-8
	<i>Torrance Creativity Test</i>	7-11
7.3	GENERAL GROUP OBSERVATIONS: GROUP A	7-12
7.4	DISCUSSION OF INDIVIDUAL CASE STUDIES: GROUP A	7-13
7.4.1	Participant 1 from Group A (Participant A9)	7-13
	7.4.1.1 Tomatis Listening Test (TLT)	7-13
	7.4.1.2 Comparison of Pre-Post-Test Scores of the Musat Test, Tennessee Self-Concept Test and Torrance Creativity Test	7-15
	7.4.1.3 Psychologist's and Parent's Reports	7-18
	7.4.1.4 Summary of Participant A9	7-19
7.4.2	Participant 2 from Group A (Participant A30)	7-20
	7.4.2.1 Tomatis Listening Test (TLT)	7-20

7.4.2.2	Comparison of Pre-Post-Test Scores of the Musat Test, Tennessee Self-Concept Test and Torrance Creativity Test.....	7-21
7.4.2.3	Psychologist's and Parent's Reports	7-25
7.4.2.4	Summary of Candidate A30.....	7-26
7.5	GENERAL GROUP OBSERVATIONS: GROUP B.....	7-27
7.6	DISCUSSION OF INDIVIDUAL CASE STUDIES: GROUP B.....	7-28
7.6.1	Participant 1 from Group B (Participant B40)	7-29
7.6.1.1	Tomatis Listening Test (TLT)	7-29
7.6.1.2	Comparison of Pre-Post-Test Scores of the Musat Test, Tennessee Self-Concept Test and Torrance Creativity Test.....	7-30
7.6.1.3	Facilitators' Report	7-32
7.6.1.4	Summary of Candidate B40.....	7-33
7.6.2	Participant 2 from Group B (Participant B47)	7-34
7.6.2.1	Tomatis Listening Test (TLT)	7-34
7.6.2.2	Comparison of Pre-Post-Test Scores of the Musat Test, Tennessee Self-Concept Test and Torrance Creativity Test.....	7-35
7.6.2.3	Facilitators' Report	7-38
7.6.2.4	Summary of Candidate B47.....	7-38

CHAPTER 8	8-1
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS	8-1
8.1 INTRODUCTION	8-1
8.2 OVERVIEW OF THE FINDINGS.....	8-2
8.3 MAIN RESEARCH QUESTION	8-4
8.3.1 Research Sub-Questions	8-6
8.3.1.1 Research Sub-Question (1a)	8-7
8.3.1.2 Research Sub-Question (1b ¹).....	8-7
8.3.1.3 Research Sub-Question (1b ²).....	8-7
8.4 TOMATIS'S THEORIES AND ELLIOTT'S PHILOSOPHY ALIGNED.....	8-8

8.5	IMPROVEMENT OF MUSICAL LISTENING	8-11
8.5.1	Case Study: Participant A9	8-13
8.5.2	Case Study: Participant A30	8-14
8.5.3	Didactic Strategies	8-14
8.6	CONCLUSIONS	8-17
8.7	METHODOLOGICAL LIMITATIONS	8-18
8.8	RECOMMENDATIONS	8-18

LIST OF TABLES

CHAPTER 2

Table 2.1:	Outcome 1 of the NCS.....	2-14
Table 2.2:	Outcome 2 of the NCS.....	2-16
Table 2.3:	Outcome 3 of the NCS.....	2-16
Table 2.4:	Outcome 4 of the NCS.....	2-17
Table 2.5:	Outcome 1 Analysed According to the Design Dimension of Musical Works	2-22
Table 2.6:	Similarities between Van der Merwe’s Categorisation and that of the Musat Test.....	2-26
Table 2.7:	Learning Sequence of Rhythm (Grade 4-6)	2-27
Table 2.8:	Learning Sequence of Timbre (Grade 4-6)	2-28
Table 2.9:	The Five Kinds of Musical Knowledge (Summary)	2-49

CHAPTER 4

Table 4.1:	A Comparison of the Differences between Research Design and Research Methodology	4-6
Table 4.2:	Table of Differences between Quantitative and Qualitative Approaches...	4-9
Table 4.3:	Approach to Distinguish between Quantitative and Qualitative Research.....	4-9
Table 4.4:	Summary of Differences between Quantitative and Qualitative Approaches	4-10
Table 4.5:	A Visual Representation of the Tests and Interventions Applied to Each Group	4-14

CHAPTER 5

Table 5.1	The Cronbach’s Alpha Reliability Co-Efficient of Measuring Instruments	5-4
Table 5.2:	Musat Test 1: Interval	5-8
Table 5.3:	Musat Test 2: Harmony.....	5-9
Table 5.4:	Musat Test 3: Timbre.....	5-9
Table 5.5:	Musat Test 4: Rhythm.....	5-10
Table 5.6:	Musat Test 5: Duration.....	5-10
Table 5.7:	Musat Test 6: Speed.....	5-11
Table 5.8:	Musat Test 7: Counting.....	5-11
Table 5.9:	Tennessee Self-Concept	5-16
Table 5.10:	Tennessee Self-Concept: Effect Sizes (d-values)	5-17
Table 5.11:	Musat.....	5-18
Table 5.12:	Musat: Effect Sizes (d-values)	5-18
Table 5.13:	Torrance Creativity: Picture	5-20
Table 5.14:	Torrance Creativity: Picture: Effect Sizes (d-values)	5-20
Table 5.15:	Torrance Creativity: Circle	5-21
Table 5.16:	Torrance Creativity: Circle: Effect Sizes (d-values)	5-21
Table 5.17:	Torrance Creativity: Elephant.....	5-22
Table 5.18:	Torrance Creativity: Elephant: Effect Sizes (d-values)	5-22
Table 5.19:	Torrance Creativity: Boxes.....	5-23
Table 5.20:	Torrance Creativity: Boxes: Effect Sizes (d-values)	5-23
Table 5.21:	Torrance Creativity: Totals.....	5-24
Table 5.22:	Torrance Creativity: Totals: Effect Sizes (d-values).....	5-24
Table 5.23:	Pre-test Comparisons of Groups A to D for Tennessee Self-Concept Test, Musat Test and Torrance Creativity Test	5-25
Table 5.24:	Group A: Tennessee Self-Concept, Musat and Torrance Creativity	5-26
Table 5.25:	Group B: Tennessee Self-Concept, Musat and Torrance Creativity	5-29
Table 5.26:	Group C: Tennessee Self-Concept, Musat and Torrance Creativity	5-32
Table 5.27:	Group D: Tennessee Self-Concept, Musat and Torrance Creativity	5-35
Table 5.28:	Tennessee Self-Concept: Adjusted Means and p-value.....	5-37
Table 5.29:	Tennessee Self-Concept: Effect Sizes for Inter-Group Comparison (d-value)	5-37
Table 5.30:	Musat: Adjusted Means and p-value.....	5-39
Table 5.31:	Musat: Effect Sizes for Inter-Group Comparison (d-value)	5-39
Table 5.32:	Torrance Creativity: Picture: Adjusted Means and p-value.....	5-40
Table 5.33:	Torrance Creativity: Picture: Effect Sizes for Inter-Group Comparison (d-value)	5-40
Table 5.34:	Torrance Creativity: Circle: Adjusted Means and p-value.....	5-42

Table 5.35:	Torrance Creativity: Circle: Effect Sizes for Inter-Group Comparison (d-value)	5-42
Table 5.36:	Torrance Creativity: Elephant: Adjusted Means and p-value	5-43
Table 5.37:	Torrance Creativity: Elephant: Effect Sizes for Inter-Group Comparison (d-value)	5-43
Table 5.38:	Torrance Creativity: Boxes: Adjusted Means and p-value	5-44
Table 5.39:	Torrance Creativity: Boxes: Effect Sizes for Inter-Group Comparison (d-value)	5-44
Table 5.40:	Torrance Creativity: Totals: Adjusted Means and p-value	5-44
Table 5.41:	Torrance Creativity: Totals: Effect Sizes for Inter-Group Comparison (d-value)	5-44

CHAPTER 7

Table 7.1:	Selection of Two Participants from Group A.....	7-6
Table 7.2:	Selection of Two Participants from Group B.....	7-6
Table 7.3:	Musat Test Scores for Participant A9.....	7-15
Table 7.4:	Tennessee Self-Concept Test Scores for Participant A9.....	7-16
Table 7.5:	Torrance Creativity Test Scores for Participant A9.....	7-17
Table 7.6:	Musat Test Scores for Participant A30.....	7-21
Table 7.7:	Tennessee Self-Concept Test Scores for Participant A30.....	7-23
Table 7.8:	Torrance Creativity Test Scores for Participant A30.....	7-24
Table 7.9:	Musat Test Scores for Participant B40.....	7-30
Table 7.10:	Tennessee Self-Concept Test Scores for Participant B40.....	7-30
Table 7.11:	Torrance Creativity Test Scores for Participant B40.....	7-32
Table 7.12:	Musat Test Scores for Participant B47.....	7-35
Table 7.13:	Tennessee Self-Concept Test Scores for Participant B47.....	7-36
Table 7.14:	Torrance Creativity Test Scores for Participant B47.....	7-37

LIST OF FIGURES

CHAPTER 1

Figure 1.1:	Diagram of the Structure of Chapter 1	1-2
Figure 1.2:	Diagram of the Four-group Pre-post Assessment Design	1-10
Figure 1.3:	Diagram of the Overview of the Research Report	1-13

CHAPTER 2

Figure 2.1:	Diagram of the Overview of Chapter 2	2-3
Figure 2.2:	The Design Dimension of Musical Works	2-20
Figure 2.3:	The Four Dimensions of Musicing	2-32
Figure 2.4:	Music Listening – Four Dimension	2-33
Figure 2.5:	A Musical Practice	2-34
Figure 2.6:	Music as a Diverse Human Practice	2-34
Figure 2.7:	Musicianship	2-35
Figure 2.8:	Consciousness, or Self	2-40
Figure 2.9:	Musicianship x Musical Challenge = Musical Values	2-41
Figure 2.10:	Musical Creativity in Context	2-42
Figure 2.11:	Degrees of Audition	2-44
Figure 2.12:	Musicianship – Listenership	2-44
Figure 2.13:	Six Dimensions of a Musical Work	2-47

CHAPTER 3

Figure 3.1:	Diagram of the Visual Representation of Chapter 3	3-2
Figure 3.2:	Schematic Presentation of a Specific Threshold of the Musical Ear	3-4
Figure 3.3:	Schematic Presentation of a Curve Indicating Musical Insensitivity	3-5
Figure 3.4:	Schematic Presentation of a Curve Indicating Incorrect Intonation Perception	3-5
Figure 3.5:	Schematic Presentation of a Curve Indicating Damaged Quality of the Voice	3-6
Figure 3.6:	Schematic Presentation of a Curve Indicating the Impossibility of Reproducing Music	3-6
Figure 3.7:	Schematic Presentation of a Curve Indicating an Unmusical Ear	3-7
Figure 3.8:	Schematic Presentation of a Curve Indicating an Unmusical Ear	3-7
Figure 3.9:	A Schematic Representation of the Trajectory of Nervous Impulses	3-9
Figure 3.10:	A Schematic Representation of the Recurrent Nerve of the Larynx	3-11
Figure 3.11:	Diagram of the Electronic Ear	3-22
Figure 3.12:	Audiometric Curve for a Normal Hearing Person: Wegel’s Curve	3-26

Figure 3.13:	Perceived Loudness of Sounds	3-27
Figure 3.14-19	Schematic Representation of Ethnograms	3-28
Figure 3.20:	A Schematic Illustration of the Hearing Organs.....	3-30
Figure 3.21:	Schematic Illustration of the Bony Labyrinth	3-31
Figure 3.22:	Schematic Illustration of the Inner-ear and Middle-ear	3-32
Figure 3.23:	Schematic Representation of the Vestibular/Somatic Integrator.....	3-34
Figure 3.24:	Schematic Representation of the Vestibular/Somatic Integrator.....	3-35
Figure 3.25:	Schematic Representation of the Ear-Brain System with Particular Emphasis on the Visual Integrator	3-37
Figure 3.26:	Schematic Representation of the Cochlear Integrator	3-38
Figure 3.27:	Schematic Representation of the Cochlear/Linguistic Integrator	3-39
 CHAPTER 4		
Figure 4.1:	Diagram of Graphic Representation of Chapter 4	4-2
Figure 4.2:	Research Wheel	4-3
Figure 4.3:	The Research Cycle	4-4
Figure 4.4:	Research Process in Four Stages	4-5
Figure 4.5:	A Typology of Research Design Types	4-5
Figure 4.6:	Four Dimensions of Design Decisions	4-12
 CHAPTER 5		
Figure 5.1:	Visual Presentation of the Layout of the Chapter	5-2
 CHAPTER 6		
Figure 6.1:	Diagram of the Layout of Chapter 6	6-3
 CHAPTER 7		
Figure 7.1:	Summary of Chapter 7.....	7-3
Figure 7.2:	TLT of Participant A9.....	7-13
Figure 7.3:	TLT of Participant A30.....	7-20
Figure 7.4:	TLT of Participant B40.....	7-29
Figure 7.5:	TLT of Participant B47	7-34
 CHAPTER 8		
Figure 8.1:	Overview of Chapter 8.....	8-2
Figure 8.2:	Relating Tomatis, Elliott and Arts and Culture.....	8-4
Figure 8.3:	Alignment of Tomatis's Theories and Elliott's Philosophy.....	8-9

LIST OF ANNEXURES

Annexure A:	Consent Form	Annex-1
Annexure B:	Questionnaire to Parents	Annex-2

1

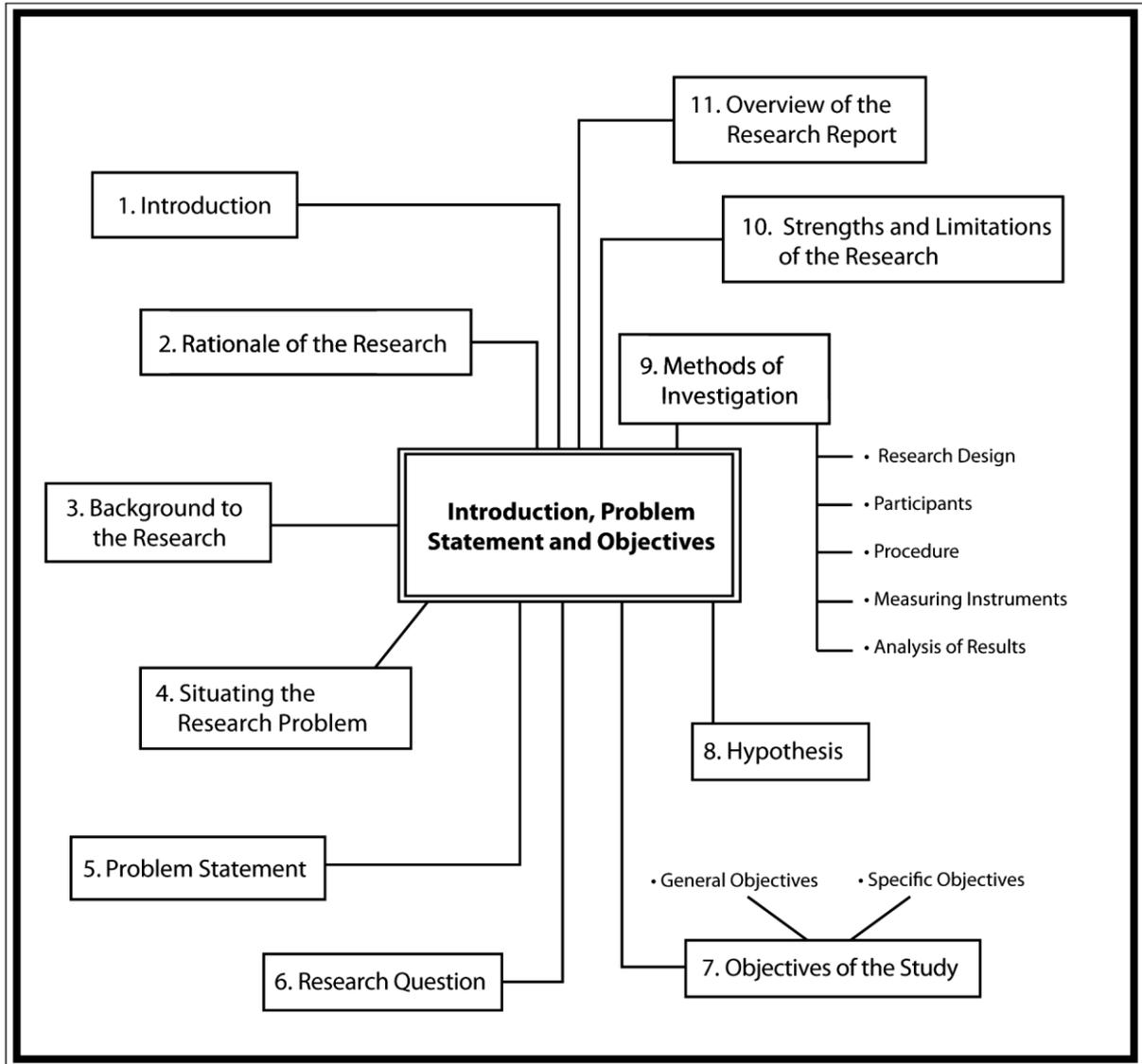
INTRODUCTION

1.1 INTRODUCTION

This thesis is a research report documenting an interdisciplinary empirical study that used mainly quantitative methods combined with qualitative (descriptive) methods to illustrate that didactic methods in the Arts and Culture learning area can be aligned with the methods of Alfred Tomatis in order to improve musical listening.

This first chapter provides an overview of the research problem and the research design. The research problem is contextualised to some degree in terms of the problems in the Arts and Culture learning area and this important background to the research project is pursued in depth in Chapter 2. The contextualisation is based upon the researcher's extensive experience of teaching Arts and Culture and specialised music.

Since the research delved into a complex field, its focus and scope had to remain narrow. This first chapter serves to indicate which aspects of the field were included in the research and how these aspects were brought together from different disciplines into a coherent research design with a clear aim. No attempt is made to discuss or even list aspects of the field that were excluded from the research. The structure of this chapter is represented in the following diagram.

Figure 1.1: Diagram of the Structure of Chapter 1

1.2 RATIONALE OF THE RESEARCH

The identification of the research problem and the design of the study were guided by certain beliefs of the researcher. They are stated in the next paragraph as axioms. Since the perspective created by these axioms is known in music education, and because similar perspectives have been elucidated and defended by other writers, the perspective of the researcher is not defended here. The aim of this research is not to motivate or even situate the researcher's perspective on musical listening specifically and more broadly on music education. The researcher's perspective is stated here only in order to guide the reader to understand the position the researcher takes regarding these important matters. The axioms are the following:

Listening forms the basis of musical experiences. In teaching, mere exposure to sound does not qualify as musical experience. This is because learners who hear do not necessarily listen. In other words, optimal processing of what has been heard is only guaranteed when didactics are guided by principles of developing musical listening. Since active listening is the basis for music teaching, a teacher needs to form a clear concept of what musical listening and the training of music listening can be. This clear concept can then be the guide for the development of didactic methods concerning music in the Arts and Culture learning area.

In music education literature one finds numerous references to musical listening. But in this study, the ideas of Alfred Tomatis are taken as basis for the research, rather than the ideas expressed in the music education literature because of the potential inherent in interdisciplinary work¹. In the words of Tomatis (1987:43) listening is:

“a very high-level perceptual function. To hear is to identify a sound passively as when we hear someone talking to us without paying attention to what they are saying. As soon we decide to listen to a speaker’s every word, or to every musical note, we engage – we mobilize our whole body – and shift our nervous system to an active body-mind dynamic. Active listening regulates the entire cybernetics of vocal emission.”

The lack of understanding of what musical listening is and of the important role it should play in music education, becomes clear when didactic methods in music education are studied. It is a grave concern that music, a discipline that is so strongly based on listening, is taught in South Africa almost entirely visually, especially when taught in groups in the Arts and Culture learning area. This teaching results in pupils with untrained ears. Early in the 1920’s Emile Jaques-Dalcroze (1967: vii) wrote: “The ears of most pupils are not able to appreciate the chords they have to write.” Although this observation was made concerning European and specifically Swiss learners almost a century ago, it is also true of South African learners today. In spite of significant contributions to music education by Zoltán Kodály, Emile Jaques-Dalcroze, Carl Orff, Shinichi Suzuki, Madeleine Carabo-Cone and others in the twentieth century, the situation in South Africa has not shown substantial improvements over the last hundred years.

¹ This choice is more fully motivated in section 1.5 of this chapter and in Chapter 3.

1.3 BACKGROUND TO THE RESEARCH

In the South African music education environment, characterised by specialisation into disciplines, one would assume that Aural Training would be the one discipline in music education where these weaknesses are addressed. However, as Pratt (1990:1) observes regarding this most basic aspect of teaching and learning music in the USA: "...the content and methods of aural training and testing are inappropriate to their presumed purpose of developing musical perceptions". This statement also rings true in South Africa today. It is, as in the time of Jaques-Dalcroze, difficult to persuade South African music teachers of the possibility of designing teaching strategies and activities that will, for example, enable children to listen to sounds before executing or representing them in notation or to evoke the thought of a tone before its production.

The weaknesses of teachers are magnified in the very challenging educational environment of the South African schools, especially in the Arts and Culture learning area. During the career of the current researcher in education over the past sixteen years – since the democratic elections in 1994 – she has become acutely aware that the weaknesses in specialised music education are aggravated in the Arts and Culture learning area in South African schools because of the lack of sufficiently trained teachers, paucity of suitable teaching-learning material and logistical problems.

When trained, teachers might not be trained sufficiently in the musical aspects of the Arts and Culture learning area before they start teaching in schools. In many cases it is expected of teachers with no musical training whatsoever to teach Arts and Culture. Furthermore, the education system lacks the ability to sustain proper in-service-training courses where teachers can acquire relevant skills and be informed about policies and syllabi. Many a teacher becomes despondent about the Arts and Culture learning area because of the lack of proper teaching material. This, combined with the lack of adequate teaching space, instruments, technology and too few prescribed periods on the time-table makes the teaching of Arts and Culture an almost impossible and therefore daunting task.

As stated before, the problems in the Arts and Culture learning area mentioned above are not discussed in this report, since such a discussion will dilute its focus. Most music educators are aware of the problems. In this study, the focus regarding these problems will fall on selected problems with the curriculum and specifically on the positioning of musical listening in the curriculum.

At this point it is important to understand that the arts, as Klopper (2004:1-1) explains, are actually well entrenched in Curriculum 2005 (C2005)² in the form of the learning area Arts and Culture, which is one of the eight compulsory learning areas for all learners from Grades 4-9. The present research was thus not undertaken in order to strengthen the position of the arts in schools.

However, a strong position for the arts does not mean that musical outcomes are achieved in our schools. The outcomes for the Arts and Culture learning area are obtained through any one of four art forms: music, dance, drama and/or visual art (South Africa 1997d: AC8 – AC21). But teaching and learning music is not the same as teaching and learning the other arts, and as argued above, musical experiences should form the basis for teaching music. Experiences of other arts are seldom musical experiences. The extent to which musical outcomes will be realised, indeed even the extent to which attention will be given to music and its components, depends on the expertise and interest of the educator in the first place and then on the availability of material and the ways in which logistical problems are mitigated.

Within this complex environment, the present researcher decided to focus on the training of musical listening as the most basic aspect of music education³. If musical listening is not trained in the Arts and Culture learning area, this in effect prohibits children who are not studying music elsewhere from taking the music specialisation offered in some schools.

1.4 SITUATING THE RESEARCH PROBLEM

Research problems are not resolved through action but through the practice of research (Klopper 2004:1-11). The nature of scientific inquiry is improved by interaction with the world of meta-science which brings about critical evidence on scientific accomplishments. As stated above, the present research developed as the result of the current researcher's long experience in schools, i.e. the interaction with the world, and the desire to contribute to the finding of solutions to problems in the schools, through answering a clearly formulated research question focusing on musical listening. The question may seem very narrow, especially in a field characterised by grand ambitions for general reform. But such is the

² Curriculum 2005 is employed in this study, since this was the curriculum in use when this research was designed and executed. The newer curriculum was not available when this report was written.

³ This position can of course be challenged, but it is one that enjoys considerable support, and only some opposition in music education literature, and therefore defending it falls outside of the scope of this research report. See chapter 2 for a more thorough discussion of relevant issues.

nature of research questions in quantitative research, which forms the strongest leg of this research design.

1.5 PROBLEM STATEMENT

For the majority of South African learners the Arts and Culture programme will be the only formal music education to which they will ever be exposed. Furthermore, knowing that music education influences the child's development only when based upon musical experiences – using material that facilitates these experiences – it is vital that effective listening skills will be used by the learner during these time restricted lessons. However, the teaching of music in our schools fails to produce adequate results, in part because decisions of educational authorities are based upon practicalities and not upon didactic principles. This results, for example, in less than one day of music teaching per annum.

'Too little time for music' is not the only problem facing music teachers in schools. Other problems concern teaching-learning materials. At present, most music education material available for the Intermediate Phase in the Arts and Culture learning area is aimed at the visual rather than the auditory modality, since the material is strongly based on visual impact on the brain. This is in part the result of the conflict between an educational system which demands identifiable measures of achievement and the study of an art which is often very subjective and defies precise measurement of the development of musical perceptions. In order to meet the demands of assessment, many activities of music educators are directed towards testing of what is right or wrong, and the most convenient material for this is written representations of the pitches and durations of notes.

Other problems, besides problems with learning material can also be identified. One of these problems results from the fragmented nature of music teaching in our schools. Attainment of almost any learning outcome presupposes continuity in teaching. Daily exposure is most likely indispensable for the development of musical listening and thus for achieving other musical outcomes. Daily exposure is not possible and teachers find it very hard to keep continuity in teaching. If Arts and Culture is taught only once a week (and sometimes not even once a week), suitable tuition material that can be used between lessons becomes a necessity. However, such material is not available, and the expertise to write efficient material that will result in excellent achievement of learning outcomes must still be developed in South Africa and depends upon appropriate research such as the present study.

It is clear that the limited teaching time for music in schools, the discontinuity in teaching-learning processes and the paucity of suitable teaching material demand that teachers know exactly what the most effective didactic methods should be in order to enable the learners to achieve the learning outcomes. However, this specialised training is largely absent from teacher training for various reasons. A teacher who wishes to fill lacunae in their training have few means to fill the gaps, because the development of musical listening and the principles of teaching in the auditory modality are not sufficiently explained on scientific grounds in the music education literature that is currently known and available to teachers in South Africa.

The present researcher hopes to contribute to filling some of the gaps in scientific information regarding the training of musical hearing. It is argued in this study that the information needed to guide the development of musical hearing can be found in psychological literature: musical listening can be developed according to the scientific principles of Alfred Tomatis's methods.

The methods of Tomatis are based upon a scientific approach to the development of hearing. The theories are scientifically explained in terms of standard psychological and neurological concepts. The Tomatis Method – known previously as audio-psycho-phonology (APP) – as defined by its founder is the study of the interaction between a human being's listening and hearing potential (audio), his/her psychological attitudes (psycho) and his control of speech and language (phonology). While the ideas of Tomatis are essentially based on neurophysiology, many of his formulations reflect a strong psychodynamic orientation.

Tomatis advocates the conditioning of the middle ear muscles. In a typical programme there is a passive and an active phase. In the passive phase the middle ear is stimulated by means of an apparatus, the Electronic Ear, devised and developed by Tomatis. It imposes a kind of osteo-muscular gymnastics (Van Jaarsveld, 1979:3) through which the auditory faculty is forced from passive accommodation to active participation. Tomatis claims that, upon contraction of the tympanic muscles, the physical properties of the conduction system of the middle ear changes so that it becomes less sensitive to low frequency tones and more sensitive to tones above 1000 Hz and this leads to an ascending audio-metric curve (Thompson, 1991:149).

The Tomatis Method has been utilised in therapy and development of hearing and listening for more than five decades (Tomatis, 1991:248; 1978:57). Increases in listening scores of subjects have proven the success of the Tomatis Method of sensory-neural integration training and psycho-education.

The implications of the Tomatis Method for the development of musical listening in Arts and Culture education in the Intermediate Phase have not yet been explored or even explicitly stated. This implies that the possibility of creating foundations for the development of effective didactic principles through interdisciplinary research into the methods of Tomatis, is not currently receiving attention in South Africa. To the knowledge of the current researcher this research is the first of its kind in South Africa, and in the world.

1.6 RESEARCH QUESTION

The research problem was clarified by formulating and answering the following research question:

How can didactic methods in the Arts and Culture programme be aligned with the methods of Alfred Tomatis in order to improve musical listening?

The following subsidiary research questions were deduced from the main research question.

- ❖ Will the Tomatis Method combined with Arts and Culture teaching lead to statistically significant:
 - improvements in musical listening as evidenced by improvements in the scores of learners in group A, obtained on the *Musat Test*, in comparison to lesser changes in the scores of learners from the other three groups?
 - enhancement of self-concept, creativity and cognitive flexibility in group A as compared to the other groups?

- ❖ Can the quantitative results be augmented by qualitative and descriptive case studies suggesting modifications to current didactic methods?

1.7 OBJECTIVES OF THE STUDY

1.7.1 General Objective

The researcher endeavoured to determine whether (and to some degree how) musical listening of learners in the intermediate phase (of primary school) can be developed more effectively when didactic methods in the Arts and Culture programme are aligned with the theories of Tomatis.

1.7.2 Specific Objectives

To determine whether the Tomatis Method combined with Arts and Culture teaching can lead to statistically significant:

- ❖ improvements in musical listening as evidenced by improvements in the scores of learners in group A, obtained from the *Musat Test*, in comparison to lesser changes in the scores of learners from the other three groups.
- ❖ enhancement of self-concept, creativity and cognitive flexibility in group A as compared to the other groups.

A further objective was to augment the quantitative results by qualitative case studies suggesting modifications of current didactic methods in the Arts and Culture learning area.

1.8 HYPOTHESIS

Musical listening can be developed effectively when didactic methods in the Arts and Culture programme are aligned with the theories of Alfred Tomatis. The quantitative results of an empirical study of the development of musical listening can be augmented by qualitative and descriptive case studies. These results can suggest modifications to current didactic methods.

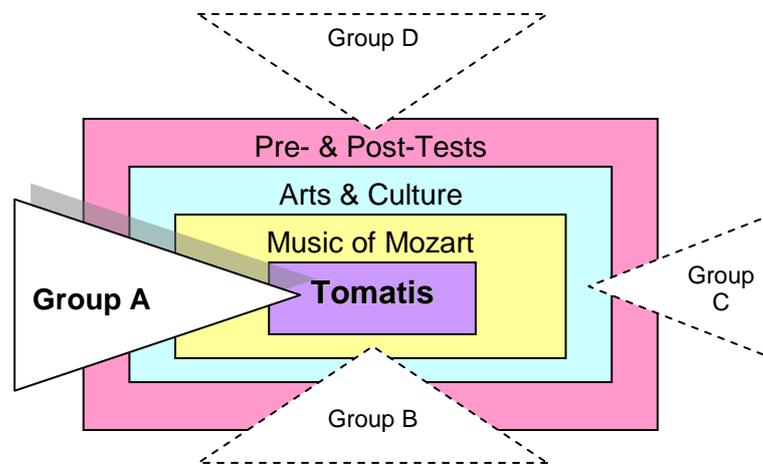
It is important to note that the hypothesis focuses on the possibility of effective development of didactic methods, the augmentation of results and modification to didactic methods and not on the development of specific strategies for doing so. This study is therefore not an instruction manual for teachers on didactic methods.

1.9 METHOD OF INVESTIGATION

1.9.1 Research Design

A four-group, experimental Group A and control groups B,C and D, pre-post assessment design was used as explained in the following diagram.

Figure 1.2: Diagram of the Four-group Pre-Post Assessment Design



1.9.2 Participants

An availability sample of forty-eight previously disadvantaged Grade 4, 5 and 6 learners from the Christian School on the Potchefstroom Campus of the North-West University were recruited and randomly assigned to:

- ❖ Group A (Tomatis stimulation through filtered sounds and Arts and Culture learning at school), (n=9);
- ❖ Group B (exposure to the unfiltered music of Mozart and the Arts and Culture programme), (n=9);
- ❖ Group C (Arts and Culture programme), (n=15);
- ❖ Group D (non-intervention control group), (n=15);

1.9.3 Procedure

Once permission for the study was obtained from relevant authorities, Grade 4, 5 and 6 learners from the Christian School were informed and written, informed consent was obtained. All participants completed the Tomatis Listening Test and thereafter the Musat Test, the Tennessee Self-Concept Test and the Torrance Creativity Test. After this the intervention phase started. Three of the four groups were exposed to different interventions.

- ❖ *Group A* participated in two four-week **Tomatis programme**, combined with an **Arts and Culture programme** in school, while
- ❖ *Group B* was exposed to the **Arts and Culture programme** and the **music of Mozart**. The two sound stimulation programmes commenced simultaneously but were attended in separate venues. The programmes were overseen by four suitably qualified individuals and monitored daily by an experienced clinical psychologist.
- ❖ *Group C* participated only in the **Arts and Culture programme**.
- ❖ *Group D* attended only the pre- and post-assessments and, upon completion of the research project, was offered participation in whichever programme proved to be most effective. Nobody responded.

Post assessment was completed at four weeks post-programme.

1.9.4 Measuring Instruments

The following tests were used:

- ❖ Musat Test
- ❖ Tomatis Listening Test

In addition, the following psychological measuring instruments were used:

- ❖ Tennessee Self-Concept Test
- ❖ The Torrance Creativity Test
- ❖ Self designed questionnaire for parents

The Tomatis Listening Test was administered by an appropriately trained speech therapist, while the psychological questionnaires and the sound stimulation programmes were conducted by a registered psychologist and assistants. Music specialists oversaw the Musat Test.

1.9.5 Analysis of Results

The Tomatis Listening Test were analysed qualitatively in terms of specific variables pertaining to listening weaknesses, i.e. left auditory laterality, selectivity closures, localisation errors and specific limiting features of the air and bone conduction curves, particularly in the speech/language domain. This was done only for four participants that were selected for case studies.

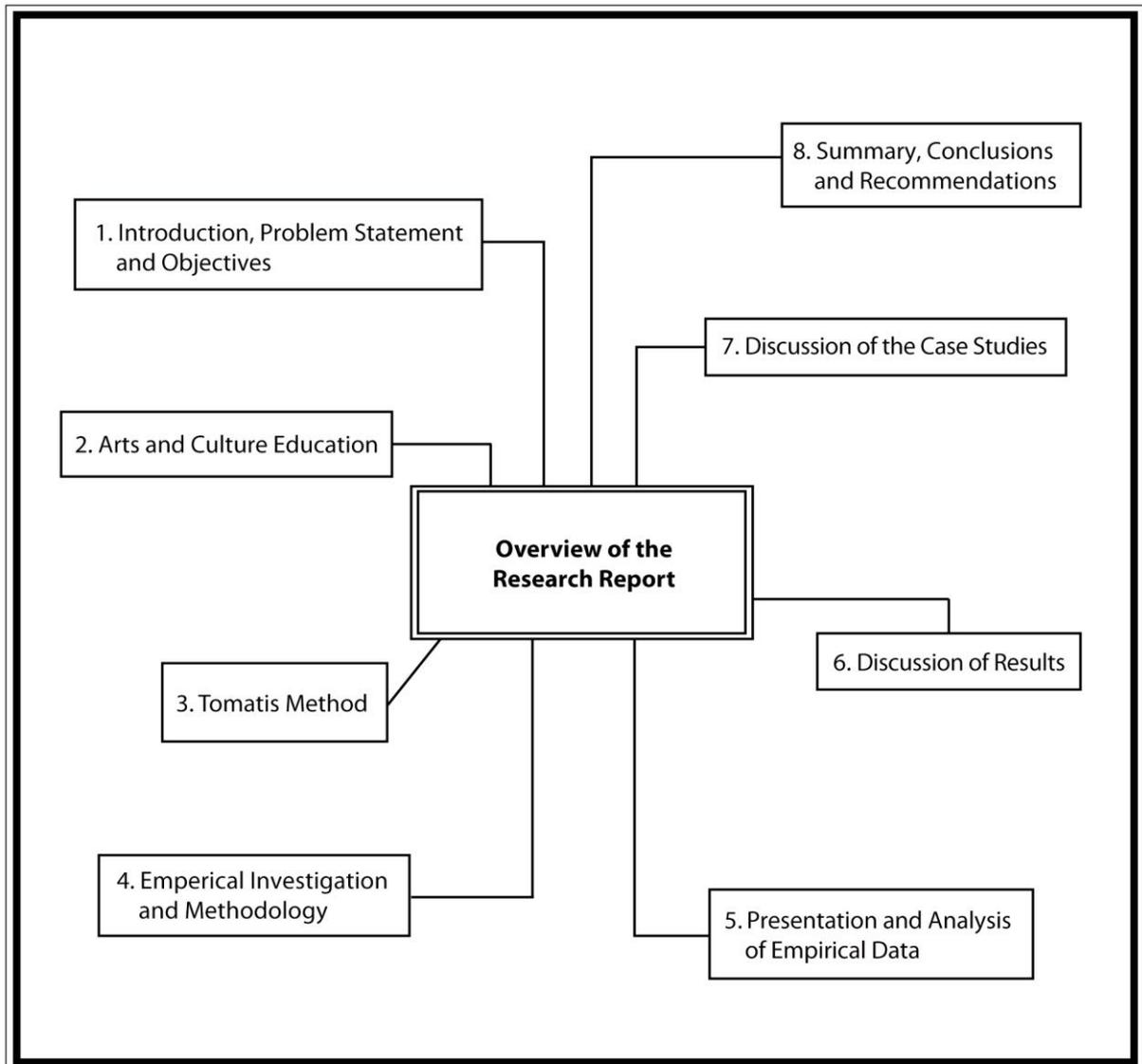
The results of other tests were analysed by means of nonparametric statistics to determine pre-post differences within and between groups. This was conducted by the Statistical Consultation Services at North-West University (Potchefstroom Campus). The questionnaires were interpreted by the researcher.

1.10 STRENGTHS AND LIMITATIONS OF THE RESEARCH

Data obtained from participants, using the above-mentioned tests, were used to determine how musical listening of learners in the intermediate phase (Grades 4-6) of primary school can be developed when didactic methods in the Arts and Culture programme are aligned with the Tomatis Method. In the intermediate phase the learning area Arts and Culture in the curriculum is linked to Life Orientation as a learning programme and is therefore not a self-standing learning area as in the senior phase (Grades 7-9). Since this is the only learning area where Music is incorporated in the learning areas of the primary school, this learning area was chosen for this research. The researcher decided to pursue research on the intermediate phase child because none or very little research on the Tomatis method and its effects has been done regarding children in this age group. This is also the age when children should start with individual tuition in different instruments and when musical listening therefore becomes of the utmost importance.

1.11 OVERVIEW OF THE RESEARCH REPORT

Figure 1.3: Diagram of the Overview of the Research Report



To keep within the focused framework designed for this study, each chapter deals with a specific aspect.

The second chapter deals with the teaching of the Arts and Culture learning area in South Africa with a specific focus on music within this learning area. This chapter provides the reader with an indication of the problems faced by educators who have to use the curriculum statement to guide the teaching learning process. This is done by suggesting a series of filters through which the curriculum statement is passed in order to understand the challenges in terms of the widely (but not universally) supported praxial philosophy of music education as formulated by David Elliott. This is done especially in order to discover the potential roles of musical listening in the outcomes stated in the curriculum statement.

Chapter 3 provides background on the Tomatis Method from the perspective of Tomatis's ideas on musical listening. This is done to provide understanding of the foundational ideas of the present research and of the nature of the intervention and to give an idea of the overlap between the ideas of Tomatis and Elliott.

Chapter 4 presents information on the research design in order to provide a background for interpreting the results presented and discussed in the following three chapters.

In Chapter 5 statistical results are provided, while in Chapter 6 these statistical results of the empirical investigation are discussed.

Four case studies are presented in Chapter 7.

The study concludes with Chapter 8 providing conclusions, methodological limitations and recommendations for further research.

2

MUSICAL LISTENING IN ARTS AND CULTURE EDUCATION IN SOUTH AFRICA

2.1 INTRODUCTION

The purpose of this chapter is to contextualise the research problem in terms of the teaching-learning processes in South African schools, and especially in terms of the South African curriculum as it pertains to music. As stated in the first chapter, the present research takes the challenge posed to teachers by the training of musical listening as the basic foundation of music education. Among the challenges identified in the first chapter, this is the only one that received attention in this study, and it is the focus of this chapter.

This chapter is structured according to some of the steps that the current researcher took as a music teacher who needed to understand the National Curriculum Statement for Arts and Culture and to find ways of realising the outcomes¹ suggested by the assessment standards. Only some of those steps that are relevant to the development of musical listening are discussed in this chapter. The aim of this chapter is not to give a full account of the actions of the teacher/researcher in teaching, or a full analysis of the National Curriculum Statement for Arts and Culture in the intermediate phase, but to provide a way of understanding the role (realised and/or potential) of musical listening in Arts and Culture teaching in South African Schools.

¹ The NCS identifies four vague, general outcomes. When using the term 'outcomes' in this study, the writer usually does not refer to these four outcomes, but to the 'smaller' outcomes suggested by the assessment standards.

The metaphor of fishing nets proved valuable in understanding the steps that a teacher needs to take in order to understand the role of musical listening in Arts and Culture teaching, and specifically in the syllabus. To the present researcher, the National Curriculum Statement seems like a dark river with many unknown fish, and not enough indication of whether and how familiar fish are to be found. The researcher designed four 'nets' to reach the objective of this chapter, which is a clearer understanding of the role of musical listening didactic strategies that are designed in order to achieve the outcomes suggested in the assessment standards.

The first 'net' is a close reading of the National Curriculum Statement for Arts and Culture (NCS) in the intermediate phase, in order to try and establish the extent to which the realisation of the suggested outcomes depends upon musical listening. This is presented in section 2.3.1 of this chapter.

The second 'net' is the evaluation of the NCS-intermediate phase in terms of the design dimensions of musical works. Those familiar with a parametric approach to the study of music will find themselves on familiar ground. The concept of design dimensions is taken from David Elliott's praxial philosophy and this section (2.3.2) will be the first, but not the main introduction to that philosophy in this chapter.

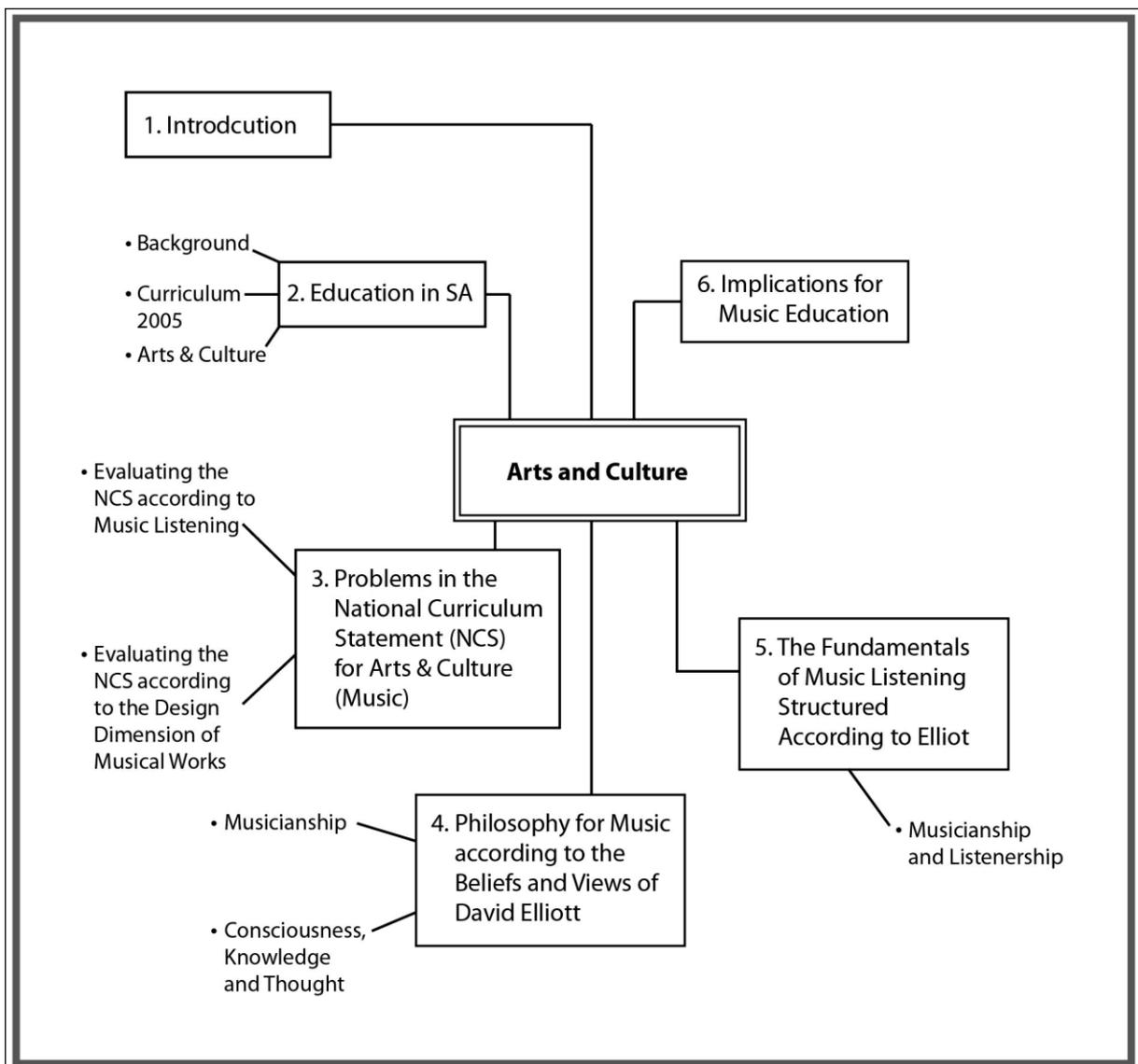
As a third 'net', existing research on the NCS in terms of conceptual progression and learning sequences is presented in order to determine how this contributes to a teacher's understanding of the teaching-learning process. This is presented in section 2.3.3.

After presenting the results of using these three nets, it becomes clear that a more powerful paradigm is needed in order to truly grasp the role of musical listening in the NCS for the intermediate phase. The paradigm chosen is the praxial philosophy of music education as presented by David Elliott. This fourth 'net' is more than a net; it is also a framework from which concepts regarding musical listening² are unpacked and re-packed in order to show that this existing paradigm can indeed aid teachers in understanding the NCS and in developing didactic methods. This very fascinating aspect of the research could unfortunately not be pursued in full depth because of the focus of the research project. For this reason the discussion in these sections of the research report is not exhaustive.

² Elliott uses the term 'music listening', while the current researcher uses the term 'musical listening' in order to emphasise the very important point that this study focuses on a specific kind of listening to music.

When showing the 'fish' caught by the four 'nets,' only a few examples of outcomes are analysed. An exhaustive analysis and discussion of the NCS will be very informative and useful, but it is not necessary in order to understand the basic arguments of this chapter and the contribution this chapter makes towards answering the research question. The chapter closes with a short discussion of the implication that the information presented here has for music education. It also hints at the overlap between the thoughts of Elliott and Tomatis. This overlap is discussed in more depth in chapter 8. The information presented in this chapter, especially in section 2.5.2, is again taken up in the final chapter of this study when it is brought into relation with information gathered through the case studies. An overview of the chapter is presented in Figure 2.1.

Figure 2.1: Diagram of the Overview of Chapter 2



2.2 ARTS AND CULTURE EDUCATION IN SOUTH AFRICA

The Arts and Culture learning area is considered an integral part of the broader education landscape in South Africa which is characterised by its aims and objectives. These aims and objectives can be summarised as 'Basic Education for All' which is a global developmental objective almost universally supported. The ideal behind this notion is that education should be a collective project that will help to create a modern society. The impact that education has on different levels of any society can never be underestimated. The disciplines and processes of education have always been used by communities according to their own cultures, and have shaped the child's identity over many centuries. However, Sverker Lindblad, professor of Education at Göteborg University in Sweden, states in his publication, *Education Restructuring: International perspectives on travelling policies* (Lindblad & Popkewitz, 2004), that in order to strike a pragmatic balance, the particular circumstances, needs, and criteria of a local situation or particular nation should be taken into consideration. This is one of the important reasons why research into music education in South Africa is needed. Our country has a unique character, and most of our music education ideas are still imports from elsewhere³.

Schools have the responsibility to provide a broad and balanced teaching-learning programme for all pupils. A National Curriculum is the starting point for planning a school curriculum that meets the specific needs of individuals and groups of pupils. Through a curriculum model, the National Curriculum stresses the vitality of processes rather than just the hardware of the content. It focuses not only on *what* is done, but also on *how* it is done. However, as is shown in this chapter, the current National Curriculum Statement is riddled with problems. In order to understand some of the problems, a brief overview of its history is given in the next section.

³ The fact that all the basic ideas of this research are also imported does not escape the current researcher's attention. The motivation for using imported ideas is that it is the *application* of the basic ideas to a *specific* South African context that will contribute to music education here and now. Elliott's philosophy incorporates insights that he gathered in South Africa (see Elliott, 1995: viii).

2.2.1 Background

Government policies have a significant impact on the development of education in music. An Education Policy is the inside factor that has a direct impact on the role of music in general education while cultural and mass media policies are outside factors that have a major impact on the status of music and thus, on the role of music in education (Leung, 2004:14). Chi Cheung Leung (2004:14) states that education policy has been identified as one of the major influences for stimulating and promoting the development of education in music. Among all other policies, an education policy is the pre-eminent source of influence due to its direct effect on education. There is a need for a balance between academic and non-academic achievement in order that non-academic subjects like music are treated equally alongside academic subjects. Cultural and non-academic subjects should be appropriately recognized in the curriculum for the status of music within schools to be recognised at all. This may entail, for example, increasing the time given to music within the curriculum and, at the same time, ensuring that music is taught at all levels of schooling. Importantly, a balance among all kinds of art has to be maintained in the curriculum, regardless of the time available to music.

Leung (2004:14) also argues that a cultural policy that recognizes music through participation, performance and composition⁴ is crucial if such a policy aims to assist music to achieve the status in society that it deserves. Such a policy should be developed for the long-term and should identify specific targets emphasizing music and its education. Leung (2004:14) states that there should be at least six aims in such a policy:

- The establishment of a long-term policy facilitating the development of music.
- An increase of performances.
- Career prospects in music.
- The encouragement of new works by local composers.
- The provision of awards and other forms of recognition for outstanding achievement in music.
- The broadcast of more television and radio programmes involving traditional, classical, and contemporary music.

All of these will entail a high degree of collaboration among government, community and schools.

⁴ This is in agreement with the praxial philosophy of Elliott.

A close reading of the whole National Curriculum Statement for the Arts and Culture learning area finds these ideas in some guise and one assumes that these or similar ideas were somehow influential in shaping the current outlook(s) on music education in South Africa. In the South African context this outlook became noticeable since the first democratically elected government took power in 1994. The new government under the African National Congress (ANC) commits themselves to create a society based on justice, people's participation in decisions that affect their lives, and to abolish and overcome the inheritance of racist divisions. One of the areas that have undergone major restructuring since the democratic 1994 elections is the South African education system. The first President under the new ANC government, Nelson Mandela, explains why: "The imbalances created by apartheid education demanded urgent and immediate correction, not only in the provision of resources and infrastructure, but also by restoring the culture of learning and teaching" (Education Africa Forum 1997:5).

As a result of this outlook on education in South Africa, a curriculum was needed that would transform the old apartheid systems of education. Curriculum 2005 was implemented and outcomes-based education became the foundation of the curriculum. It strives to enable all learners to achieve according to their highest abilities by defining the outcomes to be achieved at the end of the teaching-learning process. The outcomes encourage a learner-centred and activity-based approach to education. The Revised National Curriculum Statement builds its Learning Outcomes for the General Education and Training Band for Grades R-9 (for schools) on the critical and developmental outcomes that were inspired by the Constitution and developed in a democratic process" (Revised Curriculum statement grades R-9 (Schools) Policy: Arts and Culture, 2002:1).

2.2.2 Curriculum 2005

In 1997 the transformation of the apartheid education system was started. It resulted, as mentioned, in the implementation of Curriculum 2005 (C2005) (South Africa 1995a) which is an outcomes-based approach to education. It is an obvious attempt to align what happens in schools with both the demands of the global workplace as well as the social and political aspirations of the new South Africa.

The ideal was that C2005 should:

- develop citizens who are active and creative, inventors and problem solvers, rather than meek and unthinking followers; and
- inculcate an appreciation for diversity in the areas of race, culture and gender (Taylor, 1997:1).

The Department of Education, with input from the nine provinces, drafted the National Education Policy (South Africa 1997a) that specified the main aspects of C2005 to which all provinces must adhere. The main aspects of C2005 are the twelve critical outcomes, eight learning areas and sixty-six specific outcomes. The broadest outcomes, and those considered to be most important for all learning, are the twelve critical outcomes. C2005 is organised around the following eight learning areas.

- Language, Literacy and Communication (LLC)
- Mathematical Literacy, Mathematics and Mathematical Sciences (MLMMS)
- Human and Social Sciences (HSS)
- Natural Sciences (NS)
- Technology (TECH)
- Arts and Culture (AC)
- Economics and Management Sciences (EMS)
- Life Orientation (LO)

C2005 recognises the importance of Arts Education in the form of the learning area Arts and Culture, which is one of the eight compulsory learning areas for all learners from Grades R-9 listed above. This recognition, however, does not secure a place for any one of the art forms. The very nature of the outcomes stated on the learning area, allows for them to be attained through any of the art forms. Depending on the **area of expertise** or **interest of the educator**, the financial resources for physical resources, or societal role of arts in the school, these outcomes could be attained through the medium of music, the visual arts, drama or dance (South Africa 1997d: AC1-AC21, emphasis added).

The educator seems to take on a more and more important role in C2005. In the document *A lifelong learning development framework for general and further education and training in South Africa* (South Africa 1996a:6) reference is made to the different approaches to outcome-based education, namely traditional OBE, transitional OBE and transformational OBE. Transformational OBE is identified as the approach preferred by South Africa (South Africa 2000). At this stage of the discussion the current researcher highlights only one of the important characteristics of this approach, namely that it remains the responsibility of the educators to construct meaningful teaching-learning experiences that would lead to the mastery of outcomes as stated in the National Curriculum Statement.

The present research is an answer to this appeal on the responsibility of educators. The current researcher decided not only to criticise but also to try understanding the problems and to contribute towards finding ways of thinking about solutions. The research was designed and implemented because of a realisation that it is largely the responsibility of each educator who has to interpret the critical and specific outcomes for their learners in each learning area. It came from the realisation that music teachers need to upgrade their knowledge and experience in other cultural areas relating to the teaching of music, as well as of course their music education knowledge and skills, so they are more self-sufficient and independent in their applications of such integrated teaching. When our teachers are more able, our learners will not only learn and understand music better, but their other studies as well. To facilitate learning, it is crucial that teachers are able to adapt to different situations and are flexible in their choice of effective teaching methods. A teacher's depth of knowledge and understanding of music are of central importance to learners' progress when teachers employ an integrated approach to the learning and teaching of music such as is demanded by the National Curriculum Statement.

Every educator should be struggling against the situation described accurately by Chia (1995:6): "Apathetic teachers ... who rely on their old stand-by favourites which have little educational purpose ... there is a sense of aimlessness about art teaching in many ... schools ... there is a need for proper training of teachers who will teach the arts". The opinion of Chia is echoed by Eisner (1999:17) who claims that "we are expecting teachers to teach what they do not know and often do not love". The lack of quality in teaching and of qualified teachers imposes directly on the quality of arts education received by the child in the classroom. The vital role played by passionate and committed teachers in ensuring quality arts-rich education is apparent in all national systems and is the single most important determining factor effecting quality (Bamford, 2004:77). In South Africa today it is largely up to teachers themselves to ensure quality education. The efforts of teachers will best be based upon sound research and effective reflection-in-action and this research contributes to the construction of a foundation.

A comprehensive approach to music education curriculum planning and execution should consider important views on the teaching of music gained from different perspectives. Leung (2004:17) explains that "the task of (a) teaching popular, traditional, and contemporary music, (b) with due consideration of local, national, and global level, (c) that encompasses the three activities of appreciation, composing, and performance, (d) along with embedded knowledge in music theory, history, philosophy, and art theory, (e) while integrating various cultural subjects that enhance students' understanding of music" presents a major challenge

to any music educator. This challenge points to the need for changes to existing music curriculum thinking. Teachers in the schools should have an influence on these changes, and one of the avenues to gain influence is for teachers to become reflective practitioners by researching their own contexts and actions.

The implementation of the principles underlying the curriculum depends not only on a change of music curriculums but also on a change in the perceptions of music teachers and educators concerning the teaching of music in broader contexts. Unfortunately, music educators at schools seem to have little influence on the formulation of curricula, and their sphere of influence seems to be limited to their actions in the schools. It is therefore vital that educators at the tertiary level, especially those responsible for teacher education, take the lead in guiding future generations of teachers to take up the challenge of placing music in its rightful position. In order for this to lead in the right directions, research such as the present study is desperately needed. In the words of Scott McBride Smith (2004:25): "I believe one of the strongest factors in building a nation of well-trained music makers is the presence of a curriculum that offers resources for teaching these proficiencies, along with a meaningful third party assessment tool to measure accomplishment". To this one can add 'good teachers' and 'good trainers of teachers'.

Unfortunately, differences between the outcomes intended and the espoused policy and classroom practices as described above have been documented in almost all countries, including South Africa. Bamford (2004:47) presents the following opinion.

"The study of Arts Education ... shows an inconsistency between national policy statements which strongly emphasises the importance of the cultural dimension of education and of encouraging artistic and aesthetic development in young people and the existing practice, where the status of and the provision for Arts education appear less prominent. Moreover, emphasis on academic and technical education often places the arts in the periphery of the curricula encouraging polarities between the arts and the sciences. Such facts are reinforced by the existence in many countries of separate ministries of education and culture often resulting in the development of independent responsibilities."

It is within these contradictory circumstances that the present research aims to make a fundamental contribution.

2.2.3 Arts and Culture

'The Arts' appear in the education policy of almost every country in the world. The positioning of the arts in policies will of course have an impact on the child, the teaching and learning environment, and on the community. Anne Bamford argues in her book *The Wow Factor* (2004:31), that the meaning of the term 'arts' varies from country to country, with notable differences between economically developed and economically developing countries.

To understand the meaning of the arts in arts education, arts education can be considered as a double dimension process; firstly with education **in** the arts and secondly with education **by** the arts. The way in which this is done is almost universally regulated by policies. In South Africa, as explained (see 2.2.2), arts education is the integration of four different art forms into one learning area, namely Arts and Culture. This fact forces specialised music teachers to reflect on their actions when teaching in the Arts and Culture learning area.

The most important characteristic of the Arts and Culture learning area is the interrelatedness of the four strands Music, Drama, Dance, and Visual Art and thus of their Learning Outcomes and Assessment Standards. It would be counter-productive to the spirit of the learning area if each of the strands or assessment standards were treated in isolation from each other, or if they were approached as independent of their cultural contexts. Although the approach followed in this research does isolate music, this does not mean that, as an educator, the current researcher does not support the integration of the art forms in practice. The focus on music and on musical listening was chosen in order to design a feasible research project. The uniqueness of this learning area can perhaps best be seen in the opportunities that it provides to nurture and develop the creativity of learners. It is hoped that through Arts and Culture activities a safe and supportive environment can be created for learners to explore, experience and express thoughts, ideas and concepts within an atmosphere of openness and acceptance.

Education in the arts can be described as being sustained and systematic learning in the skills, ways of thinking and presentation of each of the art forms – dance, visual arts, music, and drama. "Arts education produces benefits in terms of improved attitudes to school and learning, enhanced cultural identity and sense of personal satisfaction and well-being. Concurrently, education which uses creative and artistic pedagogies to teach all curricula – education through the arts – enhances overall academic attainment, reduces school disaffection and promotes positive cognitive transfer. These benefits will only be accrued where there were provisions of quality programmes" (Bamford, 2004:71).

The arts provide a balance in the curriculum that is particularly important for the development of the whole person. The *White Paper on Reconstruction and Development Programme* (1994:9) in South Africa suggests that “Arts and culture are a crucial component of developing our human resources. This will help in unlocking the creativity of our people, allowing for cultural diversity within the process of developing a unifying national culture, rediscovering our historical heritage, and assuming that adequate resources are allocated” (South Africa 1994:9), (South Africa 1995d:9).

The question of why music should be included in the learning area Arts and Culture is answered in the policy documents of the province of the Eastern Cape. This document states that music is a prime transmitter of culture and a strong means to develop community and culture. It promotes ‘ubuntu’ and racial integration in order to bring people together as no other subject can. It is an aesthetic and scientific discipline and promotes self-worth, self-discipline and self-dignity. Both hemispheres of the brain are developed simultaneously by music and so problem solving and development of creativity is enhanced. Music is also a powerful therapeutic tool with a high degree of sensory integration and should be compulsory in the early school years (South Africa, 1997c:1).

It is the opinion of Carolus (1995) that the transformation of music education in South Africa can assist to transform society in alignment with the constitution of the country and the specific outcomes of the learning area Arts and Culture. It is therefore the responsibility of each music educator to ensure that music is not lost among the other disciplines of Arts and Culture and to guarantee the uniqueness of this strand of the discipline.

The ideals behind the National Curriculum Statement are sound and one cannot fault the ideas behind the NCS by identifying these ideas as the source of the problems in schools. However, teachers should analyse the many problems in the NCS for their specific learning area in order to understand strategies that can be designed in order to work around the problems in the NCS. The presentation of such an analysis of the NCS for Arts and Culture for the intermediate phase forms the bulk of this chapter.

2.3 PROBLEMS IN THE NATIONAL CURRICULUM STATEMENT (NCS) FOR ARTS AND CULTURE (MUSIC)

One of the tenets of the National Curriculum Statement is the right of every learner to receive a quality music education. However, as experienced by the current researcher and documented by researchers such as Van der Merwe (2009:28) and Hoadley and Chisholm (2005:17) Grade R to 9 learners in South Africa today are denied the right to reach their full potential regarding the music outcomes and they are disempowered by a curriculum that does not address the necessary fundamental knowledge that will ensure skills in music. Some of the fundamental weaknesses in the NCS are the lack of attention to listening skills in music and problematic gaps in learning sequences which limits conceptual development and the acquisition of relevant knowledge. Generally speaking, the NCS is badly organised, incomplete and vaguely formulated. As stated in the introduction to this chapter, the problems in the National Curriculum Statement for Arts and Culture in the intermediate phase will be 'caught' with four 'nets'. The first net is a close reading of the NCS in terms of the role of musical listening in achieving the outcomes.

2.3.1 Evaluating the NCS according to Musical Listening

Through the evaluation of the NCS⁵ according to the roles of musical listening, it becomes clear that learning verbal 'facts' about music is one of the basic activities in the curriculum. But this activity is not a musical activity in the first place, and because of limited teaching time it should be diminished in terms of the amount of attention and time it takes in the classroom. From grade to grade the Music assessment standards should provide the structure through which proper music listening skills will be taught and learned within the constraints posed by the school environment. This is not the case with the NCS.

The current researcher, after many years of being an Arts and Culture educator appointed in government schools by the Free State and Gauteng Departments of Education, is gravely concerned about the National Curriculum Statement (NCS) for Arts and Culture (Music)

⁵ The abbreviation NCS refers to the NCS for Arts and Culture. The qualification "intermediate phase" is not always added since it can be deduced by the reader from the content when the discussion refers to this sub segment of the NCS. It usually refers specifically to the sections of the NCS related to Music in this learning area.

because of its lack of focus on developing listening skills in music from a listenership perspective (as explained later in this chapter). A discipline so strongly based on listening, is often taught in South African schools almost entirely visually (see Chapter 1), resulting in pupils with untrained ears who are unable to reach outcomes in the curriculum when those outcomes rely on effective listening. The current researcher believes, as stated in Chapter 1, that the most fruitful cause of action will focus on the development of musical listening within the teaching-learning process. The implications of this belief will be unpacked later in this chapter⁶.

In order to pursue a close reading of the NCS in terms of musical listening, a basic conviction should be stated in order to situate the perspective from which the NCS is analysed. Music listening can be carried out intelligently or incompetently. When listening is carried out intelligently, the outcome is not a written description, not a picture or painting and not a theoretical analysis of musical structure, but a personal understanding, experience and expression in and through music making. In the view of the current researcher, knowledge assessments about music are not evaluations of music listening. They are evaluations of the formal knowledge component of musicianship. Formal musical knowledge should become procedural to free up the attention of learners in order for them to spend time rather on artistic problem solving than on the acquisition of more verbal information about music in isolation from music making (Elliott, 1995: 104).

The following tables are the Assessment Standards of the Intermediate Phase as found in the Revised National Curriculum Statement (NCS) Grades R-9 (schools): Arts and Culture, focusing on Music. Each music assessment standard in the Intermediate Phase of schooling, termed Intersen, Grades 4 to 6 (10 -12 year olds) of the General Education and Training Band (GET) of the learning area Arts and Culture proposed for C2005 will be evaluated in terms of the extent music listening plays a role in determining the outcome. The assessment standards are grouped into three categories.

⁶ An author that acknowledges **Listenership** as the pivotal skill in developing musicianship is David Elliott. His praxial philosophy of music education holds that musicianship always includes listenership. The views of the present researcher are congruent with those of Elliott which will be presented later in this chapter.

Firstly (indicated with the abbreviation Cat1 following the assessment standard in the following tables), the suggested outcome in the NCS can be reached **without** using **musical listening**.

Secondly (indicated with the abbreviation Cat2 in the tables), it is not clear from the outcomes to what degree the learner has to utilise his/her **listening abilities** in order to achieve the outcome. The lack of clarity can stem from one or more of the following reasons.

- 1) From the way the outcome is formulated it is unclear whether it implies the use of music notation alone or whether it will be necessary for the learner to **listen**.
- 2) Different musical actions are mixed (e.g. Grade 4: Learning Outcome 1. 'Composes' can imply written notes on paper but can also mean that the learner should use his/her listening/auditory modality/ability).
- 3) The meaning of terms referring to musical listening is not clear in the outcome.

Thirdly (indicated with Cat3), these outcomes can only be reached when the learner **relies upon musical listening**.

In Tables 2.1 – 2.4 the Outcomes of the NCS together with the different Categories are presented.

Table 2.1: Outcome 1 of the NCS

OUTCOME 1: Creating, interpreting and presenting (The learner will be able to create, interpret and present work in each of the art forms)	
Grade: 4	<ul style="list-style-type: none"> • Uses voice, body and found or made instruments to explore sounds and silence related to walking, running, and skipping note values, in order to explore rhythms and to create sound pictures. Cat2 • Composes and presents a short rhythmic pattern that has crotchets, crotchets rests, minims and minim rests through body percussion. Cat2 • Makes in various tone colour, a simple wind instrument such as a Kazoo or Tshikona/Dinaka pipes, or percussion instruments such as shakers. Cat1 • Creates and presents melodies using voice and found and natural instruments to demonstrate difference in pitch and note values. Cat 3 <p>Composite</p> <ul style="list-style-type: none"> • Makes a puppet and uses it to create a puppet show with music and movement. Cat2

5	<ul style="list-style-type: none"> • Demonstrates concentration and accurate listening through recognizing, repeating and creating rhythms and poly-rhythms, using movement, body percussion and natural instruments. Cat3 • Composes and presents a short rhythmic pattern that has crotchets, crotchets rests, minims, minim rests, quavers and quaver rests through body percussion. Cat2 • Improvises and creates music phrases that use repetition, accent, call and response. Cat3 • Sings songs in long (3/4) and normal (3/8) triplet. Cat2 <p>Composite</p> <ul style="list-style-type: none"> • There are no further Assessment Standards for this Learning Outcome in Grade 5.
6	<p>Focuses on music from a variety of South African forms:</p> <ul style="list-style-type: none"> • Improvises and creates music phrases with voice and/or instruments that explore dynamics, articulation, pitch and rhythmic patterns; Cat3 • Plays simple rhythmic patterns on a drum or equivalent; Cat2 • Explores and uses drum hand techniques such as base slap, open slap, muffle; Cat2 • Reads and sings or plays the scale and simple melodies in C Major. Cat2 <p>Composite</p> <p>Illustrate/interprets African tales through puppetry: Cat2</p> <ul style="list-style-type: none"> -designing and making hand/or head puppets; Cat1 -devising and producing puppet shows; Cat2 -composing music for puppet shows; Cat3 -choreographing movement for head puppets if used. Cat2 <p>Uses dramatic devices, visual illustrations, movement and sound to tell jokes, tall stories, lies, fantasies or absurd tales to explore realities in South Africa. Cat1</p>

Table 2.2: Outcome 2 of the NCS

OUTCOME 2: Reflecting (The learner will be able to reflect critically on artistic and cultural processes, products and styles in past and present contexts.)	
Grade: 4	<ul style="list-style-type: none"> Recognizes crotchet and minim note values and rests in a short melody. Cat2 Recognizes time signatures such as four-four and – three-four. Cat1 Listens to and identifies musical instruments in terms of appearance, name, how sound is produced, timbre and general pitch classification (high-low). Cat2
5	<ul style="list-style-type: none"> Recognizes the letter names of notes on lines and in spaces on a treble staff and their differences in pitch. Cat1 Recognizes crotchet, minim and quaver note values and rests in a short melody. Cat2 Recognizes and describes the different timbres of voices in choral music. Cat3 Listens to a variety of selected songs and identifies the genre (e.g. Blues, Pop, Kwaito, Classical, Traditional, Free-Kiba, Opera, Musicals, Malombo, Kwassa-Kwassa, Techno, Soukous), and offers opinion on the style. Cat3
6	<ul style="list-style-type: none"> Listens to and discusses the use of repetition as an organizing principle in African music. Cat2 Selects a repertoire of songs that are used in various cultural environments, describes what cultural events they are drawn from, explains what the message of the lyrical content is and what the songs are used for. Cat2

Table 2.3: Outcome 3 of the NCS

OUTCOME 3: Participating and Collaborating (The learner will be able to demonstrate personal and interpersonal skills through individual and group participation in Arts and Culture activities.)	
Grade: 4	<ul style="list-style-type: none"> Sings and/or plays canons, rounds and two-part songs with other learners, using natural, manufactured and found instruments. Cat3 Plays simple wind instruments such as a Kazoo or Tshikona/Dinaka pipes or percussion instruments such as shakers in harmony with others. Cat3
5	<ul style="list-style-type: none"> Sings and/or plays an instrument in a group with appropriate rhythms, pitch and dynamics in any genre of music. Cat3 Combines a number of melorhythm instruments (drums, marimba) to create textural blend. Cat3
6	<ul style="list-style-type: none"> Sings and/or plays in a group – canons, rounds and two-part songs from at least three cultural traditions of South Africa. Cat3

Table 2.4: Outcome 4 of the NCS

OUTCOME 4: Expressing and Communicating (The learner will be able to analyse and use multiple forms of communication and expression in Arts and Culture.)	
Grade: 4	<ul style="list-style-type: none"> • Uses voice, body, percussion, natural, found or made instruments to accompany stories, dances and songs. Cat2 • Uses sounds in a free rhythm to build up sound pictures to accompany stories or dances. Cat2
5	<ul style="list-style-type: none"> • Identifies and sings songs from different societies, cultures and contexts that seem to communicate the same idea. Cat3 • Uses own compositions of poetry and song to draw attention to current social and environmental issues. Cat2 • Communicates a musical intention using the interface of pitch-based harmony (mellophony) instruments. Cat3
6	<ul style="list-style-type: none"> • Researches, creates and presents music that conveys and suggests the symbolism of ritual. Cat2

It is clear from the analysis in this table that many of the suggested outcomes do not depend upon musical listening, or depend upon musical listening in a way not specified in the NCS. Even for those suggested outcomes that fall into category 3, the role that musical listening can or should play is not structured according to a systematic framework.

Elliott (1995:105) and the current researcher are both of the opinion that musical listening **can be taught and learned**. Elliott (1995:104) states that

“advancing a listener’s thinking-in-action depends on presenting him or her with carefully selected musical works that demand more and more advanced levels of musicianship. Progressive problem solving requires student listeners to take more and more dimensions and details of musical works into account during their efforts to make and listen for music artistically. Students who engage in progressive problem solving work at the edge of their listening competence.”

It is clear that this is not the philosophy supported in the NCS.

Although learners are encouraged to apply listening skills when pursuing some of the outcomes of the NCS, it is the opinion of the current researcher that it is not done in a systematic or well-considered manner. Knowledge acquired and displayed should be specific and not vague and undefined. Learners cannot be expected (without proper didactic methods to guide them) to use voice, body, percussion, natural, found or made instruments to accompany stories, dances and songs (see Outcome 4, Grade 4), use movement, body percussion and natural instruments creating rhythms and poly-rhythms (Outcome 1, Grade 5), or to research, create and present music that conveys and suggests the symbolism of ritual (Outcome 4, Grade 6) and then be expected to have acquired a solid foundation where progressive musical knowledge development is promoted. If a teacher hopes to develop suitable didactic methods, the teacher needs to understand the roles of musical listening in the NCS well, and this is very difficult because of the way in which the NCS is structured and formulated.

In addition, it would basically be impossible to create an effective teaching-learning environment when the outcome is vague and undefined as in “Creates and presents melodies using voice and found and natural instruments to demonstrate differences in pitch” (Outcome 1, Grade 4), or “Sings and/or plays an instrument in a group with appropriate rhythms, pitch and dynamics in any genre of music” (Outcome 3, Grade 5), or “Improvises and creates music phrases with voice and/or instruments that explore dynamics, articulation, pitch and rhythmic patterns” (Outcome 1, Grade 6). Musical listening cannot be developed effectively in undefined or ill-defined surroundings such as those suggested by the outcomes, “Makes in various tone colour, a simple wind or percussion instrument” (Outcome 1, Grade 4), “Recognizes and describes the different timbres of voice in choral music” (Outcome 2, Grade 5) or “Use drum hand techniques such as base slap, open slap and muffle” (Outcome 1, Grade 6).

To become a competent listener a learner needs to develop, amongst other capacities⁷, a refined emotional sense/feel for what is musically appropriate, original and artistically significant. Unfortunately, in the National Curriculum Statement (NCS) for Arts and Culture (Music), this development is not addressed and can therefore not take place.

⁷ These capacities are explored below in terms of Elliott’s five kinds of musical knowing.

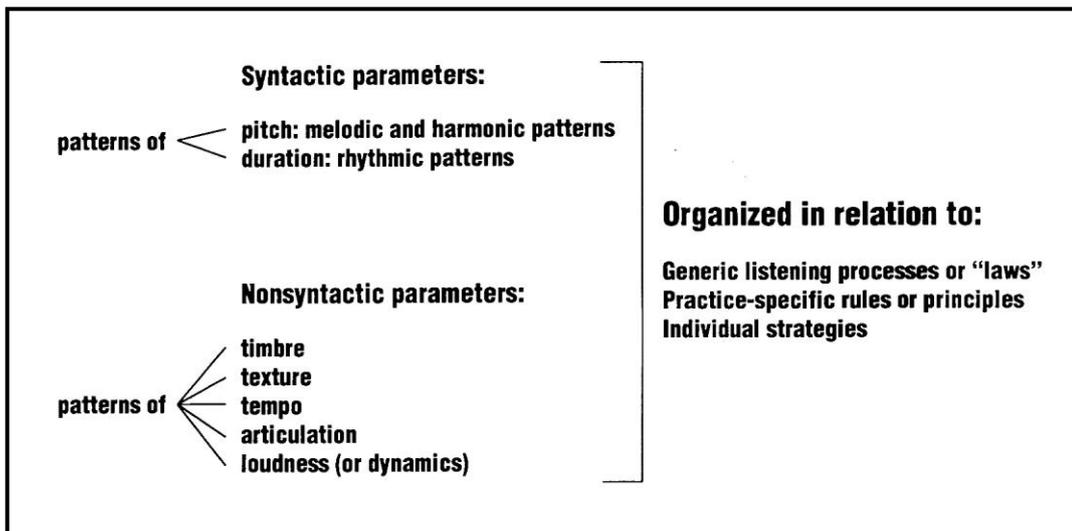
2.3.2 Evaluating the NCS according to the Design Dimension of Musical Works

Musical listening involves the cognition of sound patterns in the first instance. These patterns are the sensory experiences of music and Swanwick⁸ (1991:151) explains that, from these perceptions concepts are developed that allow learners to make comparisons, clusters, discriminations, classifications, abstractions, organise sound, generalise, allow them to reason and apply these concepts to new musical contexts. Concepts are mental models, cognitive processes, of learners' immediate environment (including musical environment). Conceptual knowledge is rich in relations and links separate concepts to a structural framework or conceptual grid.

The material forming the conceptual structure of music exists through the shaping of the elements of music (Hargreaves and Zimmerman 1992:385). This is a well-known concept in music education, and the current researcher will use the musical design dimension of musical works from Elliott⁹ (1995:95) to illustrate and explain the importance of music elements in the overall picture of music knowledge. This picture is then employed to sift one of the outcomes stated in the NCS in order to determine whether this perspective will help the teacher to grasp the NCS. Elliott (1995:95) explains that the musical design dimension of musical works consists in patterns of melody, harmony, rhythm, timbre, texture, tempo, articulation, and dynamics. Figure 2.2 offers a summary of Elliott's Design Dimension of Musical Works.

⁸ Even though the philosophies of Swanwick and Elliott are not compatible, references to the ideas of both authors are made in this chapter. The philosophy that is taken as basis is Elliott's.

⁹ Elliott's formulation of these well-known ideas is employed here so that the present researcher does not have to present the ideas in full. Readers unfamiliar with this aspect of music education can be referred to the relevant passages in Elliott 1995.

Figure 2.2: The Design Dimension of Musical Works (Elliott 1995:95)

There are two categories of parameters as illustrated above. These two categories are called the syntactic and the nonsyntactic parameters. The syntactic parameters of musical design include melody, harmony, and rhythm. The nonsyntactic parameters of musical design include timbre, texture, tempo, articulation and dynamics. The laws, principles and strategies refer to the ways in which these parameters are organised in a musical work.

Elliott (1995:95) emphasizes that there should be a distinction between the two parameters because of the nature of the generic listening processes. The pitch and rhythm parameters of music are called syntactic because their elements can be organized into patterns that give a sense of musical movement. There is a sense of tones relating to other tones and, therefore, a sense of musical completeness and closure. Elliott writes that discussions of musical syntax are usually concerned with practice-specific rules for the construction of syntactic patterns, but he also draws attention to generic laws and specific strategies. Pitch for instance, can be divided and cognized so that the similarities and differences are proportional.

In contrast, musical patterns of timbre, texture, tempo, articulation and loudness cannot be segmented. There is no equivalent in timbre to a minor third and thus timbres can only be brighter or darker in relation to other timbre patterns and so can dynamics only be louder or softer in relation to other dynamic patterns. Nonsyntactic musical qualities also form relationships, but as explained, these relationships are different. Elliott (1995:95) gives the example of a constant allegro tempo, a steady crescendo, and the continuing timbre of a trumpet section that are all examples of nonsyntactic patterns. Nonsyntactic patterns tend to persist until they cease or alter, or until changes in syntactic dimensions designate a change.

Therefore Elliott (1995:94) suggests that listening for the design dimension in musical works involves cognizing the ways syntactic and nonsyntactic musical patterns are organized, interpreted and performed in relation to practice-based rules and strategies, and in terms of laws and strategies.

Outcome 1 of the NCS for Arts and Culture in the intermediate phase will now be analysed in terms of the design dimensions to determine whether such an analysis can help a teacher to understand the NCS. Only the analysis of Outcome 1 is presented here. Analyses of the other three outcomes will not add to the conclusions that can be drawn from the analysis of outcome 1¹⁰.

¹⁰ Once again the discussion is not exhaustive, even though an exhaustive discussion will have benefits for didactics.

Table 2.5: Outcome 1 Analysed According to the Design Dimension of Musical Works

OUTCOME 1: Creating, interpreting and presenting (The learner will be able to create, interpret and present work in each of the art forms)				
		Syntactic parameters	Nonsyntactic	Organised in relation to
Grade: 4	<ul style="list-style-type: none"> • Uses voice, body and found or made instruments to explore sounds and silence related to walking, running, and skipping note values, in order to explore rhythms and to create sound pictures. • Composes and presents a short rhythmic pattern that has crotchets, crotchets rests, minims and minim rests through body percussion. • Makes in various tone colour, a simple wind instrument such as a Kazoo or Tshikona/Dinaka pipes, or percussion instruments such as shakers. • Creates and presents melodies using voice and found and natural instruments to demonstrate difference in pitch and note values. <p>Composite</p> <ul style="list-style-type: none"> • Makes a puppet and uses it to create a puppet show with music and movement. 	Duration	Tempo Unspecified	Unclear
		Duration	Unspecified	Unspecified
		Not required	Timbre	Not required
		Pitch Duration	Unspecified	Unspecified
		Unspecified	Unspecified	Unspecified
5	<ul style="list-style-type: none"> • Demonstrates concentration and accurate listening through recognizing, repeating and creating rhythms and poly-rhythms, using movement, body percussion and natural instruments. 	Duration	Unspecified	Unspecified
Duration		Not required	Unspecified	

	<ul style="list-style-type: none"> Composes and presents a short rhythmic pattern that has crotchets, crotchets rests, minims, minim rests, quavers and quaver rests through body percussion. Improvises and creates music phrases that use repetition, accent, call and response. Sings songs in long (3/4) and normal (3/8) triplet. <p>Composite</p> <ul style="list-style-type: none"> There are no further Assessment Standards for this Learning Outcome in Grade 5. 	Unspecified	Not required	Unspecified, potentially all three
		Unspecified	Not required	Unspecified
6	<p>Focuses on music from a variety of South African forms:</p> <ul style="list-style-type: none"> Improvises and creates music phrases with voice and/or instruments that explore dynamics, articulation, pitch and rhythmic patterns; Plays simple rhythmic patterns on a drum or equivalent; Explores and uses drum hand techniques such as base slap, open slap, muffle; Reads and sings or plays the scale and simple melodies in C Major. <p>Composite</p> <p>Illustrate/interprets African tales through puppetry:</p> <ul style="list-style-type: none"> -designing and making hand/or head puppets; -devising and producing puppet shows; -composing music for puppet shows; 	Pitch Duration	Loudness Articulation	Unspecified
		Duration	Unspecified	Unspecified
		Unspecified	?Timbre ?Loudness	Unspecified
		Unclear	Unspecified	Unspecified
		None	None	None
		None	None	None
		Unspecified	Unspecified	Unspecified

	-choreographing movement for head puppets if used.	Unspecified	Unspecified	Unspecified
	Uses dramatic devices, visual illustrations, movement and sound to tell jokes, tall stories, lies, fantasies or absurd tales to explore realities in South Africa.	Unspecified	Unspecified	Unspecified

Table 2.5 shows that a restructuring of the NCS in terms of the design dimensions will not greatly aid teachers to develop effective didactic strategies. It reveals that the NCS is biased towards the syntactic parameter of duration to the detriment of pitch, and that nonsyntactic parameters receive little attention. Furthermore the organising principles are almost without exception unspecified or unclear. If a teacher uses the design dimension of musical works as a paradigm to develop teaching-learning processes, the challenge will be great. But the challenges of teaching without a thorough study of the NCS will be even greater.

It is important to note that the current researcher is not suggesting that a curriculum should be based exclusively or primarily upon the design dimension of musical works. Elliott (see 1995: 241-268) discusses curriculum development in some depth, and once again the present researcher agrees with Elliott. It is not the aim of this study to suggest new ways of structuring the curriculum, but even this short analysis shows that once again the 'net' employed in this research to gain greater understanding of the NCS only serves to expose its weaknesses and the challenges it poses to music teachers.

2.3.3 Evaluating the NCS According to Conceptual Progression

Elliott's views on the design dimensions of musical works, used as a basis for the previous section of this report, correspond with the views, beliefs and experiences of the current researcher who, after many years as an educator, came to the understanding that these syntactic and nonsyntactic musical patterns (elements of music) should be taught according to the principle of conceptual progression in order to achieve high levels of knowledge and skill combined with intelligent musical listening abilities in learners. When the NCS is re-ordered in terms of the design dimensions, as was done partly in the previous section of this document, it becomes clear that there exist many gaps and inconsistencies regarding conceptual progression. The NCS is not conducive to educating young musicians because the NCS is not clearly structured according to any paradigm and because conceptual progression is not facilitated in this curriculum.

It is therefore the opinion of the current researcher that there is not only a lack of addressing musical listening skills in the NCS, but that the assessment standards described in this document also do not provide a framework for conceptual progression. In the absence of conceptual progression, the attainment of high levels of skills and knowledge becomes unlikely for most learners. Another researcher with a similar view regarding the lack of conceptual progression in the NCS is Van der Merwe¹¹ (2009: 13-31). She evaluated the conceptual progression in the music assessment standards of the Revised National Curriculum Statement (NCS) Grades R-9 (schools): Arts and Culture, focusing on Music in her research. She took each assessment standard in the NCS Arts and Culture (Music) from Grade R-9 and identified the embedded music knowledge and organised the core knowledge around the elements of music (such as 1. metre, tempo and rhythm; 2. melody and pitch; 3. timbre; 4. texture; 5. dynamics and articulation and 6. form), comparing it firstly to the Harden's progression model and secondly to Queensland Australia's arts curriculum for music. Her categorisation of the elements of music shows similarities to Elliott's design dimensions.

Van der Merwe found that, contrary to other existing learning sequences in music education used elsewhere, the NCS for Arts and Culture takes a non-linear approach to learning, and that this approach does not support conceptual progression. This explains why learners do not have the necessary skills and knowledge to progress to Grade 10 Music. Her findings are supported by Hoadley and Chisholm (2005:17) who state that "in the Arts and Culture Learning Area there is very little reference to conceptual development and knowledge". Conceptual coherence therefore lacks and there are meagre means to support sequence and progression (Chisholm 2000:8).

Van der Merwe (2009: 28) points out that the reason for this unsatisfactory attainment of a high level of knowledge and skills can be the emphasis of social reconstruction in the assessment standards in the NCS, as embedded in nation building, placing it above the acquisition of music skills and knowledge. The current researcher shares this view and knows from experience that the result of the emphasis is that learners in Grade 9 are able to talk about important issues such as human rights, global and local cultures, stereotypes, etc., as required in the assessment standards, but that they are unable to make and create music.

¹¹ Liesl van der Merwe is currently a senior lecturer in music education at the School of Music of the NWU. She previously worked at the Education Faculty of the same university, training teachers in the Arts and Culture learning area. Before that she taught in schools in South Africa. She is widely regarded in SA as a specialist in the field of music education.

Parts of Van der Merwe's analysis of the NCS are used in this report as the third 'net' to better understand the NCS. It is suitable for the present research because of a compatibility with one of the measuring instruments used in this study, namely the Musat Test. The current researcher used the Musat Test as one of the main measuring instruments in this research (as indicated in Chapter 1). The subdivisions of the Musat Test are based on the basic elements of music. In her evaluation of conceptual progression in the National Curriculum Statement (NCS) for Arts and Culture (Music), Van der Merwe focused on the same elements of music. Table 2.6 shows the similarities between the subheadings (elements of music) as used by Van Der Merwe and the subtests of the Musat Test.

Table 2.6: Similarities between Van der Merwe's Categorisation and that of the Musat Test

Van der Merwe	Musat Test
1) Melody and pitch	1) Interval
2) Texture	2) Harmony
3) Timbre	3) Timbre
4) Rhythm	4) Rhythm
5) Tempo	5) Speed
6) Metre	6) Counting
7) Dynamics and articulation	7) Duration
8) Form	8) Not covered in the Musat Test

It is the opinion of the current researcher that a focus on musical listening coupled with meaningful conceptual progression in the teaching-learning processes in Arts and Culture will lead to an elevated score in the Musat post-tests. The learners in this research exposed to only Arts and Culture teaching showed no increase in their scores in the post-tests of Musat (as shown in the results of Chapter 5) which suggests evidence for the weaknesses of the NCS as illuminated in this chapter.

As examples of Van der Merwe's analysis, only two tables with discussions are given here: one for the syntactical dimension of duration (the dimension that received most attention in the NCS) and one for the nonsyntactical dimension of timbre, which also receives some attention in the NCS. These two tables will suffice to illustrate the weaknesses of the NCS and the challenges it poses to teachers.

Learning Sequence of Rhythm (Elliott's Duration: Rhythmic Patterns)

It is the belief of the current researcher that Van der Merwe (2009:18) is correct in her conviction that a spiral ordering of the assessment standards will ensure for example that mixed metres do not feature for the first time at the exit level. A spiral curriculum starts with “an intuitive depiction of a domain of knowledge circling back to represent the domain more powerfully or formally as needed” (Bruner 1996: xii). Therefore it ensures that learners first grasp concepts fundamentally in their most simple forms. This gives learners the springboard to develop their understanding of concepts, to transfer knowledge to other contexts and to grasp relations between concepts. Thus the initial learning of basic concepts or skills is the basis for further learning (Kelly, 2009:107). But this is not how the NCS is structured. It forces teachers to either teach according to the curriculum and hope for the best, or to find the time to fill in the lacunae in the NCS according to a spiral approach. Both ‘solutions’ to the problem poses many challenges, most of them insurmountable within the constraints posed by the current school environment.

The concepts of rhythm and metre are under-specified in the NCS. The minimum requirements are vague and as a result no standards are set. Therefore it is clear that concepts in the NCS for Arts and Culture are not introduced nor revisited at the appropriate levels, where Jones and Cox (in Hargreaves and Zimmerman 1992:387) indicate that the concept rhythm develops from beat to rhythm patterns to metre.

Table 2.7: Learning Sequence of Rhythm (Grade 4-6)

4	Explore walking, running and skipping notes . Use sounds in a free rhythm to create sound pictures. Create a rhythmical pattern with crotchet and minim note values and rests.
5	Recognise, repeat and create rhythms and poly-rhythms . Create rhythmical patterns using crotchets, crotchet rests, minims, minim rests, quavers and quaver rests. Sing and play suitable rhythms of any genre.
6	Play rhythmic patterns on a drum.

Van der Merwe (2009:28) argues that Gordon's and Nzewi's approaches are valuable guidelines for sensible progression in the teaching and learning of rhythm. Nzewi and Gordon start their learning sequences in rhythm with a steady beat (see Gordon, 2006:2). They both see a bodily response to a steady beat as the starting point for rhythm and metre.

However, the NCS Arts and Culture starts with changes in tempo and a variety of rhythms. Learners are supposed to react with movement to a variety of rhythms (Grade R) (DoE 2002b:16).

In Grade 5, learners have to sing/play suitable rhythms in any genre and in Grade 7, learners are expected to sing/play South African songs from different cultures with suitable rhythms. There is a slight development from a general to a specific context. However, rhythm is not first established and developed in a spiral manner (Van der Merwe, 2009:27).

Van der Merwe (2009:27) points out that in the NCS for Arts and Culture there is no sensible progression in rhythm as beat (walking notes), dividing beats (running notes) and dotted rhythms (skipping notes) are all introduced simultaneously in Grade 2 (DoC, 2002b:24).

- Note values are only mentioned in the assessment standards in Grades R,1,6,7 and 9;
- In Grades 2, 3 and 4, the expected note values to be learned stay the same. Although the activities of body percussion (Grade 2), identify (Grade 3), and explore (Grade 4) imply progression, this progression is undermined by the fact that the note values stay the same over three years. There is only progression in difficulty and utility and not in breadth or proficiency; and
- In Grade 8, the only note values mentioned in the assessment standards are crotchets, quavers and minims.

Learning Sequence of Timbre

The NCS refers to timbre in several of the assessment standards, but this also does not show evidence of a well-planned sequence and also exhibits weaknesses because of a lack of a clear paradigm regarding the many aspects of timbre.

Table 2.8: Learning Sequence of Timbre (Grade 4-6)

4	Create sound pictures with voices. Identify and classify music instruments (appearance, name, sound production, high or low). Make wind instruments and percussion instruments with different timbres .
5	Recognise and describe different timbres of voices in choral music.
6	Drum hand techniques such as base slap, open slap, muffle.

In her evaluation of conceptual progression Van der Merwe (2009: 20) discovered that many important aspects of instruments are not covered, such as local names for, and stories about, instruments and exploring the materials, parts and construction of musical instruments. Thus the breadth of progression is insufficient. The difficulty is also not gradually increased, because too much is done on timbre in Grades 4 and 7 and too little in Grades 2, 3, 6 and 9. Identifying vocal timbre is only mentioned in Grade 5 and not prepared or revisited and therefore no increase in difficulty regarding vocal timbres take place.

Van der Merwe (2009: 27) states that learners are not expected to identify instruments (in Grades R, 1, 2, 3, 5, 8 and 9) or voices (in Grades 1, 2, 3, 4, 6, 7, 8 and 9) in their authentic ensemble contexts. Only Grades 4 and 7 focus on classifying instruments and only Grade 5 on classifying voices. She points out that because learners do not specialise in playing a musical instrument there is not an acceptable increase in proficiency in this regard. There are some references to performing instruments:

- various percussion instruments (Grades 2, and 4);
- aerophone and idiophone ensembles (Grade 4);
- natural instruments (Grade 5);
- drums and marimbas (Grade 5, and 6); and
- percussion and melodic instruments (Grade 9).

Through playing various instruments, learners do not develop competence in playing a specific instrument. Van der Merwe (2009: 20) believes that knowing develops through doing and that concept formation about timbre takes place through, among others, playing instruments and singing. Since singing is addressed in every grade in the NCS Arts and Culture, it will be possible for learners to become competent singers. An increase in proficiency in singing can thus be observed, but not in instrument playing.

This brief representation of selected ideas from Van der Merwe's analysis of the NCS, together with the evaluations in the previous two sections of this report, clearly shows that a piecemeal approach to understanding and 'remedying' the NCS is not powerful enough to enable teachers to develop effective didactic methods. A more powerful framework is needed, and such a framework can be found in the praxial philosophy of David Elliott.

2.4. THE PRAXIAL PHILOSOPHY OF MUSIC EDUCATION OF DAVID ELLIOTT

Elliott is best known for his 'Praxial Philosophy of Music Education', as presented in *Music Matters: A New Philosophy of Music Education* (Oxford University Press, 1995). His praxial philosophy of music education holds that musicianship (which always includes listenership) equals musical understanding, since auditory cognition is a multidimensional form of thinking and knowing. This is one of the basic tenets of the praxial philosophy and the one that is most relevant for the current research¹².

Elliott's philosophy is chosen as a grid into which aspects of the NCS can be unpacked and packed, because the theory is widely known in music education, and because it is clearly documented and debated. Thomas Regelski, a highly regarded music educator in the USA and world-wide writes that "... *Music Matters* has indeed provided a needed and important jump-start in the thinking of many musicians, educators and theorists. This has been entirely to the good" (Regelski, 2005: 240). He describes the book as a path-breaking work (Regelski, 2005:238). It is clear from the debates on the praxial philosophy that were published in *Praxial Music Education: Reflections and Dialogues* (Elliott, 2005) that the philosophy has sufficient scope and depth to be used for the purpose identified in this chapter. Furthermore, it is sufficiently general to be applicable in South African contexts, even though Elliott is a Canadian music educator¹³.

The current researcher's use of the praxial philosophy as a frame for increasing didactic understanding follows a suggestion by Elliott (1995:vii) to use the philosophy as "a tool – as a means of initiating, simulating, guiding and supporting the efforts of music teachers (administrators, parents and others) as they tackle the many theoretical and practical issues involved in music education." Although there are a few other philosophies (such as the one by Bennett Reimer) that could have been used for the same purposes in this research report, the choice of Elliott will not be a surprise to music educators, even to those who disagree with part or all of Elliott's philosophy.

¹² A full overview of the philosophy is not possible here. *Music Matters* is densely written and argued, with the results that any attempt to provide a full overview will loosen the focus of this research report. The focus in this section of the chapter falls on providing a 'grid' which can be employed to analyse the NCS.

¹³ The selection of the praxial philosophy will not be defended in this research report. The selection was a complex matter. Elliott's philosophy has been supported and critiqued over more than fifteen years. It will not be possible to revisit the debates here.

The choice to employ the praxial philosophy in this research does not imply that there are no alternatives. Another well-developed philosophy could also have served as the 'net' to analyse the NCS. The fact that Elliott believes that musical listening is a matter of minding which involves various cognitive processes like construct, chain, compare, order, abstract, transform, recall, and imagine auditory patterns (see Elliott, 1995: 86), makes his philosophy the obvious choice to link with the Tomatis Method. Both of these authors suggest that music is a matter of information that arises in consciousness through interactions between powers of attention, cognition, emotion, volition, and memory of a person and the artistically created aural patterns of a piece of music (see Elliott, 1995:84). This overlap is discussed in greater depth in Chapter 8 of this study.

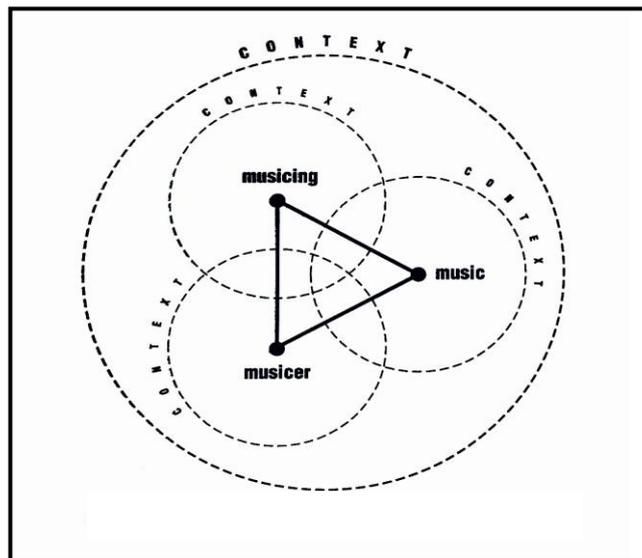
Elliott (1995: 121) believes that developing the knowledge required for meeting significant challenges in a particular context or domain of effort, leads to self-growth, self-knowledge and enjoyment. These consequences contribute, in turn, to the development of self-esteem and happiness. Music making is a unique and major source of self-growth and self-knowledge. These factors are related to some of the constructs tested by one of the psychological measuring instruments used in this research, namely the Tennessee Self-Concept Test. This overlap also suggests that it is meaningful to utilise Elliott's philosophy in this research design.

When musicianship is developed, musical creativity will automatically develop. Musical creativity and musicianship are mutually interdependent and interactive, and this is a very important conviction in the praxial philosophy. Creativity can be tested by another psychological measuring instrument used in this research: the Torrance Creativity Test. Once again, this overlap suggests that it is meaningful to utilise Elliott's philosophy.

It is the opinion of Elliott (1995:11) that to "anchor, organize, maintain, improve, and explain music education a philosophy is required. This should be a critically reasoned network of concepts and beliefs about the nature and significance of music education". It is, therefore, important for every music teacher to understand the benefits of a close working relationship between philosophy and music education. Elliott (1995:9) explains that a philosophy should be treated as a map, and in the world "a map provides a comprehensive overview of a territory. It gives us our bearings. It helps us decide where to go and how to get there. Like a good map, a good philosophy can show us the best route to our destinations based on careful considerations of the territory we want to travel. It may also point us to routes and destinations we never considered". From the previous analyses of the NCS it became clear that music teachers do indeed need a map to navigate the uneven terrain of the NCS.

Elliott (1995:39) argues that if music is essentially a form of intentional human activity, then music should be seen as a tetrad of complementary dimensions involving (1) a doer (or maker), (2) some kind of doing (the product he or she makes), (3) the activity whereby he or she makes the product, and (4) the complete context in which doers do what they do. Music can thus be illustrated as a four-dimensional concept:

Figure 2.3: The Four Dimensions of Musicing (Elliott 1995:40)

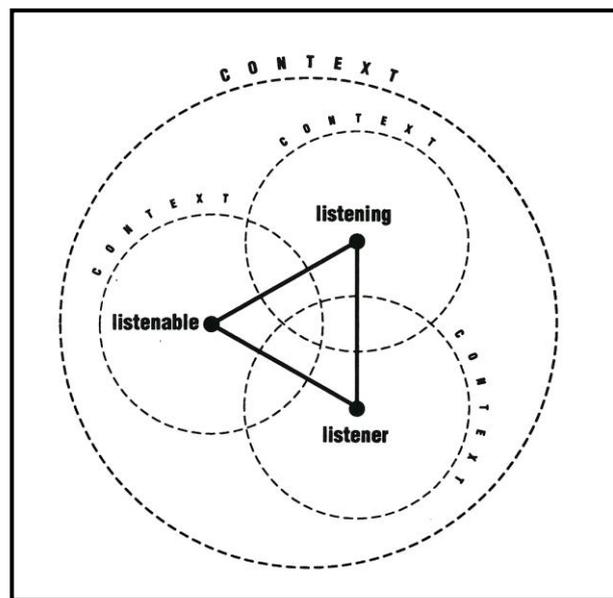


Elliott refers to musical doers as *musicers*, to musical doing as *musicing* (a contraction of music making), and to the musical “something done” as *music* – in the sense of performance, improvisations, and other kinds of audible musical achievements. Elliott also uses *musicing* in the collective sense – implying all five forms of music making: performing, improvising, composing, arranging, and conducting¹⁴.

¹⁴ Some of Elliott's ideas are stated in several passages of *Music Matters*. For ease of reading of this study, the present researcher decided not to give bibliographical references for every single presentation of every one of Elliott's ideas in this section of the study. This section consists of a presentation of Elliott's ideas. All ideas are his, even if the specific page (as in the case of ideas often stated in different parts of the book) is not mentioned. Mentioning some, several or all of the relevant pages would have made sections of this study impenetrable for the reader. This is due to the way in which the book is put together. Elliott (1995:15) writes: “... please note that the concepts and ideas in this book unfold gradually. There are several lines and layers of thinking that continue to develop from chapter to chapter, as one might expect from any topic as rich and complex as music education.” This posed considerable challenges to the current researcher in writing the overview of the philosophy in this chapter of the study.

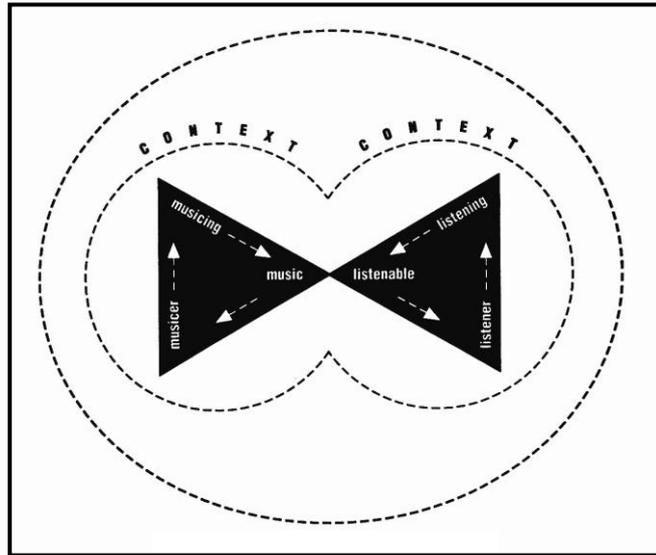
One of the most important tenets of Elliott's philosophy is that he views **listening** as the essential thread that binds the four basic dimensions of music together. Musicians, music-making, and musical products form a dynamic system of exchange and feedback: music makers are influenced by why and how their audiences (including themselves) **listen** to what they do and, equally, **listeners** are influenced by why, what, and how musicians do what they do. Musical listening, as an intentional human activity, can thus be seen as another kind of doing and forms another four-dimensional set of relationships as seen in the diagram below (see Elliott, 1995: 42-43).

Figure 2.4: Music Listening – Four Dimensions (Elliott 1995:43)



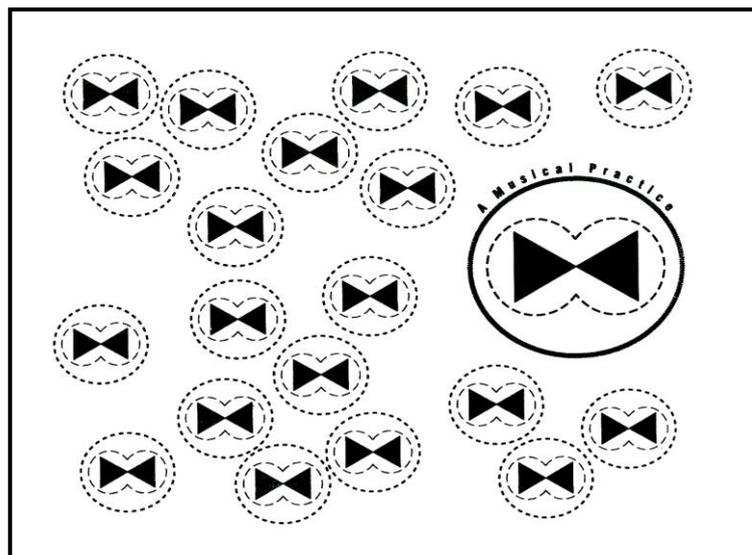
For this reason, Elliott (1995:44) sees music as a “multidimensional human phenomenon involving two interlocking forms of intentional human activity: music making and music listening. These activities are not merely linked; they are mutually defining and reinforcing”. He calls the human reality formed by this interlocking relationship a ‘musical practice’.

Figure 2.5: A Musical Practice (Elliott 1995:44)



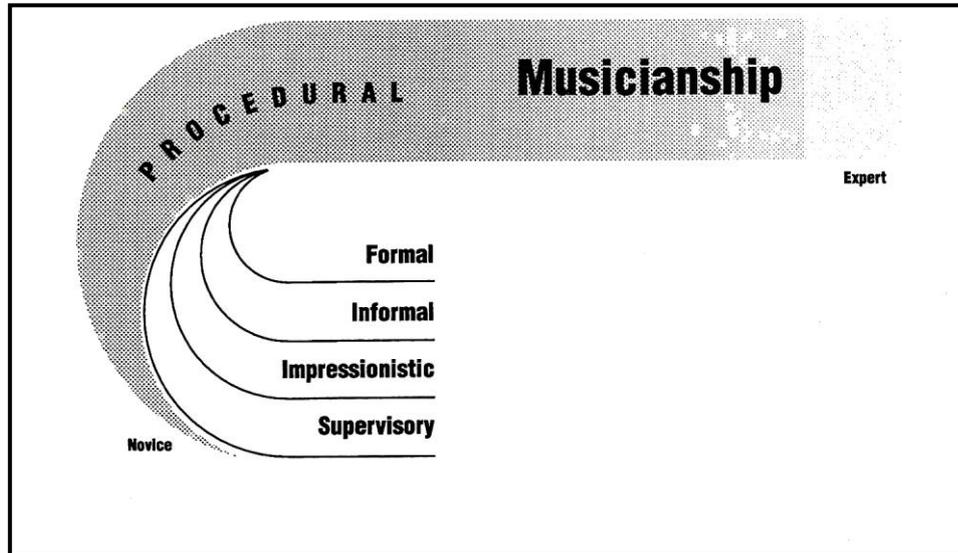
There are many different musical practices. Elliott (1995: 44, 45) explains visually in the interlocking triangle forms (above and below) that every musical practice involves the two corresponding and mutually reinforcing activities of *music making* and *music listening*.

Figure 2.6: Music: A Diverse Human Practice (Elliott 1995:45)



2.4.1 Musicianship

Figure 2.7: Musicianship (Elliott 1995:54)



Elliott's praxial philosophy of music education holds that musicianship (which always includes listenership) equals musical understanding and is therefore a form of working understanding (Elliott, 1995: 68; see also Elliott, 1995: 57). The word *understanding* implies a related network of ways of knowing which are not always linear or verbal. These ways of knowing are like a web, and in essence they are procedural (Elliott, 1995: 68). Elliott (1995:68) further qualifies this by writing that the "word *working* suggests a practical form of knowing – knowing anchored in the contexts and purposes of specific musical practices". Elliott (1995: 68-69) shows how the characteristics of the forms of understanding as identified by David Perkins apply to his ideas about this working knowledge:

First, musicianship is a *relational* form of knowing. It is gridlike. Competent, proficient, and artistic music makers know how different aspects of musicing relate to one another in terms of cause-effect, whole-part, form-function, comparison-contrast, and production-interpretation. More broadly, to possess musicianship is to comprehend how the components of one's thinking and knowing relate to the goals, ideals, standards, and histories that define particular musical communities and thereby give one's musical efforts meaning.

Second, musicianship is *coherent*. At an expert level, the various strands of tacit and verbal knowings that make up this multidimensional form of understanding weave together in a seamless fabric of fluid thinking-in-action. Musicianship is not only

unified in itself, it is effective in achieving the practical ends of musical excellence and creativity as artistic music makers actually know them.

Third, musicianship includes what Perkins calls “standards of coherence”. Standards of musical excellence, originality, and significance anchor and define the contents of musicianship. In doing so, standards also serve to guide the development of musicianship. As the various components of musicianship grow and weave together, knowledge of musical criteria directs music makers toward new goals and new possibilities of music making within a given genre.

Fourth, musicianship is a *productive* form of knowledge. As in all forms of working understanding, the relevant test of musicianship is the way it “plays out in action in response to the demands and opportunities of the moment”. What this chapter calls the procedural essence of musicianship, David Perkins terms “generative use”, the demonstration of understanding in practical achievement.

Fifth, musicianship is *open*. Like all forms of genuine understanding, musicianship is not an end but a continuous process. It grows in the way that a complex web weaves inward and outward. It develops as each of its five knowledge components mature and interweave with each other.

In the previous illustration (see figure 2.7) Elliott (1995:54) illustrates that music making (musicianship) is overall a matter of *procedural knowledge*. That, however, is not the only kind of knowing, but four other kinds of musical knowing/knowledge contribute to the procedural essence of music making. They are:

- formal musical knowledge,
- informal musical knowledge
- impressionistic musical knowledge
- supervisory musical knowledge

Collectively, these five kinds of musical knowing constitute musicianship. It is these five forms of knowledge that will be used below to analyse a section of the NCS, and for this reason each form of knowledge is explained further.

2.4.1.1 Procedural Knowledge

According to Elliott (see 1995:53, 54) musicianship can only be understood accurately if its procedural nature is understood. Procedural knowledge forms the umbrella under which all four the other kinds of knowledge will function (see Elliott, 1995: 54). The competence or proficiency of a person's knowledge is not manifested verbally, but practically. Elliott (1995:56) states it this way: "*our musical knowledge is in our actions; our musical thinking and knowing are in our musical doing and making*" (Elliott's emphasis). The procedural dimensions of musicianship are clarified by presenting four supplementary ideas. Elliott (1995:59) puts it this way:

- Actions of musical performers are not natural but cultural actions which require "the elaboration, extension, and very often the reconstruction of everyday movement patterns."
- The actions of musical performing involve different costs, benefits and levels of risk regarding success. Performing music requires personal judgments in action.
- The actions of performing are most often rehearsed before performances. Actions are prepared, informed, and practiced.
- In order to prepare for performance, musicians have to think deductively as well as inductively.

2.4.1.2 Formal Musical Knowledge

This kind of knowledge can be called textbook knowledge. It includes verbal facts, concepts, descriptions and theories (Elliott, 1995:60). He (1995:61) explains that "by itself however, formal musical knowledge is inert and unmusical. It must be converted into procedural knowing-in-action to achieve its potential".

Elliott's praxial philosophy of music education "holds that formal knowledge ought to be filtered into the teaching-learning situation parenthetically and contextually. This contextualization of formal knowledge enables learners to understand its value immediately and artistically" (Elliott, 1995:61). He identifies the acquisition of formal musical knowledge a valid but secondary goal of music education (Elliott, 1995:62).

2.4.1.3 Informal Musical Knowledge

Elliott (1995:64) sees Informal knowledge as situated knowledge: “it is knowledge that arises and develops chiefly from musical problem finding and musical problem solving in a genuine musical context or a close approximation of a real musical practice”.

People who know how to do things well in specific domains of practice have developed an ability or practical common sense which could be referred to as informal knowledge. It involves the ability to know when and how to make musical judgements, thus to reflect critically in action. Musical judgement “depends on an understanding of the musical situation or context: the standard and traditions of practice that ground and surround a particular kind of music making and music listening” (Elliott, 1995:63). Informal musical knowledge then is distinctive in being closely tied to learning and working in the local conditions of a practice.

2.4.1.4 Impressionistic Musical Knowledge

Elliott (1995:64) is of the opinion that Impressionistic musical knowledge is also situated knowledge, just like informal knowledge. The two kinds of musical knowledge are not easy to distinguish. Impressionistic musical knowledge involves feelings more than informal knowledge does and it develops through critical musical problem solving in relation to natural music making challenges. It can therefore not be taught or learned in abstraction from the actions and contexts of actual music making. The word then that would come closest to what is meant by impressionistic knowledge is intuition. It is what experts know as a strongly felt sense that one line of action is better than another.

Elliott (1995:64, 65) writes that “at root, impressionistic knowledge is a matter of cognitive emotions or knowledgeable feelings for a particular kind of doing and making. Cognitive emotions play an essential role in helping music makers evaluate, decide, judge, generate and select musical options in the actions of music making”.

Impressionistic musical knowledge makes an essential contribution to musicianship. It helps assess, categorise, and “place” musical actions in their proper positions. It is especially important in grounding the ability to make critical musical judgements in action (Elliott, 1995:65).

2.4.1.5 Supervisory Musical Knowledge

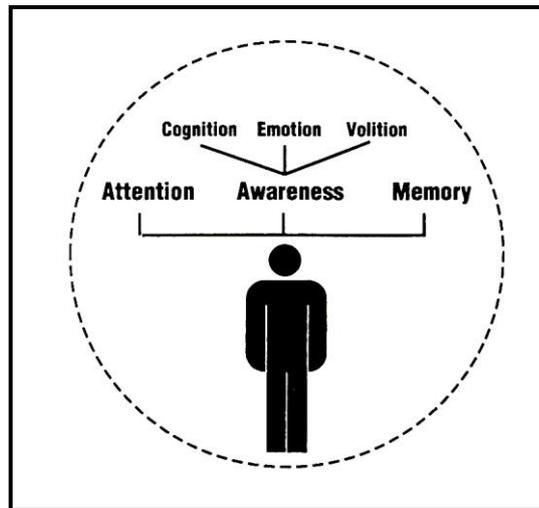
This kind of knowledge can be described with the terms metaknowledge or metacognition. This form of musical knowing “includes the disposition and ability to monitor, adjust, balance, manage, oversee and otherwise regulate one’s musical thinking both in action (“in-the-moment”) and over the long-term development of one’s musicianship” (Elliott 1995:66).

As another kind of situated knowledge, supervisory musical knowledge develops “primarily in educational contexts centred on musical actions, interactions, and transactions with life-like musical challenges” (Elliott, 1995:67).

2.4.2 Consciousness, Knowledge and Thought

In the analysis of the NCS the role of musical listening is taken as the central point of departure. As argued above, musicianship always includes listenership, and for this reason the next step in preparing to analyse the NCS in terms of the framework of the praxial philosophy is to explain listenership from Elliott’s perspective. However, before that can be done it is important to understand consciousness, knowledge and thought from the most fundamental sense of an individual, namely the conscious self as listening, and listening as a matter of minding which involves various cognitive processes like construct, chain, compare, order, abstract, transform, recall, and imaginary auditory patterns.

According to Elliott (1995:51) consciousness is part of the human nervous system which is the product of biological processes. These physical processes of the brain bring about all the characteristics of human consciousness. These characteristics include thinking, knowing, feeling, imagining, attending, remembering and intending. He therefore states that consciousness is “neither a mystical power nor a secret compartment in the head” (Elliott, 1995:51). It functions in terms of three integrated subsystems: attention, awareness, and memory with awareness consisting of the three capacities named cognition, emotion and volition (or intention) (see Figure 2.8). As a result it is clear that, attention, awareness, and memory constitute the human meaning-making system that is called consciousness (self).

Figure 2.8: Consciousness, or Self (Elliott 1995:52)

Elliott (1995:52) sums the above up by describing the following 'process'.

- Firstly: attention, awareness, and memory interact.
- Secondly: every aspect of consciousness depends on attention. Attention is required to select, sort, retrieve, and evaluate all overt and covert actions. Attention is an energy supply that fuels thinking and knowing in all their various forms.
- Thirdly: there are varieties of thinking and knowing (verbal expression is not the only form it can take).

Elliott (1995:113) explains that

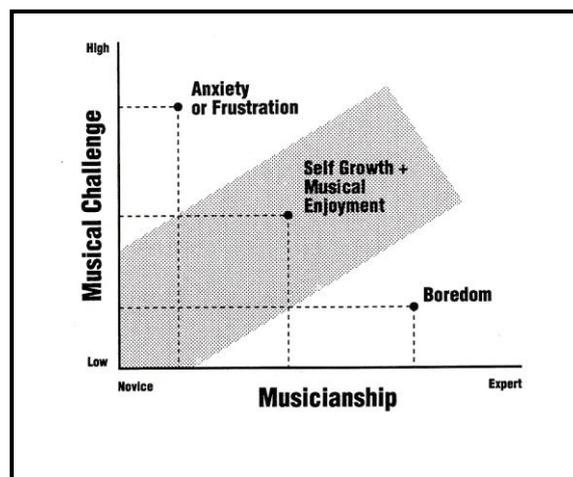
as each person develops and realises his or her powers of attending, thinking, feeling, intending and remembering, individual consciousness grows to the point of developing an independent status called the self. Each human self is a unique pattern of intentions and goals. The self determines when and where the energy of attention will be deployed. The self is not linear but circular and dynamic. This is so because: (1) attention to outside and inside information determines conscious content; (2) conscious content shapes intentions and goals; and (3) intentions and goals determine the deployment of attention.

Any form of intentional action that exercises a corresponding form of knowledge provides the basis for structuring consciousness which will bring about enjoyment. Therefore self-growth and enjoyment are set in motion by a challenge (Elliott, 1995: 115). A challenge continues to provide self-growth and enjoyment when both the challenges and the knowledge that define the pursuit become more complex over time (Elliott, 1995:116).

Self-Esteem

An outcome of self-growth is increased self-esteem. Elliott (1995: 118) states that “to have self-esteem is to have an overarching awareness (an intrapersonal kind of supervisory knowledge) that one has achieved, or that one possesses, desirable qualities ...self-esteem manifests itself as an intra-personal kind of impressionistic knowledge: as a feeling that one is successful, good, capable or productive”. Elliott (1995:119) makes it clear that self-growth, self-knowledge and enjoyment increased when the knowledge required for meeting significant challenges in a particular context or domain of effort is developed (see Figure 2.9). These consequences contribute to the development of self-esteem and happiness. Music making is a unique and major source of self-growth and self-knowledge (or constructive knowledge).

**Figure 2.9: Musicianship x Musical Challenge = Musical Values
(Elliott 1995:122)**



Creativity

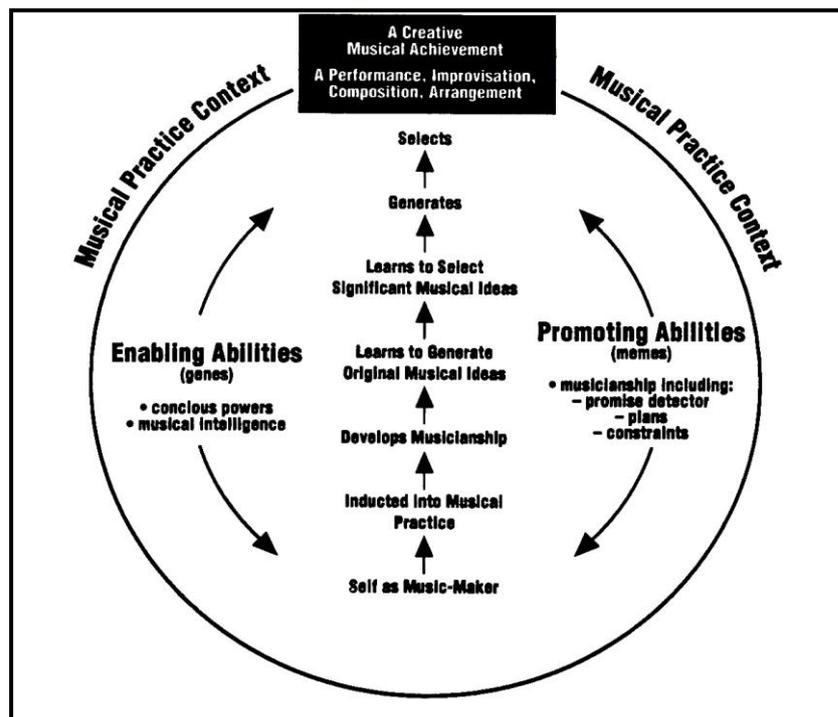
Elliott bases his thoughts regarding creativity on the work of Perkins and Csikszentmihalyi who identify knowledge and continuous effort in a specific domain of practice as the main sources of creative achievements (see Elliott, 1995:217). Elliott (1995: 219) believes that in the “domain of MUSIC then, the words *creative* and *creating* apply to achievements of musical composing, improvising and arranging that are original and significant within the context of a particular musical practice, including instances of musicing that depart in highly original and important ways from existing traditions”.

It is the belief of Elliott (1995: 224, 223) that “the roots of ordinary thought (including comparing, contrasting, remembering, inferring, and rule following) are also the roots of the

kind of thinking that yields creative achievements”: “...what goes on in consciousness during the making of creative products involves the same kinds of cognitive strategies we use to solve everyday problems, including metaphorical, analogical, and lateral forms of thinking”.

Elliott (1995: 223) states that when people are working at the edge of their abilities in order to achieve original and significant outcomes (to meet a challenge of some kind) reward is motivation for persisting in such demanding efforts. Creating is a matter of intentional, goal-directed effort. Learners who have reached certain levels of musicianship can produce creative musical results in their performing, improvising, composing, arranging and conducting, and the level of creativity will depend on the musical significance and originality of their achievements (Elliott, 1995: 220). It is clear that musical creativity cannot be developed in the absence of musicianship. Musical creativity and musicianship are mutually interdependent and interactive.

Figure 2.10: Musical Creativity in Context (Elliott 1995:230)



2.5 THE FUNDAMENTALS OF MUSIC LISTENING STRUCTURED ACCORDING TO ELLIOTT

Elliot always emphasises that “music of whatever kind always includes another kind of doing called music listening” (Elliott, 1995:78). According to him listening is fundamentally a concealed form of thinking-in-action and knowing-in-action. During acts of listening raw, one-sided information is taken in. The conscious powers of attention, awareness and memory then produce revised and enhanced representations of this information. As hearing involves degrees of attention, awareness and memory it explains why people differ in the details of what they hear (see Elliott, 1995:80). Furthermore, listening is a context-dependent process. Elliott (1995:81) explains that “what we hear comes to us not as neat little eggs in a row but as something more like scrambled eggs. The complexity of listening is increased by the fact that attention is a finite resource and that auditory cognition has limits”.

There are several basic reasons according to Elliott (1995: 78-79) why the belief of thoughtless listening cannot be supported. Listeners are bombarded with sound of which they can only absorb a limited amount because human attention is highly selective and limited. Human consciousness continuously anticipates and seeks out information of all kinds. Interpretation of information arises in consciousness by means of attention. Attention is required to select, sort, retrieve, organise and evaluate all the sound input.

Elliott (1995:80-82) remarks that listening cannot be direct or immediate, and that “competent, proficient, and expert levels of music listening involve active listening-for”. Intelligent music listening requires the deliberate deployment of a person’s powers of consciousness to achieve an intention. Music listening requires that auditory information will be interpreted and constructed in relation to personal understanding and beliefs. Personal understandings and beliefs (tacit and verbal) always mediate the auditory processes. Listening is thought-full and knowledgeable. As a result there is an increased level of personal involvement and knowledge as the shift from merely hearing to listening-for takes place. Within audition a differentiation can thus be made between passive hearing and active listening-for (see Figure 2.11). He argues that: “All acts of attending, scanning, identifying, interpreting, constructing, and comparing occur as a result of innate and learned principles of musical pattern construction The brain-mind’s complex mixing board is guided fundamentally by procedural understandings: by non-verbal, practical, and practice-specific knowing that most people in most cultures use implicitly and begin to learn easily and early in life” (Elliott 1995:83). In Figure 2.11 the degrees of audition is illustrated:

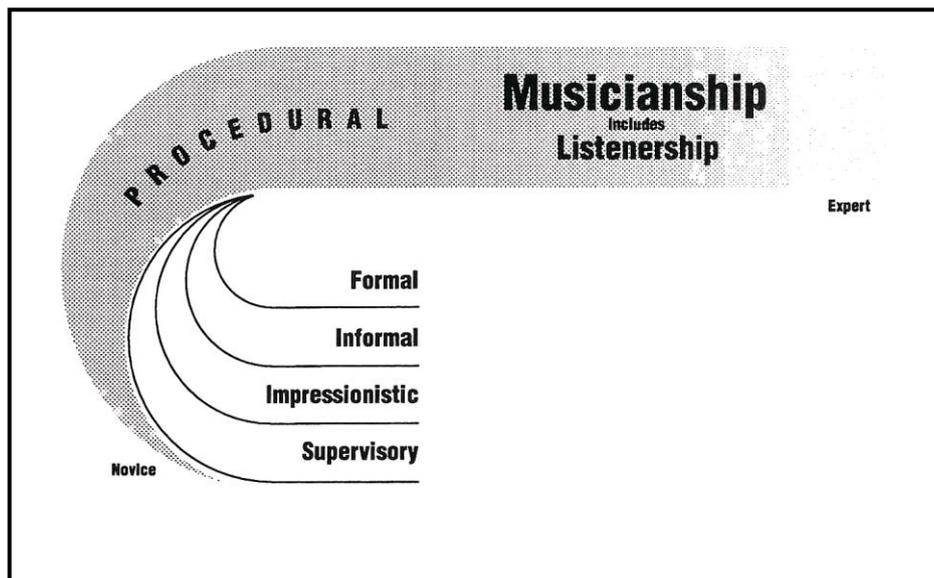
Figure 2.11: Degrees of Audition (Elliott 1995:80)



2.5.1 Musicianship and Listenership

As already mentioned, Elliott holds that musicianship always includes listenership. He (1995:96) describes that the kinds of musical knowing required to listen competently, proficiently, or expertly to the works of a given musical practice are the same kinds of knowing required to make the music of that practice: procedural, formal, informal, impressionistic and supervisory musical knowledge (see Figure 2.12 below).

Figure 2.12: Musicianship – Listenership (Elliott 1995:96)



2.5.1.1 Procedural Essence of Music Listening

The procedural essence of music listening is described by Elliott (1995: 84): this essence “consists in such covert, nonverbal acts as constructing coherent musical patterns, chaining musical patterns together, making same-different comparisons among and between patterns, and parsing musical patterns into different types of textures”. The procedural dimension of

listening includes four processes identified as closure, abstraction, transformation, and hierarchic structuring (Elliott, 1995:85).

Elliott's discussion of the procedural nature of musical listening is summarized by him (1995: 86-87) in terms of four closely related themes:

1. The procedural dimension of music listening involves various cognitive processes. When listening to a musical work, auditory patterns are created, chained, compared, ordered, abstracted, transformed, recalled, and imagined.
2. The relationship between human listening and "what musicians make for people to listen for" is reciprocal, because in musical works generic human listening processes and the practice-specific ways in which different cultures initiate and develop these processes are actualised.
3. "Music listening is a matter of minding". What is experienced as a musical performance concerns information that arises between the powers of consciousness and the artistically created aural pattern of a piece of music.
4. Musical experiences "depend on cognising very specific kinds of sound patterns in very specific ways".

2.5.1.2 Formal Musical Knowledge and Listening

Theoretical knowledge about the syntactic and nonsyntactic parameters of music is relevant to musicians and music listeners (Elliott, 1995:96): "The technical languages used by music theorists and historians can be extremely useful in helping listeners identify, construct, organize, and analyze successive and simultaneous musical patterns". Elliott (1995: 96) explains that musical works can be discussed systematically, relatively, phenomenologically, descriptively and in terms of artistic qualities.

2.5.1.3 Informal Musical Knowledge and Listening

Informal musical knowledge is a basis for learning how to listen intelligently (Elliott, 1995:98). It is the opinion of Elliott (1995: 98) that "if music listening were a matter of listening for natural sounds, then listeners could learn to listen well without the informal knowledge that arises in the processes of reflective music making. And if musical works were only a matter of abstract patterns, then listeners could achieve a competent level of listening without acquiring the critical thinking abilities that arise in the course of learning to make music competently, proficiently, and expertly".

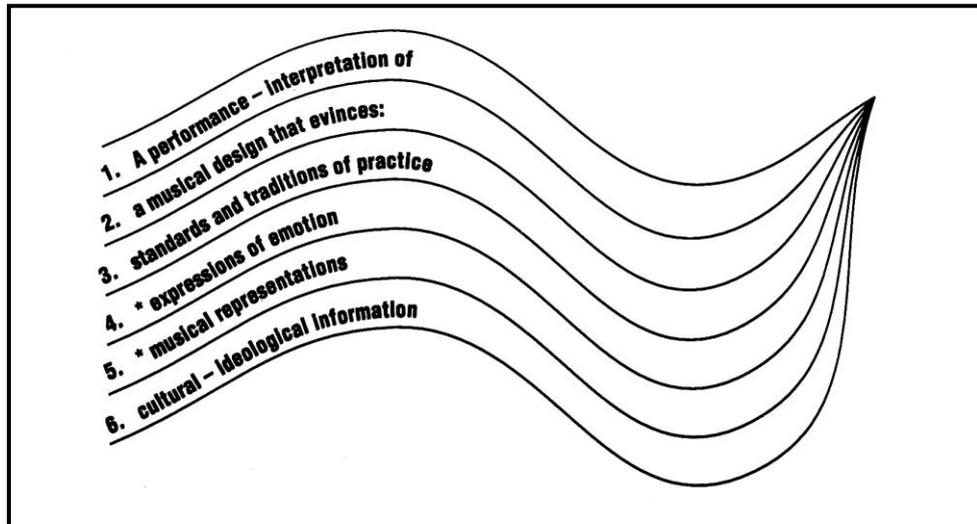
When a musician listens to his/her own efforts to make music competently, the ability to listen critically develops and strategic judgments are made possible. This development comes when the musician makes practical musical choices while assessing his outcomes. This process involves the testing of alternative artistic strategies during musical problem solving (Elliott, 1995:98).

2.5.1.4 Impressionistic Musical Knowledge and Listening

“Becoming a competent listener includes developing a refined emotional sense or feel for what is musically appropriate, original, and artistically significant in the music one makes and listens for” (Elliott, 1995: 98). Impressionistic musical knowledge (see 2.4.1.2) involves cognitive emotions which Elliott (1995:98-99) describes as “educated feelings for particular kinds of music and listening” arising “from one’s knowledge and beliefs about everything from the cultural meanings of tones-for-us to the most precise details of musical interpretation and compositional design”.

2.5.1.5 Supervisory Musical Knowledge and Listening

According to Elliott (1995:100), reflecting upon the listening process allows listeners to direct their attention to the ways in which they are using their kinds of musical knowing. An important aspect of this supervisory knowledge involves auditory imagination, because music listening includes several kinds of cognition that depend on relating an incoming pattern and a previously heard and remembered music pattern. Elliott (1995: 100) suggests that proficient and expert listeners may develop a “supervisory intention” to generate and use musical imagery while listening. He states that the ability to “make accurate comparisons between real, remembered, and imagined musical patterns orients a listener’s thinking-in-action within the bounds of a given practice and style. It also engages a listener in anticipating, hypothesizing, or listening ahead for the kinds of musical information that may (or should) be coming next in the moment-to-moment events that constitute a musical work”.

Figure 2.13: Six Dimensions of a Musical Work (Elliott 1995:199)

The diagram in Figure 2.13 summarizes the demands that musical works place on musicians and listeners alike according to Elliott (1995: 199). This philosophy proposes that every musical work involves at least four and often as many as six simultaneous and interrelated dimensions of musical information. He states the following (compare Elliott, 1995:155-156, 199-200).

- 1) Listeners always listen to a performance of some kind.
- 2) Every musical performance involves a musical design, either composed or improvised. This design is an ordering, also reconstructed in terms of relations by listeners, of syntactic and nonsyntactic musical parameters.
- 3) Every performance or improvisation can be related to aspects of a particular musical practice. Musical traditions and criteria generate the qualities of musical sound patterns and can be heard in the artistic ways that musicians create musical works when performing, improvising, composing, arranging, and/or conducting.
- 4) The musical designs and performances of some musical works involve musical expressions of emotion. Music teaching-learning should develop student musicianship as far as musical expressiveness is concerned.
- 5) Sometimes aspects of the lived world are expressed in musical designs or performances.
- 6) Because all musicing is a socio-cultural event, cultural knowings, beliefs and values will be reflected in musical designs or performances.

2.5.2 Analysing the NCS According to Listenership

In Section 2.3.1 of this chapter the NCS was evaluated in terms of the role of musical listening in the assessment standards for the intermediate phase of the Arts and Culture learning area. Assessment standards (or outcomes) were roughly classified into three categories. The first category contains those outcomes that can be reached without music listening. The second category groups together outcomes that are unclear as to the degree to which a learner has to use musical listening to achieve the outcome, and the third category contains those outcomes that can be reached only when a learner relies on musical listening.

In this section of the report each of these categories are revisited, but this time in order to determine how Elliott's perspective on listenership helps the teacher to interpret the outcomes suggested by the assessment standards in terms of didactic methods that take musical listening as their basis. The perspective on listenership will be uncovered specifically in relation to the five forms of musical knowledge which are summarised in Table 2.9 below.

Table 2.9: The Five Kinds of Musical Knowledge (Summary)

<ul style="list-style-type: none"> • Procedural musical knowledge <ul style="list-style-type: none"> ○ Involves various cognitive processes ○ Forms the umbrella
<ul style="list-style-type: none"> • Formal musical knowledge <ul style="list-style-type: none"> ○ Theoretical knowledge about the syntactic and nonsyntactic parameters of music
<ul style="list-style-type: none"> • Informal musical knowledge <ul style="list-style-type: none"> ○ Knowledge arising from musical problem finding and musical problem solving – practical common sense
<ul style="list-style-type: none"> • Impressionistic musical knowledge <ul style="list-style-type: none"> ○ Intuition – strongly felt sense that one line of action is better than another ○ Emotional sense or feel – cognitive emotion ○ Educated feelings for musicing and listening
<ul style="list-style-type: none"> • Supervisory musical knowledge <ul style="list-style-type: none"> ○ Meta-knowledge/ Meta-cognition ○ Develops in educational contexts ○ Includes disposition and ability to <ul style="list-style-type: none"> - monitor, - adjust, - balance, - oversee, and - regulate musical hearing.

2.5.2.1 Category 1 Assessment Standards (no Musical Listening)

Category 1 Assessment Standards for Outcome 1: Creating, Interpreting and Presenting

Grade 4

1) Makes in various tone colour, a simple wind instrument such as a Kazoo or Tshikona/Dinaka pipes, or percussion instruments such as shakers

Grade 5

No assessment standards in Grade 5 (Outcome 1) categorised

Grade 6

- 2) Designing and making hand/or head puppets
- 3) Uses dramatic devices, visual illustrations, movement and sound to tell jokes, tall stories, lies, fantasies or absurd tales to explore realities in South Africa

Category 1 Assessment Standards for Outcome 2: Reflecting

Grade 4

- 4) Recognizes time signatures such as four-four and – three-four

Grade 5

- 5) Recognizes the letter names of notes on lines and in spaces on a treble staff and their differences in pitch

Grade 6

- 6) No assessment standards here

Category 1 Assessment Standards for Outcome 3: Participating and Collaborating

All assessment standards for outcome 3 were evaluated as category 3.

Category 1 Assessment Standards (no musical listening) – Outcome 4: Expressing and Communicating

Grade 4

No assessments standards for Grade 4 in this category

Grade 5

No assessment standards for Grade 5 in this category.

Grade 6

No assessment standards

2.5.2.2 Category 2 Assessment Standards (role of Musical Listening unclear)

Category 2 Assessment Standards for Outcome 1: Creating, Interpreting and Presenting

Grade 4

- 7) Uses voice, body and found or made instruments to explore sounds and silence related to walking, running, and skipping note values, in order to explore rhythms and to create sound pictures
- 8) Composes and presents a short rhythmic pattern that has crotchets, crotchets rests, minims and minim rests through body percussion
- 9) Makes a puppet and use it to create a puppet show with music and movement

Grade 5

- 10) Composes and presents a short rhythmic pattern that has crotchets, crotchets rests, minims, minim rests, quavers and quaver rests through body percussion
- 11) Sing songs in long (3/4) and normal (3/8) triplet

Grade 6

- 12) Plays simple rhythmic patterns on a drum or equivalent
- 13) Explores and uses drum hand techniques such as base slap, open slap, muffle
- 14) Reads and sings or plays the scale and simple melodies in C Major
- 15) Illustrate/interprets African tales through puppetry
- 16) Devising and producing puppet shows
- 17) Choreographing movement for head puppets if used

Category 2 Assessment Standards for Outcome 2: Reflecting

Grade 4

- 18) Recognizes crotchet and minim note values and rests in a short melody
- 19) Listens to and identifies musical instruments in terms of appearance, name, how sound is produced, timbre and general pitch classification (high-low)

Grade 5

- 20) Recognizes crotchet, minim and quaver note values and rests in a short melody

Grade 6

- 21) Listens to and discuss the use of repetition as an organizing principle in African music
- 22) Selects a repertoire of songs that are used in various cultural environments, describes what cultural events they are drawn from, explains what the message of the lyrical content is and what the songs are used for

Category 2 Assessment Standards for Outcome 3: Participating and Collaborating

All assessments standards for outcome 3 were categorised as category 3 outcomes.

Category 2 Assessment Standards for Outcome 4: Expressing and Communicating

Grade 4

- 23) Uses voice, body, percussion, natural, found or made instruments to accompany stories, dances and songs
- 24) Uses sounds in a free rhythm to build up sound pictures to accompany stories or dances

Grade 5

- 25) Uses own compositions of poetry and song to draw attention to current social and environmental issues

Grade 6

- 26) Researches, creates and presents music that conveys and suggests the symbolism of ritual

2.5.2.3 Category 3 Assessment Standards (depend upon Musical Listening)

Category 3 Assessment Standards for Outcome 1: Creating, Interpreting and Presenting

Grade 4

- 27) Creates and presents melodies using voice and found and natural instruments to demonstrate difference in pitch and note values

Grade 5

28) Demonstrates concentration and accurate listening through recognizing, repeating and creating rhythms and poly-rhythms, using movement, body percussion and natural instruments

29) Improvises and creates music phrases that use repetition, accent, call and response

Grade 6

30) Improvises and creates music phrases with voice and/or instruments that explore dynamics, articulation, pitch and rhythmic patterns

31) Composing music for puppet shows

Category 3 Assessment Standards for Outcome 2: Reflecting

Grade 4

No assessments standards

Grade 5

32) Recognizes and describes the different timbres of voices in choral music

33) Listens to a variety of selected songs and identifies the genre (e.g. Blues, Pop, Kwaito, Classical, Traditional, Free-Kiba, Opera, Musicals, Malombo, Kwassa-Kwassa, Techno, Soukous), and offers opinion on the style

Grade 6

No assessment standards

Category 3 Assessment Standards for Outcome 3: Participating and Collaborating

Grade 4

34) Sings and/or plays canons, rounds and two-part songs with other learners, using natural, manufactured and found instruments

35) Plays simple wind instruments such as a Kazoo or Tshikona/Dinaka pipes or percussion instruments such as shakers in harmony with others

Grade 5

36) Sings and/or plays an instrument in a group with appropriate rhythms, pitch and dynamics in any genre of music

37) Combines a number of melorhythm instruments (drums, marimba) to create textural blend

Grade 6

38) Sings and/or plays in a group – canons, rounds and two-part songs from at least three cultural traditions of South Africa

Category 3 Assessment Standards for Outcome 4: Expressing and Communicating

Grade 4

No assessment standards for this outcome in this category

Grade 5

39) Identifies and sings songs from different societies, cultures and contexts that seem to communicate the same idea

40) Communicates a musical intention using the interface of pitch-based harmony (mellophony) instruments

Grade 6

No assessment standards for grade 6 in this category.

Discussion

For this discussion the assessment standards are once again grouped in terms of musical listening. The numbers refer to the ad hoc numbering given in this section of the chapter. The design dimension of musical works by Elliott (see figure 2.1) is used as a framework for this grouping.

Group 1: Assessment standards that cannot be related to musical listening.

AS #2

Group 2: Assessment standards that can be related to the syntactic parameter of pitch

AS #5, 9, 11, 14, 15, 16, 17, 22, 23, 24, 25, 26, 27, 29, 30, 31, 33, 34, 35, 36, 37, 38, 39, 40

A category 1 assessment standard that can be taken as an example of one that does not specify musical listening for pitch as one of the prerequisites for achieving the outcomes is 5) *Recognizes the letter names of notes on lines and in spaces on a treble staff and their differences in pitch*. It is possible to design a didactic strategy that encourages learners to listen for differences in pitch in order to achieve this outcome. A teacher can, for example, perform on a recorder two pitches (A and G) and ask learners to notate on staff notation in the treble clef which one of the two pitches they hear.

A category 2 assessment standard that can be redesigned to include listening for musical pitch is 14) *Reads and sings or plays the scale and simple melodies in C Major*. This outcome can be reached for example through a call and response format. The teacher can play an ascending or descending scale on a recorder, and then request the learners to echo. The same can be done with simple melodies. And/or the teacher can perform a phrase from a simple melody and request the learners to sing this melody on note names, etc.

Category 3 assessment standards do rely on musical listening, but the specifics of the listening process are not specified clearly as in 30) *Improvises and creates music phrases with voice and/or instruments that explore dynamics, articulation, pitch and rhythmic patterns*. Pitch has various dimensions that can be explored. The first is the dimension of higher and lower, and the second is the dimension of chroma or octave equivalence. Once these two dimensions are explored, aspects such as intervals, tendency tones, cadences, ornamentation etc. can be explored.

Regarding the five kinds of musical knowledge, the same remarks apply as to the previous assessment standard.

Group 3: Assessment standards that can be related to the syntactic parameter of duration AS#3, 4, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 33, 34, 35, 36, 37, 38, 39, 40

A category 1 assessment standard that can be taken as an example of one that does not specify musical listening for duration as one of the prerequisites for achieving the outcomes is 4) *Recognizes time signatures such as four-four and – three-four*. It is possible to design a didactic strategy that encourages learners to listen for differences in musical meter in order to achieve this outcome. As an alternative to the visual recognition using the staff only, a teacher can, for example, perform on a recorder or piano passages taken from real compositions that are in different meters and then ask learners to notate the time signature,

or use bodily movement to express their understanding of concepts relevant to musical meter such as the amount of beats that are grouped together to form a measure, as well as the subdivisions of the beats.

A category 2 assessment standard that can be redesigned to include listening for musical duration is 24) *Uses sounds in a free rhythm to build up sound pictures to accompany stories or dances.* This outcome can be reached for example through a call and response format. The teacher divides the class in three groups and then indicates through singing, clapping or body percussion the required sound durations which the learners should echo. By listening to each other the groups can even change their initial duration of note values halfway through the item.

Category 3 assessment standards do rely on musical listening, but the specifics of the listening process are not specified clearly as in 37) *Combines a number of melorhythm instruments (drums, marimba) to create textural blend.* Textural blend has various dimensions that can be explored, such as register, density, timbre, and instrumental motion. It is important for the teacher to let the learners experience these dimensions practically by letting the learner listen to real musical sounds and express their understanding of these dimensions in various formats that form part of activities that can be recognised as authentic musical practices.

Group 4: Assessment standards that can be related to the nonsyntactic parameters of timbre, texture, tempo, articulation and loudness (dynamics)

AS#1, 3, 9, 11, 13, 15, 16, 17, 19, 23, 24, 25, 26, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40

A category 1 assessment standard that can be taken as an example of one that does not specify musical listening for the nonsyntactic parameters of timbre, texture, tempo, articulation and loudness (dynamics) as one of the prerequisites for achieving the outcomes is 3) *Uses dramatic devices, visual illustrations, movement and sound to tell jokes, tall stories, lies, fantasies or absurd tales to explore realities in South Africa.* It is possible to design a didactic strategy that encourages learners to listen for differences in timbre, texture, tempo, articulation and loudness (dynamics) in order to achieve this outcome. A teacher can encourage learners for example to perform short melodies on a recorder, marimba, piano or any other instrument in first slow and then fast tempo, first playing it softly and then loudly, to experience the differences in timbre, texture, tempo, articulation and loudness (dynamics). Afterwards the learners can be asked to notate on staff notation in the treble clef the short

melody they heard with the correct tempo, articulation and dynamic indications. All of these melodies or patterns can then be explored and discussed in terms of the ways in which the nonsyntactic parameters can be employed to tell stories or create 'dramas'.

A category 2 assessment standard that can be redesigned to include listening for the nonsyntactic parameters of timbre, texture, tempo, articulation and loudness (dynamics) is 22) *Selects a repertoire of songs that are used in various cultural environments, describes what cultural events they are drawn from, explains what the message of the lyrical content is and what the songs are used for.* This outcome can be reached firstly through a call and response format and secondly through a question and answer format. The teacher can play a short melody from each song, and then request the learners to echo the melody. Thereafter the teacher can ask questions on the above-mentioned parameters as it appears in the music. The possibility to use a short melody from a selected song, or even one composed by one of the learners as dictation can also be explored.

Category 3 assessment standards do rely on musical listening, but the specifics of the listening process are not specified clearly as in 36) *Sings and/or plays an instrument in a group with appropriate rhythms, pitch and dynamics in any genre of music.* The teacher can organize players from a local orchestra or band to perform in class on their instruments and then request the learners to join in the performance on whatever level they are. Learners can even be given the opportunity to try the instrument themselves and then reflect on how nonverbal feedback from the experienced musicians guided their own participation in the orchestra or band.

Group 5: Assessment standards that can be related to laws, principles and strategies of organisation

AS#3, 9, 15, 16, 17, 21, 22, 23, 24, 25, 26, 27, 29, 30, 31, 33, 34, 37, 40

An assessment standard in category 1, namely 3) *Uses dramatic devices, visual illustrations, movement and sound to tell jokes, tall stories, lies, fantasies or absurd tales to explore realities in South Africa,* does not refer to the role of musical listening, but it has potential to be used by the teacher to enable learners to become conscious of ways in which sounds are organised. Since stories, lies and fantasies have particular structures that can be the basis for musical designs, the teacher can request learners to reflect the structure of the story (lies, fantasy and more) in the musical design. The learners' attention can be directed to ways in which the laws of human cognition are found in the story and in the musical design. The same holds for principles and strategies.

A category 2 assessment standard that can be taken as an example of one that does not specify listening according to the laws, principles or strategies of organisation as one of the prerequisites for achieving the outcomes, is 9) *Makes a puppet and use it to create a puppet show with music and movement*. It is possible to design a didactic strategy that encourages learners to listen to laws, principles and strategies of organisation in order to achieve this outcome. The same remarks as for assessment standard 3 apply.

Assessment standard 27) *Creates and presents melodies using voice and found and natural instruments to demonstrate difference in pitch and note values* also affords the possibility to explore laws, principles and strategies of organising when the teacher specifies the specific ways that the sounds can be organised, and allows learners to evaluate their musical designs aurally in terms of the specified laws, principles and/or strategies.

All of the didactic strategies suggested above can be analysed in terms of the five kinds of musical knowledge. Only two examples are discussed.

Knowing letter names (see assessment standard 5) *Recognizes the letter names of notes on lines and in spaces on a treble staff and their differences in pitch* is an example of formal knowledge. Informal and impressionistic knowledge is developed in the didactic strategy above, because learners will have to judge their own effectiveness in notating the pitches. When the teacher helps learners to develop learning strategies to improve their execution of the didactic activities, their supervisory knowledge can develop. Since this activity involves only a small aspect of musicing (namely notation tones on staff), it will not contribute greatly to the development of procedural knowledge and therefore should be combined with other activities (such as those suggested below) that involve performance, composing, arranging, and conducting. The same applies to the discussion of assessment standard 4, for example.

In the teaching-learning activity suggested for assessment standard 14) *Reads and sings or plays the scale and simple melodies in C Major* formal knowledge is embedded in the context of musicing and does not form the focal point of the teaching-learning strategy, even though such a focus is suggested in the NCS. Since the strategy suggested here involves music performance, and because learners can judge their own achievements through listening, this strategy will develop both informal and impressionistic knowledge. As above, a teacher's guidance of learners' reflection on their actions will develop supervisory knowledge. This didactic strategy involves musicing and will thus develop procedural knowledge through musical listening. The same applies to the discussion of assessment standard 30, for example.

2.6 IMPLICATIONS FOR MUSIC EDUCATION

From the analyses of the NCS presented in this chapter, it is clear that the NCS does not help teachers much to develop and implement effective teaching-learning strategies. Furthermore, filtering the NCS in a piecemeal fashion is not effective, as was shown by the fact the first three 'nets' used in this chapter to understand the NCS only revealed problems in the NCS and did not suggest solutions. By suggesting didactic strategies (based upon an application of the principles of the praxial philosophy of music education) to achieve the outcomes suggested by the assessment standards, it became clear that the philosophy of Elliott provides a framework for teachers to re-order and understand the outcomes suggested by the assessment standards in the NCS.

As the aim of this research is the enhancement of musical listening, the didactic question, "How do we organise and carry out music teaching and learning in ways that advance the development of musical listening?", should be answered. In order to answer this important question, music educators require a systematic way of bringing order to the plurality of problems that swirl around music teaching and learning while maintaining a flexible, personal, and situational stance. If the structure of the NCS is problematic, how can teachers approach the teaching-learning process in ways that are more in tune with the nature and values of music, teaching, and music education?

It is the opinion of Elliott (1995:244) that teachers and learners require direction in their approaches to the teaching-learning process. An objective is intentional and directs teachers to future outcomes in a highly determined way. In the jargon of curriculum theory, the term objective usually indicates an exceedingly specific level of intention (or target) compared to a moderately definite goal, or a broad aim.

Musicianship is the key to achieving the values, aims and goals of music education. Musicianship includes listenership. Musicianship is not something given by nature to some children and not to others. Musicianship is a form of thinking and knowing that is educable and applicable to all. Accordingly, all music students ought to be taught in the same essential way. Self-growth and self-knowledge are the central values of music and, therefore, the central aims of music education.

The next chapter contains a presentation of the Tomatis Method. In order to understand how the ideas of Tomatis and Elliott are relevant for the current study, it is important to understand that the research design stands on two legs. The first leg concerns the possibility of developing musical listening through a structured programme, the Tomatis Method, which

was the intervention employed in this study to prove that musical listening can indeed be enhanced. The second leg concerns the possibility of designing effective didactic strategies in alignment with the principles of the Tomatis Method. Since the Tomatis Method is not a didactic method, the music education philosophy of Elliott is necessary to order the challenges of the NCS, and to suggest valid didactic strategies to achieve the outcomes suggested by the NCS. This was done in this chapter. A next step would be to show the overlap between the ideas of Elliott and Tomatis, but before this step can be taken, the Tomatis Method needs to be presented in the next chapter. The overlap between the ideas of Elliott and Tomatis will be discussed only in the final chapter of this report when this overlap forms the basis for discussions regarding didactic methods.

THE TOMATIS METHOD

3.1 INTRODUCTION

Since this research examines the effect of the Tomatis Method (TM) on the development of musical hearing of Intermediate Phase learners in the current Arts and Culture programme, the researcher endeavours in this chapter to describe the Tomatis Method in terms of musical hearing.

The main research question and the subsidiary research questions will be contextualized by the question 'What is?'

The chapter is presented in six subdivisions according to the following 'what is' questions.

Section 3.2: 'What is Musical Hearing?'

Section 3.3: 'What is The Tomatis Method?'

Section 3.4: 'What is Sound?'

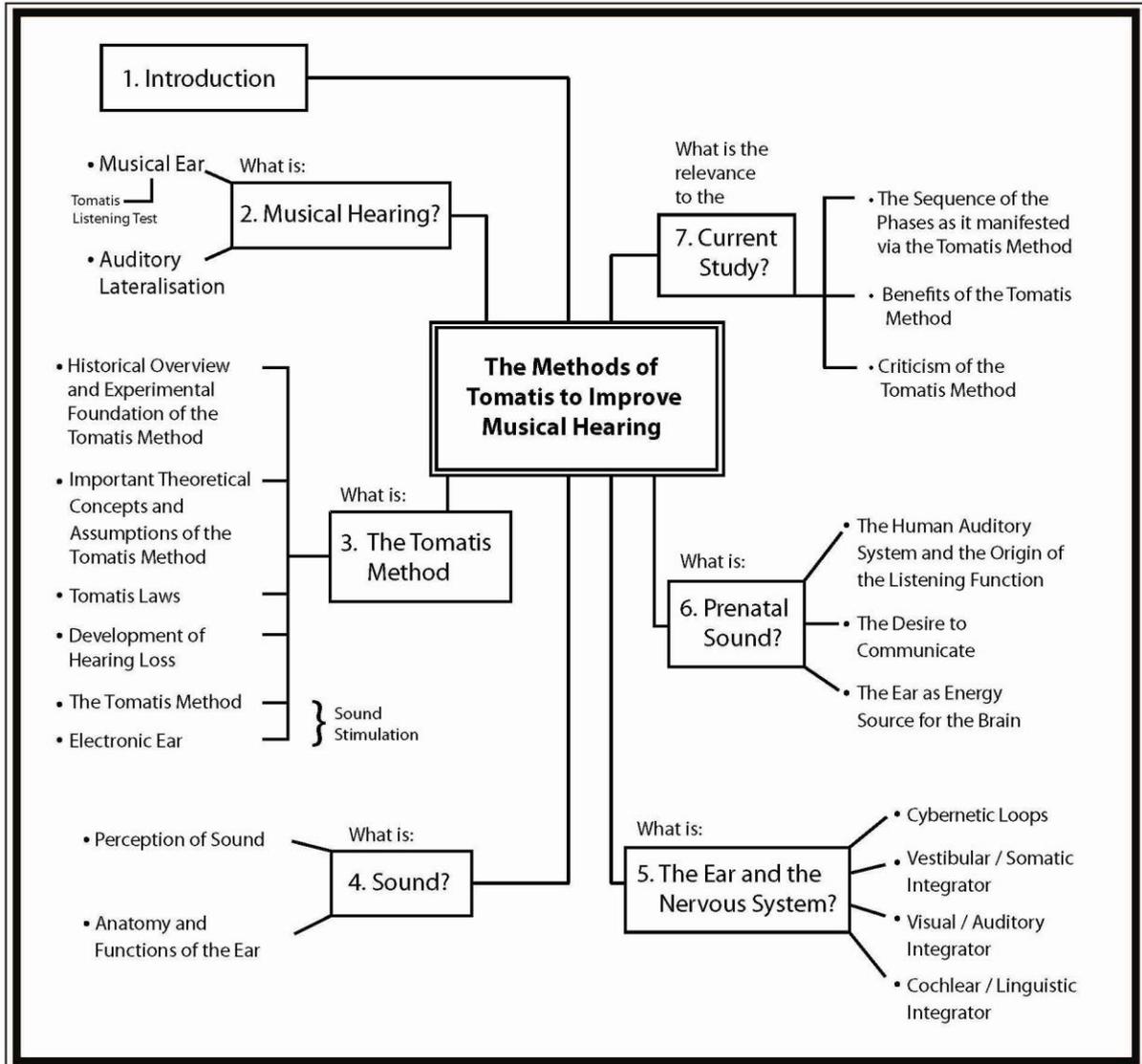
Section 3.5: 'What is the Ear and Nervous System?'

Section 3.6 'What is Prenatal Sound Perception?'

Section 3.7: 'What is the relevance of the Tomatis Method to the current study?'

These questions are expanded as indicated in the following illustration:

Figure 3.1: Diagram of the Visual Representation of Chapter 3



3.2 WHAT IS MUSICAL HEARING?

The aim of this research is to investigate the effect on musical listening through the Tomatis Method. According to Tomatis's view, musical listening will be achieved when the hearing curve is aligned with that of the musical ear and lost auditory frequencies have been restored.

3.2.1 The Musical Ear

Based upon his research of systematically examining audiograms of professional musicians, Tomatis was able to define what is conventionally called the 'musical ear' (Tomatis, 1991:50). Together with his co-workers he determined the auditory curve of an ear that would be capable of exceptional musical talent. Tomatis (1996:83) therefore established the "criterion of musicality" to be located "inside the passing band situated between 500Hz and 4000 Hz in a curve response of which he has determined the characteristics precisely". A person with an ideal listening curve as explained below is therefore undoubtedly musical and easy to teach.

Thompson (2004c:55) points out that a musical ear has to have the ability to collect and analyse every frequency of the sound spectrum, with maximum speed and precision. It must be able to fully tune into this entire sound spectrum of resonance.

3.2.1.1 An Audiometric Description of the 'Musical Ear'

The profile of good hearing is, according to Tomatis (1987:122, 2005¹:122), the profile of the musical ear. He deems it important that the listening curve should be within normal range with no distortion in the response of the ear. There are four requirements for this profile of the musical ear. The explanation of Gilmore *et al.* (1989:78) and what he believes Tomatis perceived as ideal hearing is delineated in the following list in which the ideal hearing curve is discussed (see also Tomatis 1996:83.) Thus, according to Gilmore, the profile of the musical ear should have:

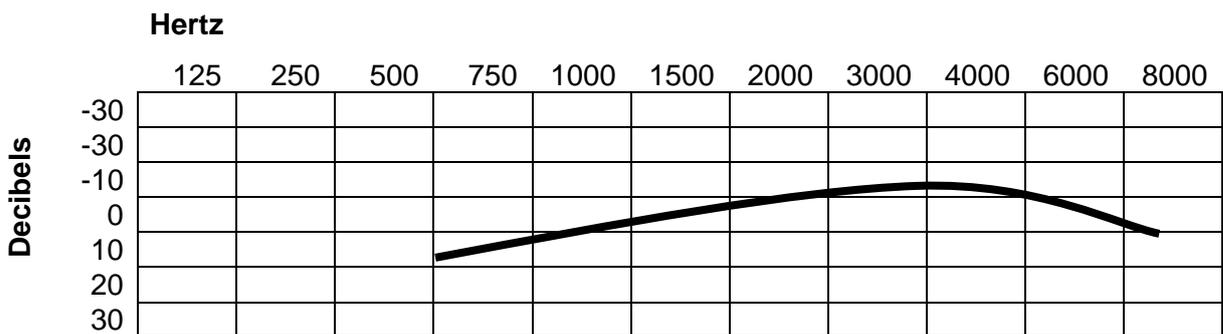
1. a curve rising to the frequencies 3000-4000 Hz, remaining at this frequency level, before descending slightly in the highest frequencies.
2. an ability to distinguish and compare varying frequencies of sound as well as the capability to identify higher and lower tones and their direction of variation. This is called open 'auditory selectivity' (Tomatis, 1972a:123).
3. a capacity to determine the origin of the sound in surrounding space, which is referred to as exact auditory spatialization (Tomatis, 1972a:123).

¹ The 2005 edition was originally published in 1988 under the title *L'Oreille et la Voix*. Roberta Prada translated this into English. Alfred Tomatis died in 2001.

4. the right ear taking auditory dominance. Gilmor *et al.* (1989:78) explains that since the times of Broca (from 1888) and his successors, in particular Penfield, works published on neurology, neuro-surgery and neuro-physiology have demonstrated the functional differentiation of the cerebral hemispheres for language. Tomatis (1996:129) suggests that, for singers and musicians, the right ear has to be the leading or dominant ear as the right ear controls and analyses sound. Other researchers have shown the predominance of the right ear in musicians who followed a long and intensified course of musical training.

Figure 3.2 represents the profile of the typical ‘musical ear’ as established by Tomatis. The frequency spectrum shown on the graph goes from low at the left to high at the right and is indicated in hertz. The volume threshold is measured in decibels.

Figure 3.2: Schematic Presentation of a Specific Threshold of the Musical Ear (Tomatis, 2005:122)



This graph represents the profile of what Tomatis delineates as a musical ear. It ensures vocal pitch and quality, a warm timbre, rich colour and indicates a person with a love for music (Tomatis, 2005:122).

An ear without any problems should have a curve as reflected in the diagram above indicating ideal hearing. Tomatis accepts that it is possible for anyone with normal hearing to acquire such a profile. Figure 3.2 is thus a representation of a curve that always has the same profile and indicates a curve that ascends between 500 Hz (C above middle C) and 4000 Hz (C four octaves above middle C) with a slant that varies between six and eighteen decibels per octave up to 2000 Hz. From 2000 to 4000 Hz a dome curve occurs with a slight drop from 4000 toward 6000 Hz. The curve is regular, without a break (scotoma). This auditory curve implies less sensitivity for low frequency tones and greater sensitivity for tones above 1000Hz. The larger the gradient of the graph (of the musical ear), the more musical talents are apparent (Tomatis 1996:83, 84).

3.2.1.2 Variances in the Curve of the ‘Musical Ear’ and Implications thereof

Tomatis (1987:122; 1996:84; 2005:122) explains that people respond differently to sound patterns. He maintains that psychological causes can modify the shape of the curve and major impacts can manifest of which a few is discussed below (Tomatis, 1987:123).

When the typical curve is raided of its treble beyond 2000 Hz, difficulties are experienced in the regulation of tonal quality, but tonal reproduction is still possible. Thus Figure 3.3 showing a dip between 500 Hz and 1000 Hz, indicates a person who is insensitive to music.

Figure 3.3: Schematic Presentation of a Curve Indicating Musical Insensitivity (Tomatis, 2005:123)

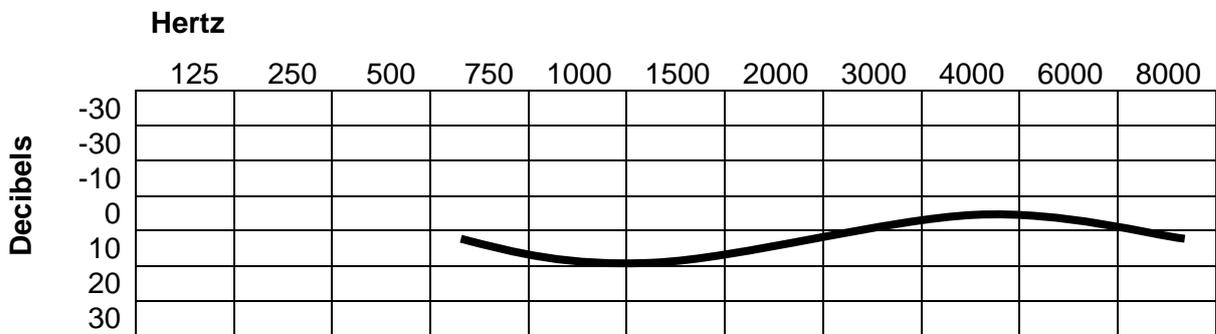
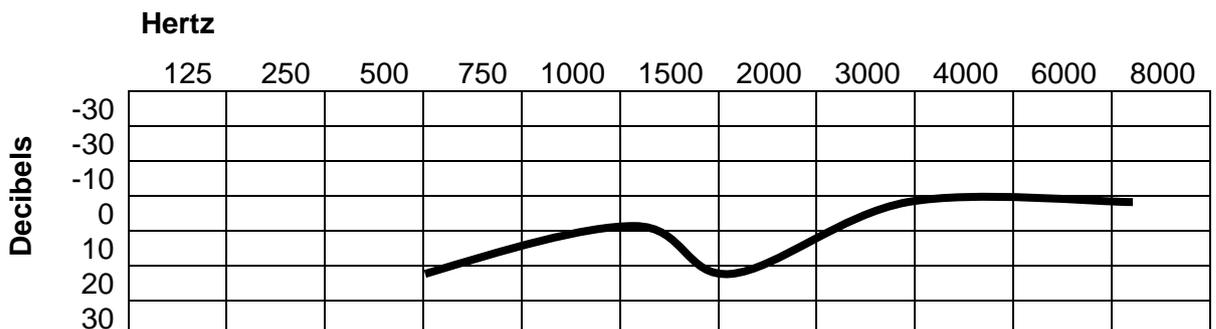


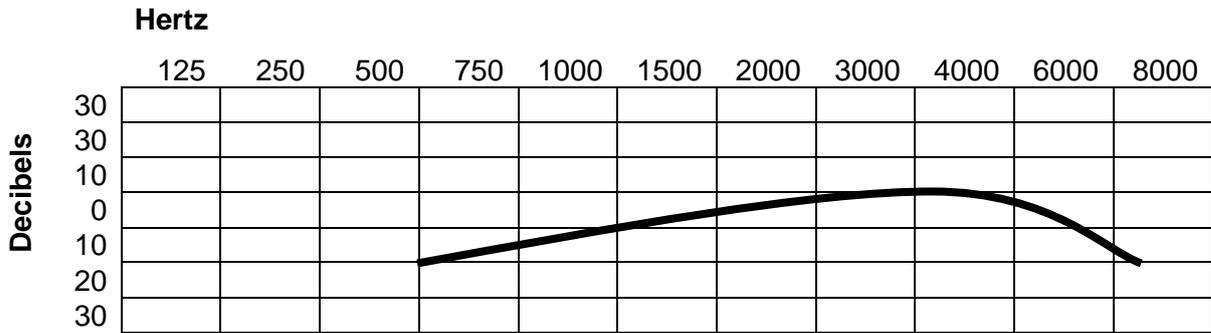
Figure 3.4 below illustrates a graph of which the slope only ascended to 1000 and after the dip to 2000 Hz. The variation that occurs in the curve between 1000 Hz and 2000 Hz indicates faulty pitch perception (Tomatis, 1996:85; 2005:123). In this case tonal reproduction becomes impossible. The ascending curve between 500 and 1000 Hz assures affinity to music although intonation will always be incorrect. In this case only musical perceptivity is recognized. The appreciation of quality is preserved if the dome is reserved between 2000 and 6000 Hz despite the faulty pitch production.

Figure 3.4: Schematic Presentation of a Curve Indicating Incorrect Intonation Perception (Tomatis, 2005:124)



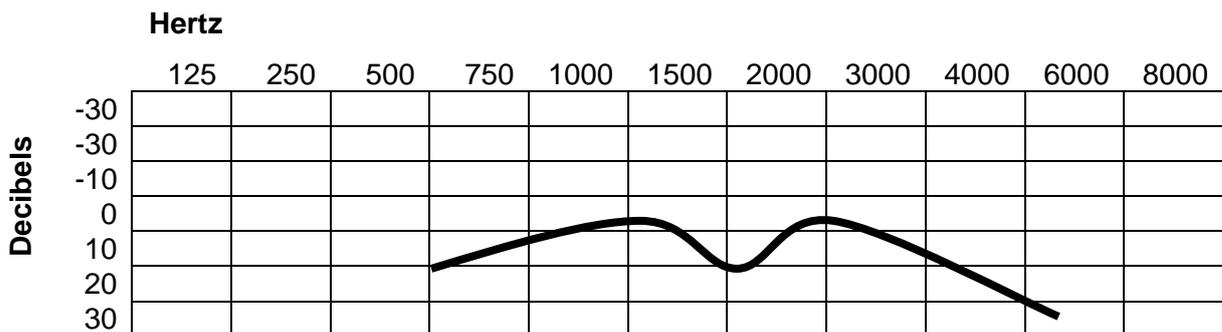
In circumstances where the curve is inharmonic above 2000 Hz, the quality of the voice is usually damaged, particularly lacking timbre and colour (Tomatis, 1987:124). This is demonstrated in Figure 3.5.

Figure 3.5: Schematic Presentation of a Curve Indicating Damaged Quality of the Voice (Tomatis, 1987:124)



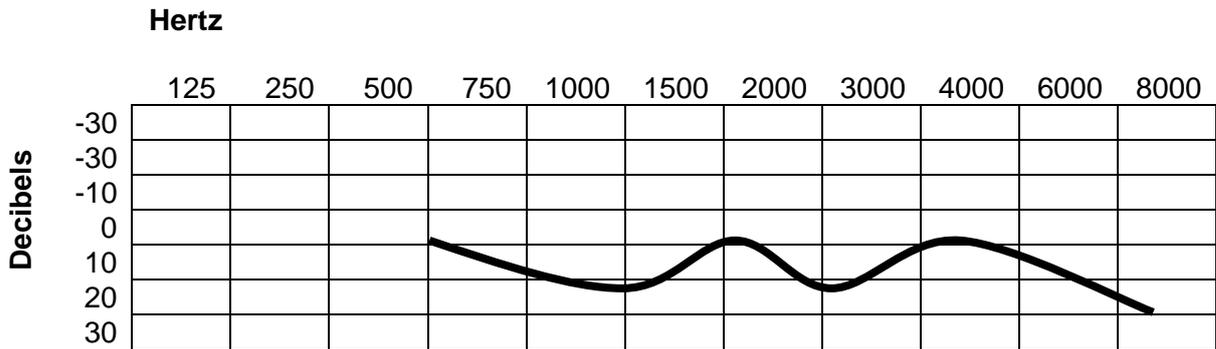
Tomatis (1987:125) states that an affinity for music exists without the possibility of reproducing it when a curve is still ascending from 500 Hz to 1000 Hz, but is strongly disjointed above 1000 Hz in the direction of the high notes (see Figure 3.6).

Figure 3.6: Schematic Presentation of a Curve Indicating the Impossibility of Reproducing Music (Tomatis, 2005:125)



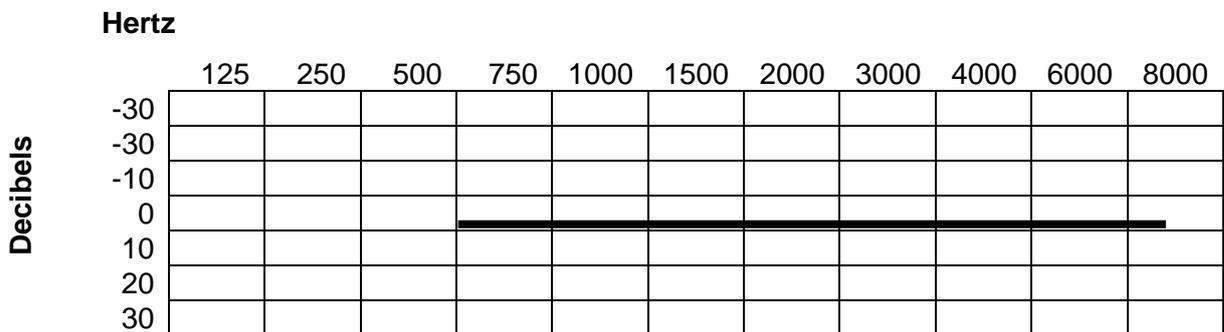
In circumstances where a curve is disjointed as in Figure 3.7 or is flat as in Figure 3.8 it indicates that neither musicality nor the possibility to reproduce musical sounds exists (Tomatis, 1987:125).

Figure 3.7: Schematic Presentation of a Curve Indicating an Unmusical Ear (Tomatis, 2005:125)



Tomatis makes it clear that if the tonal curve takes a linear form or is completely disjointed, reproduction is absolutely impossible both in quality and pitch. “We would say that we are in the presence of an unmusical ear” (Tomatis, 1996:85) as represented in Figure 3.8.

Figure 3.8: Schematic Presentation of a Curve Indicating an Unmusical Ear (Tomatis, 1987:126)



The following statement by Tomatis (1996:84): “Thus we sing with our ears! How many times have we heard this absurd statement, which, where singing is concerned, always has the effect of silencing us”, is therefore important in the global context of this chapter. The information on the different listening curves and how they influence musical hearing is vital in the understanding and application of teaching methods. This will be discussed in Chapter 7.

3.2.2 The Tomatis Listening Test

The profile of the musical ear is derived from the listening curve which is obtained by the Tomatis Listening Test, one of the measuring instruments used in the current research. This Test will be discussed in depth in Chapter 4 (see 4.6.2).

3.2.3 Auditory Lateralisation

An important element in the enhancement of musical listening and the self-listening process is the establishment of an audio-vocal laterality, or lateral dominance at the level of listening. This means that it is important to have one ear as the leading ear for speech sounds. Experiments led Tomatis to the conclusion that a person has a chosen, preferential ear. The right ear develops primarily as the dominant ear in the listening process which results in the fact that laterality develops to the right (Tomatis, 1991:117; 1996:129). Laterality is necessary for complete speech development and is also fundamental to language. It plays an essential role in sensory control, which is central to the self-listening process, and thus to the production of music.

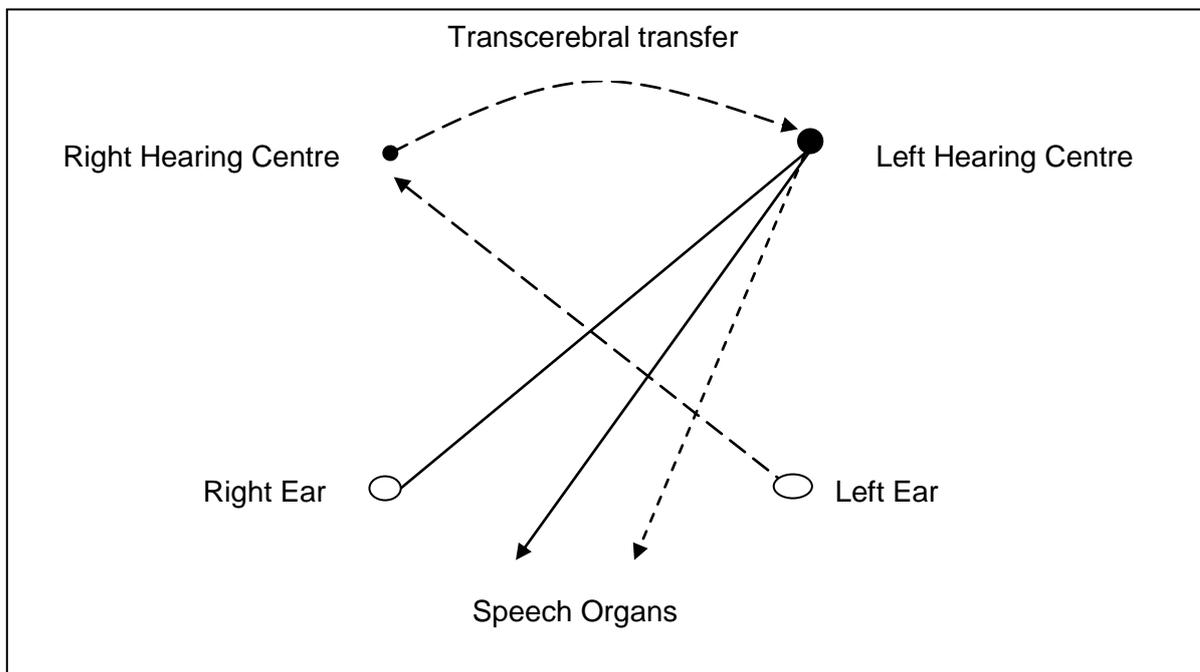
In the experiments relating to the hearing of singers, Tomatis and his co-workers discovered that the two ears differ with regard to vocal control. He realised that an excellent music performance depends on right-ear dominance (Tomatis, 2005:22). These experiments made him believe that in normal circumstances the right ear will take the lead in the listening process and that the right ear coordinates phonation and all musical capabilities (Tomatis 2005:25). He observed that the right ear is dominant and acts as the directing ear in all great singers and musicians (Tomatis, 1991:50), which correlates with research in the United States of America, indicating statistically proven right-ear dominance in people with long and intensive musical training (Madaule, 1976:3).

The explanation for this observable fact Tomatis based on the functioning of the various nerve pathways. In view of the fact that the contra-lateral nerve connections are more prominent than those of the ipsi-lateral, the language representation in the left hemisphere facilitates the right sensory and motor control systems (Tomatis 1991:50). The right auditory circuit consists of five stages, while the left auditory circuit involves six stages. The extra step in the transfer of information of the left auditory circuit causes a measurable delay. Thus the right ear receives the information more quickly, and therefore takes control. Good auditory lateralisation therefore means that the right ear will be the 'leading ear' (Tomatis, 1991:104; Madaule, 1994:44).

Laterality implies the use of one side of the body in preference to the other. Tomatis (1996:130) points out that it is extraordinary that this specialization is present only in humans. Of more significance is the fact that, as a rule, human laterality has been right-dominant and data suggest that this right-hand dominance is statistically overwhelming. Tomatis was convinced that laterality and language are interlinked and that without laterality there would be no language (Tomatis, 1996:143).

Tomatis (1996:143) states that eloquent human language requires a sophisticated cybernetic control, which involves the existence of a receiver that does not have to be singular, but definitely unilateral. Language and the need to control it established the need to create laterality. This sensory control is unilaterally organised and represents sensory knowledge and is also known as *gnosis*. *Praxis*, on the other hand is an important condition for conscious knowledge of an activity. A gnosial and praxial (knowing and acting) brain has thus been defined as the left, and the referential brain as the right. The entire human being is therefore controlled by the dominant side of the body and Tomatis explains that this is a consequence of language (Tomatis, 1996:144).

Figure 3.9: A Schematic Representation of the Trajectory of Nervous Impulses (Tomatis, 1991:51)



Straight lines show normal trajectory of nervous impulse when the right ear is dominant: dotted lines show the trajectory with brain-transfer of left ear dominance, with general lateralization to the right

In circumstances where the right ear has not developed as the leading ear, it often results in language and learning problems (Madaule, 1994:44). When conflict occurs here, it leads to problems in the area of time and space organisation, which in turn could generate anxiety and raises the susceptibility of psychosomatic illnesses (Van Jaarsveld, 1982:4).

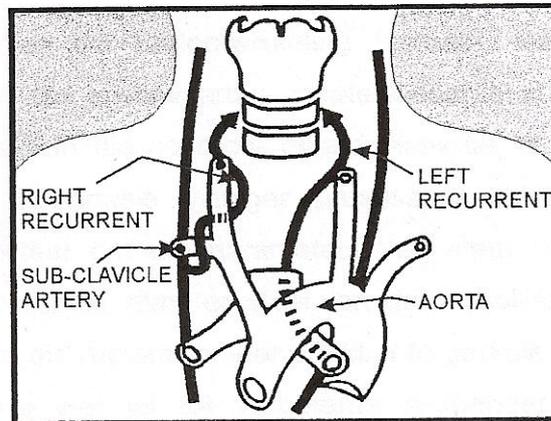
Tomatis views the vagus nerve, the sensory auricular branch of the pneumogastric nerve, as very important in the linking of gnosial and praxial. He explains that this nerve controls the entire emotional life of a person. He outlines how this nerve runs from the middle ear right down to the anus (Tomatis, 1978: 77).

“It is the tenth cranial pair, in conjunction (anastomosis) with the ninth pair or glosso-pharyngeal nerve that sensitizes the middle ear, the internal wall of the tympanum and the pharynx. Then it joins the spinal nerve (XI the cranial pair) which innervates the muscles. It then sensitizes the larynx (through one of its collateral branches, the upper laryngeal nerve), taking care of its motor function through the recurrent nerve. Next it innervates the bronchia, and the heart at the coronary system level; finally it joins the opposing vagus nerve, plunging down through their common stem to the viscera, spleen, kidneys, pancreas, liver and gall bladder, innervating the digestive tube from the esophagus, stomach, small intestine and large intestine, all the way to the anus. The importance of this nerve is obvious. It is the ‘path of the vagrant soul’. This nerve controls the entire field of potential somatisations” (Tomatis, 1978: 77).

Thus the vagus controls the larynx, the pharynx, and the viscera, which are the lungs, heart, stomach, liver, kidney and intestine, through its numerous branches (Gilmor *et al.*, 1989:85.) The auricular branch runs on the outer surface of the eardrum and Tomatis (1991:50) sees this as a distinct link between the inner, neuro-vegetative life, and the outside world.

According to Tomatis (1991:50) the cortical instruction for vocal-motor response starts simultaneously from both cerebral hemispheres. The two nerve paths differ in length due to the anatomic asymmetry typical of the two inferior laryngial nerves. The right recurrent larynx nerve follows a path around the sub-clavicle artery towards the right side of the larynx. The left recurrent nerve is longer than the right and descends towards the thorax where it follows a path around the aorta to ascend vertically in joining the larynx on the left (see Figure 3.10). Madaule (1993:43) explains that the difference in length of the two nerves results in a difference of the delivery of impulses to the larynx.

Figure 3.10: A Schematic Representation of the Recurrent Nerve of the Larynx (Madaule, 1993:43)



Tomatis indicates that the same nerve controlling the muscles of the middle ear is also involved in production of speech. Madaule (1994:10) points out that Tomatis discovered very early in his career the importance of the dominant ear in speech. Tomatis explains that this underlying asymmetry results in cortical asymmetry and a specializing of the left hemisphere in language - bearing in mind that the right pathways are the shortest. Language development and use of language result in the development of dominant nerve paths, as well as to cerebral dominance and laterality.

Lateralization of functions is not present at birth, but starts to be noticed in the course of development and is clearly associated with developmental processes. Van Jaarsveld (1982:4) explains this process as one that has to do with inherent organization resulting from normal development. It can be blocked by abnormalities and is specifically related to language. Researchers agree that lateralization of language in the left hemisphere, progressively correlates with language development (Madaule, 1994:44).

The benefit of the right ear as the leading ear thus lies in the fact that the right ear processes incoming auditory information more rapidly than the left. People with right ear dominance can regulate the parameters of their voices and speech, such as intensity, frequency, rhythm, flow of sentence construction much better than people with left ear dominance. Through development of right ear dominance, individuals gain better control over their voice and they are also capable of more effective communication which raises self control and self trust. Tomatis (1991:51) therefore finds that the left lateralized person will be restricted in his/her language development.

The Tomatis Method enhances the use of the right ear, resulting in better control and communication which then has the outcome of improved self-control and self-confidence. Right ear dominant people demonstrate a more extroverted orientation, are more responsive and are in control of their emotional responses. They are also less susceptible to anxiety, stress, frustration and aggression. All these findings are in line with Tomatis's (2005:22) predictions of his method regarding laterality.

3.3 WHAT IS THE TOMATIS METHOD?

The work of Alfred Tomatis (1920-2001), a French ear, nose and throat specialist, psychologist and educator led to the development of Audio-Psycho-Phonology (APP) almost 50 years ago. This term was used to describe his multi-disciplinary approach known today as the Tomatis Method and applied as a therapeutic intervention. Burger (1999:31) claims that this method led to a revolutionary new outlook on the concept of hearing and exceptional breakthroughs in areas such as learning, self-esteem, communication, language, music and creativity.

Through repeated administration of sounds that previously were not heard or heard in a distorted manner, a modification of speech and hearing can be accomplished. The ears are re-exposed and 'opened' to the full spectrum of sound which the human ear is capable of hearing. This is called 'opened selectivity' (Thompson & Andrews, 2000:176). This effect is relaxing and energising for both the body and the brain. "It forces the person to listen to things he does not necessarily want to hear, to confront this information, give attention to it and incorporate it in his life". Levinson (in Gidish, 1998:22) tells us that "only then and then alone will healing begin". This method restores the capacity to focus and gives back the ability to begin appropriate listening. This is evident after intervention when the graphs of the listening curve become similar to that of the 'musical ear' and when auditory lateralisation occurs.

3.3.1 Historical Overview and Experimental Foundation of the Tomatis Method

The focal point of the Tomatis Method is to enhance the way in which people listen and according to Gilmore *et al.* (1989:15) can be referred to by different terms like auditive training, listening stimulation and listening therapy. Madaule (1994:32) states that the aim of the method is to improve areas such as language, communication, creativity, musical abilities, social behaviour and interaction.

Early in his career Tomatis was the director of the French Laboratory for Acoustic Physiology. He initially started with research on *audiology* since he was asked by the French government to look into the problems of hearing loss among aircraft factory workers. He began extensive research on the effect of noise on hearing with special attention to noise that causes vocational hearing loss, also known as professional deafness. Vocationally deaf people can still hear, but their ears are incapable of analyzing speech. During the Second World War, Tomatis treated people who worked in a weapons factory which was a workplace with high levels of noise pollution. He realized that, although these workers were not completely deaf, they all lost the ability to distinguish specific sound frequencies.

The term *phonology* originated when Tomatis often had to examine and treat hearing and voice problems of singers and other musicians. As the son of an opera singer, Tomatis was consulted for his detailed knowledge of musicians in their professional environment and for having successfully treated his father for voice problems.

It is to these above-mentioned fields that the word *audio-phonology* refers (Van Jaarsveld, 1981:2). Through his research Tomatis began to realize that the ear controls the voice and therefore a close correlation existed between a person's listening abilities and his/her voice. Tomatis also discovered that problems with the voice were not necessarily linked to the larynx but originated in the ear. He found, after observing hundreds of singers, a deficiency around the frequency of 4000 cycles, which is about an octave above the highest note of the flute. It was the same deficiency that he found with workers exposed to factory noise. From this he concluded that there was a range of response which allows a person to sing in tune.

As his research progressed he discovered that all the answers were not to be found in medical science, since medical treatments did not always improve the patients' conditions. Therefore he pursued further studies in psychology. Van Jaarsveld (1996:2) indicates that a new concept was then added, namely *psycho*, and from there the term *audio-psycho-phonology* originated. Tomatis's research, which verified many of his observations, led to his 75 publications published between 1952 and 1996.

3.3.2 Important theoretical concepts and assumptions of the Tomatis Method

The Tomatis Method is fundamentally based upon the process of listening and, as Tomatis (1991:136) illustrates, specifically upon listening that is enabled by language. The importance of the ear and auditory processing in language development constitutes a fundamental assumption underlying the Tomatis Method: although a person's hearing may be normal, it cannot be assumed that effective listening is apparent.

Gilmor *et al.* (1989:18) state that a second basic assumption of Tomatis is that there is an important distinction between *listening* and *hearing*. The latter is normally a passive process in which sound is perceived, while listening is an active, focusing process where sounds that are heard are analysed quickly and precisely. Both neuropsychological and motivational components are present in listening abilities. The *desire*, as well as the *capacity*, must be evident for successful recognition and analysis of sound. Therefore in his definition of the listening ability Tomatis includes both a neurophysiological and a motivational component. Listening, therefore, is a high level activity which has its origins in the most complex of brain functions.

A third assumption of Tomatis is that the quality of an individual's listening ability will affect the quality of both his spoken and written language development (Gilmor *et al.*, 1989:18). Tomatis (1991:107) confirms that an idea which is expressed through language should also be bodily constructed. Within this framework the emphasis lies on the relation between listening, speaking, reading and writing with large emphasis being placed on the vestibular, visual/auditory and cochlear integrators (see 3.5.3). Thus the ear is a system which makes an essential contribution to the holistic human being.

In summary: the process of listening starts *firstly* with the ear as the origin of the awakening of the listening process and the initiation of thought. *Secondly*, the ear centralises and integrates the sensory modalities (auditory, visual and kinaesthetic), associated with language (spoken, read and written). *Thirdly*, it is the origin of energy generation on a cortical level and therefore provides psychological energy. *Fourthly*, it is an initiator of language, enforces a dynamic balance on the two hemispheres through which cerebral domination and lateralisation of functions are defined and embedded. *Lastly*, upright body position and positive body image are initiated through the vestibular part of the ear.

3.3.3 The Tomatis Laws

The verification of experimental findings and clinical observations in a therapeutic setting at his ear-nose-and-throat practice were instrumental for Tomatis in formulating his theories (Tomatis, 1991:52). The three so called 'Tomatis Laws' were developed from his discovery of the links between hearing and speech. He (2005:72) maintains that his discovery of the audio-laryngeal loop (see 3.5.5) was the starting point of all his observations and subsequent discoveries (Tomatis, 1991:44). His research led him to formulate the three laws that became the basis of the Tomatis Method.

His first law, known as the *Tomatis effect*, concerns the correlation between hearing curves (see 3.2.1) and the timbre of the voice: "The voice only contains the harmonics that the ear can hear" (Tomatis, 1978:57). In 1957 the French Science Academy as well as the French Medicine Academy acknowledged this discovery by naming it the *Tomatis Effect*.

His research after the formulation of his first law was aimed at restoring the lost auditory frequencies of the singer through a system where electronic filters were used to play high frequency sounds that would improve the functioning of the ear. He formulated his second law: "When the possibility is given to the ear to correctly hear the distorted frequencies of sound that are not well heard, these frequencies are immediately and unconsciously restored into the voice" (Tomatis, s.a:7). To enable him to formulate this law he researched the voices of famous singers and defined the 'musical ear'. This ear has the ability to perceive the human auditory field accurately and precisely in a very short time. He believed that restoring a person's hearing and thus giving him the same characteristics of the 'musical ear' would enable him to produce the same sound qualities.

Thompson (2004:43) claims that the electronic system, later known as the Electronic Ear, enabled an auditory self-conditioning process. Thus the hearing ability is forced from a passive accommodation of sound to an active participation. From this idea the third law is derived: "The imposed audition sufficiently maintained over time results in permanently modifying the audition and phonation" (Tomatis, s.a:7).

3.3.4 The Development of Hearing Loss

The section 3.4 'What is **Sound**?' denotes how Tomatis (1996:198) believes that the human ear has the capability to perceive sound and to process this sound without distortion. It can discriminate between higher and lower frequencies of sound and perceive the spatial origin of sounds. Furthermore it can attend to sounds the ear wants to hear and tune out the ones the ear prefers not to hear. It stimulates the brain with sensory input and has the capability to integrate sensory information from muscle movement. In addition, it is capable to establish good balance/equilibrium, control phonation and also control musical ability. These functions can be influenced at any age by accident, illness, emotional or physical trauma (Madaule, 1994:44).

Madaule (1976:4) states that the malfunctioning of one or more of the above-mentioned capabilities of the human ear will cause disharmony resulting in impaired listening and a lack of musicality. The best way to avoid hearing would be to 'close' the ear. This is done by the relaxation of the ear drum. Sound messages are therefore poorly received or not received at all. When the middle ear muscles are exposed to this non-activated state for too long, there will be no tympanic pressure and therefore the analysis of sounds will be impaired. The sound, incorrectly picked up, will also remain incorrectly perceived and analysed (Madaule, 1976:4).

The term 'closed selectivity' refers to sensory auditory inputs that were selected so strictly that a part of the normal human sound spectrum became completely lost (Madaule, 1994:44). A child disconnects himself in certain instances from the auditory world which is the world of communication. This detachment can be initiated by various incidents such as a life crisis, affective set backs, parental/social boundaries as well as physiological shortcomings. Tomatis (1996:97) explains that, no longer willing to listen, the child introduces distortions and fadings and lengthens the response circuits to enable him to withdraw into this state of isolation. This behaviour causes the child to be imprisoned and locked in from the outside world (Thompson & Andrews, 1999:92; 2000:179).

The daily distortions and overload of sounds cause people to stop listening as a survival mechanism. Bull (*in* Gidish, 1998:20) sums it up by saying that our ears are passages to the soul but attentive listening is sadly neglected. A person develops selective hearing and the only cure will be to find the time to start listening properly again.

Tomatis (1991:164) explains that hearing loss could be the result when the cochlea stops functioning as a satisfactory auditory organ. Hearing starts to be less carefully controlled resulting in poor conduction via air. The bone conduction curve is not in harmony with the shape of the air conduction curve. The two curves diverge and become asymmetrical. Distortions are found in one or both pairs of air or bone conduction curves, or in any of the single or combined curves.

Another possible cause for hearing loss could be that the integration of the central nervous system weakens because of problems mostly encountered on the thalamic level, resulting in malfunctioning of the projection on to the temporal area. This causes selective hearing with incorrect localization of spatial sounds. The correlation between the two hemispheres is weakened by functional under-development of the different integrators. That in turn results in somatic projection, co-ordinating problems and under-developed lateralization (Tomatis, 1991:164).

A break in the auditory curve can be the beginning of occupational deafness. This is identical to any traumatic deafness caused by noise. Typical of this deafness is the frequency spectrum which is reduced by loss of sensitivity to high pitched sounds. The first manifestation is a scotoma which is the appearance of a deaf spot at the level of 4,000 Hz. This impairment lies high on the tone scale and corresponds to the C, two octaves above middle C on the piano. In the beginning stages this deafness is mostly discovered by accident (Tomatis, 1996:178).

Tomatis (1996:178) denotes that this high frequency defect would be of no consequence in itself. Unfortunately it is rapidly accompanied by alteration of higher and lower frequencies, causing a spread in the loss of high-pitch sensitivity. If the defect produces a scotoma approaching 2000Hz, the person's voice becomes less rich in harmonics, resulting in a more frail, flat, and hesitant tone. Tomatis explains meticulously that if the scotoma continues to invade the frequency spectrum and erases control of the frequencies between 1000 and 2000 Hz, it will cause difficulties of tonal control. Vocal pitch will thus be compromised. The most essential elements that rule quality and perceive pitch, are altered and as a result the ideal 'musical ear' no longer exists.

3.3.5 Sound Stimulation: The Tomatis Method (TM)

Generally the Tomatis Method can be described as a sound stimulation and educational intervention that improves the functioning of the ear, listening, communication through language, desire for communication and learning, body-image awareness, self image, audio-vocal control, motor control, and posture (Tomatis, 1996:197; Thompson, 2004:55). The application of The Method can restore to the ears their original capability, as long as the hearing loss is not due to conductive or sensory-neural damage. According to Tomatis poor self-esteem and low motivation are the results of poor functioning of the ears. Organic or sensory-neural difficulty is partly caused by delayed development, or the desire to exclude undesirable information (Tomatis, 1996:198).

The Tomatis Method consists of an initial assessment, followed by listening sessions designed to train the ear and restore it, as mentioned, to its full potential. The sound stimulation is achieved by means of the Electronic Ear, and is complemented by counselling (van Jaarsveld & Du Plessis, 1988:136).

3.3.5.1 Filtered Sounds

It is an objective of the Tomatis Method to stimulate intrauterine listening. To accomplish this, high quality recordings of the mother's voice together with music are sent through a system of electronic filters, modifying it in such a manner that only high frequency sounds remain (Tomatis, 1991:149; Madaule, 1994:22). Madaule points out that these filtered sounds have the effect of opening the ear's 'auditory diaphragm', and thus increasing the selective power of the ear. Listening to filtered music through the Electronic Ear, the muscles of the middle ear are trained to perceive the high harmonics of any sound source. This training enables musicians to control and improve the tone quality of their instruments and timbre of their voices.

Tomatis (s.a.:7, 1987:129) points out that his method addresses and works on three levels simultaneously. This statement is supported by Madaule (1993:25). These three levels are the functional, emotional and rational.

The Functional Level

Musical abilities are enhanced and language learning is facilitated on the functional level (Tomatis, s.a.:8, Madaule, 2001:12). This happens when the Electronic Ear (EE) develops

and improves the receptive listening ability and voice control mainly through its ability to modify sound to a higher frequency. Voice control and self-listening are enhanced by means of a process where language sounds are spoken into a microphone which feeds the sounds back to earphones on the listener's ear.

Permanent re-establishment of proper listening skills can be achieved after approximately 60 – 100 hours of listening and self-listening stimulation. A therapist monitors the learning of the improved body position in each participant which is essential to assure optimal listening abilities, as well as voice and speech production (Gilmor *et al.*, 1989:27).

Tomatis asserted that the vestibular (for balancing) and cochlear (for decoding sound) functions of the ear are joined in a single system. The vestibular nerve is directly connected to all the muscles of the body as it forms part of the medulla. Filtered music received by the ear can thus have an effect on body image. In the literature it is generally accepted that the vestibular system has an observing function on balance. Improved vestibular control therefore enhances the temporal-spatial awareness required for rhythmic sense (Tomatis, 2005:85).

The Emotional Level

Listening to filtered sounds stimulates the prenatal sound environment. This is the basis of unique emotional relief (Tomatis, 1991:125; 2005:45) that restores the lost motivation to listen and communicate. Events causing this loss could be problematic parental development, a traumatic birth process, early separation from the mother and health problems during the infant and toddler phase. The Electronic Ear simulates different phases of hearing development to which the participant is re-exposed. The return to the prenatal sound milieu equips him/her to a more positive emotional bridging experience of the development phases. The length of each of these phases differs according to the specific individual and is determined by a therapist who monitors the changes during the course of the programme (Tomatis, 1991:154).

The Rational Level

On a rational level, individuals who participate in a Tomatis programme receive therapeutic accompaniment to facilitate the changes that they experience and to assist them to focus on new perspectives which their enhanced listening and communication abilities will bring about (Tomatis, 1991:153). In the current research, individual interviews were held with the mothers/guardians of Group A participants to assess the outcome the Method brought about.

3.3.5.2 The Music

The cells that bring about cortical recharge are concentrated in the area of the cortex. Tomatis (1991:150) discovered that music rich in high frequencies are most effective to reach this area. Over a period of twenty five years music of various composers have been tested in his practice and because of the good results obtained, he and his co-workers decided on and preserved compositions of Mozart as well as Gregorian chants (Tomatis, 1991:150, Madaule, 1994:65).

Music by Mozart

During the listening programme the music of Mozart creates a perfect balance between the energising effect, a feeling of well-being and calmness (Madaule 1994:66) and the development of thinking (Thompson & Andrews, 1999:91). For this reason and as compositions by Mozart provided consistent results during the sound stimulation programme, Tomatis included certain symphonies and violin concertos, knowing that these compositions are uniquely suited to the purpose of the programme (Tomatis, 2005:x). Criteria for the music were that the music should:

- be at a tempo of 120 beats per minute
- be rich in high harmonics and
- not have any intense emotional content. This is important as the listener should not be distracted by internal dialogue of the music (Tomatis, 2005:x).

Gregorian Chant

In accordance with the compositions by Mozart, the Gregorian chant should in turn have special qualities that are suited to the purpose of the Tomatis programme. Recordings from the abbey of St. Pierre de Solesmes demonstrated these qualities and were found most effective. The music:

- possessed overtones that are energising (Madaule, 1994:63; Thompson & Andrews, 1999:91),
- is devoid of a specific beat, and
- simulates the rhythm of the respiration and heartbeat of a rested, relaxed person.

The body and mind are kept “in a state of calm awakening” (Madaule, 1994:63) when listening to Gregorian chant and is therefore listened to when the heart rate ought to be lowered and calm breathing needs to be encouraged (Tomatis, 2005:x).

3.3.6 Sound Stimulation: The Apparatus: The Electronic Ear

The Electronic Ear (EE) is a complex electronic apparatus which is used as the central source of sound stimulation in Tomatis Method training. It consists of specialised headphones, specific recordings, a CD player and a microphone. The apparatus was developed in order to train and improve the human ear and heal vocal problems. Tomatis (1991:58) developed this apparatus to meet the requirements set by the therapeutic implications of his three laws, assisting the human ear to establish or re-establish its full potential and to restore the influence of the ears on the neurological system (Thompson & Andrews, 2000:177).

Tomatis's outlook on the electronic system he developed is summarized in his words: "We stimulate the ear with sound, higher frequency sound in the form of music or with a recording of the mother's voice if it is possible to obtain The foetus in the womb hears essentially by bone conduction, and in our therapy we emphasize the delivery of sound by bone conduction. The electronic system that allows us to do this is called the Electronic Ear. It helps the ear to develop a proper listening response" (Tomatis, 1987:30).

The apparatus has a microphone as input and earphones as output. With the help of the amplifiers, filters and gate control systems, this system is capable of modifying acoustic energy (Tomatis, 1991:59). A modified sound spectrum is therefore presented to the human ears.

The Headphones

It is important for a participant to perceive sounds through bone as well as air conduction (Tomatis, 2005:127). Therefore the specialised headphones do not only allow sound through normal air conduction through the ears, but is also equipped with a small vibrator that produces bone conduction through the skull. Gilmor *et al.* (1989:80) explains that the Electronic Ear triggers three mechanisms, namely the Filters, the Electronic Gate and the Balance.

The Filters

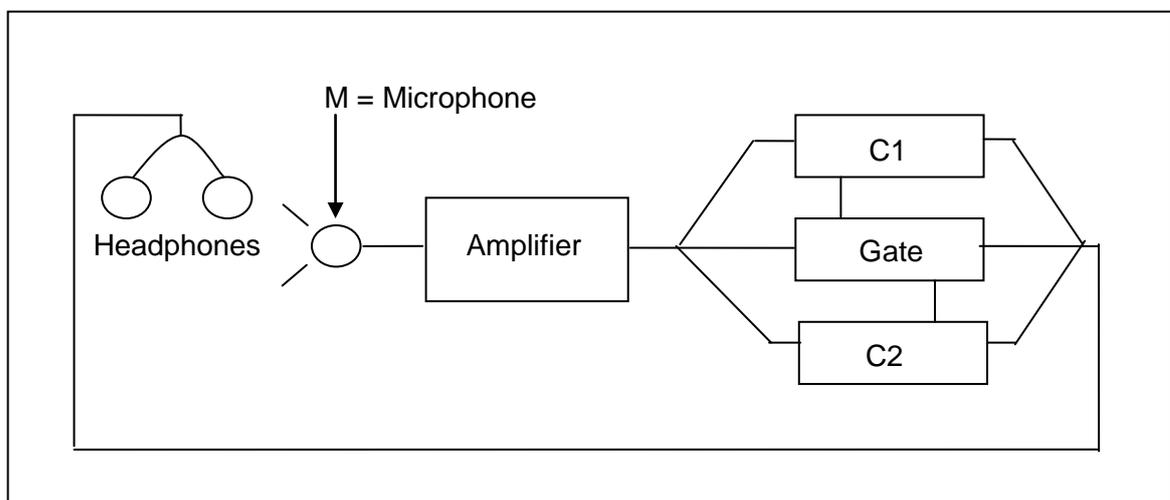
The filters can be regulated so that the information is altered inside the specific frequency band of the musical ear in order to eliminate distortion. This procedure uses acoustic energy modified by the apparatus and sends it back to the participant's ears as altered sound spectra. The sources of energy are varied: high filtered sounds from the mother's voice, high

filtered music (at 9000 Hz), Gregorian chants and/or filtered snippets of the participant's own voice.

The Electronic Gate

At the power source the signal is amplified after which it is divided into three streams, with one going to a meter that measures the sound level, the other going to the gate controlling circuit which controls the other two streams, which are the gates of channel one and channel two. The gate control is of such a nature that in the non-active state, the gate in channel one is left open while the gate in channel two is closed. During the active phase gate two is open and gate one closed (Figure 3.11). Both channels have equalisers to change the sound spectrum that is sent back to the participant's ears. The modifications from channel one equals the mass vibration (descending curve) of a relaxed tensor tympani and stapedius muscle, while the modifications from channel two equals that of the ascending audiometric curve that implicates a tonic middle ear system (Tomatis, 2005:127). The alternating passage of sound from one channel (relaxing the muscles) to another channel (tensing the muscles) stimulates the middle ear. According to Tomatis (2005:127) the muscle of the stirrup is exercised through bone conduction, and the muscle of the hammer through air conduction. In order to support a more rapid response to incoming information, the Electronic Ear allows for the timing delay of sound reception between bone and air conduction to be controlled (Thompson & Andrews, 2000:177). This enables the ear to adjust itself automatically and instinctively for listening. The alternation from one channel to another is automatically regulated by the above-mentioned electronic gate which opens and closes itself according to the varying signals. Repetition of the action over time will uphold the ear's ability to perceive and analyze sound correctly on a permanent basis (Tomatis 2005:127).

Figure 3.11: Diagram of the Electronic Ear (Tomatis, 1991:59)



Tomatis's assumption that the contractions of the middle ear muscle will change the conducting system to an energized state and that the participant will then obtain an ideal listening curve is proved by research (Thompson 2004c:56; Tomatis, 2005:127). Listening to filtered music through the electronic ear improves the tension of the tympanic membrane which, when tensed, eases the amplitude of the vibration of the sensory auricular branch. Furthermore, this taut tympanic membrane regulates the vagus nerve (see 3.2.3). Control gained in this way is generally experienced as a sensation of well-being by the person, with increased self-confidence and awareness of abilities.

The Tomatis Method implies that auditory training by means of the Electronic Ear will condition the muscles of the middle ear to adapt to the surrounding sounds. According to Gilmore *et al.* (1989:27) the EE trains the ear to function without distortion, as it should. The EE plays on two tiny muscles connected to the hammer and stirrup, two of the ossicles of the middle ear, so that the muscles become more flexible. This innovative form of stimulation uses the violin concertos of Mozart, Gregorian Chants and densified music to accomplish the retraining of the listening ability back to the level of the natural state or expected normal functioning.

The Balance

The purpose of the Tomatis Method is to progressively stimulate the right ear. Through the electronic apparatus, the intensity of sounds fed via headphones to the left ear are gradually reduced while the right ear receives more sound stimuli in order to develop to right ear dominance (Rolf, 1998: 53). Sounds can now be heard without distortion and the analyses will be more accurate. The assumption is that the right ear is forced to become the leading ear (Madaule, 1994:10).

It seems that the Electronic Ear facilitates self-conditioning since hearing is conditioned from passive accommodation of sound to active participation in sound. Thompson (2004:56) is also of the opinion that the Electronic Ear assists the human ear to establish or re-establish its full potential. She indicates four mechanisms that are used by the Electronic Ear and headphones: 1) Filters, to regulate sound, 2) Electronic Gate, ensuring that the ear attunes itself automatically for listening, 3) Balance control, to ensure that the right ear becomes the leading ear, 4) Timing of sound reception controlled, which is the gradual change to more efficient patterns of reception and processing.

Each session lasts about 30 minutes. The number and scheduling of these sessions are set out following the initial assessment which includes tests of listening, lateral dominance, figure drawing, and a clinical interview. The apparatus and compilation of programmes are detailed by Tomatis (1991: 58-63).

3.4 WHAT IS SOUND?

3.4.1 The Perception of Sound

Sound is the audible band of the mechanical wave spectrum similar to the band of visible light within the electro-magnetic wave spectrum. The various parameters that constitute sound are pitch, timbre, duration and intensity (Tomatis, 1996:47). One of the measuring instruments applied in this research was the Musat Test, designed to determine how the child participants would interpret intervals, harmony, timbre (tone colour), rhythm, duration, tempo and metre in music. Since these aspects of musical hearing are concerned with the perception of sound, it is important to know how the ear perceives sound. A study of the perception of sound will also enable better understanding of how the Tomatis Method can enhance musical hearing.

Tomatis explains that the structure of sound is highly complex. The description of what sound precisely is, should start with sine waves: pure sound, which is a product of the laboratory and consists of a single frequency. The pitch of a sound is determined by its frequency. Tomatis (1996:23) notes that pure sounds are distinguished from each other by their pitch, namely, by the frequency of vibrations from the releasing source. Low sounds produce a limited amount of vibrations while a multitude of vibrations in the same time span will result in high sounds. A certain sound therefore has a specific number of cycles per second (cps), measured in hertz (Hz).

Tomatis (1996:24) identifies another measurable parameter of sound: intensity. Intensity depends on the amplitude of the wave and is not influenced by speed. Distance causes intensity to fade; therefore it is proved that the quality and characteristics of a pure sound can also be determined by the length of time that it lasts.

What has been described above is limited to pure sound. Sounds with a timbre, characterized by the mixture of their constituents are so-called complex sounds. When dealing with these sounds everything becomes more complicated.

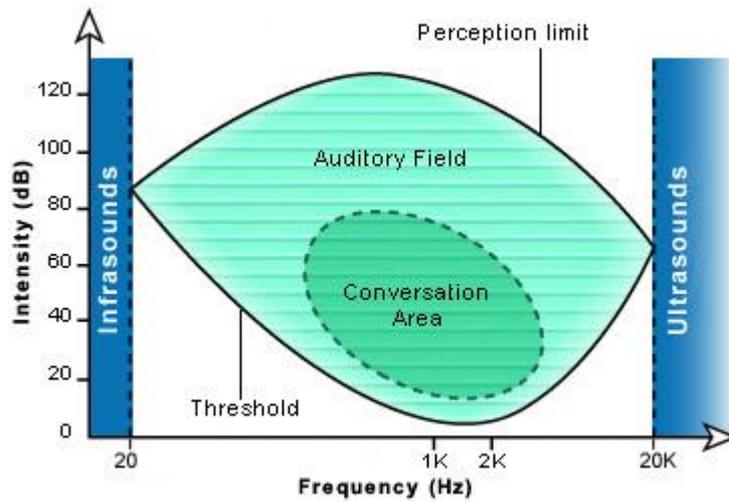
3.4.2 Perception through Hearing

Hearing is the perception of mainly two parameters of sound by the ear. *Frequency* allows a person to perceive differentiations of pitch and is measured in waves per second (Hertz) (wave/sec = Hertz). Differentiation of intensity is perceived through *pressure level*, measured in decibel (dB).

Tomatis (1996:49) is of the opinion that human acoustic communication is through vibrations of air. It is clear that not all of these vibrations can be absorbed, although the ear can analyze sounds in the band between 50 and 5000 cps. The last step in the chain of signal transmission between sound in the air and movement of fluid in the inner ear happens in the middle ear. The middle ear, bounded by the ear drum and the bony labyrinth, provides an additional 20 – 30 dB of mechanical amplification by coupling the large eardrum (tympanic membrane) to the oval window into the fluid filled inner ear. The 20 to 30 dB of amplification is approximately the difference in sound intensity between a whisper and normal conversation. The electrical signals which code the sound characteristics are carried to the brain via the auditory nerve (Tomatis, 1996:49).

In order to comprehend musical hearing and value the contributions of Tomatis regarding the musical ear appropriately, it is imperative to realize that the human auditory field is limited by the threshold curve, a curve giving the lower and upper limits of sound perception. Sounds too low to be heard are called infrasonic and sounds above the upper threshold that escape the ear and become inaudible are called ultrasonic. At each frequency, between 20 Hz and 20 kHz, the threshold of sensitivity of the human ear differs. The best threshold at around 2 kHz is close to 0 dB. The so-called conversation area represents the range of sounds most commonly used in human voice perception and when hearing loss affects this area, communication is impaired (Tomatis, 1991:53, 189). Figure 3.12 illustrates the audiometric curve for a normal hearing person. This curve represents the work of Wegel, a psychophysicist who suggested measurement of sensation. The curve indicates sensitivity as a function of frequency and in addition to specify high and low frequencies, the diagram also indicates the minimum threshold level of human auditory perception. Below, the ear hears silence, above, hearing becomes painful and intolerable (Tomatis, 1996:49).

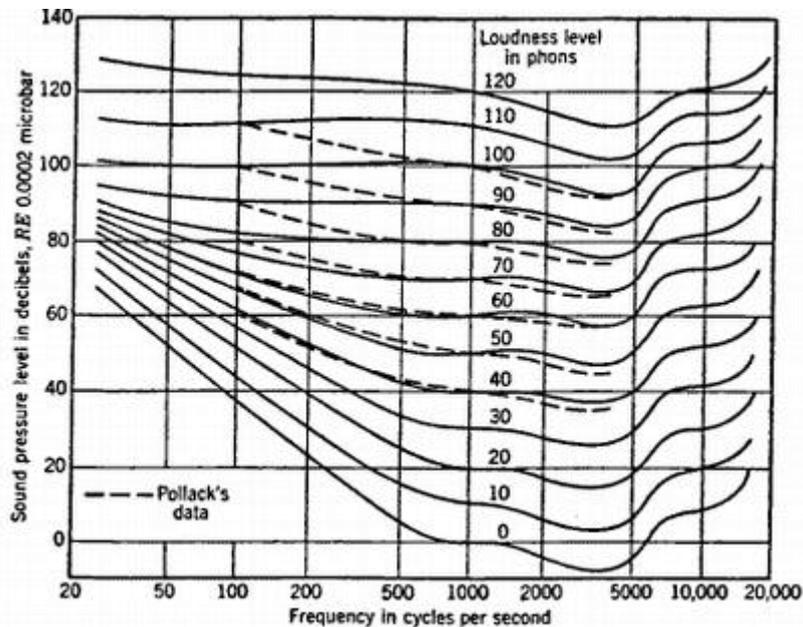
Figure 3.12: Audiometric Curve for a Normal Hearing Person: Wegel's Curve (Tomatis, 1996:49)



In addition to the above-mentioned capabilities the ear has the ability to analyze intensity of sound. Tomatis (1996:49) mentions that sounds are perceived as loud or faint according to their energy content. The sensation of loudness is affected by the frequency of the sound. A series of tests using sound waves produced the curves shown in Figure 3.13 below. At the low end of the frequency range of hearing, the human ear becomes less sensitive to soft sounds, although as a matter of interest, the pain threshold as well as judgment of relatively loud sounds is not affected much. Sounds of intermediate softness show some but not all of the sensitivity loss indicated for the threshold of hearing. At high frequencies the change in sensitivity is more abrupt, with sensation ceasing entirely around 20 kHz. The threshold of pain also increases in the top octave. The ability to make loudness judgments is compromised for sounds of less than 200ms duration. Below that limit, the loudness is affected by the length of the sound; shorter is softer. Durations longer than 200m/s do not affect loudness judgment, beyond the fact that listeners tend to stop paying attention to long unchanging tones.

Figure 3.13: Perceived Loudness of Sounds

(Mark: 2007, http://www.audioholics.com/education/acoustics-principles/human-hearing-amplitude-sensitivity-part-1/clip_image001.gif/image_preview)



According to Ferguson (in Tomatis, 1991:72), it is worth knowing that Tomatis discovered that people differ in their range of hearing according to the language(s) they learned in childhood. Since this study involved children with different maternal languages, the information is deemed relevant. Tomatis (1991:71) mentions that a particular 'ear' is associated with each language and that the ethnic ear can be classified by its range of accessibility. Tomatis created the 'ethnogram', an envelope curve based on the recorded values of all the frequency peaks in the spoken language. It is called the basic/preferred frequency band. This report includes ethnograms compiled on some of the languages Tomatis analyzed in order to explain that all people do not hear in the same way, as explained in 3.2. French people, for example, who hear essentially between 1000 and 2000 Hertz (Figure 3.14) have considerable difficulty in learning English from the British with a frequency band between 2000 and 12000 Hertz (Figure 3.15) but not from the North Americans with their frequency band ranging from 750 to 3000 Hertz (Figure 3.16). The reason for this is that the ranges of selectivity of French and British English are adjacent while the ranges of selectivity of French and American English overlap. It presents a lower basic frequency band with a peak at 1500 Hz as indicated in the following ethnograms:

Figure 3.14-19: Schematic Representation of Ethnograms (Tomatis, 1991:73-74)

Figure 3.14: French language curve with range of selectivity from 1000 to 2000 Hertz

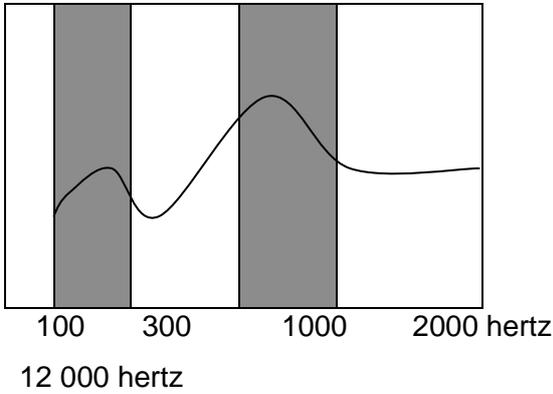


Figure 3.15: British English Language curve with range of selectivity from 2000 to 12 000 Hertz

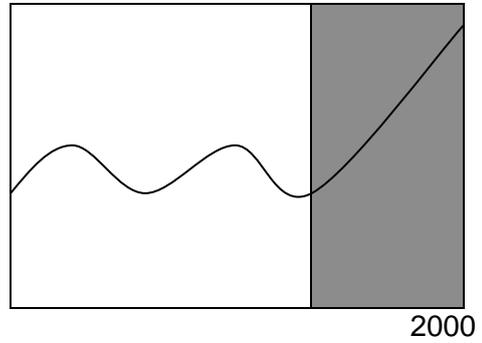


Figure 3.16: North American language curve with range of selectivity from 800 to 3000 Hertz.

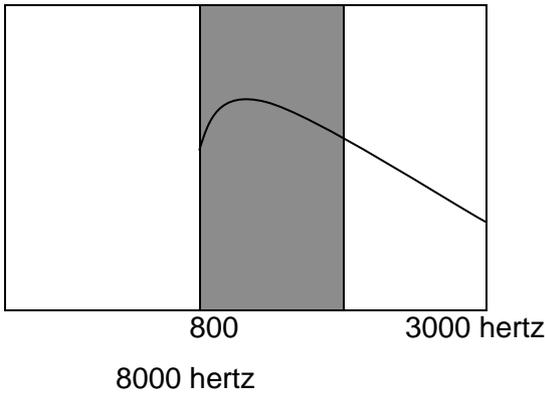


Figure 3.17: Slavic language curve with range of selectivity ranging from very low sounds to very high sounds.

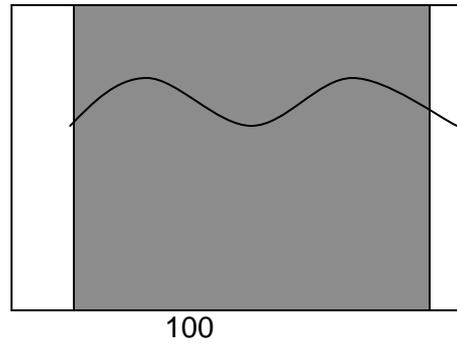


Figure 3.18: German language curve with range of selectivity from 100 to 3000 Hertz

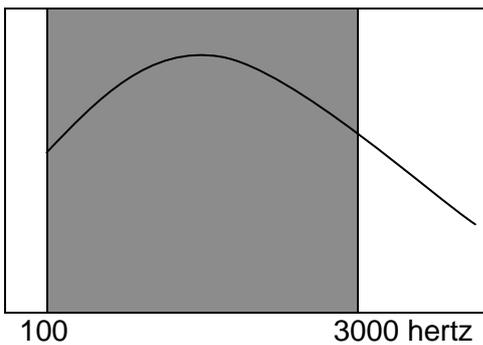
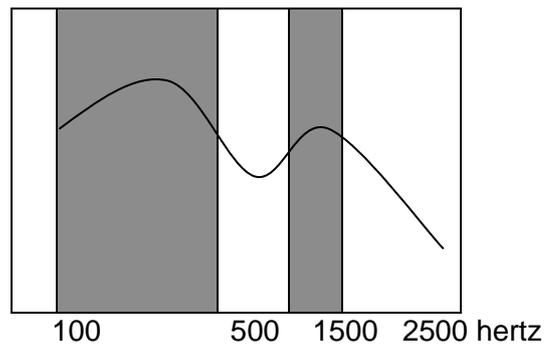


Figure 3.19: Spanish language curve with range of selectivity from 100 to 500 and 1500 to 2500 Hertz.



As mentioned above the North American English ear is between 750 and 3000 Hz (Figure 3.16) while the band which divides the low and high frequencies of the Slavs is extraordinarily wide – it extends from very low frequencies to exceptionally high ones (Figure 3.17). The German language also presents itself with a wide band (Figure 3.18) and Spaniards have two sensitivity fields, those between 100 to 500 Hz and those between 1500 and 2500 Hz (Figure 3.19). Slavic people with their wide-ranging auditory receptivity prove the theory that the ability to master foreign languages is more an aptitude for hearing them than for speaking them (Tomatis, 1991:72).

It is essential at this point to discuss the conditions that allow musical listening to take place and for perception of sound to occur, therefore an explanation of the anatomy and functions of the ear follows.

3.4.3 Anatomy and Functions of the Ear

Tomatis, specializing as an otorhinolaryngologist, had a thorough knowledge of the anatomy and functions of the ear. Based upon this knowledge he conducted his research that led to the development of the Tomatis Method. His description of the anatomy and functions of the ear is presented in this report in order to explain the perception of sound (Tomatis, 1987: 46).

Audition is the act of analyzing sound stimuli and is performed by a three-stage anatomical unit that comprises the following three parts:

- The **inner ear** is the most complex structure and is also called the labyrinth. It comprises two organs: the vestibule which acts on position and balance and influences the body position and the cochlea which is more specifically the organ of hearing and forms the interface between ear and brain.
- The **middle ear** contains the ossicles, a chain of three linked, mobile, small bones, the hammer, anvil and stirrup, found in this order. This chain is suspended by ligaments inside a cavity sealed on one side by the tympanic membrane and on the other by the outer wall of the inner ear. In addition, two tiny muscles act respectively on the hammer and the stirrup. The ossicles join the eardrum to the inner ear, the hammer literally penetrating the thickness of the eardrum with one of its extensions (the handle), while the base of the stirrup (the footplate) is integrated with one of the two membranes that seal the inner ear. The proper relationship between the muscles of the hammer and the stirrup allows the middle ear to function.
- The **outer ear**, extending from the auricle (pinna) to the tympanic membrane (eardrum).

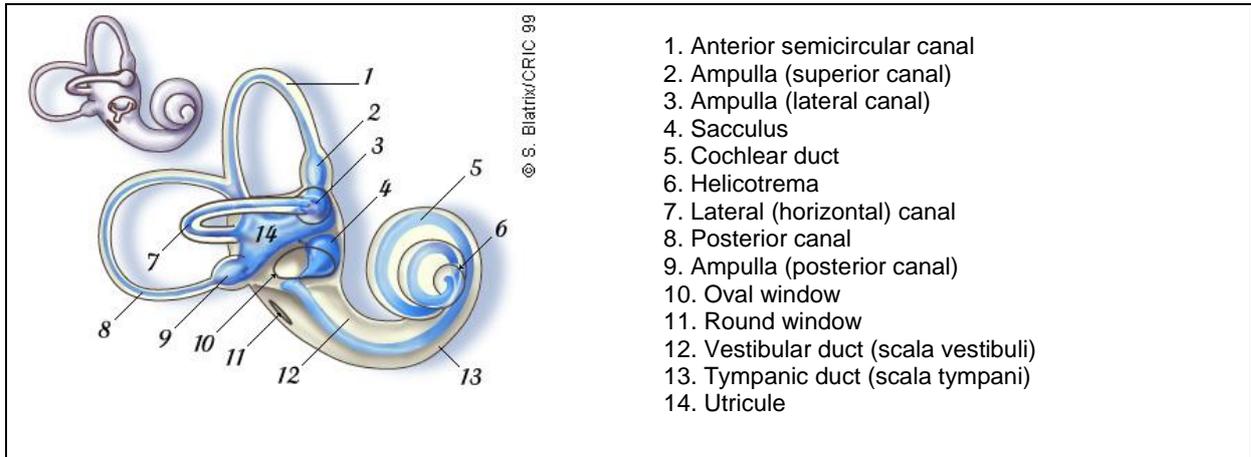
Sound is collected by the outer ear and reaches the inner ear by crossing the ossicle bridge of hammer-anvil-stirrup.

Figure 3.20: A Schematic Illustration of the Hearing Organs (Harris: s.a. <http://static.howstuffworks.com/gif/hearing-2.jpg>)



3.4.3.1 The Inner Ear

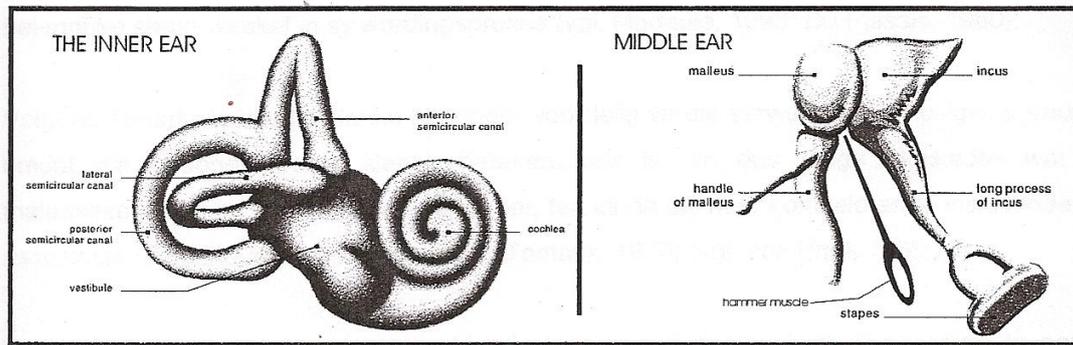
The inner ear or labyrinth is the most complex structure of the ear. As mentioned, it consists of two organs namely the vestibule and the cochlea. The vestibule registers movements of the body, while the cochlea registers movement of sound. The anatomy of the inner ear is dominated by large fluid-filled spaces enclosed in membranes. It consists of a complex series of tubes, running through the temporal bone of the skull. The bony tubes sometimes called the bony labyrinth are filled with fluid called perilymph. Situated in the bony labyrinth of the inner ear one finds the vestibular system which consists of the nucleus in the brain stem and the vestibular receptor. Within this bony labyrinth is found a second series of tubes made out of delicate cellular structures, called the membranous labyrinth, filled with the fluid called endolymph. This membranous labyrinth contains the hair cells of the organ of Corti which is the actual hearing cells (Tomatis, 1987:46).

Figure 3.21: Schematic Illustration of the Bony Labyrinth(Blatrix: 1999. <http://www.cochlea.org/in/spe/inner-ear.html>)

The vestibule is made up of the *utricle* which organizes movements mainly on the horizontal plane, particularly at the level of the head, the *sacculus* which, on the other hand, organizes movements primarily on the vertical level. These are topped by the *semicircular canals*, which are nearly perpendicular to one another. Tomatis (1987:46) explains that this arrangement leads to the discovery of movement in all directions and allows the body to move in the three axes of space.

The cochlea's location with respect to the ear canal is shown in Figure 3.20. Tomatis (1987:48) explains that it appears after the vestibule in phylogenic development as well as in the ontogenic domain. The cochlea is a spiral structure, which resembles a snail and contains the vestibular, tympanic and median canals. The word cochlea is derived from the Greek word 'Kokhlias' (snail). The cochlea is responsible for converting sounds which enter the ear canal from mechanical vibrations to electrical signals. This process, known as transduction, is performed by specialised sensory cells within the cochlea. Thus the cochlea supplies the encephalon with audition (hearing), language and the instinctive cerebral motor observations, which are all part of its higher functions.

Tomatis (1987:51) maintains that the role of the inner ear is to analyze movement, rhythms and pitch (sequences of frequencies). The inner ear is the organ of listening. It also controls posture, enables interaction with the environment, and allows focused attention. For this to happen, the hair cells of the membranous labyrinth, which act as receptors, are placed in specific locations to act in response to their various functions. They could be on the floor of the utricle, in the ampullae of the semicircular canals, on the perpendicular face of the sacculus and in the basilar membrane of the organ of Corti.

Figure 3.22: Schematic Illustration of the Inner-ear and Middle-ear (Madaule, 1993:49)

3.4.3.2 The Middle Ear

The middle ear consists of three 'hearing bones' (ossicles); the hammer (malleus), the anvil (incus) and the stirrup (stapes). They are of different embryological origin and are derived from different areas at the beginning of foetal development (see 3.6.1). Sealing off the opening on the side of the external ear is the eardrum (tympanic membrane). Attached to this membrane by its handle is the hammer, the most external of the ossicles. Firmly attached to the hammer is the anvil which has the tip of the stirrup joined to its lower and interior tip. The stirrup is attached to the oval window by a footplate. The oval window is one of two openings into the wall of the cochlea and is sealed by a flexible membrane (Tomatis, 1987:49).

The ear is connected to the pharynx by the middle ear that joins with the Eustachian tube in the front and the mastoid in the rear. The Eustachian tube runs at an angle towards the middle and front of the body. Of paramount importance to the Tomatis Method and therefore to the current research are the two muscles in the middle ear. Tomatis (1987:49) explains that these muscles, the muscle of the stirrup and the muscle of the hammer are largely responsible for regulating the ear and are thus the controls for the listening function. The middle ear muscles, which are the tympanic muscle as well as the stapedius muscle, have the ability to contract, resulting in the optimal adjustment of the ear with the conduction of sound. This is known as the accommodation theory of the middle ear muscle. It assumes that the individual is capable of selecting certain sounds. It is accepted that the contractions of the tympanic muscle changes the physical characteristics of the conduction system of the middle ear and that let changes occur in the acoustic impedance (Rolf 1998:42).

Functional hearing is the basis for excellent listening skills. Tomatis (1987:52) advocates that fitness of the muscles in the middle ear enables the optimal use of the inner ear. The muscles of the hammer and stirrup must therefore be in coordination. They act synergistically rather than antagonistically. This balance between the flexor (hammer) and extensor (stirrup) muscle results in an optimal tone. The muscle of the stirrup also controls the inner ear.

3.4.3.3 The External Ear

The external ear consists of the auricle and the auditory canal, sealed by the eardrum/tympanic membrane. This is thus the visible part of the ear. This part of the ear develops last on both the phylogenetic and ontogenetic levels. According to Tomatis (2005:54) it acts as amplifier, but also as filter, allowing only certain sounds into the inner ear, especially high frequencies.

Tomatis points out that several cranial nerves, including the vagus which is also called the pneumogastric nerve innervate the eardrum (Tomatis, 2005:61).

3.5 THE EAR AND THE NERVOUS SYSTEM

The human body uses diverse cybernetic networks which rule verbal and nonverbal communication. In these networks there should be a correlation between the muscular command paths and those paths of sensory responses related to the matching areas. Tomatis (1987:55) believes that the ear is regulated by these large networks.

3.5.1 Cybernetic Loops

Vercueil (2010:48) explains that, according to Tomatis, cybernetics is the science of automatic control systems or mechanisms. Thus, a cybernetic loop is a circular route where the end returns to the beginning (Tomatis, 2005:65). Vercueil (2010:48) states that, in the case of physiological mechanisms, Tomatis posits that there should be a commanding organ, transmitters responding to that central organ's commands, and a control centre to monitor whether the emission conforms to the commanding organ's requirements (Tomatis, 2005:67).

Tomatis accepts that the different elements of the auditory control loops are the brain, the nerves that stimulate various muscle groups and nerves that transfer sensory information to the brain, confirming a level of proprioceptive control. The auditory control gathers and coordinates sensory information, and organises stimuli conducted through both air and bone (Tomatis, 2005:67).

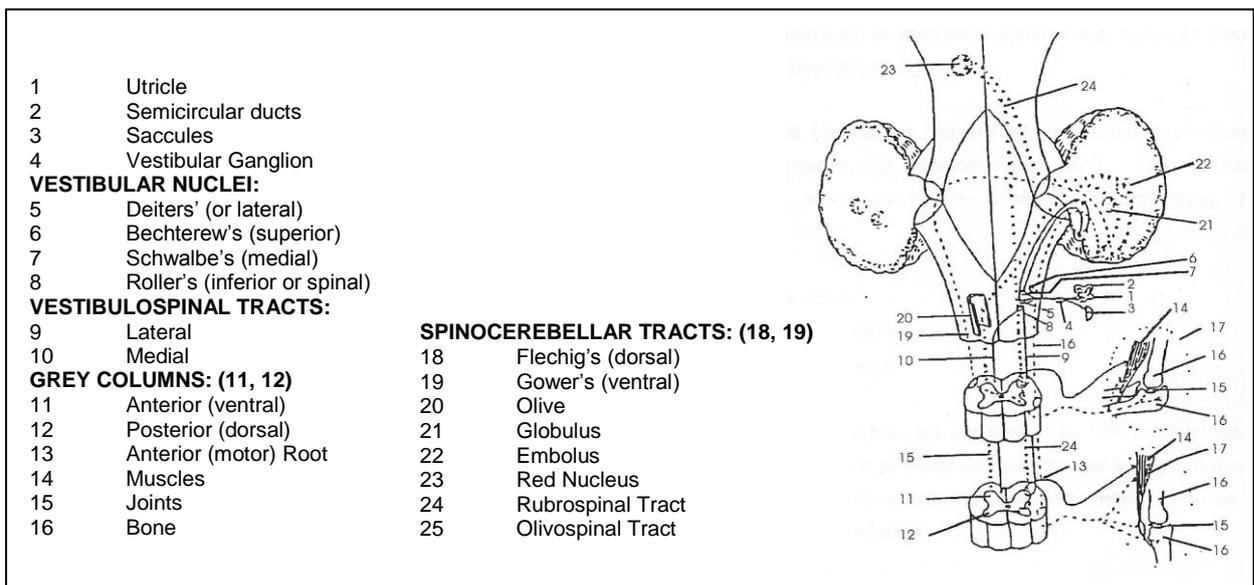
Tomatis (2005:69-75) describes 11 auditory control loops. These loops are the:

- 1) Audio-Mandibular Loop, 2) Audio-Larynx Loop, 3) Audio-Pharyngeal Loop, 4) Audio-Lingual Loop, 5) Audio-Thoracic Loop, 6) Audio-Mouth Loop, 7) Audio-Nasal Loop, 8) Audio-Recurrent Loop, 9) Audio-Lumbar-Sacral Loop, 10) Audio-Cervical Loop and the 11) Audio-Corporeal Loop.

The number of loops identified by Tomatis shows the extent of the ear's connections to the whole body. Since the "discovery of the audio-vocal loops in 1947" (Tomatis, 1996:168), Tomatis discovered other circuits, which led him to the study of larger networks of nervous pathways which he called integrators. He (Tomatis, 1987:55) advocates that the human neural tree is composed of three of these major integrators, which became known in terms of their phylogenetic and ontogenetic history. In the current explanation of these integrators, Tomatis's earliest discovery will be discussed first and the remainder will be addressed chronologically. The integrators are the Vestibular/Somatic Integrator, the Visual and Auditory Integrators and the Cochlear/Linguistic Integrator.

3.5.2 The Vestibular/Somatic Integrator

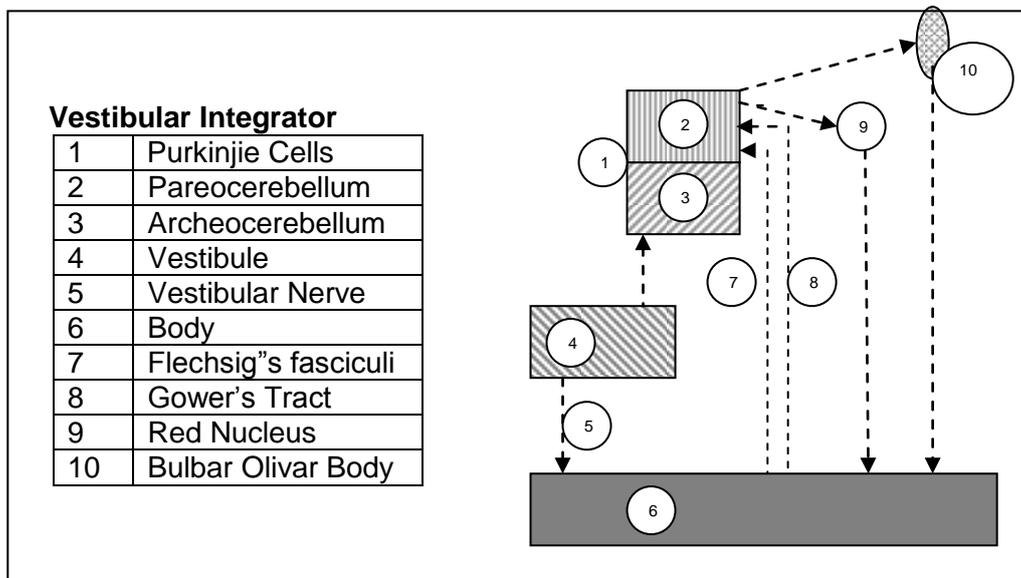
Figure 3.23: Schematic Representation of the Vestibular/Somatic Integrator (Rolf, 1998:42)



The motor and sensory responses of the whole body are involuntarily controlled by the vestibular integrator, related to the vestibule. Working outside the domain of consciousness, the vestibular integrator, using a protopathic neural structure, controls all movement of the different muscle groups, and therefore all motor functions. It enables standing still, as well as moving around. The incorporation of the archaio-cerebellum as well as the paleo-cerebellum makes it even more complex. Tomatis (1987: 55) explains that it is in reality the functional, primitive brain that coordinates all bodily functions, giving it the further description of 'somatic integrator'. This integrator also controls the brain - the ultimate source of the nervous system. The vestibular integrator forms the basis of and is also informed by the other integrators.

The components of the vestibular nerve are the utricular, ampular, and saccular nerves. Tomatis (1987:55) gives detailed descriptions as to how these nerves emerge from the vestibule and meet in Scarpa's ganglion. The vestibular nerve is then directed toward four nuclei and thence to the ventral roots of the spinal column (see Figure 3.23). These motor roots perform a dual purpose, exercising their control, but are in themselves cybernetically dependent on vestibular control. These nerve fibres are the homolateral vestibule-spinal tracts of Deiter and the contra lateral vestibule-spinal tracts, emerging from Roller's nucleus. The vestibule is in control of all these systems (Tomatis, 1987: 55).

Figure 3.24: Schematic Representation of the Vestibular/Somatic Integrator (Tomatis, 1996:172)



The functioning of the vestibular integrator can be represented as follows (Tomatis, 1996: 171):

- Sensory information from the vestibule is transmitted to the body via the vestibular nerve. This information is conveyed to the nerve endings in the muscles by means of the extrapyramidal nerve.
- The body returns the sensory information by means of Flechsig's fasciculi and Gowers' tract to the paleo-cerebellum.
- The paleocerebellum sends this sensory information back to the vestibule, passing through another transmitter, the archaeocerebellum.
- The passing of information from one cerebellum to the next happens through a system of Purkinje cells.
- This group of integrators are supported by two auxiliary fasciculi. The one is transmitted through the red nucleus and the other through the bulbar olivary body.

This system is very sensitive to any change in position and movement and has a strong integrating influence on the brain as one group of vestibular receptors reacts on gravity and the other on movement. Van Jaarsveld (1982:2) notes that, apart from gathering sound stimuli which have meaning that result in thought, the ear gathers information responsible for the co-ordination of the vestibular part of the labyrinth in the ear. Van Jaarsveld (1981:3) also affirms that descending impulses along the spine have an interaction with other sensorimotor impulses to enhance body image, balance and movement while ascending impulses interact with auditory, visual, tactile and proprioceptive impulses, thus making observation and orientation in space possible. The vestibule is in charge of co-ordination, verticality, musicality and the control of the eye muscle. It also helps with spatial body image which is the core for kinetic movement. Fouchard (1997:29) elaborates on the statements by Tomatis (1979:56) when he writes that the vestibule is an important conductor of sensory energy sent to the brain via the body. In addition to the above-mentioned facts, the vestibular system has special importance for the integration of the five senses, which is linked to reading and writing (Feinberg *in* Rolf, 1998:42).

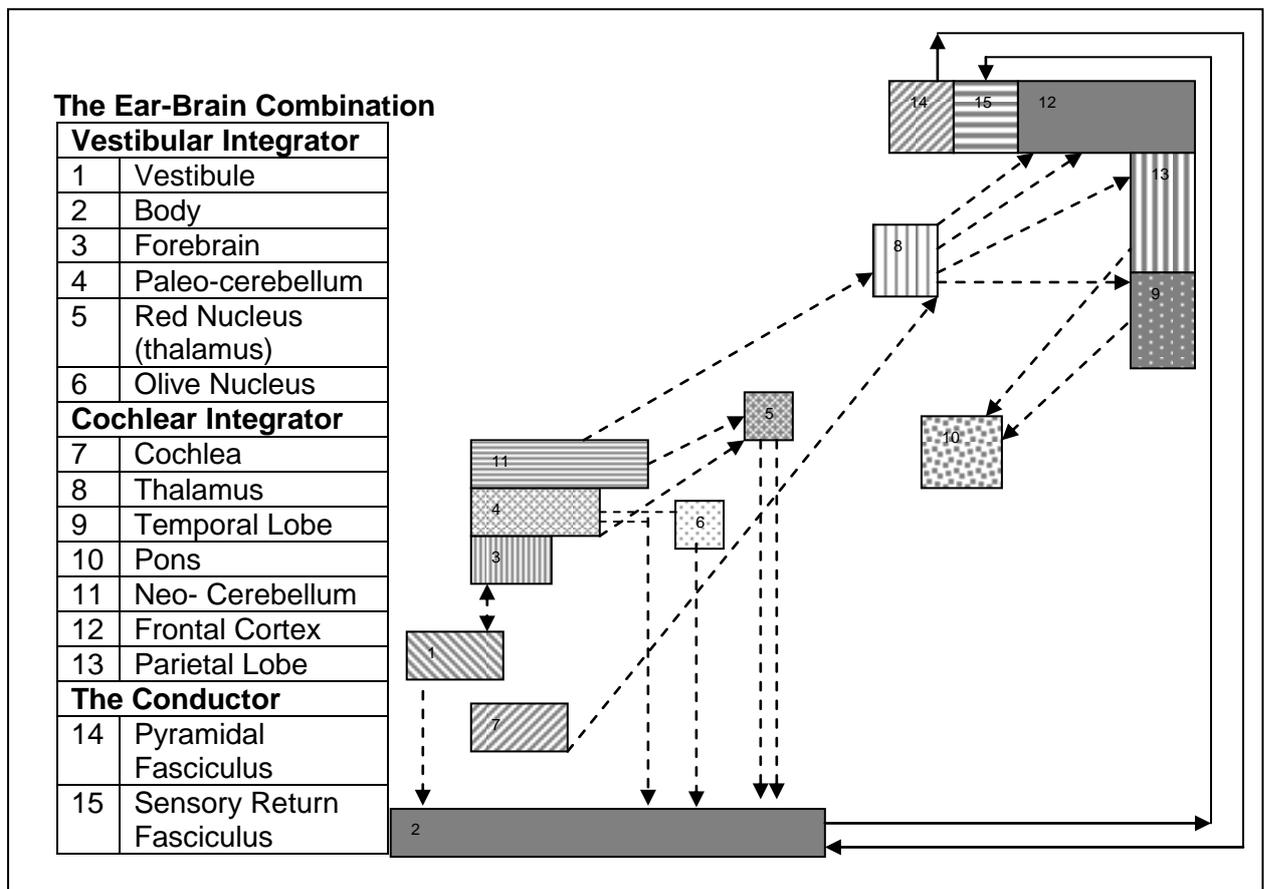
3.5.3 The Visual and Auditory Integrators

In humans the visual and auditory integrators concern reading and speech. Tomatis emphasizes the close relationship between the auditory nerve and the ocular-motor nerve, also called the ocular-giro. Tomatis clarifies on the integration between reading and listening/audition: the eye is the antenna that collects all the information that the ear needs,

therefore a 'dynamic act that sets in motion a controlled verbalization circuit ...relating it to the written word to be sonorized' (Tomatis, 1978:74).

Figure 3.25 illustrates the ear-brain system with particular emphasis on the visual integrator. The diagram shows the complexity and highly integrated nature of the interrelationship between the ear and the brain. The feedback loops (see 3.5.1) permit extensive control (Tomatis 1987:58).

Figure 3.25: Schematic Representation of the Ear-Brain System with Particular Emphasis on the Visual Integrator (Tomatis, 1987: 58)



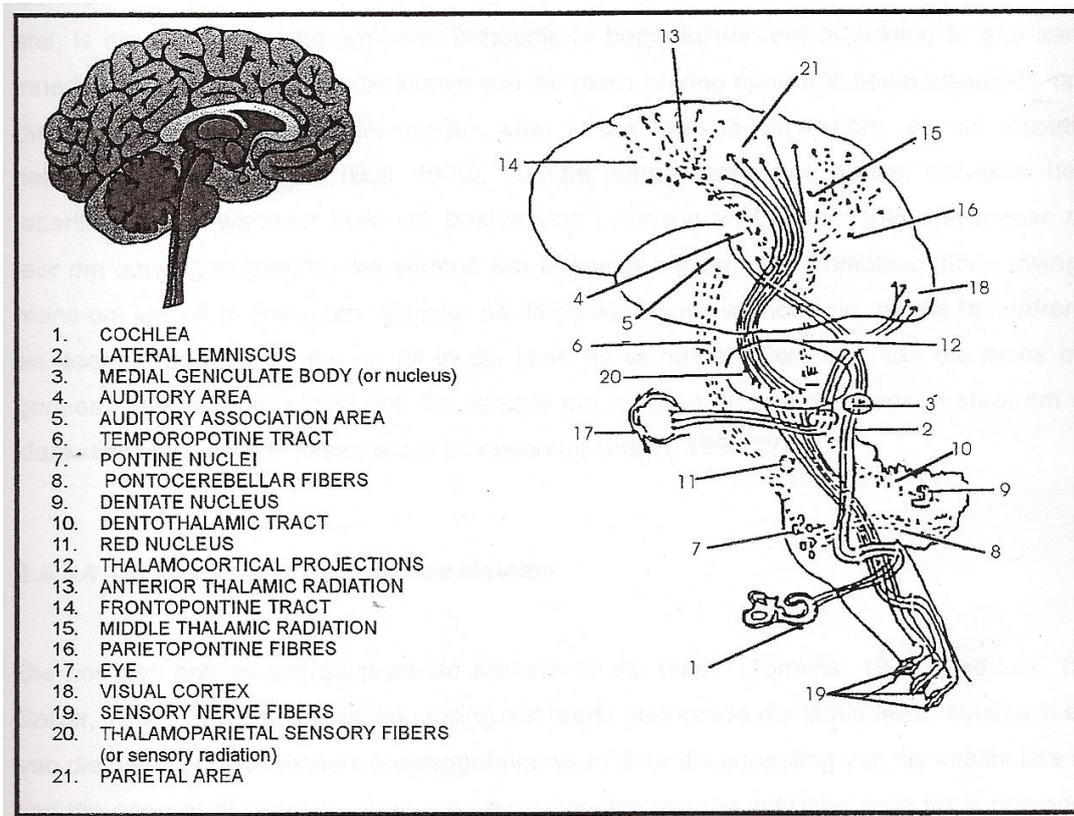
3.5.4 The Cochlear/Linguistic Integrator

The cochlear integrator is responsible for changing the relationships between various neuronal components. The cochlea takes control of the system and, as with the other integrators, interdependence exists between the vestibule and the cochlea. The cochlea

positions itself spatially and in conjunction with the vestibule the cochlear integrator gradually brings about the vertical, upright posture of the human being, the 'listening posture'. This posture, characteristic of the human species, allows for the upright position, dexterity, the hand's freedom of movement and language Tomatis (1987:57).

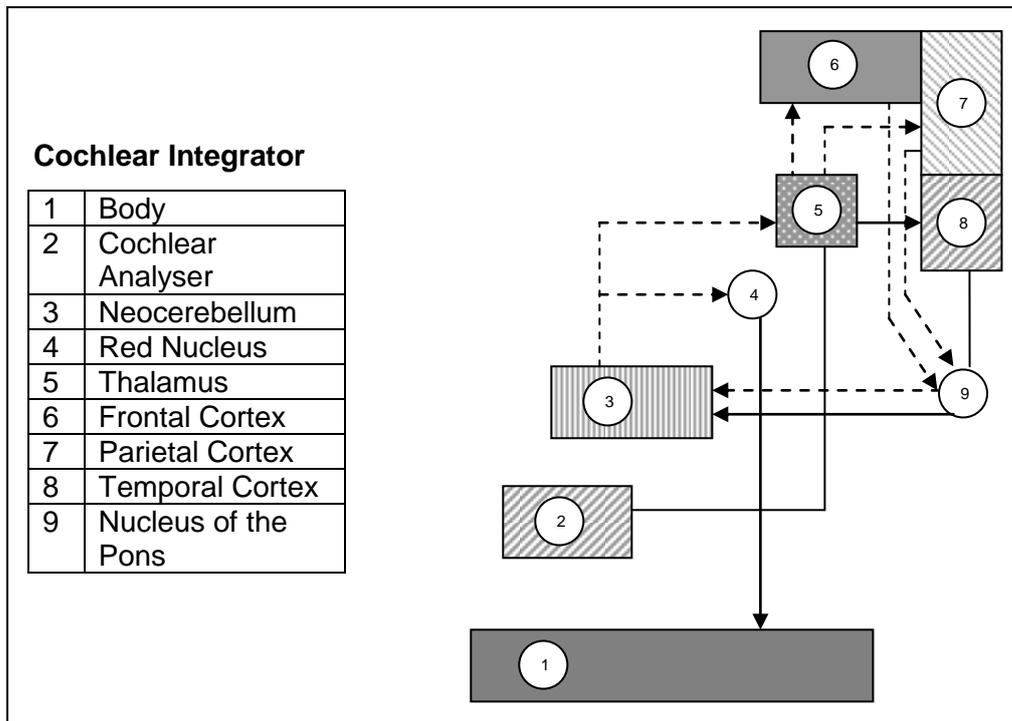
According to Tomatis (1987:57) the listening posture enables man to obtain both internal and external messages which allow articulation from the time he is able to recognize another person through sound. He also discovers himself through the spoken word.

Figure 3.26: Schematic Representation of the Cochlear Integrator (Rolf, 1998:49)



This circuit touches the cochlea, the thalamus, the cortex, the pons, the cerebellum, back to the thalamus, and back to the cortex in succession before continuing to new areas. Essential information transferred to the nucleus directed to the anterior roots of the medulla, represents another circuit connected to the vestibular fasciculus. The most external part of the brain, the neocerebellum, contains the cortical area. The cortical area can furthermore be seen as the projective system of the vestibular nerve as it enables it to install analogous differential responses connected to the anterior areas of the paleocerebellum and the archaeocerebellum (Tomatis, 1987:58).

Figure 3.27: Schematic Representation of the Cochlear/Linguistic Integrator (Tomatis, 1996: 173)



Tomatis (1996:172) delineates the path of the cochlear integrator as follows:

- From the cochlear analyzer the cochlear integrator passes through the back section of the thalamus and then moves to the temporal cortex.
- The sensory information is gathered from the temporal cortex and then travels to the centre of the pons from where it is to meet the neocerebellum.
- It then passes through the central part of the thalamus to return to the frontal and parietal cortex.
- The above results in a large cortical circuit by means of which the information is stored in the whole brain.
- The red nucleus in turn uses a nerve branch to send a fasciculus to the body to get it engaged.
- The network formed by Purkinje cells is utilized by the vestibule to join the neocerebellum with the archaeocerebellum, and the paleocerebellum.

Concluding this section on the anatomy and function of the ear, it should be apparent that this overview is insufficient for a comprehensive understanding of the complex field of hearing and in particular musical hearing. Thus the current researcher bases a more detailed

discussion of the development of the human auditory system and specifically the origin of the listening function on Gilmore *et al.* (1989:164).

3.6 WHAT IS PRENATAL SOUND PERCEPTION?

Tomatis claimed that perception of sound commences before birth. It is on this assumption that he based his whole Method and development of the Electronic Ear.

3.6.1 The Human Auditory System and the Origin of the Listening Function

Tomatis believed that the ear creates itself. He (Tomatis, 1987:76) states that the embryo begins existence as a series of five brachial arches. The first two are of specific importance in Tomatis's Method because the ear develops in the encephalic area, which emerges from the first two brachial arcs.

The first brachial arch grows into the lower jaw with its adductive muscles, the muscles that eventually will open and close the mouth, and into the first two ossicles of the ear, namely the malleus with its muscle, and the incus. The adductor muscles of the jaw (temporal and masticatory) and the malleus muscle fall under the same control of the trigeminal nerve, which is the fifth cranial nerve. Tomatis saw this as the origin of the mouth-ear relationship (Tomatis, 1987:76).

The second brachial arch produces the third ossicle, the stapes with its stapedius muscle – and is innervated by the facial nerve which is the seventh cranial nerve. This arch also develops into the upper part of the larynx, responsible for phonation, the hyoid bone where the tongue muscles anchor (important for articulation), the anterior ventral segment of the digastric muscle (oppositional to the adductor muscles of the jaw and therefore abducting from the latter), all of the facial muscles (except for the muscle that raises the eyelid), the stirrup bone and the third ossicle of the ear with its muscle. It is therefore clear that even in the embryo, close relationships exist between mouth and ear, making future interaction between the two possible (Tomatis, 1978:76).

According to Tomatis (1987:45) the ear is the first sensory organ to function, appearing in the first days after conception, and is able to analyse the data that reach it at the level of the vestibule-cochlear nuclei as from the second month of pregnancy.

Van Jaarsveld & Du Plessis (1988:3) explain the embryological development of the ear regarding the integration of its two functions: that of the vestibular system, in control of balance and coordination; and that of the cochlear system, responsible for the processing of auditory stimuli. Firstly, the establishment of the vestibular system with its neuron paths and nuclei occurs. By an interpretation of clinical observations it was proven by Minkowski (in Clauser, 1971:69) that the vestibular apparatus in the inner ear is already fully differentiated and functional at 27 to 28 weeks of foetal life. Tomatis (1991:127; 2005:45) explains that in the fourth month after conception, the vestibular nerve develops its myelin sheath and myelination of the hearing nerve starts approximately at the same time. Secondly, the cochlear system develops. Myelination of the cochlear nerve is completed after five and a half months of pregnancy. The integrated functioning of these two systems prepare the body and nervous systems to process information and enable listening through the focusing on sound.

Tomatis is not the only researcher that embraces the idea of prenatal perception of sound. Shahidullah and Hepper (1992:237) noted that researchers in Belfast used a pure pulse sound at 250-500 Hz and found behavioural responses clearly seen via ultrasound, thus demonstrating that reactive listening begins at 16 weeks, two months sooner than other types of measurements indicated. This is especially significant because reactive listening begins eight weeks before the ear is structurally completed at about 24 weeks (Tomatis, 1991:127; 2005:45).

According to Tomatis (1987:6) the organ of perception in the ear is the organ of Corti. On the basilar membrane the cells of Corti are much more compactly organized in the area receptive to high frequencies than that in the area receptive to low frequencies. In the zone of the low frequencies there are only a few dozen cells, in the middle a few hundred, and in the zone of the high frequencies there are approximately 24000 cells. Consequently the number of impulses conveyed to the cortex in high-frequency sounds is more intense than in the case of lower frequencies. Tomatis (1987:45) affirms through his experimental findings that initially the foetus responds best to lower frequencies (2000 Hz – 4000 Hz) but as the basilar membrane changes structure, the hair cells become sensitive to increasingly higher frequencies. The cells responsible for the higher frequencies also mature faster than any of

the other cells and therefore Tomatis accepts that the foetus is essentially exposed to high frequency sounds (Van Jaarsveld & Du Plessis, 1988:3).

Tomatis (1991:209) also explains that the ear of the foetus acts like a high-pass filter, since it is only towards 2000 Hertz that foetal hearing begins to take place. Influenced by the verification of experimental findings and clinical observations in a therapeutic setting, Tomatis (1991:144, Gilmore *et al.*, 1989:7) claimed that the foetus, with a hearing process that starts at this very early age, can, among the many uterine sounds, distinctly perceive the mothers' voice. Rather than being overwhelmed by the background noise created by the mother and placenta, it is confirmed that it is first and foremost sounds that reach the womb (Tomatis, 1991:127). The sound energy in amniotic fluid stimulates foetal hearing through a bone conduction route, rather than through the external and middle ear systems. Intonation patterns of pitch, stress, and rhythm, as well as music, reach the foetus without significant distortion. A mother's voice is particularly powerful because it is transmitted to the womb through her own body reaching the foetus in a stronger form than outside sounds carried to the unborn via bone transmission (Van Jaarsveld & Du Plessis, 1988:3).

It is clear that the voice of the mother has a significant conditioning and stimulating influence on the foetus. The tonality, affectivity and rhythm of the mother's voice are experienced by the foetus and understanding is attached to it. This relationship has an influence on all levels of post-natal development. Based on extensive research proved through scientific literature, Tomatis explains that the voice of the mother does not only feed the infant emotionally, but also prepares the child to learn language after birth (Tomatis, 1991:109).

3.6.2 The Desire to Communicate

The desire to communicate through language develops, according to Tomatis (1987:45), in the womb. According to Tomatis the desire to communicate is the fundamental requirement for speech development. He (Tomatis, 1978:63) believes that this desire exists in all human beings and to use his own words he sees it as a "sort of archaic seed, deeply buried in the human soil, perhaps springing from the indefinable and yet an uneradicable regret for a lost world; in any case it nourishes distant echoes throughout life, spurring on that stubborn quest, impossible ever to fulfil, for a final, absolute relationship".

Since the process of listening commences in the ear, Tomatis stresses that listening is a high level ability that releases consciousness. Thus listening and consciousness are inter-dependant where one becomes more active as the other grows. He states: "Man speaks.

Speech is his most detailed, nuanced way to communicate and relate. It allows him to find himself, to become conscious of his own existence, and to better spot his limitations within his own life” (Tomatis, 1996:27).

The developing of communication in the prenatal stage (Tomatis, 1978:63) forms the basis for further language development after birth. Clauser (1971:71-80) elaborates by providing a detailed, well-motivated explanation of voice and speech development, starting from embryonic, through foetal up to toddler stage. He stresses the close relation between voice training and all affective components and experienced rhythm as the root phenomena of life. Tomatis (1991:214) emphasizes the rhythm aspect in particular when he explains that many of the sound-sensations gathered by the foetus are perceived solely at the level of rhythm.

Tomatis (1996:58, 1991:135) emphasises that the hearing of the infant after birth has to adapt from sound waves carried by water to sound waves carried by air. In spite of this adaptation the newborn still recognises voice nuances and rhythm of the mother which Tomatis advocates as the first phase of speech development, considering this affective stage of audio-vocal conditioning as very important. After this initial phase there is a phase when the new born discovers its own voice and hearing.

3.6.3 The Ear as an Energy Source for the Brain

The statement “the ear is a power source for the brain” by Tomatis (1991:224) is emphasized by Madaule (2001:13, 1993:60). Tomatis found through research that the connection between the vestibular part of the ear and the cortex results in the structuralizing of the entire nervous system which already exists in the foetus of a few weeks old. Some of the first impulses are from the vestibule when the foetus moves and in the very early stages of foetal movement impulses from the labyrinth are sent to the foetal brain via the sensory nuclei of the brain stem. A close connection between the ear, the reticular formation and the cortex exist and the stimulating influence on the cortex leads to heightened activity, muscle tone and sensitivity.

Tomatis (1991:125,186,209) is of the opinion that high frequency sounds increase the energy sent to the brain while low frequency sounds drain energy levels. These lower-frequency sounds not only supply insufficient energy to the cortex, but may even tire the person by inducing motor responses which absorb more energy than the ear can provide. People who tend to be tired or depressed often have dull, toneless voices with very little high-frequency content. Low frequency sounds thus introduce somnolent or even hypnotic effects. Tomatis states that the brain ought to receive sensory stimulation to remain healthy. These stimuli are

usually in the region of 3.5 million per second, for at least four and a half hours per day, in order for the brain to function properly, be alert and attentive (Tomatis, 1987:6; Tomatis, 1991:186).

Gilmor *et al.* (1989:82) states that for Tomatis, the ear is primarily an apparatus of which the purpose is to bring forth a cortical charge, which has the effect of increasing the electrical potential of the brain. This leads to increased protein biosynthesis and structurally changes brain cells. Tomatis (1991:125) explains that sound is transformed into nervous influx by the ciliform cells of the inner ear. The electrical energy obtained from the influx of nervous impulses reaches the cortex, which then distributes it throughout the body. This leads to heightened activity through the whole system and greater dynamism will then be conveyed. In 3.6.1 it is explained how the organ of Corti in the ear is the organ of perception. Tomatis points out that the number of impulses transmitted to the cortex in the case of high-frequency sounds are higher than in the case of lower sounds. The reason is that in the basilar membrane the cells of Corti are more densely packed in the area responsive to high frequencies than in the area responsive to low frequencies. This is the reason why Tomatis calls those sounds rich in high harmonics the 'charged' or 'charging' sounds (Tomatis, 1991:125).

The ear, via the vestibule alone, ensures 60% of this electrical charge. It organizes and controls equilibrium, verticality and balances the entire anti-gravitational harmony. The cochlea as sound detector, adds 30% to this charge. The cochlea-vestibular apparatus therefore plays an important part in providing electrical energy to the cortex (Tomatis, 1991:125).

Additionally, Tomatis (1991:188) believes that the ear functions in exactly the opposite way from what is generally believed. The hammer, anvil and stirrup have the function of putting the entire cranium into resonance, they do not merely act as bridge between the outer and inner ear. The sounds that are picked up by means of the eardrum travel the osseous itinerary throughout the cranial box which, because it vibrates, follows the vesicle labyrinthine all the way through its contours. A balance between sound distribution and sound regulation is ensured by the constant movement of the stirrup muscle that results in even pressure in the vesicle labyrinthine.

Tomatis is therefore of the opinion that old beliefs and theories should be overturned. Moreover, he advocates that everything consists of dialogue, of language and therefore of listening. Should there be disharmony in listening it would bring disharmony in the brain and

thus there will be disharmony in the total integration of the individual (Tomatis, 1991:125, 188).

3.7 WHAT IS THE RELEVANCE OF THE TOMATIS METHOD TO THE CURRENT STUDY?

Tomatis describes in his writing the energizing effect of musical and vocal sounds rich in high frequency. Realizing that the foetus is exposed to these high frequency sounds and also understanding transmission of sounds through bone conduction in utero he used both these concepts when creating the Electronic Ear for his sound stimulation programme.

3.7.1 The Sequence of the Phases as it Manifested via the Tomatis Method

Thompson (2004:55) explains that the Tomatis programme begins with an *initial assessment*. This assessment consists of tests that evaluate listening and lateral dominance and the participant is also asked to do some projective drawings. The functional abilities of the ear are identified by the Listening Test which evaluates strengths and weaknesses.

A *consultation* follows the above-mentioned assessments to review the results and to obtain the personal history of the participant. Suitable goals are then determined and lastly a programme is recommended to achieve these goals.

It is important to understand that the programme is formulated to simulate all stages of listening and language development - from the earliest to the more sophisticated stages demanded when attending school and eventually the communication and interaction needed in the adult world. There are two basic stages in the programme. Tomatis describes them as 'passive' and 'active'. The ideal would be for each participant to go through each stage of the programme, but the tempo at which each participant moves from one stage to another will vary according to individual progress.

The programme in the current research was structured according to the traditional Tomatis guidelines where the learner is exposed to a total of 120 half hour sessions of auditory stimulation by means of the Electronic Ear. In the current research the passive part of the

programme started mid-May and lasted until mid-June. The phases of the stimulation programme were:

3.7.1.1 The Passive Phase (Auditory Training)

Sonic Return / Reversed Musical Birth

The passive phase of the programme consists of a gradual introduction to filtered sounds. [As explained earlier Tomatis (1978:145) posits that the term filtered sounds refers to 'sounds which have been sent through electronic filters so that they will sound as though they are being heard through a liquid barrier – as they would be in the womb... This process recreates the prenatal acoustic environment.' Tomatis describes in his writing the energizing effect of musical and vocal sounds rich in high frequency. He also explains the beneficial effect of sound stimulation on laterality, motor functions, balance, coordination and body image by describing the interrelationships between the vestibular system of the inner ear, the nervous system and various body functions (Gilmor *et al.*, 1989:17).]

The auditory stimulation was applied during a series of sessions listening to audio-tapes which took approximately 30 minutes to complete. The participants are therefore prepared in stages for the simulation of the pre-natal listening process. The process consisted of the gradual exposure to progressively more filtered sounds which started at 0Hz and is filtered up to 9000Hz. During a session, the sound was received through earphones as well as a bone conduction device. Gilmor *et al.* (1989:27) explains that the intensity/loudness of the sounds presented is adjusted to the individual's own comfort level which, in most cases, ranges between 60 to 80 decibels.

The second stage in the passive phase of the programme involved the presentation of filtered music. In addition to developing the focusing (listening) response, this part of the passive phase simulate the desire to communicate in two ways. Firstly, the filtered sound stimulates important aspects of the prenatal listening experience of the individual in order to permit a renewal of the desire to communicate. Secondly, the neural energy generated by the higher frequency sounds created a 'charging effect' which stimulates the cortex and cortical functions including communication. While taking sessions, children are free to draw or play with others in a room designed for children.

In the current study, filtered recordings of violin concertos of Mozart and Gregorian chants were used. The violin sounds of Mozart's music are functional for energy generation, while

the Gregorian chants are relaxing. The rhythm of the chants is induced through a psychological rhythm which enhances inner peace and provides energy (Madaule, 1993:63). Gregorian chant is to a certain extent a naturally filtered form of music and the rhythm of this music equals the physiological rhythms of the human being. The fundamental tones are noticeably calm compared to the range of harmonics which are very rich. The musicality of the voice is improved by the development of its possibilities of modulation. It is these particular characteristics of the Gregorian chant which is the reason why this type of singing is chosen for the audio-vocal exercises (Tomatis, 1974:139).

The music of Mozart on the other hand consists of an intrinsic rhythm which follows the heartbeat of the foetus which is approximately 120 beats per minute. Madaule (1993:64) highlights the universal qualities of filtered Mozart sounds. It is universally accepted that the music of Mozart relaxes the over stimulated and anxious person, but simultaneously provides energy to the tired, depressed person.

When these sounds reach a filter level of 9000Hz they simulate the pre-natal sound milieu which, according to the Tomatis Method, reactivates the pre-natal feeling of security. This reactivation is usually facilitated through the filtered voice of the mother (Tomatis, 1991:150) but when not available, filtered recordings of the violin concertos of Mozart and Gregorian chants were used. The high notes which are found in Mozart's music substitutes the mother's voice and reaches the area of the inner ear which is responsible for the cortical reloading as indicated in 3.3.5.2.

Gilmor *et al.* (1989:27) gives a comprehensive clarification of the process that happens when sound reaches the individual's ear. From there it is further modified by the EE. This device presents the sounds in two rapidly alternating forms. In the one form, the lower frequencies of the incoming sound are accentuated and the higher frequencies are diminished which results in a state of passive hearing/non-accommodation. In the second form the whole process is applied *visa versa*. In this form the higher frequencies of the incoming sound are accentuated and the lower frequencies are diminished. This then provokes listening/focusing.

Tomatis believed that hearing will be improved when sound inflicted upon the ear in rapid succession alternate between one type of stimulation followed by another type of stimulation. He speculates that the muscles of the middle ear are conditioned to attend to sound in an improved manner after listening repeatedly to music and speech sounds modified in a way where lower frequencies are accentuated (non-accommodation), alternated with a process

where higher frequencies are accentuated (accommodate or focus). Consequently the ability to listen is enhanced (Gilmor *et al.*, 1989:27). Tomatis explains that the complete harmonic range of sound information is made audible to the ear by the above procedure. Filtered sounds have different effects on different people. The effects range from calming through emotional discharge to stimulating through raising energy on a cortical level. It is important to carefully observe and monitor each participant during this phase, with specific reference to the Listening Test.

Sonic/Musical Birth

When certain behavioural signposts are reached and test results are satisfactory, the third stage in the passive phase of the programme can begin. This includes the gradual de-filtration of the filtered music (or the mother's filtered voice). This phase simulates the transition from the liquid pre-natal acoustic environment to the aerial post natal acoustic environment. Tomatis called this phase the *sonic/musical birth*.

This phase is the opposite of the reversed musical birth. Filtered sounds are progressively de-filtered from 9000Hz to 0Hz by adding lower sounds to the point where the music is original and unfiltered. This also simulates the birth process where body and water conduction of sound is exchanged and is adjusted for air conduction.

Behavioural signs which indicate acceptance of this phase help the clinician evaluate the individual's readiness to begin the active phase of the programme. It has been confirmed that once a person has completed the passive phase of the programme, he/she is more motivated and better able to work with teachers and other professionals. These professionals include psychologists and psychiatrists, speech language pathologists, physical and occupational therapists and physicians whose specialties involve using language, posture, motivation, and motor control. Tomatis (1996:202) confirms that the person is better able to learn in the traditional educational settings and develop skills more easily that were difficult in the past.

3.7.1.2 The Active Phase (Audio Vocal Phase)

A person is ready to participate in audio-vocal training after completion of the sessions of filtered music. This training consisted of repetition of words and of texts alternated with sessions of singing and filtered or unfiltered music. The active phase starts with singing and

chanting exercises. Some of these include humming, which produces bone conducted sounds dense in high frequencies and thus highly energising (Madaule, 1994:25). Gregorian chant is used for the singing because of its richness in overtones, which allows the voice to exploit its potential.

Linguistic/Language Integration Phase

The linguistic stage is the final stage of the programme during which the language sessions are introduced. Tomatis (1991:159) explains that this new phase starts with listening through the EE to phonemes rich in high frequencies, which he called 'filtered sibilants'. This stage is an extension of the pre-linguistic stage of the programme and it includes the presentation of more spoken-language content.

The participant repeats words, phrases, sentences and afterwards reads aloud during these active sessions. The voice is transmitted directly through the Electronic Ear by the use of a microphone before being fed back to the ears via earphones and the bone conduction device. To enhance the higher frequencies/higher harmonics in the voice, the feedback is modified. Gilmore *et al.* (1989:27) explains that, simultaneously, increased stimulation is given to the right ear in order to enhance its role as the leading/directing ear in the control of the individual's own speech. The sound is presented in a way that is designed to enhance the quality of the individual's voice, and to encourage the right ear to take the leading or directing role in the process of self-listening or audio-vocal control.

During the active phase of the programme, changes in the quality of the individual's voice, speech and use of language are commonly observed (Madaule, 1994:25; Thompson, 2004c:58). Also, continuing changes are observed in the individual's motivation and desire to communicate as well as in the individual's level of self confidence in using language. During the final stage of the programme, the individual is given a reading-aloud exercise to do at home. The purpose of this exercise is to reinforce the effects of the training and to assist further development of listening and audio-vocal control. The programme does not involve teaching or tutoring, nor is 'homework' assigned as part of the programme.

As a follow-up to the audio-vocal programme, every day practice of half an hour is advised. An exercise of reading aloud, while maintaining the audio-vocal posture, is given. When placing the right hand in fist form a few centimetres to the right of the mouth the person will become aware that the voice becomes considerably richer in the high harmonics, warmer

and more colourful. This strengthens self-control on the right side. Likewise, he will realize that the rhythm of the verbal flow is improved considerably.

Gilmor *et al.* (1989:91) writes that the Tomatis Method sheds “light on the understanding of the neuro-physio-psychological processes underlying musical expression. It adds new elements to support the conviction that music is intimately part of our body, mind and spirit”.

However, during the last couple of years, subsequent to this study, a new trend away from filtered sounds has emerged. It involves the more extensive use of unfiltered sounds like unfiltered Mozart music, Gregorian chants and so-called ‘band passant’ music, with limited filtering. This development is coupled with more emphasis on so-called short or long precession and delays, depending upon the person’s problem, history and test results (Du Plessis, personal communication, 2011).

3.8 BENEFITS OF THE TOMATIS METHOD

The benefits of the Tomatis Method are supported by reports of various authors. Enhanced listening skills can improve and enrich a person’s life and Madaule (1994:53) claims that the “clinical implications of this ear-body relationship and the effects of sound stimulation are endless” (in Vercueil. 2010:64).

At the close of the twentieth century there were more than two hundred and fifty Tomatis Method centres world wide (Madaule, 1993:21). The purpose of these centres is to study the human being holistically and therefore examine listening skills, psychological makeup, and control over speech and language. All these centres are directed by certified specialists from the fields of music, psychology, medicine, ortho-phonology, education, audiology, speech therapy, occupational therapy and motor therapy (Gilmor *et al.*, 1989:26). In these centres, the Tomatis Method is utilised to enhance physical-wellbeing, emotional wellbeing and spiritual-wellbeing, leading to several benefits that are documented in the literature on the Tomatis Method (Van Jaarsveld & Du Plessis, 1988:138; Madaule, 1994:53; Nicoloff, 2004:35).

Gilmor *et al.* (1989:170) points out that the list of maladies successfully treated via the Tomatis Method (also known as high-frequency auditive therapy) includes: 1) ear, nose and throat disorders: hearing and voice loss, stuttering, tinnitus, otitis media, scotomas; 2) neurological disorders: toe walking caused by vestibular nuclei problems, drooling,

strabismus; 3) psychiatric disorders: depression, attention deficit disorder, hyperactivity; 4) learning disorders: dyslexia, inability to concentrate; 5) a variety of balance/coordination problems related to vestibular dysfunction.

In addition to the above it is confirmed by clients as well as professionals that the Tomatis Method has a positive effect on communication, learning, psychological well-being, reduction of psychological symptoms, the enhancement of musical skills (Du Plessis *et al.*, 2001:35) and physiological aspects (Madaule, 1994:32; Gilmor, 1999:13). When used in combination with the Tomatis Method, other therapies produce quicker results as indicated by Trumps (2004:23), Nicoloff (2004:33) and Tatum (2004:42).

3.8.1 Establishment of Right-Ear Dominance

Laterality which implies right ear dominance is a requirement for the 'musical ear'. Without this 'perfect' listening curve excellent hearing and consequently excellent performing cannot happen. Tomatis (1991:52, 108; 2005:24, 122) claims that training through the Tomatis Method could accomplish this dominance, which will enable a musician to realise his/her potential and will lead to an improvement in the overall achievements.

3.8.2 Academic Performance

Confirmed by research studies and clinical observations, exposure to the Tomatis Method enhanced academic performance (Du Plessis *et al.*, 2000:36) such as attention, concentration and memory (Tomatis, 2005:129; Thompson, 2004c:57; Madaule, 1976:25; 1994:31); reading and writing skills (Gilmor, 1999:13; Madaule, 1994:31; Van Jaarsveld & Du Plessis, 1988:138); comprehension and perceptual processing (Nicoloff, 2004:35).

3.8.3 Communication

Enhanced listening skills facilitate the desire to communicate (see 3.6.2). Research and clinical observations indicate improvements in: general communication skills (Nicoloff, 2004:35; Gilmor, 1999:13); speech fluency (Du Plessis *et al.*, 2001:36; Van Jaarsveld & Du Plessis, 1988:141); the ability to express feelings and thought (Van Jaarsveld & Du Plessis,

1988:138; Nicoloff, 2004:35); and the use of body language (Madaule, 1994:53) after the Tomatis intervention.

3.8.4 Control Over Sound Production

Listening to filtered sounds through the Electronic Ear (see 3.3.6) trains the muscles of the middle ear to tune into the high harmonics of a sound. Thompson (2004c:57) explains that the musician becomes more aware of the harmonics of the sound he/she produces in the voice or on his/her instrument and it facilitates control over tone colour and regulates the melody. This will give surety to Tomatis's (2005:21) requirement that "nothing passes without strict verification" (in Vercueil 2010:67) and will ensure control of sound production through self-listening.

3.9 CRITICISMS OF THE TOMATIS METHOD

The method Tomatis developed has been the focus of some controversy and criticism, which is not unexpected, in view of the wide diversity of opinions concerning the nature of the problems this method addresses.

Van Jaarsveld & Du Plessis (1988:136) point out that Stutt (1983:1) proclaims that the Tomatis Method approach seems to have been neither well received nor well understood. The argument is that Tomatis writes only in French in a very ornate and flamboyant manner. Although some of his work have been translated, it is not that easy to interpret. His critics state the primary reasons why it is not acceptable in scientific literature. Others question the theoretical guidelines and therapeutic approach due to his emphasis on clinical observations and lack of rigorously controlled empirical support.

Another point of dispute is that Tomatis did not follow any of the modern psychological theories. He based his ideas fundamentally on neurophysiology with a strong psychodynamic orientation in the majority of his formulations. It does not align with any of the modern psychological theories. Van Jaarsveld & Du Plessis (1988:136) state that further criticism on the Tomatis Method is that Tomatis promises too much. He advocates the conditioning of the

middle ear muscles on the one hand, but on the other, insists on his patients taking full responsibility for their lives.

Understanding of the Tomatis Method is claimed to be useful in cases of stuttering, delayed language development, difficult second language learning, dyslexia, autism, neurosis, depression, and epilepsy. Despite test responses and psychological results indicating impressive practical changes after the auditory stimulation and sensory-motor stimulation programme have been applied, it is the concern of Van Jaarsveld and Du Plessis (1988:138) that the experimental designs of these studies have not adequately met the increasingly complex criteria for satisfactory outcome research. To complicate the matter even further, it is important to take into consideration that unidentified variables appear in all forms of therapy with positive influence as the outcome, making it nearly impossible to identify the specific contribution of the particular therapeutic technique.

The evidence, according to Stutt (1983:1), is usually clinical rather than experimental. It may, however, be argued that Tomatis's clinical deductions, which were eventually incorporated into a holistic theory of human development, would have been impossible without his large scale experiments on occupational deafness, as well as his ingeniously designed laboratory experiments. What cannot be opposed is criticism that most investigations of the therapeutic effectiveness of the Tomatis Method have not been carried out on a large enough scale, with all the proper precautions and controls, to make the findings scientifically convincing.

However, during the recent Tomatis International Convention in Panama City in 2011, a new website was demonstrated. This involves, amongst other, space where pre- and post-treatment results of questionnaires in the public domain obtained from clients could be entered. They are then automatically scored and made available to the practitioner in order to facilitate research involving larger numbers of participants (Du Plessis, personal communication, 2011).

The next chapter of this dissertation will focus on the empirical investigation. The research process is discussed by presenting the research design and methodology. An explanation of the difference between quantitative and qualitative methods as well as the hypotheses and research questions are delineated. The techniques and the measuring instruments are presented.

4

EMPIRICAL INVESTIGATION AND METHODOLOGY

4.1 INTRODUCTION

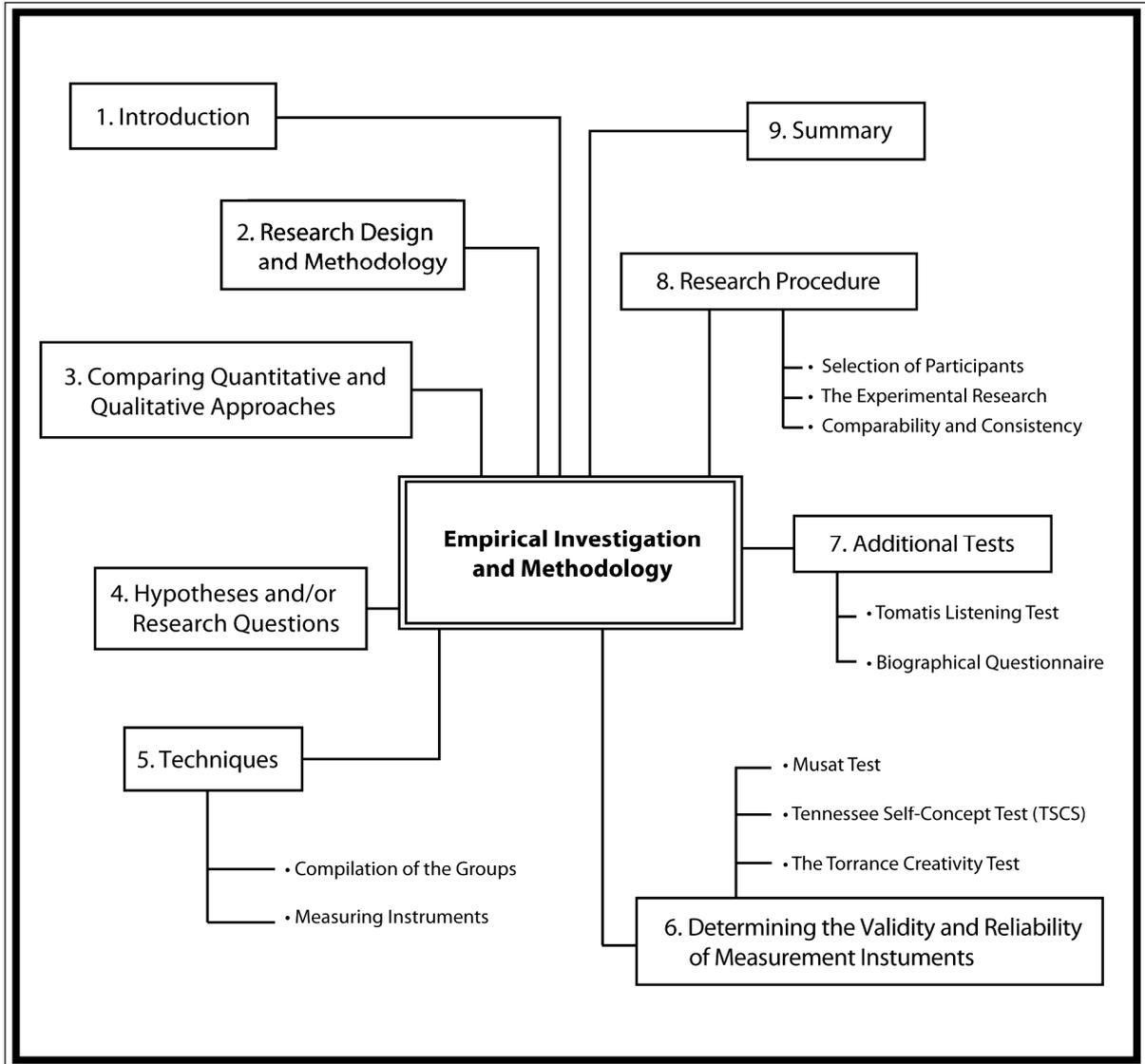
In Chapter Four the research process is discussed by presenting the research design and methodology of this empirical investigation. The research design and methodology will be discussed first with an explanation of the difference between quantitative and qualitative methods that follow.

Thereafter the hypotheses and research questions are explained with a discussion of the techniques which include the participants, compilation of the groups and the measuring instruments used.

Then the Validity and Reliability of the measuring instruments: the Musat Test, Tennessee Self-Concept Test and Torrance Creativity Test are discussed. Additionally the Tomatis Listening Test is used as a clinical tool, rather than a research instrument. Thus it does not feature specific validity or reliability scores. A Biographical Questionnaire was self-designed to obtain basic information from participants' parents. The research procedure is scrutinized by examining the experimental research and the comparability and consistency after which a summary ends this chapter.

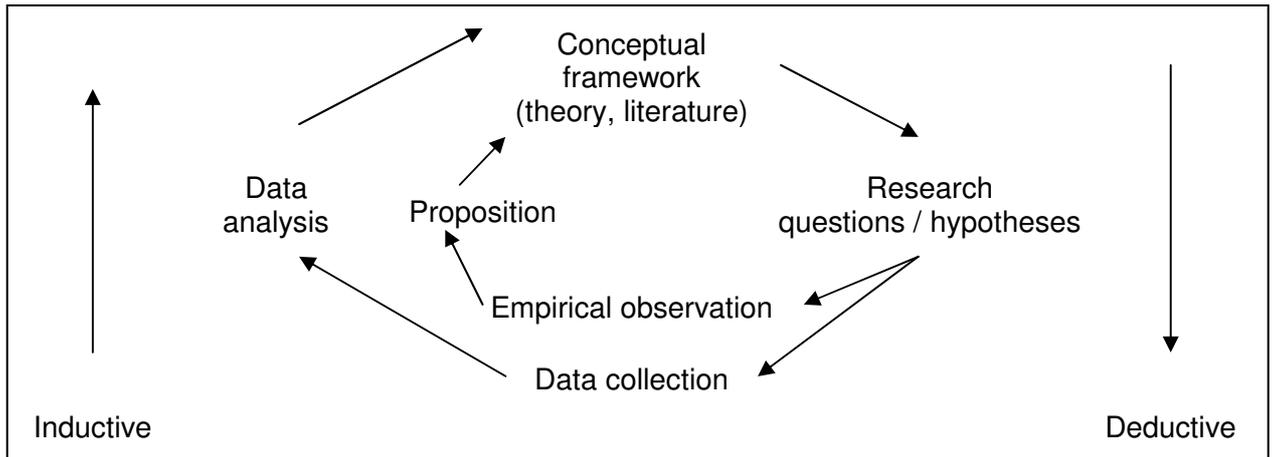
In Figure 4.1 a diagram of the graphic representation of Chapter four will be delineated.

Figure 4.1: Diagram of Graphic Representation of Chapter 4



4.2 RESEARCH DESIGN AND METHODOLOGY

To understand the research design and methodology that were used, it is important to understand how the current researcher thinks about research. One way of thinking about the phases of the research process is with reference to the so-called research wheel (see Figure 4.2).

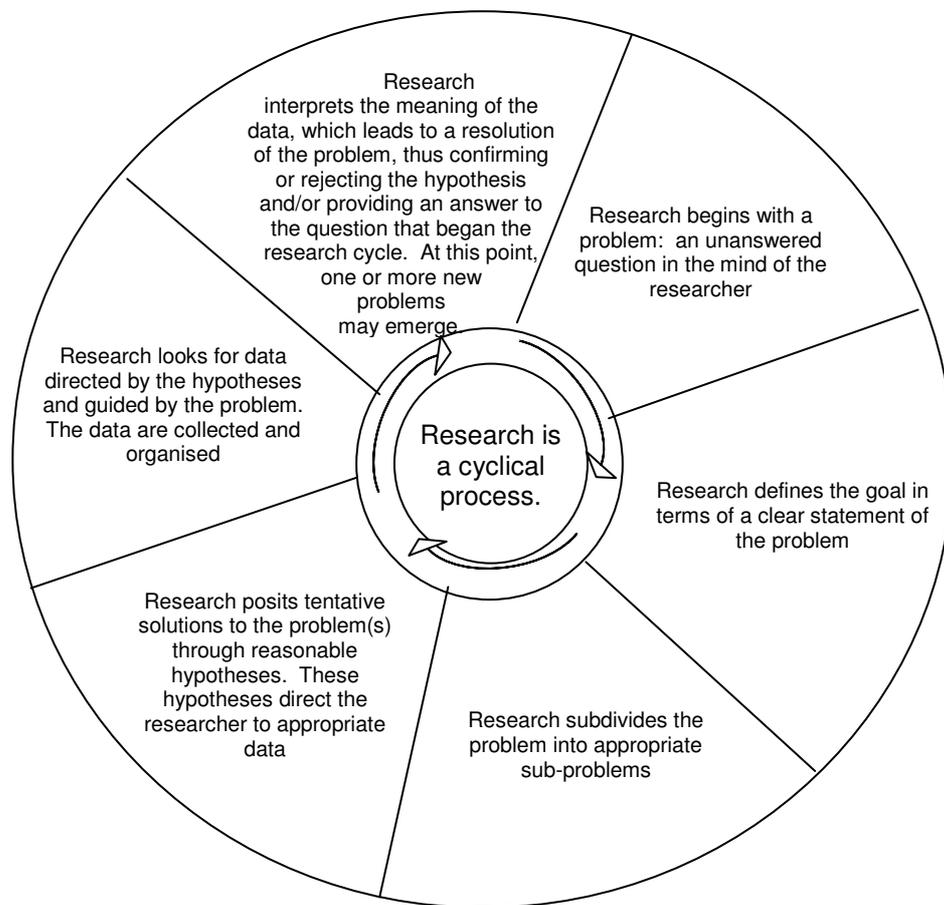
Figure 4.2: Research Wheel (Rudestam and Newton, 2001:5)

Rudestam and Newton (2001:5) argues that “the wheel metaphor suggests that research is not linear but a recursive cycle of steps that are repeated over time. The most common entry point is that of empirical observation.” Leedy & Ormrod (2001:4) on the other hand wants research to be the “systematic process of collecting and analyzing information (data) in order to increase our understanding of the phenomenon about which we are concerned or interested.” Eight distinct characteristics stand out in a typical research and can be summarised as:

1. Research originates with a question or problem.
2. Research requires a clear articulation of a goal.
3. Research follows a specific plan of procedure.
4. Research usually divides the principal problem into more manageable sub-problems.
5. Research is guided by the specific research problem, question, or hypothesis.
6. Research accepts certain critical assumptions.
7. Research requires the collection and interpretation of data in an attempt to resolve the problem that initiated the research.
8. Research is, by its nature, cyclical or, more exactly, helical.

This research cycle is portrayed in Figure 4.3.

Figure 4.3: The Research Cycle (Leedy & Ormrod, 2001:9)

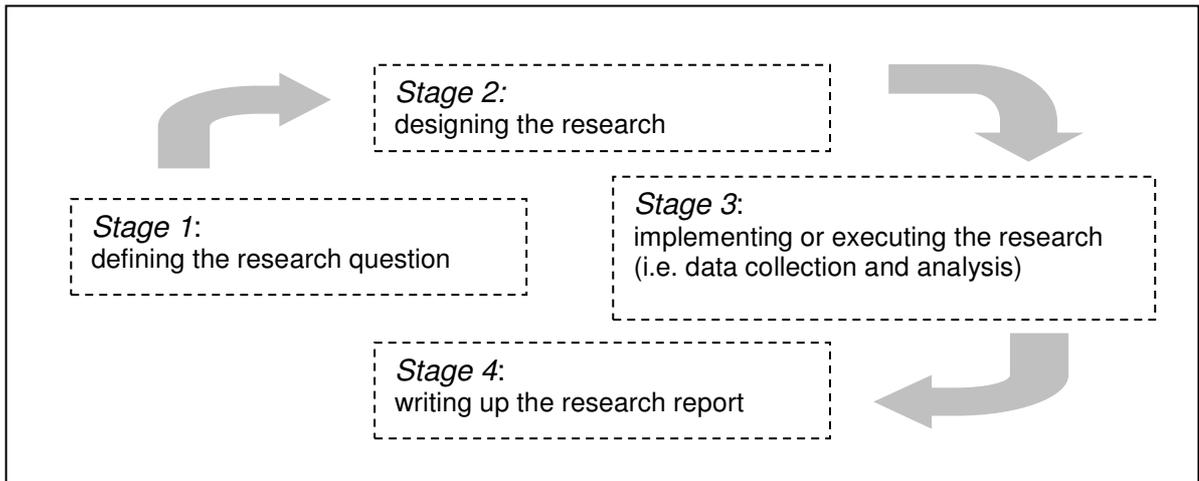


Freimuth (in Rudestam and Newton, 2001:24) suggests that research contributes to the data of a speciality field by considering a three-level hierarchy of knowledge:

1. Axiologic/Epistemic Level: Epistemology refers to the study of the nature of knowledge, while axiology refers to the study of ethics, values, and aesthetics.
2. Theoretical Level: This is the level of models and theories.
3. Empirical Level: In the field of epistemology, empiricism refers to a commitment to obtaining knowledge through sense experience. In the present context, the empirical level includes hypotheses and the methods and data of scientific research. Hypotheses are tentative answers to questions, generally based on theory.

Durrheim (2002b:30) refines research further by suggesting that it entails a process with four definite distinct stages (as illustrated in Figure 4.4).

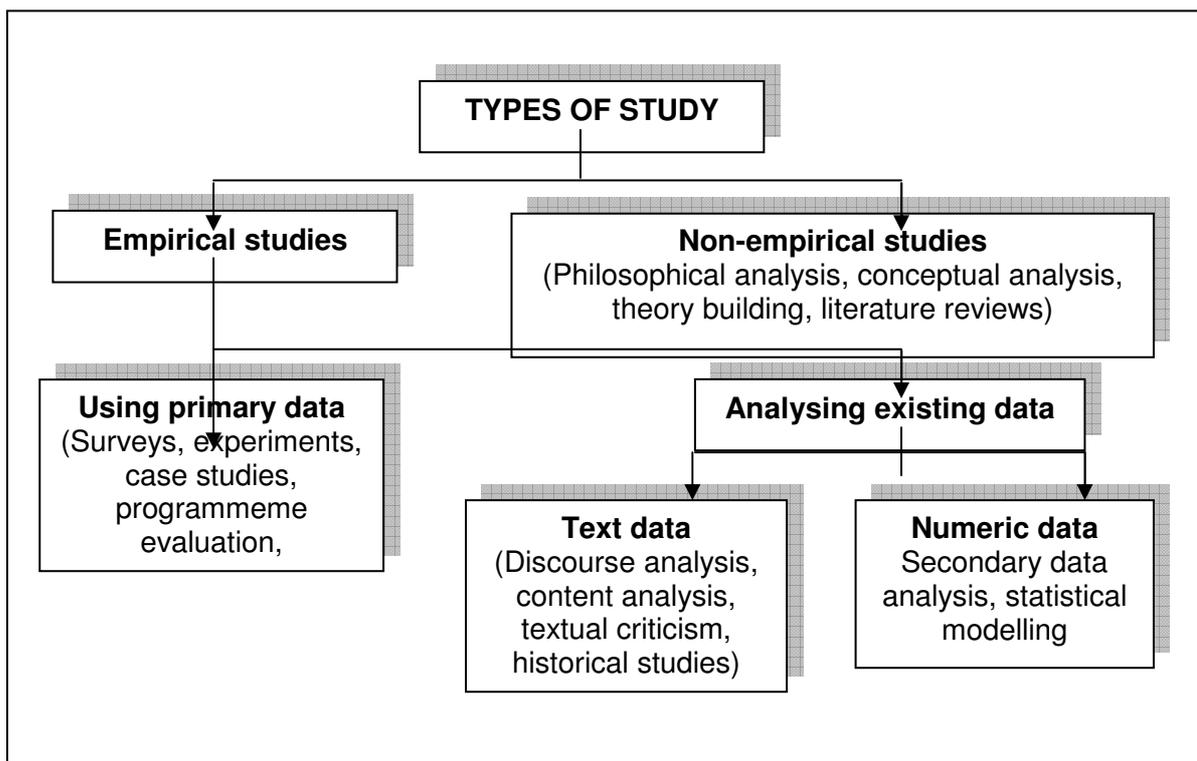
Figure 4.4: Research Process in Four Stages (Durrheim 2002b:30)



A research design is a blueprint of how the research is performed to answer the research question. It must be understood that research designs address different kinds of questions. When different kinds of studies and design types are categorised, it is done according to the kind of questions that they are able to answer.

Mouton (2001:57) proposes a typology of research design types where types of study are clearly divided into two main divisions, namely empirical (using primary data - experiments and not theory) and non-empirical (analysing existing data - theory and text). Figure 4.5 illustrates this typology of research design types.

Figure 4.5: A Typology of Research Design Types (Mouton 2001: 57)



The current research was an empirical study and primary data was collected. As the focus of this research was to investigate the enhancement of musical hearing in the intermediate phase child, and the data used were obtained through practical observation and experiment, this research is identified as an empirical study (Drever, 1981:83). This empirical study uses primary (new) data and it compared highly structured conditions to natural field settings.

Creswell (in Leedy & Ormrod, 2001:161) describes a data analysis spiral which takes the following steps:

1. Organizing the data.
2. Peruse the entire data set several times to get a sense of what it contains as a whole.
3. Identify general categories or themes, and perhaps subcategories or sub-themes as well and then classify each piece of data accordingly.
4. Integrate and summarize the data. This step might include offering propositions or hypotheses that describe relationships among the categories. It might also involve packaging the data into an organizational scheme such as a table, figure, matrix, or hierarchical diagram.

At this point it is important to understand that researchers often confuse ‘research design’ and ‘research methodology’, but, as Mouton (2001:55) clarifies, these are two very different aspects of a research project. An analogy is used in Table 4.1 to best explain the differences between the two very important scientific terms.

Table 4.1: A Comparison of the Differences between Research Design and Research Methodology (Mouton 2001:55)

Research design	Research methodology
Focuses on the end product: What kind of study is being planned and what kind of result is aimed at?	Focuses on the research process and the kind of tools and procedures to be used.
Point of departure = Research problem or question	Point of departure = Specific tasks (data collection or sampling) at hand
Focuses on the logic of research: What kind of evidence is required to address the research question adequately?	Focuses on the individual (not linear) steps in the research process and the most “objective” (unbiased) procedures to be employed.

Methodology can, in other words, be defined as “a branch of logic, which deals with methods of scientific research” (Drever, 1981:172). Lincoln and Guba (1985:225) outline a broad series of elements that must be considered in the methodology process. These 10 design considerations are reproduced below.

1. Determining the focus for the inquiry
2. Determining fit of paradigm to focus
3. Determining the fit of the inquiry paradigm to the substantive theory selected to guide the inquiry
4. Determining where and from whom data will be collected
5. Determining successive phases of the inquiry
6. Determining instrumentation
7. Planning data collection and recording modes
8. Planning data analysis procedure
9. Planning the logistics
10. Planning for trustworthiness

4.3 COMPARING QUANTITATIVE AND QUALITATIVE APPROACHES

In research quantitative and qualitative approaches represent complementary components of the research process. The quantitative approach can also be called traditional, experimental, or positivist approach. Leedy and Ormrod (2001:101) explain that, generally speaking, quantitative research is used “to answer questions about relationships among measured variables with the purpose of explaining, predicting, and controlling phenomena.”

Klopper (2004:3-8) points out that Cohen (in Cohen *et al.* 2002:117) refines this line of thought by suggesting that this kind of approach can be regarded as reliable only if it were to be carried out on a similar group of respondents in a similar context and results obtained would be similar. The principles that can be used to guide this kind of research are outlined by the same author (Cohen *et al.* 2000:106).

He suggests that these principles are:

- Controllability
- Replicability
- Predictability
- The derivation of laws and universal statement of behaviour
- Context-freedom
- Fragmentation and automation of research
- Randomisation of samples
- Observability

Quantitative researchers must be loyal to these principles in order to guarantee validity and reliability where measurement is concerned. Watkins (2003:16) suggests that there are four possible ways to gather quantitative data, namely:

1. Interviews, 2. Questionnaires, 3. Tests and measures and 4. Observation

He expands by also mentioning less common quantitative methods from which data can be collected which are Archives and Data Banks.

In contrast, qualitative research is typically used to “answer questions about the complex nature of phenomena, often with the purpose of describing and understanding the phenomena from the participants’ point of view” (Leedy & Ormrod, 2001:101). The qualitative approach is also referred to as the interpretative, constructivist or post positivist approach.

Watkins (2003:16) points out that “the most fundamental of all qualitative methods is that of ‘in-depth-interviewing’. A research strategy, which is synonymous with qualitative methods, is the ‘case study strategy’, most likely to be appropriate for ‘how’ and ‘why’ questions.”

He highlights qualitative methods not frequently used:

- The critical incident technique
- Repertory grid technique
- Project technique
- Delphi method
- Group interviews/ Focus groups/ Group discussions
- Cognitive mapping

From the above it is clear that there is much overlap between the two approaches. Most qualitative researchers examine quantitative-type data and vice versa, however, they differ in significant ways. Watkins (2003:16) explains that “qualitative data consists of words, while quantitative data consists of numbers”. Neuman (2003:16) highlights the differences between the two concepts using the following table:

Table 4.2: Table of Differences between Quantitative and Qualitative Approaches (Neuman: 2003:16)

Quantitative Style	Qualitative Style
Measure objective facts	Construct social reality, cultural meaning
Focus on variables	Focus on interactive processes
Reliability is key	Authenticity is key
Face value	Values are present and explicit
Independent of context	Situationally constrained
Many cases, subjects	Few cases, subjects
Statistical analysis	Thematic analysis
Researcher is detached	Researcher is involved

To further distinguish between quantitative and qualitative approaches, Fouché (2003:3) has provided a useful approach tabled below:

Table 4.3: Approach to Distinguish between Quantitative and Qualitative Research (Fouché 2003:3)

Quantitative	Qualitative
Deductive form of reasoning	Inductive form of reasoning
Researcher determines meaning	Derives meaning from subjects
Objective measures to be able to predict	Understanding meaning of people's lives
Regards reality as objective	Regards reality as subjective
Data tests hypothesis	Data discovers meaning
Concepts are variables	Concepts are themes/categories
Data is presented as numbers	Data is presented as words/quotes
Research design is fixed and can be replicated	Research design is flexible and evolves through the process
Data is analysed by means of statistical procedures	Data is analysed by extracting themes and patterns

Leedy and Ormrod's (2001:102) summary of the differences between qualitative and quantitative approaches is presented in Table 4.4.

Table 4.4: Summary of Differences between Quantitative and Qualitative Approaches (Leedy & Ormrod, 2001:102)

Question	Quantitative	Qualitative
What is the purpose of the research?	To explain and predict	To describe and explain
	To confirm and validate	To explore and interpret
	To test theory	To build theory
What is the nature of the research process?	Focused	Holistic
	Known variables	Unknown variables
	Established guidelines	Flexible guidelines
	Static design	Emergent design
	Context-free	Context-bound
	Detached view	Personal view
What are the methods of data collection?	Representative, large sample	Informative, small sample
	Standardised instruments	Observations, interviews
What is the form of reasoning used in analysis?	Deductive analysis	Inductive analysis
How are the findings communicated?	Numbers	Words
	Statistics, aggregated data	Narratives, individual quotes
	Formal voice, scientific style	Personal voice, literary style

Charles (1995:21) claims that qualitative research “explores traits and situations from which numerical data can be obtained, while quantitative researchers collect data in the form of written or spoken language, or from observations that are recorded in language, and analysed through identifying and categorising themes”.

Klopper (2004:3-5) argues that “qualitative research allows for selected issues to be studied in depth, as well as for openness and detail. Quantitative research, however, begins with a series of predetermined categories, usually in standardised quantitative measures, and collects data to make broad and generalised comparisons”.

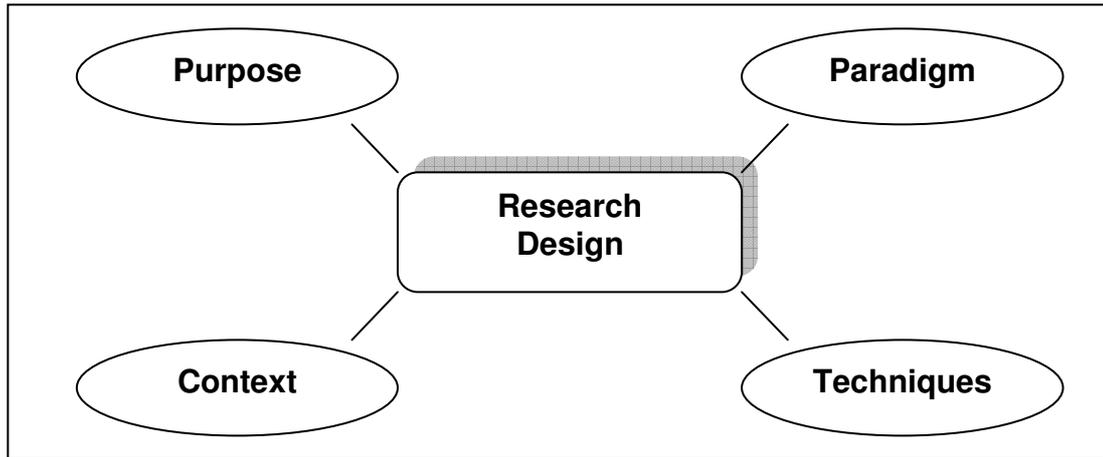
It has been determined in section 4.2 that this research is empirical in nature as the data is primary and reduced to numbers, which will be presented as the results of statistical tests. Taking into account the above-mentioned, it is clear that the approach in this specific research is both quantitative and qualitative; as data is, in the first place, collected in the form of numbers and statistical data analysis is used while, in the second place, interpretive narratives are constructed from the data obtained and it was simultaneously tried to capture the complexity of the phenomenon under study. A more personal, literary style will be used in the case studies.

4.4 HYPOTHESES AND/OR RESEARCH QUESTIONS

In paragraph three of 4.2 the current researcher has mentioned that hypotheses are tentative answers to questions, generally based on theory. It can in other words be said that hypotheses are tentative propositions set forth to assist in guiding the investigation of a problem or to provide possible explanations for the observations made. “These hypotheses and questions suggest the kind of data the researcher should collect and suggest how the researcher should analyse and interpret those data “ (Leedy & Ormrod, 2001:60).

This school of thinking is also applied by Durrheim (2002b:33) with his four dimensions of design decisions. Klopper (2004:3-4) argues that when followed, these dimensions can guide the researcher to make sound choices in describing the research question. Figure 4.7 illustrates the four dimensions which are:

1. the theoretical paradigm informing the research
2. the purpose of the research
3. the context or situation within which the research is carried out
4. the research technique employed to collect and analyse data

Figure 4.6: Four Dimensions of Design Decisions (Durrheim 2002b:33)

In the current study it was hypothesized that musical listening can be developed effectively when didactic methods in the Arts and Culture programme are aligned with the theories of methods of Alfred Tomatis. The quantitative results of an empirical study on the development of musical hearing can be augmented by qualitative case studies. These results can suggest modifications to current didactic methodology.

4.5 TECHNIQUES

The techniques that were utilised to accomplish the goals of this research can be put into the following categories:

- Sampling
- Testing
- Application of the Tomatis Method
- Re-testing
- Data collection
- Analysis
- Descriptive Case Studies

4.5.1 Compilation of the Groups

To test the hypothesis of this research a four-group (experimental group A and three control groups B,C and D) pre-post assessment design was used which will, according to Kazdin (1986:95-105) eliminate any deficiencies that might have occurred in comparative studies.

With this design an attempt is made to identify the specific role of the Tomatis programme. Van der Berg (1993:106) states that this design shows the common factors of the differences between the interventions and diverse processes through which the effects have been obtained.

The names of the participants were placed in a box from which Groups A – D were randomly selected. The participants were randomly assigned to:

- Group A (Tomatis stimulation programme of 120 sessions, and the Arts and Culture programme in school), (n=9);
- Group B (listening to the music of Mozart on compact discs (CDs) for 60 sessions and the Arts and Culture programme in school), (n=9);
- Group C (Arts and Culture programme), (n=15);
- Group D (non-intervention control group), (n=18).

4.5.2 Measuring Instruments

The procedures that followed were the use of the measuring instruments to evaluate the identified dependent variables and according to which the hypothesis is tested. These measuring instruments are listed below:

1. All four groups were tested by using:
 - the Musat Test
 - the Tomatis Listening Test
 - the Tennessee Self-Concept Test
 - the Torrance Creativity Test

In addition to the above the parents of Group A participants were exposed to:

- a Biographical questionnaire
- a Personal interview with a parent/guardian four weeks post-programme

2. Thereafter:

- Group A participated in two four week Tomatis programmes combined with Arts and Culture programme at school,
- Group B was exposed to the Arts and Culture programme and the music of Mozart on CDs.

The two sound stimulation programmes commenced simultaneously but were attended in separate venues.

The programmes were overseen by four suitably qualified individuals and Group A participants were monitored daily by a clinical psychologist during the first and second sessions.

- Group C participated in the Arts and Culture programme.
- Group D only attended pre- and post-assessments. For the duration of the research these participants were willingly excluded from the Arts and Culture programme at school. After completion of the programme they joined the Arts and Culture classes immediately.

After completion of the sound stimulation programmes, the four groups were post-tested by using the mentioned tests. Comparing the pre and post test results the impact of the Tomatis Method on Group A could clearly be seen in comparison to Groups B, C and D.

Table 4.5: A Visual Representation of the Tests and Interventions Applied to Each Group

<i>Pre-Tests</i>	<i>Group A</i>	<i>Group B</i>	<i>Group C</i>	<i>Group D</i>
Musat	√	√	√	√
Tomatis Listening Test	√	√	√	√
Tennessee Self-Concept Test	√	√	√	√
Torrance Creativity Test	√	√	√	√
Personality Questionnaire for Children	√	√	√	√
<i>Post-Tests</i>	<i>Group A</i>	<i>Group B</i>	<i>Group C</i>	<i>Group D</i>
Musat	√	√	√	√
Tomatis Listening Test	√	√	√	√
Tennessee Self-Concept Test	√	√	√	√
Torrance Creativity Test	√	√	√	√
Personality Questionnaire for Children	√	√	√	√
<i>Interventions</i>	<i>Group A</i>	<i>Group B</i>	<i>Group C</i>	<i>Group D</i>
Tomatis programme	√			
Arts & Culture Programme	√	√	√	
Mozart Music on CD		√		

4.6 Determining the Validity and Reliability of Measurement Instruments

“Trustworthiness is a general term representing what conventional researchers think of as internal and external validity, reliability, and objectivity” (Rudestam and Newton 2001:98). Seltiz *et al.* (1976:168) stated: “The validity of a measuring instrument may be defined as the extent to which differences in scores on it may reflect true differences among individuals on the same characteristics that we seek to measure rather than constant or random errors”.

For the purpose of this research it is important to understand that definitions for validity and reliability are found in literature, as outlined below, but it is also to be found in the characteristics of the data. Thus the current researcher has tested both reliability and validity practically through statistical means (Chapter 5, 5.2.6).

Ghiselli (1964: 338) underlines this with his statement that “predictive validity refers to the accuracy with which we can make guesses about one characteristic of an individual from another characteristic”. Lincoln and Guba (1985:21) stressed that in traditional empirical research, reliability concerns the replication of the study under similar circumstances, where internal validity refers to the validity of a casual inference and external validity refers to the generalisability of the findings of the study.

Leedy & Ormrod (2001:98) explains that the validity of a measuring instrument is the extent to which the instrument measures what it is supposed to measure. The current researcher has used factor analysis as the statistical tool to prove the validity of the measuring instruments used (Chapter 5, section 5.2.8).

Validity takes different forms which Leedy and Ormrod describe as:

1. Face validity – the extent to which an instrument seems to measure a particular characteristic.
2. Content validity – the extent to which a measurement instrument is a representative sample of the content area (domain) being measured.
3. Criterion validity – the extent to which the results of an assessment instrument correlate with another, presumably related measure (criterion).
4. Construct validity – the extent to which an instrument measures a characteristic that cannot be directly observed but must instead be inferred from patterns in people’s behaviour (construct).

Reliability, on the other hand, is “the extent to which measurement instruments yields consistent results when the characteristics being measured have not changed” (Leedy & Ormrod, 2001:99). In other words, reliability is concerned with precision and accuracy. Chapter 5, **5.2.6**, explains that reliability in this research was tested by Cronbach’s alpha coefficient.

The following are several forms of reliability, described by Leedy & Ormrod (2001:99) that are frequently of interest in research studies:

1. Interrater reliability: the extent to which two or more individuals evaluating the same product or performance give identical judgements.
2. Internal consistency reliability: the extent to which all the items within a single instrument yield similar results.
3. Test-retest reliability: the extent to which the same instrument yields the same result on two different occasions (particularly used in the current research).

A statistically accurate definition for reliability is given by Huysamen (1976:258) that the reliability of a test is the *relation of the variance of actual scores to that of obtained scores*.

As pointed out, something can be measured accurately only when it can also be measured consistently. In other words, in order to have validity, there must also be reliability. The more valid and reliable the measuring instruments, the more likely it is that appropriate conclusions can be drawn from the data collected and thus that the research problem can be solved in a credible manner. Leedy and Ormrod (2001:27) state that “measurement is ultimately a comparison: a thing or concept measured against a point of limitation”.

The measuring instruments of this research are discussed according to the following headings:

- Background
- Description
- Rationale
- Reliability and validity
- Motivation for inclusion in this research
- Application

4.6.1 Junior Musical Aptitude Test (Musat J)

4.6.1.1 Background

The Junior Musical Aptitude Test (Musat J) was developed by Wegelin and Wolmarans (1977) for the Human Sciences Research Council to satisfy the need in musical education for standardised tests with which the musical aptitude for pupils may be measured and evaluated. This test has been specifically designed for South Africa and is not a nationally standardised international test. The aim of the test is to measure certain aspects of the musical ability.

4.6.1.2 Description

❖ *Musical Aptitude*: Musical aptitude is regarded as a “specific mental ability which can be distinguished from general intellectual ability” (Wegelin *et al.*, 1977:5). The musical aptitude measured by this test is regarded as fundamental to the pupil’s musical development. Music plays a part in various spheres of life and various aptitudes. Aptitudes that are related to musical aptitude, but are not included in these musical aptitude tests, should be mentioned:

- ◆ Technical (motor) aptitude for playing an instrument or developing vocal qualities,
- ◆ Aesthetic aptitude,
- ◆ Musical-theoretical (intellectual) aptitude, and
- ◆ Creative aptitude. For the purpose of this investigation *creativity* will be tested with a separate set of tests: The *Torrance Test of Creative Thinking*.

4.6.1.3 Rationale

Wegelin *et al.* (1977:5) argue that “it is accepted that a pupil’s ability to recognise different aspects of music for instance, intervals, rhythmic patterns, time and differences in harmony, coupled with his/her ability to distinguish timbre and observe differences in tempo and duration of tones and to understand music with all these facets as a musical concept in its totality, constitutes a valid criterion for his/her musical ability”.

4.6.1.4 Reliability and Validity

Norms or standard scores are used for the effective expression of the degree of musical aptitude as measured by the test. The basic approach in respect of norms, as they are used in standardised tests, is that a person's scores actually become significant only when they are compared with the achievement of a specific group to which the person belongs.

In order to compare the raw scores obtained with the achievement of the norm group to which the testee belongs according to grade, use is made of a stanine and a percentile scale. The stanine scale is a normalised, nine-point standard scale. It provides standard scores from 1 to 9 with a mean of 5 and a standard deviation of 1.96. Each stanine represents a certain theoretical percentile range as indicated on the tables provided for marking the tests.

The percentile rank which a person occupies in a test may be regarded as the expected percentage of testees in the norm group who are at a lower level than the testee in the characteristic measured by the test. The percentile scale may be used when there is a need for a finer norm scale than the stanine scale. In the case of the total score of the seven subtests it is necessary to interpolate for the raw scores with uneven numbers to obtain the corresponding percentile rank.

4.6.1.5 Motivation for Inclusion in this Research

The aim of this research was to evaluate the improvement of musical listening after exposure to the Tomatis Method. The current researcher decided to use a musical aptitude test to assist with the assessment of improvement. Furthermore, reliability was an imperative requirement for the outcomes of this investigation and this test had proved, above other possible tests, to be reliable, therefore it has been included as part of the measuring instruments in this research. The reliability is the degree of accuracy and consistency with which the test measures. Wegelin *et al.* (1977:5) state that "the reliability coefficient of the separate subtests of the Musat J was determined with the aid of the Kuder-Richardson Formula 8, which also provides an indication of the internal homogeneity of the subtests" and that the "reliability coefficient of the combination of subtests was subsequently calculated with the aid of Mosier's formula".

4.6.1.6 Application

The Musat J was designed and standardised for learners in Grades 3 to 7. The instructions, practice examples and items were recorded on a CD. It consists of 87 items for the seven subtests. A shorter version can take approximately 49 minutes, but the total duration of the application of the test including the time for completing the identifying data and a short break is about 1 and a half hours. The duration of the individual subtests varies between 5 and a half and 11 minutes and there is one break of approximately 15 minutes after subtest 4. The subtests are scored with the aid of a scoring stencil. Space has been provided after each subtest on the answer sheets for filling in raw scores and space has also been left before the first subtest for a summary of the raw scores and for percentile ranks, stanines and test profiles for the subtest combinations. Wegelin and Wolmarans (1977:9-17) explain the subtests as follows:

- ❖ *Subtest 1 – Interval:* The recognition of intervals is a basic aspect of music and a prerequisite for the perception of melody.
- ❖ *Subtest 2 – Harmony:* The ability to perceive small differences in a concord plays an important part in music.
- ❖ *Subtest 3 – Timbre (tone colour):* The perception of extremely small differences in timbre is important when listening to the sound of voices, instruments, choir or orchestra.
- ❖ *Subtest 4 – Rhythm:* Rhythmic ability is one of the fundamentals of the practice of music, from the most primitive to the most sophisticated.
- ❖ *Subtest 5 – Duration:* The feeling for duration plays an important part in the correct rendering of music.
- ❖ *Subtest 6 – Speed:* An acute ability to perceive and memorise tempo is indispensable for the appreciation and performance of music, particularly for soloists and conductors.
- ❖ *Subtest 7 – Counting:* The ability to count in music is a further facet of the time aspect and is of importance in the counting of beats, parts of beats and full bars. The traditional music is based on the regular division into beats with the main accents always on the first beat of the bar so that the result can be duple, triple or quadruple time. This sub-test specifically measures the ability that is an indispensable requirement for participation in musical activities.

4.6.2 Tennessee Self-Concept Test (TSCS)

4.6.2.1 Background

The Tennessee Self-Concept Scale (TSCS) was originally developed by Fitts and Warren (1988) to fill the need for a scale that would be simple for the respondent, broadly applicable, and multidimensional in its description of self-concept (Fitts and Warren 1988:3). The relationship between self-concept and human behaviour has been tied together with this measuring instrument. The authors state that, with the second edition in 1988, the TSCS:2 has been restandardised on a nationwide sample of over three thousand individuals ranging in age from 7 to 90 years old.

4.6.2.2 Description

Fitts and Warren (1988:15), authors of the Tennessee Self-Concept Scale (TSCS:2), explain that these tests have “an Adult and Child Form containing 82 and 76 self descriptive items respectively, and provides a global indication of a person’s self concept as measured in 5 response categories:

- Physical self
- Moral-Ethical self
- Personal self
- Family self
- Social self.

The forms can be administered individually or in groups and can be completed in 10 to 20 minutes.

- The *Child Form* can be completed by children who can read at a second-grade level or higher and it is standardized on 1, 784 children aged 7 – 14”.

The form consists of self descriptive statements that Fitts and Warren (1988:3) have put together in such a way to allow the individual to portray his or her own self picture using six response categories: “Always False”, “Mostly False”, “Partly False”, “Partly True”, “Mostly True” and “Always True”.

The TSCS:2 can be easily scored in a few minutes by hand or computer. Both the Adult Form and the Child Form generate the same scores. The basic scores are:

- two *Summary* Scores: Total Self-Concept and Conflict
- six *Self-Concept* Scales: Physical, Moral, Personal, Family, Social and Academic/Work.
- four *Validity* Scores for examining response bias: Inconsistent Responding, Self-Criticism, Faking Good and Response Distribution.
- three *Supplementary* Scores: *Identity*, *Satisfaction* and *Behaviour* which involve combining items from some of the basic scales in a way that reflects the original theoretical thrust of the test.

In accordance with recommendations from the authors of the TSCS:2, these tests were administered by an experienced professional (dr A.M. van der Berg) with advanced training in the application of psychological tests. She gave the introduction, presented the instructions, remained present throughout the test and marked the results.

According to Fitts and Warren (1988:15)

- The *Inconsistent Responding* (INC) score indicates whether there is an unusually wide discrepancy in the individual responses to pairs of items with similar content.
- The items that contribute to the *Self Criticism* (SC) score are all mildly derogatory statements, common frailties that most people would admit to when responding candidly.
- Stanwyck and Garrison (1982) in Fitts and Warren (1988:15-20) developed the *Faking Good* (FG) score by requesting that college students deliberately “fake good” as if they were applying for a fictitious job and wished to present a favourable impression.
- The *Response Distribution* (RD) score is calculated by counting the number of extreme responses circled by the respondent. This score is highly correlated with a pattern of the individual’s responses as distributed across all five available response options.

The authors of the TSCS:2 indicate that the scores for most individuals tend to fall between 40*T* and 60*T*. These relatively flat profiles indicate no disturbance or only mild disturbances in self concept. Specific disturbances in self concept are indicated by scores below 40*T*.

- The *Total Self-Concept* (TOT) score is the single most important score on the TSCS:2 (Fitts & Warren, 1988:21). It reflects the individuals' overall self-concept and associated level of self-esteem. For children younger than 10 years of age the excellent reliability of the TOT score is especially important.
- The *Conflict* (CON) score compares the extent to which an individual differentiates his or her self-concept by assertion through agreement with positive items.

The following scales all contain items which are positively as well as negatively scored.

- *Physical Self-Concept* (PHY) scale
- *Moral Self-Concept* (MOR) scale
- *Personal Self concept* (PER) scale
- *Family Self-Concept* (FAM) scale
- *Social Self-Concept* (SOC) scale
- Fitts and Warren (1988:24) stress that “the *Academic/Work Self Concept* (ACA) scale, a measure of how people perceive themselves in school and work settings and how they believe they are seen by others in those settings, is the most strongly related of all the TSCS:2 scores to actual academic performance”.

The most frequent patterns of scores of the Self-Concept scale, other than “flat” profiles are those in which only one or two of the six scores are significantly higher or lower than other scores (Fitts and Warren 1988:24). According to the authors there are several patterns with considerable intuitive and clinical meaningfulness in which two Self-Concept scales scores are simultaneously high or low.

The supplementary scores are groups of TSCS: 2 items for each Self-Concept subscale that have historically been classified as expressing one of three primary messages.

The *Identity* (IDN) score, with which the individual describes his/her basic identity, as well as the *Satisfaction* (SAT) score, which describe how satisfied the individual feels with his/her perceived image, together with the *Behaviour* (BHVP) score, which measures the individual's perception of his/her own behaviour or the way he/she functions, are scores, like the critical items on the TSCS:2, for which certain responses should not go uninvestigated. The individual may require immediate attention from a health care professional.

4.6.2.3 Rationale

As mentioned under 4.6.3.1, the TSCS was originally developed to fill the need for a scale that would be simple for the respondent, broadly applicable and multi-dimensional in its description of self-concept. The clinical and research knowledge concerning relationships between self concept and human behaviour have been collected and the TSCS is the instrument where these two worlds tie up.

It is valid both when compared to other psychological instruments (i.e. Wehmer and Izard Self-Rating Positive Affect Scale (1962), Coopersmith Self-Esteem Inventory (1981), Jackson Personality Inventory(1970), Janis-Field Feelings of Inadequacy (1959) and many more) (Fitts and Warren1988: 64) and when differentiating among various groups. Fitts and Warren (1988: 38) endeavour for the TSCS:2 to preserve those aspects of the TSCS that have served the majority of its users well, to eliminate unnecessarily complex and confusing materials that represented experimental scoring strategies, to provide an updated standardization sample and to extend the use of the test across a larger age range.

4.6.2.4 Motivation for Inclusion in this Research

It is important to use a measuring instrument that has been found to produce reliable and valid results. Since the 1950s to the present the TSCS features internally consistent scales and reflect coherent personal characteristics. Over the course of many years of development and use, the TSCS has been found to do just that: produce reliable and valid results. The current researcher is in solid agreement with the authors that it is valid both when compared to other accepted psychological instruments and when distinguishing among various groups. The TSCS:2, with its refined scales and expanded coverage, has been shown to faithfully preserve the strengths of the TSCS. It can be used with confidence to identify strengths and weaknesses in overall self-concept and in specific areas of self-concept, and to plan interventions accordingly (Fitts and Warren 1988:79).

4.6.2.5 Reliability and Validity

According to Fitts and Warren (1988:59) the examination of test reliability involves determining the extent to which test results can be expected to remain stable from administration to administration. For the TSCS:2 scores, two types of reliability estimates are presented. These estimates are:

- Internal consistency
- Test – retest reliability.

The authors state (1988:61) that “the widespread use of the TSCS in diverse counselling, education, clinical, and medical settings has provided an accumulation of evidence for the validity of the scale as a measure of general self-concept and its multiple dimensions. The examination of test validity involves determining the extent to which test scores actually measure those characteristics that they claim to measure in a consistently meaningful and useful way”. The validity scores tested in this TSCS scale are listed below:

- Content Validity
- Construct Validity
- Concurrent Measures
- Discriminant Validity

The validity scores are designed to identify defensive, guarded, socially desirable, or other unusual or distorted response patterns (Fitts and Warren, 1988:21). The reason for unusual validity scores may be explored using interview, clinical history, or other data that might indicate an extra-ordinary orientation to the content of the test items or to the test-taking situation.

4.6.2.6 Application

The TSCS:2 is designed for easy administration and scoring. It can be administered in large or small group settings, as well as in individual clinical or counselling situations.

The four groups in the current research were tested simultaneously. Each participant was provided with the appropriate form for his or her age. The *Child Form* was used due to the fact that this research was conducted on the Intermediate Phase learner and their age group fall in, what Fitts and Warren (1988:5) suggest to be, youngsters in the lower grades (grade 2-8) (ages 7 through 14).

The current researcher furthermore tried, as advised by Fitts and Warren (1988:5), to make the administration setting as comfortable, well lighted, ventilated, and free from noise and other distractions as possible.

Once the various interventions had been performed, the post testing was done in exactly the same manner.

4.6.3 The Torrance Creativity Test

4.6.3.1 Background

Torrance (1974), the author of *The Torrance Test for Creative Thinking* (TTCT), sees creativity as “a process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies, and so on; identifying the difficulty; searching for solutions, making guesses, or formulating hypotheses about the deficiencies; testing and retesting these hypotheses and possibly modifying and retesting them; and finally communicating the results” (Torrance 1974:8). This definition for creativity is the result of years of research by the author of *The Torrance Test for Creative Thinking* (TTCT). This is the first complete battery of tests for creativity which is available for general use, especially with children. Van der Berg (1993:117) points out that “this is a measuring instrument of creative abilities for gifted, average and underperforming persons, which is neither culture nor age restricted”. A revised edition was published in 1984 (Torrance and Hall, 1984). The tests are compiled in such a way that it represents the creative process as well as different creative ways of thinking in relatively non-correlated tasks. The selection of tasks is determined by factor analysis of different test tasks which are reconstructed by the author. It incorporates verbal and non-verbal thinking (Torrance 1974:24 –30).

4.6.3.2 Description

Torrance's Test for Creative Thinking consists of two Verbal and two Non-Verbal test batteries (*Verbal Tests A and B* and *Figural Tests A and B*). Parallel activities are compiled in each of the A and B test batteries. When using this *Test for Creative Thinking*, Torrance has suggested that, for research purposes, only one test battery or two batteries in combination could be used. (i.e. *Verbal Test A* in combination with *Figural Test B*). For the purpose of

this research, the *Verbal Tests A* (activity 4 and 5) and *Figural Tests A* (activity 2) and B (activity 3) have been utilised.

The *Verbal Activities* are:

- Activity 1 Questionnaire
- Activity 2 Cause exploration
- Activity 3 Anticipation of consequences
- Activity 4 Product improvement
- Activity 5 Unusual uses
- Activity 6 Unusual questions
- Activity 7 Assumptions of highly unlikely situations

The *Figural Activities* are:

- Activity 1 Picture construction
- Activity 2 Picture completion
- Activity 3 Repeated figures to create pictures

In the *Figural Tests* participants are requested to supply their pictures with titles.

4.6.3.3 Rationale

The purpose of these tests is to obtain meaningful information through which the creative abilities of the individual are determined. It represents specific characteristics of creativity such as fluency, flexibility, originality of thought and the ability to expand an idea (Torrance 1974:9).

According to Van der Berg (1993:118) the rationale of these tests is closely connected to Torrance's theoretical approach to creativity. He states that creativity is a natural human process. Strong human needs are involved at each stage of the creativity process. He argues (Torrance 1974:8) that "tension is aroused if disharmony or some incompleteness is sensed. The individual is uncomfortable and wants to release the tension. The uneasiness caused by the stress encourages the individual to solve the problem. Since learned ways of behaviour is often insufficient, the individual starts to search for new answers by investigating, diagnosing, manipulating, and making guesses or estimates". Tension continues until hypotheses are tested, modified and re-evaluated. The tension is lifted only when the creative solution is reached (Torrance, 1974:8).

4.6.3.3.1 Rationale of the *Verbal Test Battery*

Torrance (1974:11) states that the essence of creative thinking is captured in the process of questioning and guessing, which he calls the 'Ask-and-Guess Activities'.

- The *Question Activity* enables the individual to ask questions so that information gaps can be filled. Curiosity, as a complimentary characteristic of especially scientific creativity, is reflected in the type of questions asked.
- The *Guessing Activity* reflects the individual's ability to formulate hypotheses according to cause and effect (Torrance, 1974:12). The number of responses gives an indication of idea fluency, and the number of different category questions, cause and effect, are indications of flexibility and of a psychologically healthy personality. The number of times that the response deviates from the norm, obvious and general conduct, indicates the individual's originality and is an important element in creative thought.

Werner (1957:321), on the other hand, explains that the law of development, insofar as causality is concerned, is one of increasing abstraction and generalisation. That is the highest stage of causal reasoning is attained when the explanation is in terms of universal, abstract, necessary causes.

- *The Product Improvement Activity* has always been one of the most dependable measures. Torrance (1974:12) proposes that it allows the individual to regress in service of the ego. It enables him to play with ideas which he would not even have considered in a more serious task. He further points out that the fluency scores for this activity is the number of relevant responses produced. The flexibility score is the number of different approaches used in producing ideas for improvement. The originality score is based on the statistical infrequency and appropriateness of the ideas produced.
- *The Unusual Uses Activities* included in Verbal Forms A and B is the fifth activity and are fairly direct modifications of Guilford's Brick Uses Test. Torrance decided to substitute 'tin cans' (Form A) and 'cardboard boxes' (Form B) for bricks. These tasks expect the moving away from rigidity and yields scores to fluency, flexibility, originality and elaboration.

4.6.3.3.2 Rationale of the *Figural Test Battery*

Referring back to 4.6.4.2, the Figural Activities have been listed. Van der Berg (1993:119) has derived from Torrance that these activities discuss elements of creative functioning, such as games, recklessness, idea fluency, postponing of immediate satisfaction, originality, flexibility, tolerance and conflict, structuring, integration and synthesising. The complexity of the figural tasks provides scores in fluency, flexibility and originality idea expansion.

- The *Picture Construction Activity* is an original activity which Torrance himself has devised. Subjects are required to think of a picture with originality and elaboration.
- *The Incomplete Figures Activity* is an adaptation of the Drawing Completion Test, developed by Kate Franck and used in studies of creativity by Baron in 1958 and others (Torrance 1974:14). The incomplete figures were created by Torrance with the assistance of Elizabeth Kennedy. Each figure is scored for flexibility, originality, and elaboration.
- The *Repeated Figures Activity* is similar to the Incomplete Figures Activity. This activity provides scores for fluency, flexibility, originality and elaboration.
- *General Scheme of Figural Activities* is a triad of test activities that represents three different aspects of creativity or three different creative tendencies. Again scores for fluency, flexibility, originality and elaboration will be obtained.

4.6.3.4 Motivation for Inclusion in this Research

Torrance has produced tests that evaluate the effect of creativity stimulation through the test, re-test procedure. He differs from Gordon (1961:6) who insists that, in the creative process, the emotional component is more important than the rational. He believes that creative thinking abilities are susceptible to development through educational experiences. The current researcher has incorporated the TTCT as a measuring instrument as it proved to be effective in measuring intrinsic characteristics of creativity in children. These characteristics, which received specific attention in the creativity development programme are fluency, flexibility, originality and the ability to expand ideas. Van der Berg (1993:120) points out that, in addition, these tests also evaluate emotional motivating forces like inquisitiveness, intuition and recklessness which are involved in creative productivity.

The Torrance Creativity Test was included as the current researcher learned that the Tomatis stimulation often results in some form of creativity enhancement, thus it was an opportunity to assess whether these children participants would also become more creative despite their formerly deprived educational background (Du Plessis personal interview 28/10/2011).

4.6.3.5 Reliability and Validity

For research purposes reliability estimation must be high enough. With the scoring guides that accompany the instruction manuals of the Verbal and Figural Forms A and B of the *Torrance Test of Creative Thinking*, there has been little difficulty in obtaining high levels of inter- and intrascorer reliability (Torrance and Hall 1984:17). According to the same author, there are almost no differences in means, and the coefficients of reliability are in excess of 0.90. Thus, this inter-scoring comparison is highly satisfactory. An average correlation of 0.95 between experienced markers and markers in training are reported (Torrance 1974:17). This is also the case for the test- re-test reliability of reference to both the norm and the criteria.

Since a person can behave creatively in an almost infinite number of ways, Torrance (1974:21) showed how difficult and ridiculous it is to even try to develop a comprehensive battery of tests of creative thinking abilities. Instead of calculating a concept of an overall validity coefficient which is grossly inappropriate, Torrance (1974:21-48) provides a variety of criteria of creative behaviour and creative thinking against which the validity of the tests can be measured.

To insure content validity of the TTCT, Torrance has made a consistent and deliberate effort to base the test stimuli, tasks, instructions and scoring procedures on the best theory and research available.

Satisfying construct validity scores are supported by a variety of further studies:

- studies with young children (Weisberg and Springer (1961) in Torrance 1974:22),
- studies with high school children (Torrance and Dauw, 1965).

Torrance (1974:23) mentions that Liebermann (1965) explored the hypothesis that “there is a relationship between the quality of playfulness in young children’s behaviour and fluency, flexibility and originality”. He further points out that Cropley (1971) connected creative thinking and creative behaviour with humour, fantasy, language, science, economics and art. According to Torrance the construct validity of the TTCT is best illustrated by intervention studies where statistically significant growth or improved functioning is brought about by creative stimulation. In one hundred and forty four studies of this kind the success rate ranges between 71 and 90 percent (Torrance 1974: 33).

4.6.3.6 Application

Torrance recommends that users base their interpretations on the three verbal (fluency, flexibility, and originality) and the four figural (fluency flexibility, originality, and elaboration) scores. The *Verbal Tests* (Form A) and *Figural Tests* (Form B) were applied during the course of one day. The *Verbal Tests* were written during the morning and the *Figural Tests* were applied once the groups of participants had a break and lunch.

Marking and the allocation of marks were done according to the prescriptions of Torrance (1974a: 65-72). After all the scores were accumulated, a spread score sheet was drawn up. Raw scores were calculated to standard scores. The same procedure of marking and processing that was applied with the pre-tests was also implemented with the post tests.

4.7 ADDITIONAL TESTS

4.7.1 Tomatis Listening Test

4.7.1.1 Background

Alfred Tomatis, a French ear-, nose-, and throat-specialist (1920 – 2001), developed a sound stimulation and educational intervention called the Tomatis Method. Thompson (2004c:55) explains that this intervention “improves the functioning of the ear, communication through language, desire for communication and learning, body image awareness, audio-vocal control, and motor control”.

She expands by drawing attention to the fact that “the human ear has the functional capabilities to do at least the following”:

- ◆ Perceive sound
- ◆ Process sound without distortion
- ◆ Discriminate between higher and lower sounds
- ◆ Perceive spatial origin of sounds
- ◆ Attend to sounds we want to hear, and tune out ones we don't want
- ◆ Transmit energy (cortical charge) to the brain
- ◆ Integrate information from muscle movement
- ◆ Establish balance/equilibrium

- ◆ Stimulate neuro-vegetative balance
- ◆ Control phonation
- ◆ Control musical ability.

Thompson (2004b:43; 2004c:55) mentions that Tomatis sees the Listening Test as the fundamental measuring instrument in the Tomatis programme. Listening strengths and weaknesses are identified by comparing “a person’s listening to the ideal good functioning ear” (Thompson 2004c:55). Tomatis lists the following criteria which should be used to compare a person’s listening to the ideal good functioning ear:

- ◆ Hearing threshold within normal range
- ◆ An open auditory selectivity to identify and compare higher and lower frequencies of sound
- ◆ A precise auditory spatialization to identify the direction of the source of the sound
- ◆ An ascending curve slope up to 3000 - 4000 Hz with stabilization at this level and a slight drop in the highest frequencies, to allow easier discrimination between sounds
- ◆ An attention to externally perceived sounds we want to hear and the ability to tune out those we do not want, and the parallel perception of bone and air conducted sounds over the frequency spectrum
- ◆ Evenness of reception and an absence of distortion and stress in the response curve of the ear
- ◆ Balance of bone and air reception within and between both ears
- ◆ A right audio-vocal lead ear for the neurologically most efficient pathway directly to the speech centre in the left brain hemisphere
- ◆ Vestibular integration of muscle and sensory information for effective motor co-ordination
- ◆ Reception of high frequency sounds to energize the brain

Thompson (2004c:56) writes that, according to Tomatis,

“a listening problem, that is not the result of organic lesion, is generally associated with the psychological origin. Shutting out information is actually possible. It manifests itself at the psychological level by a relaxation of the muscle of the middle ear. Unfortunately it is not as easy for the ear as it is for the eye to open again. If the muscles of the middle ear are inactive for too long they lose their muscle tone. Sounds are imprecisely perceived and, as a result, incorrectly analysed. In other words listening is impeded. In order to assist the human ear to establish or re-establish its full potential Tomatis developed and patented components of the Electronic Ear, special headphones with bone and air conduction and special audio tapes to use with the Electronic Ear”.

4.7.1.2 Description

The Listening Test was the outcome of Tomatis's distinction between hearing and listening (Du Plessis *et al.*, 2001:36). It is an auditory perception test combining information on hearing and information on the exploitation of the desire to listen (Du Plessis *et al.*, 2001:36). A speech therapist's audiogram is used to locate a hearing disability and according to the results, prescribe treatment. The Listening Test will enable the Tomatis practitioners to assess the person's willingness to listen, as well as other aspects.

The Listening Test consists of various sub-tests (Tomatis, 1973; 1980) to determine the following:

- ◆ The limiting value curve
- ◆ The auditive spatial orientation
- ◆ The selectivity
- ◆ The auditive laterality

1. Threshold Evaluation

Firstly, a person's ability to hear is studied. A specific, pre-determined intensity threshold with frequencies of the normal sound scale ranging from 125 to 8,000 Hz is used as basis. The sound is directed to the ear canal and from that an air conduction curve can be derived. Simultaneously, the mastoid bone is stimulated by a vibrator and a bone conduction curve can thus be obtained. This frequential overview is subsequently analysed. In normal auditory perception the two curves will be parallel. When dealing with the disturbed sonic universe of a disabled person, Tomatis (1978:122) argues that distortions are immediately apparent and often a 'saw-tooth' pattern is apparent. Sometimes these particular curves can also be used as a basis to judge tonal dominance on the right or the left. When the curve as a whole is examined there could be various inflections in one of the three ranges; that of the bass: 125 Hz to 800 Hz, the middle: 800 Hz to 2000 Hz and the treble range: 2000 Hz to 8000 Hz.

When the curve rises at the rate of 6 db per octave, from 125 Hz to 2000 Hz or 3000 Hz, it is the ideal case with a flawless self-monitoring. That means that overall, the curve shows a 100% frequential climb from octave to octave, descending slightly after 3000 Hz in French speaking people.

2. Selectivity Evaluation

A second analysis is done after completion of the first test. The dynamics of the ear at about 40 to 50 db is tested. For the uninformed this test will sound as a set of treble and bass tones. The purpose is not to test the person's ability to recognize pitch variations between closely related sounds. The aim is to determine his ability to recognize vigorous tonal differentiation, and as Tomatis (1978:123) puts it, his ability to incorporate his sense of these differences into his gnostic function. The persons' powers of auditory discrimination can thus be evaluated. Tomatis stresses that this discriminatory ability varies according to age. The average child will have attained a receptive scope extending from 125 Hz to 8000 Hz by the time he is eight to ten years old.

3. Spatialization Evaluation

This test is one of the most important. The ear is examined for its temporal spatial orientation ability. According to Tomatis (1978:124) it is obvious that everyone has to use his own 'antenna' to locate himself within the universe. Something that should be fundamental can, however, when there is an auditory dysfunctionality, cause problems. The person does not perceive sounds that are directed to his right side as coming from any specific direction, whether they are travelling through air or bone conduction. These sounds are rarely located correctly in space as some are perceived on one side and some are monitored on the other. This test reveals the surprising degree of confusion on the part of specific dyslexic people in the localizing ability acquisition area. It therefore is indicative in the obtaining of the applicable data concerning spatialization.

4. Leading Ear Evaluation

The auditory laterality test indicates the dominant ear which controls language. Secondly this test shows how the child uses his ear within the communication function. Tomatis (1978:124) attaches major importance to this final test as it indicates how the person uses his hearing ability in order to listen. It could, according to Tomatis, almost stand alone. With this final test sufficient data have been gathered to evaluate and treat the person's self-monitoring ability while listening to noise or to some more acceptable sound, such as music. This advanced ability is then applied to listening to language provided by another person. Therapy will be concentrated on the self-monitoring of the person while he himself is speaking.

The views of Tomatis (1996:199) on the Listening Test can be seen as:

“A well-functioning ear is described as a good listening ear. It can tune in across the entire sound spectrum to sounds it wants to hear and tune out those it does not want. It can perceive and analyze every part of the frequency spectrum with maximum speed and precision. It integrates muscle movement received from the entire body. A good ear is mirrored by a voice with a good tone and quality. That is, a good voice reflects a good ear. We listen, speak, sing, read, write, and learn with our ears. The Listening Test identifies listening strengths and weaknesses”.

Tomatis (1973:46) explains that, to interpret the Listening Test, certain parameters must be taken into consideration, which are:

- ◆ Air transmission (AT)
- ◆ Bone transmission (BT)
- ◆ Relationship between AT and BT in each ear
- ◆ Relationship between AT and BT from one ear to the other

Tomatis's indicates in his *Introduction to the listening test* (1973) that the following should be taken into consideration. The current researcher gives the explanation from Tomatis's views:

4.7.1.2.1 Air Conduction Curve (AC)

The air conduction curve (the blue line in the graph of the Listening Test is the indicator of air conduction of sound frequencies) shows the peaks as well as the distortions, which indicate problems experienced by the listener. This curve specifically measures the way in which the person listens to the outside world, but also how he listens to other people (Tomatis, 1973:46).

4.7.1.2.2 Bone Conduction Curve (BC)

When interpreting the graphs of the Tomatis Listening Test the red line is the indicator of the bone conduction of sound frequencies. This curve suggests the listening to the self, in other words, the inner response. With the help of this curve somatic responses, in accordance with frequencies, can be detected. The position of the posture, as well as the head, is highlighted by interpreting the different levels of the spine (Tomatis, 1973:46).

4.7.1.2.3 The Relationship Between AC And BC Within Each Ear

The relationship between these two curves within the ear is of the utmost importance. It identifies the conflict-relationships: the diversity between social and external behaviour on the one hand (air conduction) and the deeper and internal reactions (bone conduction) on the other. To develop a personality integrated in its milieu and itself, the aim should be to have curves without distortions in a harmonious co-operation (Tomatis, 1973:46).

4.7.1.2.4 The Relationship Between AC and BC From One Ear to the Other

The above-mentioned relationship gives valuable information while assessing the listener. Discrepancies in character can be detected when distortions occur between the two ways of listening: left ear in contrast with the right ear. When an occurring pattern of these discrepancies is detected, it can show the dominance of the past over the future (Tomatis, 1973:46).

4.7.1.2.5 The Importance of The Left and the Right Diagram

According to the Tomatis Programme a symbolic meaning can be attached to both ears. Tomatis (1973:47) the left ear may show:

- ◆ symbolic affection,
- ◆ the anchor to the past,
- ◆ the roots into the soil,
- ◆ the bonding with the mother, and
- ◆ the search for the 'life-giving mother'.

In comparison to the above, the right ear is:

- ◆ the connection with the active dynamic of the personality,
- ◆ the opening to the future,
- ◆ the pursuing of the 'sun image', and
- ◆ the discovering of the father, the intuition of the Creator (Tomatis, 1973:48).

When analysing and studying the listening curves, these elements must be taken into consideration.

4.7.1.2.6 Important Information About the Different Areas of the Same Diagram

The three aspects that form the whole listening pattern are closely interwoven, but each one of them selectively dominates a certain aspect. This must be contemplated when interpreting the Listening Test.

Tomatis (1973:15, 16, 17) states that:

- ◆ the zone from 125 Hz to 1000 Hz indicates the 'unaware' responses of the person: his ego or subconscious.
- ◆ the zone from 1000 Hz to 3000 Hz represents speech, the 'logic of the ego' and communication with other people.
- ◆ The zone from 3000 Hz to 8000 Hz and above (all the high sounds and above average harmonies) symbolizes the intuition, spirituality, ambitions, goals and desires of the person.

4.7.1.3 Rationale

In the Tomatis Programme the Listening Test is a fundamental measuring instrument. As mentioned before, Tomatis explains that the Listening Test not only tests the ability to hear, but also tests how motivated a person is to listen on the one hand and on the other the difference between the Listening Test and the audiogram.

The audiogram is used to locate a hearing disability and according to the results, prescribe treatment to fix hearing problems, whereas, the Listening Test will use the same information to compile a structured psychological process which will enable the therapist to assess the person's willingness to listen to material at a perceptive level. Using the various sub-tests and taking the different parameters into consideration, valuable information is gathered. In order to assist the human ear to establish or re-establish its full potential, the Tomatis method can be applied.

4.7.1.4 Motivation For Inclusion In This Research

Thompson (2004c: 55) mentions in section 4.6.2.1 that Tomatis considers the Listening Test as one of the fundamental measuring instruments in the Tomatis Programme in *The Ear and Language* (1996). The Listening Test tests:

- ◆ Hearing threshold within normal range
- ◆ An open auditory selectivity to identify and compare higher and lower frequencies of sound
- ◆ A precise auditory spatialization to identify the direction of the source of the sound
- ◆ An ascending curve slope up to 3000 - 4000 Hz with stabilisation at this level and a slight drop in the highest frequencies, to allow easier discrimination between sounds
- ◆ An attention to externally perceived sounds we want to hear and the ability to tune out those we do not want, and the parallel perception of bone and air conducted sounds over the frequency spectrum
- ◆ Evenness of reception and an absence of distortion and stress in the response curve of the ear
- ◆ Balance of bone and air reception within and between both ears
- ◆ A right audio-vocal lead ear for the neurologically most efficient pathway directly to the speech centre in the left brain hemisphere
- ◆ Vestibular integration of muscle and sensory information for effective motor co-ordination
- ◆ Reception of high frequency sounds to energize the brain

Thus it reflects how the desire to listen is utilised or resisted and reveals listening strengths or weaknesses. Section 4.6.2.4 points out that it, like the conventional audiogram, tests for threshold evaluation and renders air and bone conduction curves. This diagnostic backbone of the Tomatis method will give important information on the participants chosen for this research.

4.7.1.5 Reliability and Validity

The Listening Test is Tomatis's variation of the standard audiogram. Tomatis makes a definite differentiation between hearing, which he describes as an unconscious awareness of sound (tested by a standard audiogram), and listening which in his terms can be described as a conscious desire to listen. The desire to listen is assessed by the Listening Test (Tomatis, 1973:15). Like the conventional audiogram, it tests for threshold evaluation: frequencies ranging from 125 to 8000 Hz. It also renders air and bone conduction curves. In addition, it assesses other parameters, such as the individual's ability to recognise pitch differences in neighbouring sounds, spatialisation (whether the source of direction of a sound is correctly identified) and auditory laterality (whether sound is controlled by the left or right ear; the right audio-vocal lead ear constitutes the most efficient neurological pathway to the

speech centre in the left hemisphere) (Weeks, in Gilmore and Madaule, 1988). Thus it reflects how the desire to listen is utilised or resisted and reveals listening strengths or weaknesses (Thompson, 1996:56). The Listening Test constitutes the diagnostic backbone of the Tomatis method.

4.7.1.6 Application

Before application of the Tomatis Programme, all participants will have to complete the Listening Test, tested in a sound proof room equipped with the necessary apparatus.

4.7.2 Self-Designed Biographical Questionnaire

The current researcher used a biographical questionnaire as a framework to determine the following variables: age, marital status, family health, birth order, behaviour patterns, daily habits, academic performance, life stressors and traumas, attitude towards music, social and financial status. Parents were requested to complete this questionnaire and parents and learners were assured of the utmost confidentiality regarding their responses. A 100% response was received. Although many variables were explored with these questionnaires only gender and age of participants were used.

4.8 RESEARCH PROCEDURE

4.8.1 Selection of Participants

According to Klopper (2004:3-9) "sampling is the process used to select cases for inclusion in a research study". Durrheim (2002a:44) stresses that samples must be representative and for this to happen, random samples were drawn. The accuracy of a sample is more important than its size (Oppenheim 1992:43) and therefore the decision to select forty eight Grade 4, 5 and 6 learners from the Intermediate Phase of the Christian School on the Potchefstroom Campus of the North-West University as participants in this research. From these participants 4 groups were randomly selected and the features that emphasized the homogeneity of the groups were:

- The participants belonged to the intermediate life phase which was identified as a relevant age group for this test sample.
- None of the participants have received any musical training prior to their testing.
- All the participants came from previously disadvantaged circumstances.

The selected participants were not required to have an aptitude for music or creativity, based on the assumption that learners from the Intermediate Phase attending a mainstream primary school would be receptive to the Tomatis Method i.e. they would have the ability to see it through to the end as well as understand the process.

Earlier in this chapter it is mentioned that the focus of this research was to enhance musical listening in the intermediate phase child. The specific purpose determined what the influence of the Tomatis programme was on the musical listening ability and personality development (self esteem and creative functioning) of these learners.

4.8.2 The Experimental Research

Prior to approaching any school or individual, permission for the study was obtained from the relevant educational authorities. All Learners in Grade 4, 5 and 6 from the Christian School on the Potchefstroom Campus were identified as participants. This particular group of learners would serve the purpose of this research best because of their common background and age. The current researcher made an appointment with the principal who was informed of this research and was invited to participate. The principal responded positively and prior to assessing an availability sample of forty eight previously disadvantaged Grade 4, 5 and 6 learners from the Intermediate Phase (the focus group of this research), a research application was submitted to the governing body of the school.

Once written consent was obtained, the sampling method decided upon was employed. Once informed of the project, an availability sample of forty eight previously disadvantaged learners was recruited. The technique was one of simple random sampling to ensure that every Intermediate Phase learner from this school had the same probability of selection. The basic ethical principle of “no harm should come to the respondents as a result of their participation in the research” (Oppenheim, 1992:83) was observed and all respondents’ parents were invited to complete an informed consent form (see Annexure A). This was done for all learners in the control groups and experimental group. These learners were randomly assigned to Groups A, B, C or D.

To test the hypothesis of this research, a four-group pre-post assessment design was used. In order to divide the availability sample into four groups, the names of the participants were placed in a box and four groups were randomly selected. The features that emphasised the homogeneity of the groups were:

- The participants belonged to the intermediate life phase which was identified as a relevant age group for this test sample.
- None of the participants had received any musical training prior to their testing.
- All the participants came from previously disadvantaged circumstances.

The pre-assessment of all four groups were conducted as follows: Forty eight of the Intermediate Phase learners were transported in groups to the Psychology building of the North-West University, Potchefstroom Campus, where the Tomatis Listening Test was first conducted individually. Two weeks later all four groups wrote the Musat Test and within another week the Tennessee Self-Concept Test and the Torrance Creativity Test were completed. A week later the two sound stimulation programmes commenced simultaneously but were attended in separate venues. The programmes were overseen by four suitable qualified individuals and Group A was monitored daily by a clinical psychologist.

To be able to determine the impact of the Tomatis Method on musical listening of the Intermediate Phase learner, this research was centred on the following four groups of respondents who were exposed to different interventions. All learners from Group A and Group B were invited to attend afternoon sessions at the Institute for Psychotherapy and Counselling (IPC) on the Potchefstroom Campus of the North-West University.

- A group of nine learners (Group A) were randomly selected to attend two four week Tomatis stimulation programmes through filtered sounds while they continued attending the compulsory Arts and Culture programme at school in the mornings during school time. This programme was presented in the afternoons after 16H00 when the Tomatis apparatuses became available.
- Another group of nine learners (Group B) were exposed to the unfiltered recordings on CD of the music of Mozart in the afternoons for 60 half hour sessions while attending the Arts and Culture programme during school time in the mornings.
- A group of fifteen learners (Group C) were randomly selected to attend only the compulsory Arts and Culture programme at school.

- A group of fifteen learners (Group D), randomly selected, were the non-intervention control group. They did not receive any intervention and did not attend Arts and Culture classes for the duration of this research. Group D attended only the pre- and post-assessments and, upon completion of the research project, was offered participation in whichever programme proved to be most effective.

Attending the Tomatis Method: Group A started participating (a week later) in two four week Tomatis programmes combined with an Arts and Culture programme in school. Group B was attending the Arts and Culture programme in school and the music of Mozart on CD for 60 half hour sessions. The two sound stimulation programmes commenced simultaneously but were attended in separate venues. The programmes were overseen by four suitably qualified individuals and Group A was monitored daily by a clinical psychologist during the first 60 sessions.

During the second 60 sessions two senior students from the Faculty of Education were present throughout. They presented colouring in tasks, and socialized with the Group A participants. They also assisted during the active sessions and were guided by experienced Institute staff. Group C participated only in the Arts and Culture programme at school, whereas Group D, a non-intervention control group, only attended pre- and post-assessments.

General ethical requirements were observed throughout the study, including maintenance of confidentiality and freedom to withdraw at any moment, should a participant wish to do so.

At four weeks post-programme, post-assessments were completed in the same order and in a similar way as the pre-tests. At four weeks post-programme mothers/guardians were given a questionnaire to complete (see Annexure B) and they were interviewed to obtain feedback about the changes in the participants noted by them.

4.8.3 Comparability and Consistency

For research to be successful, the different interventions should be scientifically comparable. Thus, comparability and consistency of the intervention programmes were maintained in this research. Group A had 120 half hours of sound stimulation (Tomatis Method) while Group B attended 60 half hours of sound stimulation (music of Mozart on CDs).

The similarities and differences between interventions can be identified easily in comparative studies and Kazdin (1986:96) explains that “the similarities and differences may address important theoretical questions about the nature of alternative techniques and the processes through which their effects are achieved”.

According to Van der Berg (1993:127), the second group of variables are those that specifically belong to each intervention individually and they are expected to differ. Research differences point to the effect of the individual intervention strategies. In this research proper statistical tests will be used to evaluate whether differences between and within groups are statistically significant.

Non-specific variables are the third group of variables which can be mentioned when identifying the similarities and differences between interventions. Van der Berg (1993: 128) states that these factors cannot be identified in advance as they occur during specific procedures.

In the current study statistical tests were used as part of the experimental procedure. Therefore Chapter 5 will deal with the effects of similarities and differences between and within the groups in a more detailed manner.

4.9 SUMMARY

In Chapter Four the distinctions between the research design and methodology have been delineated together with measures to ensure validity and reliability. In this study it was explained in Chapter One that both quantitative and qualitative approaches will be followed to address the research question. Section 4.3 in this chapter points out that quantitative and qualitative approaches represent complementary components of the research process. Thus a quantitative approach in the current research is used “to answer questions about relationships among measured variables with the purpose of explaining, predicting, and controlling phenomena” and qualitative research is used to “answer questions about the complex nature of phenomena”. Case studies will accordingly be discussed in Chapter Seven.

The participants were carefully selected and as for the measuring instruments mentioned in this chapter the current researcher is of the opinion that they are sensitive enough to measure the listening ability, creativity and the psychological phenomena involved in this study and that they are also equipped to reflect the effects of the intervention programmes.

5

PRESENTATION AND ANALYSIS OF EMPIRICAL DATA

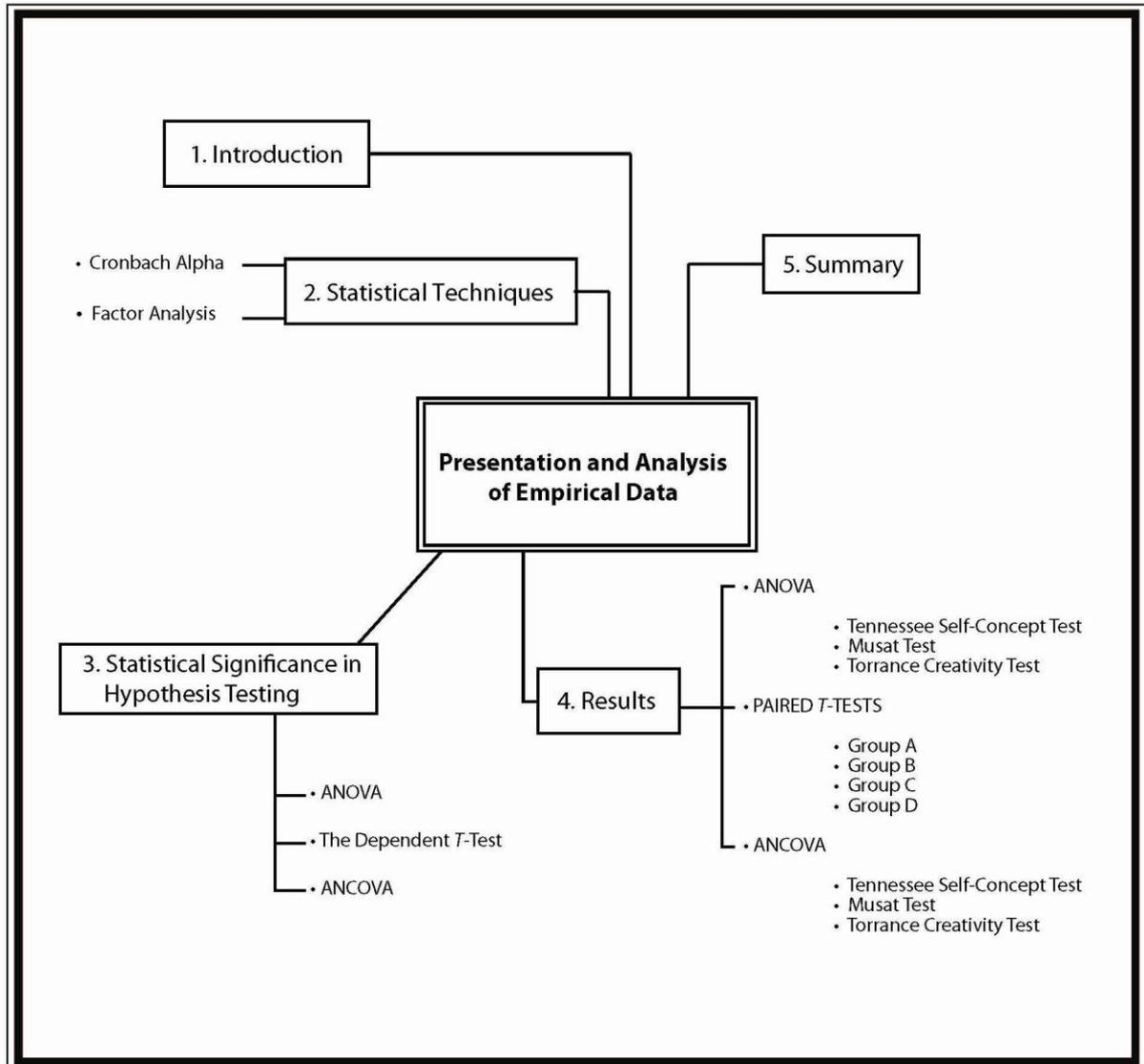
5.1 INTRODUCTION

Chapter Five communicates the statistical analysis of the empirical findings. The reliability and validity of the measuring instruments is discussed initially, with explanations about the Cronbach Alpha and Factor Analysis.

The ANOVA addresses the comparability of the experimental and control groups at pre-treatment level. The paired *t*-test elucidates the comparability of the pre- to the post-test mean.

Thereafter the results of the Tennessee, Musat, and Torrance interventions are evaluated by obtaining and presenting consecutive post-test scores presented with the ANCOVA. An explanation of the qualitative and quantitative importance of the above-mentioned interventions are presented, after which this Chapter is concluded with a summary.

A visual presentation of the layout of Chapter 5 is presented in the graphic illustration:

Figure 5.1: Visual Presentation of the Layout of the Chapter

5.2 STATISTICAL TECHNIQUES

Psychological tests are normally seen as psychological measuring instruments (Smit, 1980:5). Armstrong *et al.* (2007:287) describe measuring as the description of data in terms of numbers, while Stevens (1951:12) sees measuring as numbers given to subjects and happenings according to certain rules and laws (also see Huysamen, 1998:10). Magnussen (1966:1) unites it all with his description of measuring as “to assign numbers to the quantities of the properties of objects in accordance with given rules whose validity can be tested empirically”. He also explains that (1966:123) “the validity of a method is the accuracy with which meaningful and relevant measurements can be made with it, in the sense that it actually measures the traits it was intended to measure” (also see Shaughnessy *et al.*, 2006:38; Spata, 2003:8).

It is accepted that the validity of a test is in line with its reliability if all other factors are stable. Jackson (2003:45) noted this relationship between validity and reliability as being very important and Helmstadter (1964:85) proposed that “the maximum possible validity is the square root of the reliability” (also see Spata 2003:63; Mitchell *et al.*, 2004:17,18) Therefore Brown (1976:84), looking at consistency estimates that are foremost concerned with the internal structure of the test, uses the term homogeneity. For the purpose of this research and also for statistical purposes reliability of the measuring instruments are tested by the Cronbach Alpha, while validity is determined by Factor Analysis.

After the structure in data has been confirmed through Factor Analysis the reliability of the data needs to be confirmed. Reliability means that the scale should consistently reflect the construct it is measuring. Some methods of testing for reliability are:

- *Test-retest reliability* - is used for the same person or the same score for similar items. Individual items (or sets of items) should produce results consistent with the overall (Shaughnessy *et al.*, 2006:173, Mitchell and Jolley, 2004:97, 98).
- *Split-half reliability* – is used where the variables underlying a construct are randomly split into two halves and the correlation between the two halves is then calculated (Huysamen, 1998:73).
- *Cronbach’s Alpha* – is the average correlation between all possible permutations of split-halves which are approximated (Field, 2005:668).

5.2.1 Internal Consistency / Reliability of Measuring Instruments:

Cronbach Alpha

A summary and classification of the methods of Cronbach is found in Cronbach and Meehl (1955:281-302; Field, 2005:668) and Cronbach (1970:26) where it is explained that the *Cronbach Alpha* tests the internal consistency of the measuring instruments. In addressing the current relevance of the Cronbach Alpha as a well-established statistic Schweizer (2011:143) reported that 80.5% of papers published in the *European Journal of Psychological Assessment* in 2010 include a report of consistency based on Cronbach’s Alpha.

The internal consistency of the measuring instruments is determined by a “systematic procedure for observing a person’s behaviour and describing it with the aid of a numerical scale or a category system”. Therefore the Cronbach’s Alpha is a loosely equivalent to splitting data in all ways and calculating the correlation coefficient for each split.

The average of the above-mentioned is Cronbach's Alpha coefficient with a formula:

$$\alpha = \frac{N^2 \text{mean}(Cov)}{\sum s_{item}^2 + \sum Cov_{item}}$$

Thus De Klerk (2003:196) states that "the Cronbach Alpha is an index of the internal consistency (reliability) of an instrument and can be defined as the degree to which the item inter-correlate with the test total or the degree to which items measure the same trait. It is thus a measure of the degree to which the items show a similar content and it ranges from 0 (no internal consistency) to 1 (perfect internal consistency)". For the purpose of this study different instruments were utilised to determine particular psychological aspects of the learners. Table 5.2 represents the Cronbach Alpha values and internal consistency reliability of the measuring instruments used in the current research.

Table 5.1: The Cronbach's Alpha Reliability Co-Efficient of Measuring Instruments

MUSAT TEST	
T1	0.76
T2	0.46
T3	0.41
T4	0.48
T5	0.70
T6	0.54
T7	0.72

TENNESSEE SELF-CONCEPT TEST	
IND	0.76
SAT	0.63
BHV	0.69
PHY	0.49
MOR	0.48
PER	0.76
FAM	0.57
SOC	0.61
ACA	0.50
INCR	0.68

TORRANCE CREATIVITY TEST	
Picture Total	0.57
Circle Total	0.91
Elephant Total	0.87
Boxes Total	0.87

A satisfactory internal consistency is demonstrated by the majority of the instruments used for the purpose of this research, as exhibited in the Cronbach Alpha values of the measuring instruments. Sub-tests T2, T3 and T4 (Musat Test), as well as PHY and MOR (Tennessee Self-Concept Test) have, however, Cronbach Alpha values lower than 0,5 indicating a lack in reliability and the conclusions regarding these sub-tests must be done with care. Chapter 4 mentioned that previously disadvantaged learners were used as participants in this research. None of them have been exposed to any music intervention prior to the current research. The current researcher is thus of the opinion that the lower Cronbach Alpha values can be the result of these participants not understanding the majority of the questions under the above-mentioned sub-tests or that the field of experience in music of these learners are so limited that they did not know how to answer the questions asked in these sub-tests.

5.2.2 Validity

In the opinion of French and Michael (1966:165) "Validity information indicates the degree to which the test is capable of achieving certain aims. Tests are used for several types of judgements and for each type of judgement a different type of investigation is required to establish validity" (also see Spata 2003:321). In addition to being reliable, measures must also be valid. Jackson (2003:44) is of the opinion that Validity refers to whether a measure is "truthful or genuine ... one that measures what it claims to measure". There is in fact a strong correlation in the opinion of different researchers, because Sundberg (1977:43) also states that "...it is the property of a test that makes the obtained results useful. A procedure is not valid in general, it is valid for something" (also see Kerlinger and Lee, 2000:666; McBurney and White, 2004:169).

There are many types of validity (i.e. face-, content-, construct validity) and for the purpose of this research the construct validity of measuring instruments has been determined by Factor Analysis.

5.2.1.1 Content Validity

Psychological tests are valid for specific purposes and aspects of validity can be noted according to these purposes. Huysamen (1976: 415) explains: "to be valid, that is, to serve the purpose for which it is intended, the tasks required by the items contained in the test ... should be a representative sample of the total universe of tasks ... This requirement of

representativeness concerns the content validity of the test” (also see Spata, 2003:316; Mitchell and Jolley, 2004:552).

According to the above it is established that internal consistency has to do with the interior of a test, in other words the substantive elements. Guion (1965:125) is of the opinion that “content validity is concerned with the degree to which the test includes a representative sample of all the tasks that could have been included ... Content validity must be a matter of judgement not of empirical correlation” (also see Kerlinger and Lee 2000:667).

5.2.1.2 Construct Validity

Brown (1976:128) states that construct validating takes into consideration both construct and the basic theoretical aspects that are lineated with the construct (also see Shaughnessy *et al.*, 2006:174). Intra testing methods, inter testing methods (method of congruent validity, factor analysis of inter correlation of specific tests as well as methods of convergent discriminating validity), as well as criteria based studies and internal consistency are methods used to determine the construct validity of a test, in other words “...a determination of the adequacy of the sampling of items from the universe of potential items”. McBurney and White (2004:171) agree that construct validity of research “concerns the question of whether the results support the theory behind the research”. In addition to this view it is the opinion of Jackson (2003:45) that construct validity of a test assesses the extent to which a measuring instrument accurately measures a theoretical construct or trait that it is designed to measure.

A statistical procedure for the identification of psychological traits is called *Factor Analysis*. Factor analysis is a powerful and indispensable method of construct validation (Kerlinger and Lee, 2000:679). This is a technique to identify groups or clusters of variables or latent variables. Anastasi (1976:506) and Mitchell and Jolley (2004:554) explained that it is of particular relevance to construct validity. Anastasi outlined that a series of studies by Guilford and his co-workers represent one of the pioneer ventures in this direction. They developed the Guilford-Zimmerman Temperament Survey (Guilford, 1959:16; Guilford & Zimmerman, 1956). Often, particularly in social science research, the variables of major interest cannot directly be measured but have to be measured from a number of questions. In some cases, a concept may be represented by a single latent variable, but often they are multi-dimensional in nature and so involve more than one latent variable. These latent variables are called factors.

There are a few methods with which factor analysis can be outlined. Two of these methods are *principal component* and *maximum likelihood*.

- *Principle Component* - Conclusions are restricted to the sample collected and cannot be generalised. A close link between factor analysis and Principal Component Analysis (PCA) exist. It is therefore common to regard PCA as a method for factor analysis.
- *Maximum Likelihood* - Sample results can be generalised to populations.

Factor analysis is used to understand the structure of a set of variables. It is also used to construct a questionnaire to measure an underlying variable. Another possibility is to use it to reduce a data set to a more manageable size while retaining as much of the original information as possible.

In the light of the above Anastasi (1976:362) and Mitchell and Jolley (2004:535) state that the principle object of factor analysis is to simplify the description of data by reducing the number of necessary variables, or dimensions (this is the factor matrix). The tests providing the best measures of each of the factors are thus maintained. All factor analysis begins with a complete table of inter-correlations (the correlation matrix) and end with a factor matrix (a table showing the weight or loading of each of the factors in each test).

A factor matrix with a row for each variable and a column for each factor are constructed from obtained data. When the researcher wants to confirm that there is only one factor, it is called confirmatory factor analysis. Proportion of common variance present in a variable is its communality. When found that a factor pattern is not sufficient it can be rotated to get a more favourable pattern. This is done with the varimax, quartimax and equamax: i.e. orthogonal rotation methods (Huysamen, 1998: 53).

5.2.1.3 Factor Analysis

Construct Validity for the Tennessee Self-Concept Test has been established in the South African context (Boshoff, 2006; Hugo, 2005) and will not be repeated in this study. Therefore Factor Analysis was applied only to the Musat Test data to allow a fuller understanding of the comparisons of the scores of each individual in the various tests. As a relatively small sample is used, care must be taken when these factors are interpreted and thus it will be used for explanatory purposes only. The method that was used in this analysis was Principal component factor analysis with Varimax rotation.

The seven sections of the Musat Test are:

- Interval (Test 1, Question 1 – 15)
- Harmony (Test 2, Question 1 – 12)
- Timbre (Test 3, Question 1 – 13)
- Rhythm (Test 4, Question 1 – 15)
- Duration (Test 5, Question 1 – 12)
- Speed (Test 6, Question 1 – 10)
- Counting (Test 7, Question 1 – 10)

The current researcher delineated that only one factor was extracted by Kaiser's criterion for Tests 5 to 7, while more factors were extracted for Tests 1 to 4. Marked loadings are > 0.3 . When two factors were identified in the same test, scores exceeding 0.3 determined whether the question will be predominantly under Factor 1 or Factor 2 as outlined in the tables that follow:

Table 5.2: Musat Test 1: Interval

Variable	Factor Loadings (Varimax raw) (Musatv.sta) Extraction: Maximum likelihood factors (Marked loadings are > 0.300000)		
	Factor 1	Factor 2	Communalities
T1 Q1	0.432267	0.330620	0.296164
T1 Q2	0.101815	0.115305	0.023662
T1 Q3	0.516621	0.263222	0.336184
T1 Q4	0.770302	0.018171	0.593695
T1 Q5	0.661935	0.277776	0.515317
T1 Q6	0.306055	0.381279	0.239043
T1 Q7	0.301517	0.053797	0.093807
T1 Q8	0.134106	0.527626	0.296374
T1 Q9	0.687461	0.236803	0.528678
T1 Q10	0.392201	0.111682	0.166294
T1 Q11	0.131687	0.306667	0.111386
T1 Q12	0.143340	0.441276	0.215271
T1 Q13	0.293306	0.667011	0.530932
T1 Q14	0.326789	0.238034	0.163451
T1 Q15	0.094391	0.595186	0.363155
Expl. Var	2.564249	1.909166	
Prp. Totl	0.170950	0.127278	

Two factors were extracted under the Interval section. Question 1, 3, 4, 5, 7, 9, 10 and 14 seem to load on factor one while Question 6, 8, 11, 12 and 13 all load on Factor 2. Question 2 does not fit into either of these two factors.

The factors that were identified are now delineated:

Table 5.3: Musat Test 2: Harmony

Variable	Factor Loadings (Varimax raw) (Musatv.sta) Extraction: Maximum likelihood factors (Marked loadings are > 0.300000)		
	Factor 1	Factor 2	Communalities
T2 Q1	0.114495	0.629431	0.409292
T2 Q2	0.021539	0.413753	0.171656
T2 Q3	0.004957	0.466691	0.217825
T2 Q4	0.042860	0.105931	0.013058
T2 Q5	0.263783	0.225177	0.120285
T2 Q6	0.427635	0.212876	0.228188
T2 Q7	0.351120	0.037687	0.124706
T2 Q8	0.022424	0.080285	0.006949
T2 Q9	0.120855	0.552926	0.320333
T2 Q10	0.400643	0.167329	0.188514
T2 Q11	0.760289	0.065124	0.582281
T2 Q12	0.121465	0.032318	0.015798
Expl. Var	1.159590	1.239295	
Prp. Totl	0.096632	0.103275	

Questions 6, 7, 10 and 11 load on factor 1. Questions 1, 2, 3 and 9 load on Factor 2.

Questions 4, 5, 8 and 12 have no significance for either of the above factors.

Table 5.4: Musat Test 3: Timbre

Variable	Factor Loadings (Varimax raw) (Musatv.sta) Extraction: Maximum likelihood factors (Marked loadings are > 0.300000)		
	Factor 1	Factor 2	Communalities
T3 Q1	0.367251	0.400096	0.294950
T3 Q2	0.252574	0.680908	0.527429
T3 Q3	0.410264	0.216539	0.215206
T3 Q4	0.028959	0.029155	0.001689
T3 Q5	0.981563	0.121385	0.978199
T3 Q6	0.096936	0.064992	0.013621
T3 Q7	0.580207	0.123858	0.351981
T3 Q8	0.393565	0.441337	0.349672
T3 Q9	0.223659	0.147757	0.071855
T3 Q10	0.209147	0.015334	0.043977
T3 Q11	0.074774	0.049440	0.008036
T3 Q12	0.273780	0.286145	0.156834
T3 Q13	0.192912	0.568129	0.359986
Expl. Var	2.043746	1.329690	
Prp. Totl			

On Timbre it was Question 3, 5 and 7 that contributed to Factor 1, while Factor 2 had only 2 questions loading on it; question 2 and 13. Question 1 and 8 showed equally strong loadings for both factors and question 4, 6, 9, 10, 11 and 12 did not load on either factor 1 or 2 (with

no particularly high scores). The current researcher refers back to this chapter page 2 **Table 1** where the reliability score was also rather low.

Table 5.5: Musat Test 4: Rhythm

Variable	Factor Loadings (Varimax raw) (Musatv.sta) Extraction: Maximum likelihood factors (Marked loadings are > 0.300000)		
	Factor 1	Factor 2	Communalities
T4 Q1	0.598232	0.237643	0.414356
T4 Q2	0.076101	0.321443	0.109117
T4 Q3	0.376950	0.071916	0.147263
T4 Q4	0.819581	0.213970	0.717496
T4 Q5	0.010169	0.349408	0.122190
T4 Q6	0.218703	0.143728	0.068489
T4 Q7	0.255530	0.019011	0.065657
T4 Q8	0.170715	0.246516	0.089914
T4 Q9	0.228205	0.506950	0.309076
T4 Q10	0.047158	0.607824	0.371674
T4 Q11	0.305435	0.116771	0.106926
T4 Q12	0.115345	0.422167	0.191530
T4 Q13	0.514905	0.157193	0.289837
T4 Q14	0.076188	0.512627	0.268591
T4 Q15	0.461289	0.225469	0.263624
Expl. Var	1.964467	1.571272	
Prp. Totl	0.130964	0.104751	

Questions 1, 3, 4, 11, 13 and 15 load on Factor 1 and Questions 2, 5, 9, 10, 12 and 14 load on Factor 2. Questions 6, 7 and 8 did not load on either factor.

Table 5.6: Musat Test 5: Duration

Variable	Factor Loadings (Varimax raw) (Musatv.sta) Extraction: Maximum likelihood factors (Marked loadings are > 0.300000)	
	Factor 1	Communalities
T5 Q1	0.638759	0.408012
T5 Q2	0.525458	0.276106
T5 Q3	0.378831	0.143513
T5 Q4	0.571636	0.326768
T5 Q5	0.488891	0.239014
T5 Q6	0.319274	0.101936
T5 Q7	0.603169	0.363812
T5 Q8	0.255966	0.065519
T5 Q9	0.457523	0.209327
T5 Q10	0.341118	0.116361
T5 Q11	0.280359	0.078601
T5 Q12	0.084342	0.007114
Expl. Var	2.336083	
Prp. Totl	0.194674	

The only factor that was extracted under Duration is the length of the audible note.

Table 5.7: Musat Test 6: Speed

Variable	Factor Loadings (Varimax raw) (Musatv.sta) Extraction: Maximum likelihood factors (Marked loadings are > 0.300000)	
	Factor 1	Communalities
T6 Q1	0.466074	0.217225
T6 Q2	0.285654	0.081598
T6 Q3	0.976940	0.954412
T6 Q4	0.141047	0.019894
T6 Q5	0.352958	0.124579
T6 Q6	0.431714	0.186377
T6 Q7	0.374547	0.140286
T6 Q8	0.427725	0.182949
T6 Q9	0.137293	0.018849
T6 Q10	0.129135	0.016676
Expl. Var	1.942847	
Prp. Totl	0.194285	

For Speed also only one factor was extracted which determined how fast or slow rhythmic patterns were applied.

Table 5.8: Musat Test 7: Counting

Variable	Factor Loadings (Varimax raw) (Musatv.sta) Extraction: Maximum likelihood factors (Marked loadings are > 0.300000)	
	Factor 1	Communalities
T7 Q1	0.507702	0.257762
T7 Q2	0.315329	0.099433
T7 Q3	0.419036	0.175591
T7 Q4	0.198552	0.039423
T7 Q5	0.755626	0.570971
T7 Q6	0.761088	0.579255
T7 Q7	0.660877	0.436758
T7 Q8	0.197587	0.039041
T7 Q9	0.561027	0.314752
T7 Q10	0.047843	0.002289
Expl. Var	2.515274	
Prp. Totl	0.251527	

One factor was extracted for the Counting Test. This is to determine the beats per bar; whether duple, triple or quadruple time has been used for the composition.

The general expectation was that all tests should have extracted only one common factor, which did not happen with the current Factor Analysis. It is the opinion of the current researcher that the reason can be found in the fact that the Musat Test was extremely

foreign to the particular participants as they were from previously disadvantaged circumstances and had no or very little exposure to Western music and its applications.

Construct Validity was not tested in the Torrance Creativity Test as these tests do not propose themselves to Factor Analysis; the scores not found on the Likert Scale of measurements.

5.3 STATISTICAL SIGNIFICANCE IN HYPOTHESIS TESTING

The results of this research were derived from various statistical techniques. From these results conclusions were drawn as to whether the interventions were successful and if the purpose of the research had been attained.

The choice of the significance level is a capricious topic as any statistical result can be attributed to chance. Huysamen (1980:258) is of the opinion that the reliability of a test is the relation of the variance of the real scores with the relation of the obtained scores (also see Mitchell and Jolley, 2004:558; De Vos *et al.*, 2009:162). To accommodate the probability that the observed relation (in the situation of correlation) or differences (in the situation of *t*-tests), are due to chance, a *p*-value is given to particular test statistics.

If the *p*-value of the test statistic (the *p*-value associated with a particular *t*-value) is smaller than the significance level, it is concluded that the statistic is significant at the pre-selected significance level. The significance level is traditionally set at 0.1, 0.05 or 0.01. In the current study the statistical consultant at the NWU recommended that a significance level of 10% should be used as the data sets may not be large enough to indicate significance on a 5% level.

Tests where statistically significant differences between groups were indicated are discussed below to determine if differences were important in practice. The significance of the effects was calculated in order to determine the practical significance of the Tomatis intervention. In this study, where significant *p*-values occurred, it was decided to compare the results on the basis of the size of the *d*-values (effect). The current researcher used the *d*-value as explained by Cohen (1988:78) as a measure of the significance of the treatment effect.

This index is independent of sample size and guidelines for interpretation of effect sizes are given as:

$d > 0.2$ (small effect) =	indication of minor differences
$d > 0.5$ (medium effect) =	indication of medium differences between the groups / trends towards practical differences
$d > 0.8$ (large effect) =	indication of large practical differences between the groups

An effect size of $d > 0.5$ was regarded as an indication of trends towards practical differences, while an effect size of $d > 0.8$ was regarded as a large practical difference.

The selection and application of statistical techniques used in this research are now delineated.

5.3.1 ANOVA

This section of the statistical procedure addresses the comparability of the experimental and control groups at pre-treatment level. The term analysis of variance or ANOVA indicates how much of the total variation can be explained by the independent variables (Bohrstedt & Knoke, 1981:200; Field, 2005:309; Shaughnessy *et al.*, 2006:540). The ANOVA compares more than two groups' means. According to Steyn (et al, 1996:736) the hypothesis $H_0 : \mu_1 = \mu_2 = \mu_3$ can be tested in the following way:

- It is important to know whether the means of the populations, which had undergone certain treatment (where experimental people, animals, plants etc. were chosen from), differ from the control population where no treatment was given. Usually there is more than one treatment which has the result that when the hypothesis $H_0 : \mu_1 = \mu_2 = \mu_3$ is tested the means of the populations, both control and experimental, will differ.

Such a test is called an *omnibus-test*, because it only gives an indication of whether a difference between group means exists. For this, analysis of the variance is used. There are methods to test hypotheses to determine which groups differ. These tests are known as *post-*

hoc tests (tests done afterwards). The method generally used is known as the Tukey-method (also known as HSD: “Honestly Significantly Different” test).

ANOVA (formula for post-hoc tests):

$$t_{ij} = \frac{|\bar{x}_i - \bar{x}_j|}{\sqrt{\frac{GKB}{n}}}$$

Post-hoc tests give a p-value, indicating significant differences between groups. The ANOVA was used to compare pre-test scores of all tests used in this research to determine whether groups were comparable.

5.3.2 The dependent *t*-test

When a group is tested and re-tested, as in this study, and the object is to compare the pre-test mean to the post-test mean, the appropriate test is a *t*-test for dependent samples (Howell, 1999:119). The dependent *t*-test therefore compares two means, given that the means came from the same group of people (Field, 2005:295). Kerlinger, (1992:56) and Rosenthal & Rosnow, (1999:87) suggest that the *t*-test is a statistical test that evaluates the differences within groups which are statistically significant. As indicated in this chapter, the effects of the Tomatis intervention as tested by the Musat Test, Tennessee Self-Concept Test and Torrance Creativity Test were determined on a pre- and post-test basis.

In the present study for each of the control groups and experimental group the pre-test scores were compared to the post-test scores to ascertain whether any of the scores have changed. To ascertain whether changes were statistically significant, *t*-tests for dependent groups (so-called pair-wise *t*-tests) were performed.

The *t*-test for dependent measures was applied:

$$t = \frac{\bar{D}}{s_D / \sqrt{N}}$$

$$d = \frac{\bar{x}_{diff}}{s_1}$$

Differences in the mean scores of pre- and post-test results were checked in terms of significance (p-value). This was also done to determine possible improvements as a result of the Tomatis Method as tested by the Musat Test, Tennessee Self-Concept Test and

Torrance Creativity Test. The *t*-test involved a comparison of certain dependent measurements or scores; difference in scores involving the significance of differences from pre- to post-test.

5.3.3 ANCOVA

This section deals with the comparison of the experimental and control groups at post-treatment level controlling for pre-test differences. Furthermore it provides comparative data pertaining to pre-interventions test scores related to that of post-intervention.

Field (2005:779) describes the *analysis of covariance*, often referred to by its acronym ANCOVA, “as the result of a felicitous marriage between the analysis of variance and the concepts and procedures of linear correlation and regression”. He emphasizes that the reasons for ANCOVA are to reduce within-group error variance and to eliminate confounds. ANCOVA is differentiated from the ANOVA in that it is used when the researcher wants to neutralize the effect of a continuous independent variable, e.g. effect of the pre-test from the post-test results.

Brown (1976:144) declared that “to understand and to predict human behaviour fully one must take into account the highly configural nature of the interaction between variables, a task only trained human judgement can accomplish” (see also Sanders, 2010:275).

5.4 RESULTS

The results and discussions of the different analyses, are tabled under the following headings, and outlined in the respective tables:

5.4.1 ANOVA

The ANOVA is the comparability of the experimental and control groups at pre-treatment level.

5.4.1.1 Tennessee Self-Concept Test

The first test results to be tabulated and discussed will be that of the Tennessee Self-Concept Test.

Table 5.9: Tennessee Self-Concept

	Group A		Group B		Group C		Group D		P-Value
	Mean	Std Dev							
Self criticism	28.88	2.14	27.22	3.11	27.13	3.66	27.88	4.32	0.67
Identity	77.22	12.90	79.33	11.00	79.26	10.25	81.77	10.17	0.76
Satisfaction	54.22	5.95	54.66	8.88	55.46	9.18	60.44	5.74	0.10
Behaviour	75.77	7.87	73.33	9.64	75.26	6.67	74.16	9.26	0.91
Physical	47.44	4.85	49.11	5.23	47.00	0.00	47.00	0.00	0.31
Moral	31.11	4.93	31.22	4.71	32.73	5.28	31.50	5.90	0.85
Personal	40.11	6.07	40.22	7.13	41.93	5.81	45.94	4.77	0.03 +
Family	45.22	3.76	42.44	5.29	42.80	4.87	44.38	4.52	0.47
Social	45.55	7.71	48.66	8.90	48.46	6.11	48.22	7.44	0.77
Academic	39.55	5.45	36.44	5.05	38.66	6.30	35.11	4.87	0.15
Inconsistent Responding	75.66	7.64	73.88	7.65	73.77	9.83	75.38	7.60	0.91
Faking good	25.44	2.60	26.00	3.35	25.06	2.86	26.33	2.89	0.63
Total	246.77	23.67	243.77	30.43	248.66	26.55	251.50	23.58	0.89

+ Statistically significant on a 10% level of significance

Table 5.10: Tennessee Self-Concept: Effect Sizes (d-values)

Effect sizes						
d-value						
	<i>A with B</i>	<i>A with C</i>	<i>A with D</i>	<i>B with C</i>	<i>B with D</i>	<i>C with D</i>
Self criticism	0.53	0.48	0.23	0.02	0.15	0.17
Identity	0.16	0.16	0.35	0.01	0.22	0.24
Satisfaction	0.05	0.14	1.05	0.09	0.65	0.54
Behaviour	0.25	0.06	0.17	0.20	0.09	0.12
Physical	0.32	0.09	0.09	0.40	0.40	0.00
Moral	0.02	0.31	0.07	0.29	0.05	0.21
Personal	0.02	0.30	0.96	0.24	0.80	0.69
Family	0.53	0.50	0.19	0.07	0.37	0.32
Social	0.35	0.38	0.35	0.02	0.05	0.03
Academic	0.57	0.14	0.81	0.35	0.26	0.56
Inconsistent responding	0.23	0.19	0.04	0.01	0.20	0.16
Faking good	0.17	0.13	0.31	0.28	0.10	0.44
Total	0.10	0.07	0.20	0.16	0.25	0.11

All the pre-tests showed no statistically significant differences between the four groups A, B, C and D.

No statistically significant differences (on a 10% level of significance) between groups were indicated at pre-testing. The effect sizes were calculated to determine if differences were practically different.

- Group A (d-value = 0.53) indicated a trend towards practical difference for **Self criticism** when compared to Group B.
- In the **Satisfaction** pre-test Group D (d-value = 1.05) scored practically significantly higher marks than Groups A and also showed a trend towards practical difference in comparison to Group B (d-value = 0.65), while Group C had a trend towards a practically higher mark than Group D (d-value = 0.54).
- Group B showed a small difference from both Groups C and D (d-values in both cases 0.40) in the **Physical** pre-test.
- In the pre-test the averages for the **Personal** scores for groups A, B and C were substantially lower in practice than those of Group D with d-values of 0.96, 0.80 and 0.69 respectively.
- Group A showed a trend towards practical differences with Groups B and C with a d-values of 0.53 and 0.50 respectively in the **Family** pre-test.
- In the **Academic** pre-test Group A (d-value = 0.57) compared with Group B and Group C compared to Group D (d-value = 0.56) indicated trends towards practical differences while Group A indicated trends towards large practical differences compared to Group D (d-value = 0.81).
- In the **Faking Good** pre-test it is only Group D that scored higher marks than Groups C (d-value = 0.44).

5.4.1.2 Musat Test

The next set of tests discussed will be that of the Musat Test.

Table 5.11: Musat

	Group A		Group B		Group C		Group D		P-Value	
	Mean	Std Dev								
Interval	10.56	2.65	9.11	2.67	6.8	3.76	7.06	3.19	0.0232	+
Harmony	8.44	1.74	7.33	1.32	7.27	2.25	6.83	1.5	0.1876	
Timbre	8.33	1.12	8.44	1.88	7.53	1.96	7.61	1.94	0.5095	
Rhythm	11.44	2.19	12.22	1.72	10.73	2.15	10.22	2.37	0.1413	
Duration	9.11	2.03	9	1.22	7.73	2.99	7	2.83	0.1271	
Speed	7.78	1.72	6.89	2.03	4.93	1.71	6.06	1.98	0.005	+
Counting	8	1.32	6.22	1.99	4.93	2.91	6.17	2.36	0.0314	+
Total Musat	63.7	4.09	59.22	6.9	49.93	9.03	50.94	11.13	0.0012	+

+ Statistically significant on a 10% level of significance

Table 5.12: Musat: Effect Sizes (d-values)

Effect sizes						
d-value						
	A with B	A with C	A with D	B with C	B with D	C with D
Interval	0.54	1	1.1	0.61	0.64	0.07
Harmony	0.64	0.52	0.93	0.03	0.33	0.19
Timbre	0.06	0.41	0.37	0.47	0.43	0.04
Rhythm	0.36	0.33	0.52	0.69	0.85	0.22
Duration	0.05	0.46	0.75	0.42	0.71	0.25
Speed	0.44	1.66	0.87	0.96	0.41	0.57
Counting	0.90	1.05	0.78	0.44	0.02	0.42
Total Musat	0.68	1.73	0.92	1.09	0.38	0.54

The **Musat Pre-Test** for Harmony, Timbre, Rhythm and Duration showed no statistically significant differences between the four groups.

- In terms of **Test 1: Interval** the average scores of the groups differed in the pre-test. Group A obtained a practically higher mark than that of Groups C and D (d-value = 1.0 and 1.1 respectively) and a trend towards a higher mark than Group B (d-value = 0.54). Group B also showed a trend towards higher marks than Groups C and D (d-value = 0.61 and 0.64 respectively).
- **Test 2: Harmony** indicated a trend towards practical differences between Group A with Groups B and C with d-values= 0.64, 0.52 and significantly better performance of Group A compared with Group D (d-value= 0.93).
- In **Test 4: Rhythm** Group A showed a probably better score than Group D (d-value= 0.52) and Group B indicated a trend towards practical differences

compared to Group C (d-values= 0.69), and indicated a large practical difference with Group D (d-values= 0.85).

- In the Duration test, **Test 5: Duration**, it was Group A that had a practically significantly higher score than Group D (d-value= 0.75), where Group B also illustrated a trend towards practical difference compared to Group D (d-value= 0.71).
- **Test 6: Speed** showed that Group A was on average practically significantly better than both Groups C and D (d-value = 1.66 and 0.87 respectively). Group B similarly illustrated practically significantly better results on average than Group C (d-value = 0.96) which in turn tended towards being practically better than Group D (d-value = 0.57).
- In practice, Group A obtained on average better scores than all the other three Groups for **Test 7: Counting**. Comparisons with Group A yielded d-values for Group B as 0.90, Group C as 1.05 and Group D as 0.78.

Conclusively the **Musat Totals**, indicated that Group A had practically significantly better results on average than Groups B (d-value = 0.68) and D (d-value = 0.54). In practice Group A indicated large practical differences when compared to Group C and D (d-value = 1.73 and 0.92 respectively). Group B confirmed statistically significant larger differences than Group C (d-value = 1.09).

5.4.1.3 Torrance Creativity Test

The tables and discussion of the results of the Torrance Creativity Test follow:

5.4.1.3.1 Picture Test

Table 5.13: Torrance Creativity: Picture

	Group A		Group B		Group C		Group D		P-Value	
	Mean	Std Dev								
Picture fluency	9.67	0.71	8.67	2.00	9.80	0.41	9.39	1.24	0.14	
Picture flexibility	9.22	1.09	8.11	2.26	9.33	0.72	9.06	1.30	0.18	
Picture originality	12.89	2.15	8.67	4.00	9.47	2.61	9.78	2.67	0.01	+
Picture elaboration	11.33	4.53	7.00	3.64	8.73	5.96	8.67	3.88	0.27	
Total Picture	43.11	6.43	32.44	9.45	37.33	6.92	36.89	6.96	0.03	+

+ Statistically significant on a 10% level of significance

Table 5.14: Torrance Creativity: Picture: Effect Sizes (d-values)

Effect sizes						
d-value						
	A with B	A with C	A with D	B with C	B with D	C with D
Picture fluency	0.50	0.19	0.22	0.57	0.36	0.33
Picture flexibility	0.49	0.10	0.13	0.54	0.42	0.21
Picture originality	1.06	1.31	1.17	0.20	0.28	0.12
Picture elaboration	0.96	0.44	0.59	0.29	0.43	0.01
Total Picture	1.13	0.83	0.89	0.52	0.47	0.06

During the **Creativity Picture Pre-Test** there were practically significant differences in the **Picture originality** and the **Total Picture** score between the groups.

- In terms of **Picture Fluency** Group B indicated a trend towards lower marks than Groups C with a score of d-value= 0.57.
- Group C indicated a trend towards practical differences in **Picture Flexibility** compared with Group B (d-value = 0.54).
- The average scores of the groups differed in the pre-test in **Picture Originality**. Group A obtained a practically higher mark than that of Groups B, C and D (d-value = 1.06, 1.31 and 1.17 respectively).
- **Picture Elaboration** showed a large practical difference in Group A compared to both Groups B and D (d-value = 0.96 and 0.59 respectively).
- Group A similarly illustrated practically significantly better results on average than Group B, C and D (d-value = 1.13, 0.83 and 0.89) in **Total Picture** scores, while in turn Group C showed a trend towards practical differences compared to Group B (d-value = 0.52).

5.4.1.3.2 Circle Test

Table 5.15: Torrance Creativity: Circle

	Group A		Group B		Group C		Group D		P-Value	
	Mean	Std Dev								
Circle fluency	14.56	4.93	10.56	2.83	7.67	3.96	8.28	4.48	0.00	+
Circle flexibility	11.22	2.64	8.11	2.47	5.93	2.66	6.22	3.57	0.00	+
Circle originality	15.11	8.54	11.44	7.07	5.73	4.89	8.39	7.27	0.01	+
Circle elaboration	6.44	5.05	4.44	3.64	2.33	2.47	4.00	4.50	0.12	
Total Circle	48.00	20.40	34.56	13.63	21.67	12.53	26.89	18.92	0.00	+

+ Statistically significant on a 10% level of significance

Table 5.16: Torrance Creativity: Circle: Effect Sizes (d-values)

Effect sizes						
d-value						
	A with B	A with C	A with D	B with C	B with D	C with D
Circle fluency	0.81	1.40	1.27	0.73	0.51	0.14
Circle flexibility	1.18	1.99	1.40	0.82	0.53	0.08
Circle originality	0.43	1.10	0.79	0.81	0.42	0.37
Circle elaboration	0.40	0.81	0.48	0.58	0.10	0.37
Total Circle	0.66	1.29	1.04	0.95	0.41	0.28

During the **Creativity Circle Pre-Test** there were practically significant differences in all but the Circle Elaboration scores between the groups.

- On average Group A was significantly better in practice than Group B (d-value = 0.81) in the **Circle Fluency Pre-Test**. Group B was better than Group C and D (d-value = 0.73 and 0.51). In comparison to the above-mentioned, Group A also proved to be significantly better in practice than Groups C and D (d-value = 1.4 and 1.27 respectively).
- Groups C and D (d-value = 1.99 and 1.40 respectively) performed weaker than Group A that was practically significantly stronger. It proved to be that Group A could also have been better in practice than Group B (d-value = 1.18). Consequently Group B was also possibly practically better than Groups C and D (d-value = 0.82 and 0.53 respectively). These results were recorded during the **Circle Flexibility Pre-Test**.
- In the **Circle Originality Pre-Test** Group A (d-value = 1.1) indicated practical differences larger than Group C. Moreover it proved to be that Group A had much higher marks than Group D (d-value = 0.79) and Group B in its turn was possibly practically better than Group C (d-value = 0.81).

- The **Circle Elaboration Pre-Test** showed that statistically significant results were obtained in practice, indicating large practical differences. It was Group A that scored a d-value of 0.81 with Group C. Group B could have also been practically better than Groups C (d-value = 0.58).
- The following resulted during the **Total Circle Pre-Test**. Practically significantly better marks were found on average in Group A against Groups B, C and D (d-value = 0.66, 1.29 and 1.04 respectively), and in Group B against Group C (d-value = 0.95).

5.4.1.3.3 Elephant Test

Table 5.17: Torrance Creativity: Elephant

	Group A		Group B		Group C		Group D		P-Value
	Mean	Std Dev							
Elephant fluency	6.11	3.37	4.44	2.30	7.27	5.06	5.06	3.56	0.28
Elephant flexibility	5.00	3.97	3.22	2.17	6.00	4.63	4.11	2.70	0.26
Elephant originality	6.00	4.97	2.56	1.81	4.93	3.86	3.67	3.24	0.18
Elephant elaboration	2.44	3.28	2.67	3.39	1.73	1.79	1.00	1.37	0.27
Total Elephant	19.56	13.67	12.89	7.82	19.93	13.72	13.67	9.62	0.28

Table 5.18: Torrance Creativity: Elephant: Effect Sizes (d-values)

Effect sizes						
d-value						
	A with B	A with C	A with D	B with C	B with D	C with D
Elephant fluency	0.49	0.23	0.30	0.56	0.17	0.44
Elephant flexibility	0.45	0.22	0.22	0.60	0.33	0.41
Elephant originality	0.69	0.21	0.47	0.62	0.34	0.33
Elephant elaboration	0.07	0.22	0.44	0.28	0.49	0.41
Total Elephant	0.49	0.03	0.43	0.51	0.08	0.46

During the **Creativity Elephant Pre-Test** there were no practically significant differences between the groups.

- While **Elephant Fluency** was **Pre-Tested** a trend towards practical differences was obtained in Group C in comparison with Group B (d-value = 0.56).
- Group C also indicated trends towards practical differences compared to Group B (d-value = 0.60) in the **Elephant Flexibility Pre-Test**.

- The **Elephant Originality Pre-Test** proved that Group A could possibly be practically significantly better than Groups B, (d-value = 0.69) while it was Group B that showed practically significantly lower marks than group C (d-value = 0.62).
- The total acquired from the **Elephant Pre-Test** underlined the fact that Group C had a trend towards better results than Group B (d-value = 0.51).

5.4.1.3.4 Boxes Test

Table 5.19: Torrance Creativity: Boxes

	Group A		Group B		Group C		Group D		P-Value
	Mean	Std Dev							
Boxes fluency	9.11	6.43	8.56	2.74	9.67	5.41	8.50	4.38	0.91
Boxes flexibility	7.56	6.64	6.33	2.55	6.87	4.10	5.50	4.62	0.71
Boxes originality	8.78	7.73	6.89	3.22	6.67	5.01	6.17	5.40	0.70
Boxes elaboration	2.22	2.17	3.11	4.54	1.47	1.46	1.22	1.35	0.23
Total Boxes	27.67	21.71	24.89	10.83	24.67	14.02	21.56	14.67	0.80

Table 5.20: Torrance Creativity: Boxes: Effect Sizes (d-values)

Effect sizes						
d-value						
	A with B	A with C	A with D	B with C	B with D	C with D
Boxes fluency	0.09	0.09	0.10	0.21	0.01	0.22
Boxes flexibility	0.18	0.10	0.31	0.13	0.18	0.30
Boxes originality	0.24	0.27	0.34	0.04	0.13	0.09
Boxes elaboration	0.20	0.35	0.46	0.36	0.42	0.17
Total Boxes	0.13	0.14	0.28	0.02	0.23	0.21

During the **Creativity Boxes Pre-Test** there were no practically significant differences between the groups.

- No practically significant differences were noted.

5.4.1.3.5 Totals

Table 5.21: Torrance Creativity: Totals

	Group A		Group B		Group C		Group D		P-Value	
	Mean	Std Dev								
Total fluency	39.44	11.65	32.22	5.67	34.40	11.65	31.22	8.00	0.21	
Total flexibility	33.00	9.81	25.78	5.02	28.13	8.80	24.89	7.46	0.10	
Total originality	42.78	18.19	29.56	10.74	26.80	10.26	28.00	12.50	0.02	+
Total elaboration	23.11	8.88	17.22	7.82	14.13	8.56	14.89	7.89	0.06	+
Total of Totals	138.3	45.63	104.7	26.10	103.6	32.00	99.00	32.99	0.05	+

+ Statistically significant on a 10% level of significance

Table 5.22: Torrance Creativity: Totals: Effect Sizes (d-values)

Effect sizes						
d-value						
	A with B	A with C	A with D	B with C	B with D	C with D
Total fluency	0.62	0.43	0.71	0.19	0.12	0.27
Total flexibility	0.74	0.50	0.83	0.27	0.12	0.37
Total originality	0.73	0.88	0.81	0.26	0.12	0.10
Total elaboration	0.66	1.01	0.93	0.36	0.30	0.09
Total of Totals	0.74	0.76	0.86	0.04	0.18	0.14

During the **Creativity Total Pre-Test** there were practically significant differences in the Total Originality and Total of Total scores between the groups.

- A trend towards better marks were achieved by Group A against Groups B and D (d-value = 0.63 and 0.71) in the **Total Fluency Pre-Test**.
- Where **Total Flexibility** was pre-tested, Group A had a trend towards better results when compared to Groups C (d-value = 0.50) and attained practically significant better results than Group D with a d-value of 0.83. Group A indicated trends towards practical differences compared to Group B (d-value = 0.74).
- The **Total Originality Pre-Test** found that Group A scored practically significantly higher marks than Groups B and C and D (d-value = 0.73, 0.88 and 0.81).
- Group A indicated large practical improvements compared to Group C (d-value = 1.01) and D (d-value = 0.93) in the **Total Elaboration Pre-Test**. Group A also indicated a trend towards practical differences when compared to Group B (d-value = 0.66).
- In final conclusion it can be said that practically significantly more favourable marks in these overall **Pre-Test Totals** were obtained by Group A against Group C and D (d-value = 0.76 and 0.86 respectively). Meanwhile Group A could have been possibly practically better than Group B (d-value = 0.74).

A summary of the combined table of the pre-test comparisons of the four groups is included.

Table 5.23: Pre-test Comparisons of Groups A to D for Tennessee Self-Concept Test, Musat Test and Torrance Creativity Test

	Group A		Group B		Group C		Group D		P-Value		
	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev	Mean	Std Dev			
Tennessee Self-Concept	Self criticism	28.88	2.14	27.22	3.11	27.13	3.66	27.88	4.32	0.67	
	Identity	77.22	12.90	79.33	11.00	79.26	10.25	81.77	10.17	0.76	
	Satisfaction	54.22	5.95	54.66	8.88	55.46	9.18	60.44	5.74	0.10	
	Behaviour	75.77	7.87	73.33	9.64	75.26	6.67	74.16	9.26	0.91	
	Physical	47.44	4.85	49.11	5.23	47.00	0.00	47.00	0.00	0.31	
	Moral	31.11	4.93	31.22	4.71	32.73	5.28	31.50	5.90	0.85	
	Personal	40.11	6.07	40.22	7.13	41.93	5.81	45.94	4.77	0.03	+
	Family	45.22	3.76	42.44	5.29	42.80	4.87	44.38	4.52	0.47	
	Social	45.55	7.71	48.66	8.90	48.46	6.11	48.22	7.44	0.77	
	Academic	39.55	5.45	36.44	5.05	38.66	6.30	35.11	4.87	0.15	
	Inconsistent responding	75.66	7.64	73.88	7.65	73.77	9.83	75.38	7.60	0.91	
	Faking good	25.44	2.60	26.00	3.35	25.06	2.86	26.33	2.89	0.63	
Total	246.77	23.67	243.77	30.43	248.66	26.55	251.50	23.58	0.89		
Musat	Interval	10.56	2.65	9.11	2.67	6.8	3.76	7.06	3.19	0.02	+
	Harmony	8.44	1.74	7.33	1.32	7.27	2.25	6.83	1.5	0.18	
	Timbre	8.33	1.12	8.44	1.88	7.53	1.96	7.61	1.94	0.50	
	Rhythm	11.44	2.19	12.22	1.72	10.73	2.15	10.22	2.37	0.14	
	Duration	9.11	2.03	9	1.22	7.73	2.99	7	2.83	0.12	
	Speed	7.78	1.72	6.89	2.03	4.93	1.71	6.06	1.98	0.00	+
	Counting	8	1.32	6.22	1.99	4.93	2.91	6.17	2.36	0.03	+
	Total Musat	63.7	4.09	59.22	6.9	49.93	9.03	50.94	11.13	0.00	+
Torrance Creativity	Picture fluency	9.67	0.71	8.67	2.00	9.80	0.41	9.39	1.24	0.14	
	Picture flexibility	9.22	1.09	8.11	2.26	9.33	0.72	9.06	1.30	0.18	
	Picture originality	12.89	2.15	8.67	4.00	9.47	2.61	9.78	2.67	0.01	+
	Picture elaboration	11.33	4.53	7.00	3.64	8.73	5.96	8.67	3.88	0.27	
	Total Picture	43.11	6.43	32.44	9.45	37.33	6.92	36.89	6.96	0.03	+
	Circle fluency	14.56	4.93	10.56	2.83	7.67	3.96	8.28	4.48	0.00	+
	Circle flexibility	11.22	2.64	8.11	2.47	5.93	2.66	6.22	3.57	0.00	+
	Circle originality	15.11	8.54	11.44	7.07	5.73	4.89	8.39	7.27	0.01	+
	Circle elaboration	6.44	5.05	4.44	3.64	2.33	2.47	4.00	4.50	0.12	
	Total Circle	48.00	20.40	34.56	13.63	21.67	12.53	26.89	18.92	0.00	+
	Elephant fluency	6.11	3.37	4.44	2.30	7.27	5.06	5.06	3.56	0.28	
	Elephant flexibility	5.00	3.97	3.22	2.17	6.00	4.63	4.11	2.70	0.26	
	Elephant originality	6.00	4.97	2.56	1.81	4.93	3.86	3.67	3.24	0.18	
	Elephant elaboration	2.44	3.28	2.67	3.39	1.73	1.79	1.00	1.37	0.27	
	Total Elephant	19.56	13.67	12.89	7.82	19.93	13.72	13.67	9.62	0.28	
	Boxes fluency	9.11	6.43	8.56	2.74	9.67	5.41	8.50	4.38	0.91	
	Boxes flexibility	7.56	6.64	6.33	2.55	6.87	4.10	5.50	4.62	0.71	
	Boxes originality	8.78	7.73	6.89	3.22	6.67	5.01	6.17	5.40	0.70	
	Boxes elaboration	2.22	2.17	3.11	4.54	1.47	1.46	1.22	1.35	0.23	
	Total Boxes	27.67	21.71	24.89	10.83	24.67	14.02	21.56	14.67	0.80	
Total fluency	39.44	11.65	32.22	5.67	34.40	11.65	31.22	8.00	0.21		
Total flexibility	33.00	9.81	25.78	5.02	28.13	8.80	24.89	7.46	0.10		
Total originality	42.78	18.19	29.56	10.74	26.80	10.26	28.00	12.50	0.02	+	
Total elaboration	23.11	8.88	17.22	7.82	14.13	8.56	14.89	7.89	0.06		
Total of totals	138.33	45.63	104.78	26.10	103.60	32.00	99.00	32.99	0.05	+	

+ Statistically significant on a 10% level of significance

5.4.2 PAIRED T-TEST

The paired *t*-test reflects the comparability of the pre-test mean to the post-test mean.

5.4.2.1 Group A

In this section the first test results to be tabulated and discussed will be that of Group A.

Table 5.24: Group A: Tennessee Self-Concept, Musat and Torrance Creativity

		<i>Pre-Test Mean</i>	<i>Mean Increase</i>	<i>Std Dev</i>	<i>P-Value</i>		<i>D-Value</i>	
Tennessee Self-Concept	Self criticism	28.88	-0.11	3.85	0.93		-0.03	
	Identity	77.22	4.44	6.30	0.06	+	0.70	**
	Satisfaction	54.22	3.77	6.59	0.12		0.57	*
	Behaviour	75.77	4.11	6.15	0.07	+	0.67	*
	Physical	47.44	-0.88	6.64	0.69		-0.13	
	Moral	31.11	4.11	5.01	0.03	+	0.82	**
	Personal	40.11	4.11	6.23	0.08	+	0.66	*
	Family	45.22	-0.55	2.83	0.57		-0.19	
	Social	45.55	3.33	6.16	0.14		0.54	*
	Academic	39.55	3.00	5.38	0.13		0.56	*
	Faking good	25.44	1.66	3.60	0.20		0.46	*
	Total	246.77	15.33	12.66	0.00	+	1.21	**
Musat	Interval	10.56	0.89	2.52	0.16		0.35	
	Harmony	8.44	0.11	1.54	0.42		0.07	
	Timbre	8.33	1.56	2.01	0.02	+	0.78	**
	Rhythm	11.44	1.33	1.73	0.02	+	0.77	**
	Duration	9.11	1.56	1.33	0.00	+	1.17	**
	Speed	7.78	0.33	1.66	0.28		0.20	
	Counting	8	1.22	1.92	0.95		0.64	*
	Total Musat	73	11.44	9.81	0.00	+	1.17	**
Torrance Creativity	Picture fluency	9.67	0.33	0.71	0.10		0.47	
	Picture flexibility	9.22	0.22	1.30	0.31		0.17	
	Picture originality	12.89	3.22	4.29	0.97		0.75	*
	Picture elaboration	11.33	9.56	8.38	0.00	+	1.14	**
	Total Picture	43.11	6.89	11.61	0.06	+	0.59	*
	Circle fluency	14.56	3.67	8.34	0.11		0.44	
	Circle flexibility	11.22	5.22	7.29	0.03	+	0.72	*
	Circle originality	15.11	15.78	14.53	0.01	+	1.09	**
	Circle elaboration	6.44	9.11	11.24	0.02	+	0.81	**
	Total Circle	48.00	33.11	37.21	0.01	+	0.89	**
	Elephant fluency	6.11	4.22	5.31	0.02	+	0.80	**
	Elephant flexibility	5.00	2.89	6.57	0.11		0.44	
	Elephant originality	6.00	7.22	7.46	0.01	+	0.97	**
	Elephant elaboration	2.44	3.22	6.30	0.08	+	0.51	*
	Total Elephant	19.56	17.56	23.07	0.03	+	0.76	*
	Boxes fluency	9.11	4.22	6.32	0.04	+	0.67	*
	Boxes flexibility	7.56	1.89	5.80	0.18		0.33	
	Boxes originality	8.78	7.78	7.61	0.01	+	1.02	**
	Boxes elaboration	2.22	2.11	4.68	0.11		0.45	
	Total Boxes	27.67	16.00	19.13	0.02	+	0.84	**
Total fluency	39.44	12.44	11.47	0.01	+	1.08	**	
Total flexibility	33.00	10.22	10.32	0.01	+	0.99	**	
Total originality	42.78	27.56	24.06	0.00	+	1.15	**	
Total elaboration	23.11	23.33	23.83	0.01	+	0.98	**	
Total of Totals	138.33	73.56	62.73	0.00	+	1.17	**	

+ Statistically significant on a 10% level of significance

* Medium effect

** Large effect that is of practical significance

All p-values that have statistically significant results, indicated by '+', will be scrutinized to see whether there were medium or large practical difference and will be discussed accordingly. The comparison within the groups clearly showed that there were large practical differences in the following sections:

5.4.2.1.1 Tennessee Self-Concept Test

- On the Tennessee Self-Concept where the pre- and post-test mean were compared it was Satisfaction (d=0.57), Behaviour (d=0.67), Personal (d=0.66), Social (d=0.54), Academic (d=0.56) and Faking Good (d=0.46) and Identity (d=0.70) that trend towards practical significance while **Moral** and the **Total** indicated large improvements with d-values 0.82 and 1.21 respectively.

5.4.2.1.2 Musat Test

- The comparison within the groups clearly showed that there were noticeable large practical improvements on the **MUSAT Test 3: Timbre*** with a d-value of 0.78.
- **Test 4: Rhythm*** (d-value 0.77) as well as
- **Test 5: Duration** (d-value 1.17) also clearly indicated larger improvements of practical significance.
- In terms of the overall **MUSAT TEST**, the **Total** proved that there were larger practical differences (d-value 1.17).

*(The Cronbach Alpha values of these tests were lower than 0.5, indicating a lack in reliability, thus the deductions regarding these sub-tests has to be done with care: see 5.2.1).

- The comparison within the groups showed a trend towards practical difference in the **MUSAT Test 7: Counting** with a d-value of 0.64.

5.4.2.1.3 Torrance Creativity Test

In the Creativity Test, under the section **Picture** it was only the

- **Picture elaboration** (d=1.14) that showed trends towards large practical differences.
- **Picture originality** and
- **Total Picture** indicated trends towards practical differences with d-values of 0.75 and 0.59 respectively.

In the **Circle** section of the Creativity Test it was the

- **Circle originality** with a d-value of 1.09 that clearly indicated large practical differences.
- Both the **Circle elaboration** and the
- **Total** scores of the **Circles** Test also showed large practical differences with 0.81 and 0.89 as d-values respectively.
- **Circle flexibility** showed a trend towards practical difference with a d-value of 0.72.

In the Creativity **Elephant** Test it was the

- **Elephant fluency** with a d-value of 0.80 and
- **Elephant originality** with a d-value of 0.97 that showed large practical differences, while the
- **Elephant Totals** with a d-value of 0.76 indicated a trend towards practical difference, together with
- **Elephant elaboration** and the **Total Elephant** which showed d-values of 0.51 and 0.76 respectively.

In the **Boxes** Test of Torrance Creativity Test it was the

- **Boxes originality** that had a d-value of 1.02 and the score of the
- **Total Boxes** with a d-value of 0.84 are the scores that indicated large practical difference.
- **Boxes fluency** indicated a trend towards practical difference with 0.67 as the d-value.

In the **Totals** section of the Creativity Test all the scores showed large improvements that are of practical significance.

- **Total fluency** had a score of 1.08 as d-value, while
- **Total flexibility** had 0.99.
- **Total originality** rated on a d-value of 1.15, while
- **Total elaboration** was not far behind with 0.98 as the d-value.

It was determined that the **Total of Totals** indicated that Group A had larger difference that are of practical significance as indicated by a d-value of 1.17.

5.4.2.2 Group B

In this section the next test results to be tabulated and discussed will be that of Group B.

Table 5.25: Group B: Tennessee Self-Concept, Musat and Torrance Creativity

		<i>Pre-Test Mean</i>	<i>Mean Increase</i>	<i>Std Dev</i>	<i>P-Value</i>		<i>D-Value</i>	
Tennessee Self-Concept	Self criticism	27.22	-0.11	2.26	0.88		-0.05	
	Identity	79.33	1.88	9.42	0.56		0.20	
	Satisfaction	54.66	2.22	6.11	0.30		0.36	
	Behaviour	73.33	2.88	9.07	0.36		0.32	
	Physical	49.11	-5.77	5.38	0.01	+	-1.07	**
	Moral	31.22	0.77	6.97	0.74		0.11	
	Personal	40.22	1.44	5.91	0.48		0.24	
	Family	42.44	1.33	4.63	0.41		0.29	
	Social	48.66	1.11	6.60	0.62		0.17	
	Academic	36.44	1.33	4.50	0.40		0.30	
	Faking good	26.00	-0.22	4.43	0.88		-0.05	
Total	243.77	4.55	23.42	0.57		0.19		
Musat	Interval	9.11	1.33	3.16	0.12		0.42	
	Harmony	7.33	1.22	1.79	0.04	+	0.68	*
	Timbre	8.44	0.67	3.00	0.74		0.22	
	Rhythm	12.22	1.44	1.51	0.99		0.96	**
	Duration	9	0.44	1.81	0.24		0.25	
	Speed	6.89	0.67	1.66	0.87		0.40	
	Duration	6.22	1.00	2.18	0.90		0.46	
	Total Musat	56.44	5.33	19.13	0.79		0.28	
Torrance Creativity	Picture fluency	8.67	0.44	1.51	0.20		0.29	
	Picture flexibility	8.11	0.56	1.51	0.15		0.37	
	Picture originality	8.67	0.11	4.40	0.47		0.03	
	Picture elaboration	7.00	9.56	11.63	0.02	+	0.82	**
	Total Picture	32.44	10.67	16.56	0.04	+	0.64	*
	Circle fluency	10.56	2.44	4.39	0.07	+	0.56	*
	Circle flexibility	8.11	4.11	3.26	0.00	+	1.26	**
	Circle originality	11.44	7.78	10.81	0.03	+	0.72	*
	Circle elaboration	4.44	6.00	6.22	0.01	+	0.96	**
	Total Circle	34.56	20.33	20.96	0.01	+	0.97	**
	Elephant fluency	4.44	1.22	4.49	0.22		0.27	
	Elephant flexibility	3.22	1.33	3.24	0.13		0.41	
	Elephant originality	2.56	5.56	3.75	0.00	+	1.48	**
	Elephant elaboration	2.67	2.33	4.18	0.07	+	0.56	*
	Total Elephant	12.89	10.44	13.31	0.02	+	0.78	*
	Boxes fluency	8.56	1.56	4.77	0.82		0.33	
	Boxes flexibility	6.33	0.56	4.72	0.63		0.12	
	Boxes originality	6.89	3.22	6.40	0.08	+	0.50	*
	Boxes elaboration	3.11	1.11	6.83	0.32		0.16	
	Total Boxes	24.89	2.22	20.39	0.38		0.11	
Total fluency	32.22	2.56	11.93	0.27		0.21		
Total flexibility	25.78	5.44	8.76	0.05	+	0.62	*	
Total originality	29.56	16.67	15.59	0.01	+	1.07	**	
Total elaboration	17.22	19.00	15.84	0.00	+	1.20	**	
Total of Totals	104.78	43.67	42.30	0.01	+	1.03	**	

+ Statistically significant on a 10% level of significance

* Medium effect

** Large effect that is of practical significance

All p-values that have statistically significant results, indicated by '+', will be scrutinized to see whether there were medium or large effects in practice and will be discussed accordingly. The comparison within the groups clearly showed that there were large effects of practical significance in the following sections:

5.4.2.2.1 Tennessee Self-Concept

In the **Tennessee Self-Concept Test** there were no noticeable medium improvements with practical significance. There was, however, a large deterioration in Group B under

- **Physical** (d-value = -1.07) which was of practical and statistical significance.

5.4.2.2.2 Musat

Large improvements that are of practical significance in the **Musat Test** were found only on

- **Test 4: Rhythm*** with a d-value of 0.96.

*(The Cronbach Alpha value of this test was lower than 0.5, indicating a lack in reliability, thus the conclusions regarding this sub-test must be done with care: see 5.2.1).

- Medium improvements in Group B were found in **Test 2: Harmony** (d-value = 0.68).

5.4.2.2.3 Torrance Creativity

In the **Picture Creativity Test** it was

- **Picture elaboration** that showed large effects in practice with the d-value of 0.82.
- Trends towards practical differences were found in Group B in the **Total Picture** score with a d-value of 0.64.

In the **Circle Test** it showed that

- **Circle flexibility** (d-value -1.26),
- **Circle elaboration** (d = -0.96) and the
- **Total Circle** score (d= -0.97) have large improvements which are of significance in practice.
- **Circle fluency** and
- **Circle originality** indicated trends towards practical differences with d-values 0.56 and 0.72 respectively.

In the **Elephant** section of the Creativity Test

- It is the **Elephant originality** scores (d-value = 1.48) that indicates large improvements noticeable in practice.
- The **Total Elephant** mark (d-value = 0.78) and
- **Elephant elaboration** (d-value of 0.56) showed trends towards practical differences.

In the **Boxes** section of the Torrance Creativity Test it was only

- **Boxes originality** that showed medium improvements in group B with a d-value of 0.50.

In the **Total** scores of the Creativity Test it was

- **Total originality** (d-value = 1.07),
- **Total elaboration** (d-value = 1.20) and the
- **Total of Totals** with a d-value of 1.03 that pointed out large improvements in practice that is statistically and practically significant.
- **Total flexibility** showed medium improvement (d-value = 0.62).

5.4.2.3 Group C

In this section the next test results to be tabulated and discussed will be that of Group C.

Table 5.26: Group C: Tennessee Self-Concept, Musat and Torrance Creativity

	<i>Pre-Test Mean</i>	<i>Mean Increase</i>	<i>Std Dev</i>	<i>P-Value</i>		<i>D-Value</i>	
Tennessee Self-Concept	Self criticism	27.13	0.40	3.97	0.70		0.10
	Identity	79.26	-2.73	12.76	0.42		-0.21
	Satisfaction	55.46	0.86	9.65	0.73		0.09
	Behaviour	75.26	0.80	7.98	0.70		0.10
	Physical	47.00	-1.00	6.04	0.53		-0.17
	Moral	32.73	-1.06	6.19	0.51		-0.17
	Personal	41.93	-0.60	7.07	0.74		-0.08
	Family	42.80	-0.73	6.13	0.65		-0.12
	Social	48.46	-0.60	8.02	0.77	+	-0.07
	Academic	38.66	-1.60	5.42	0.27		-0.30
	Faking good	25.06	1.26	4.66	0.31		0.27
	Total	248.66	-2.66	30.17	0.73		-0.09
Musat	Interval	6.8	0.93	2.24	0.14		0.42
	Harmony	7.27	0.27	2.94	0.37		0.09
	Timbre	7.53	0.87	2.10	0.07	+	0.41
	Rhythm	10.73	0.13	2.26	0.59		0.06
	Duration	7.73	0.67	2.69	0.18		0.25
	Speed	4.93	1.20	2.18	0.03	+	0.55
	Counting	4.93	0.13	2.85	0.57		0.05
	Total Musat	27.93	8.33	23.74	0.10		0.35
Torrance Creativity	Picture fluency	9.80	0.00	0.65	0.50		0.00
	Picture flexibility	9.33	0.00	1.20	0.50		0.00
	Picture originality	9.47	0.87	2.97	0.86		0.29
	Picture elaboration	8.73	5.93	7.62	0.00	+	0.78
	Total Picture	37.33	5.07	8.75	0.02	+	0.58
	Circle fluency	7.67	2.67	4.81	0.02	+	0.55
	Circle flexibility	5.93	3.13	3.81	0.00	+	0.82
	Circle originality	5.73	8.73	9.77	0.00	+	0.89
	Circle elaboration	2.33	4.40	5.12	0.00	+	0.86
	Total Circle	21.67	18.93	20.23	0.00	+	0.94
	Elephant fluency	7.27	0.07	3.90	0.53		0.02
	Elephant flexibility	6.00	1.07	3.51	0.87		0.30
	Elephant originality	4.93	2.60	5.28	0.04	+	0.49
	Elephant elaboration	1.73	0.47	2.64	0.25		0.18
	Total Elephant	19.93	1.93	11.76	0.27		0.16
	Boxes fluency	9.67	0.47	7.12	0.40		0.07
	Boxes flexibility	6.87	1.07	3.63	0.86		0.29
	Boxes originality	6.67	6.73	10.74	0.01	+	0.63
Boxes elaboration	1.47	0.27	2.25	0.33		0.12	
Total Boxes	24.67	5.87	20.30	0.14		0.29	
Total fluency	34.40	3.07	10.36	0.14		0.30	
Total flexibility	28.13	1.00	7.57	0.31		0.13	
Total originality	26.80	17.20	16.06	0.00	+	1.07	
Total elaboration	14.13	10.67	9.85	0.00	+	1.08	
Total of Totals	103.60	31.80	32.10	0.00	+	0.99	

+ Statistically significant on a 10% level of significance

* Medium effect

** Large effect that is of practical significance

All p-values that have statistically significant results, indicated by '+', will be scrutinized to see whether there were medium or large effects in practice and will be discussed accordingly. The comparison within the groups clearly showed that there were large effects that are of practical significance in the following sections:

5.4.2.3.1 **Tennessee Self-Concept Test**

There were no statistical or large effects that are of practical significance in the **Tennessee Self-Concept Test**.

5.4.2.3.2 **Musat**

In the **Musat Test** it was with

- **Test 6: Speed** that Group C indicated trends towards practical differences with a d-value of 0.55.

5.4.2.3.3 **Torrance Creativity**

In the **Creativity Test** where **Pictures** were concerned it was only

- **Picture elaboration** that indicated large improvements in practice with a d-value of 0.78.
- The **Total Picture** score of group C pointed out only a medium improvement with practical and statistical significance, the d-value being 0.58.

In the **Circle Creativity Test** Group C showed trends towards large differences that are significant in practice in

- **Circle flexibility** having a d-value of 0.82,
- **Circle originality** with a d-value of 0.89 while
- **Circle elaboration** showed a d-value of 0.86.
- In the **Total Circle** score the d-value is 0.94.
- Medium improvements were obtained by Group C in the **Circle fluency** test with a d-value of 0.55.

In the **Elephant Test**

- **Elephant originality** was the only section where medium improvements were noted with the d-value of 0.49.

In the **Boxes Test**

- **Boxes originality** showed medium improvements with statistical and practical significance having 0.63 as a d-value.

In the **Total** scores of the Creativity Test it was the

- **Originality Total** that indicated large improvements with a d-value of 1.07, followed by that of **Total Elaboration** with its d-value = 1.08 and the **Total of Totals** which scored 0.99.

5.4.2.4 Group D

In this section the next test results to be tabulated and discussed will be that of Group D.

Table 5.27: Group D: Tennessee Self-Concept, Musat and Torrance Creativity

		<i>Pre-Test Mean</i>	<i>Mean Increase</i>	<i>Std Dev</i>	<i>P-Value</i>		<i>D-Value</i>	
Tennessee Self-Concept	Self criticism	27.88	-0.11	4.92	0.92		-0.02	
	Identity	81.77	-0.38	11.41	0.88		-0.03	
	Satisfaction	60.44	0.66	8.52	0.74		0.08	
	Behaviour	74.16	3.44	13.36	0.28		0.26	
	Physical	47.00	-1.05	5.52	0.42		-0.19	
	Moral	31.50	1.88	9.68	0.41		0.19	
	Personal	45.94	0.27	7.46	0.87		0.04	
	Family	44.38	0.05	5.24	0.96		0.01	
	Social	48.22	1.88	7.88	0.32		0.24	
	Academic	35.11	3.55	6.34	0.02	+	0.56	*
	Faking good	26.33	0.77	3.99	0.42	+	0.19	
	Total	251.50	7.27	32.75	0.35		0.22	
Musat	Interval	7.06	1.17	1.92	0.01	+	0.61	*
	Harmony	6.83	0.72	2.44	0.11		0.30	
	Timbre	7.61	0.11	1.68	0.39		0.07	
	Rhythm	10.22	0.11	2.45	0.42		0.05	
	Duration	7	1.17	2.23	0.02	+	0.52	*
	Speed	6.06	0.06	2.15	0.54		0.03	
	Counting	6.17	1.44	2.45	0.99		0.59	*
	Total Musat	44.56	6.17	22.52	0.13		0.27	
Torrance Creativity	Picture fluency	9.39	0.06	1.70	0.45		0.03	
	Picture flexibility	9.06	0.28	1.84	0.73		0.15	
	Picture originality	9.78	1.89	3.86	0.97		0.49	
	Picture elaboration	8.67	5.44	8.20	0.01	+	0.66	*
	Total Picture	36.89	3.33	12.90	0.14		0.26	
	Circle fluency	8.28	0.94	4.14	0.17		0.23	
	Circle flexibility	6.22	2.56	4.36	0.01	+	0.59	*
	Circle originality	8.39	2.00	10.25	0.21		0.20	
	Circle elaboration	4.00	2.28	6.62	0.08		0.34	
	Total Circle	26.89	7.78	23.05	0.09		0.34	
	Elephant fluency	5.06	0.72	4.24	0.24		0.17	
	Elephant flexibility	4.11	0.17	3.11	0.59		0.05	
	Elephant originality	3.67	2.50	4.38	0.01	+	0.57	*
	Elephant elaboration	1.00	0.44	1.89	0.17		0.24	
	Total Elephant	13.67	4.29	10.89	0.06		0.39	
	Boxes fluency	8.50	0.67	4.04	0.75		0.16	
	Boxes flexibility	5.50	1.33	5.56	0.84		0.24	
	Boxes originality	6.17	3.67	5.65	0.01	+	0.65	*
	Boxes elaboration	1.22	0.44	1.62	0.87		0.27	
	Total Boxes	21.56	1.06	15.06	0.38		0.07	
Total fluency	31.22	1.06	8.63	0.31		0.12		
Total flexibility	24.89	0.78	9.14	0.36		0.09		
Total originality	28.00	0.28	15.04	0.05	+	0.02		
Total elaboration	14.89	7.72	13.46	0.01	+	0.57	*	
Total of Totals	99.00	15.83	39.51	0.05	+	0.40		

+ Statistically significant on a 10% level of significance

* Medium effect

** Large effect that is of practical significance

All p-values that have statistically significant results, indicated by '+', will be scrutinized to see whether there were medium or large effects in practice and will be discussed accordingly.

The comparison within the groups clearly showed that there were NO noticeable large improvements that are of statistical and practical significance in all the sections. The comparison did indicate medium effects in:

5.4.2.4.1 Tennessee Self-Concept Test

There were no noticeable large effects that are of practical significance in the **Tennessee Self-Concept Test**, but medium improvement that is of practical significance was obtained in

- the **Academic** test with the d-value = 0.56.

5.4.2.4.2 Musat

Group D showed medium improvements in practice and therefore

- **Test 1: Interval** indicated this medium improvement which is statistically and practically significant with a d-value of 0.61, while
- **Test 5: Duration** and
- **Test 7: Counting** had d-values of 0.52 and 0.59 respectively.

5.4.2.4.3 Torrance Creativity Test

In the **Creativity Test** where **Pictures** were concerned it was

- **Picture elaboration** showing medium improvement with the d-value 0,66.

In the **Circle** Creativity Test

- **Circle flexibility** was the only test that showed medium improvement for Group D with 0.59 as the d-value.

In the **Elephant** Creativity Test, where Group D was compared with the other Groups, it was only

- **Elephant originality** that showed medium improved results with the d-value of 0.57, while

In the Boxes test it is the

- **Boxes originality** that had a d-value of 0.65, making it a medium improvement with practical significance.

In the **Totals** it is in the

- **Total elaboration** that a medium improvement in the scores was picked up with a d-value of 0.57 that has statistical and practical significance.

5.4.3 ANCOVA

The comparability of the experimental and control groups at post-treatment level controlling for pre-test differences to adjust for differences in the groups on pre-test level.

5.4.3.1 Tennessee Self-Concept Test

The first test results to be tabulated and discussed in this post-tests section will be that of the Tennessee Self-Concept Test.

Table 5.28: Tennessee Self-Concept: Adjusted Means and p-value

	Group A	Group B	Group C	Group D	MSE of ANCOVA	p-value
	Mean	Mean	Mean	Mean		
Self criticism	28.36	27.32	27.77	27.73	12.02	0.93
Identity	82.74	77.47	76.59	80.21	89.34	0.41
Satisfaction	59.01	57.67	56.70	58.94	55.49	0.82
Behaviour	79.59	76.56	75.90	77.73	66.86	0.73
Physical	46.63	42.73	46.25	46.20	31.97	0.43
Moral	35.30	32.06	31.50	33.40	37.77	0.49
Personal	44.83	42.24	41.37	44.98	32.85	0.27
Family	43.95	44.38	42.50	44.12	20.63	0.70
Social	49.95	49.31	47.50	49.86	42.21	0.72
Academic	41.56	38.24	36.49	39.76	23.78	0.08
Faking good	27.10	25.78	26.31	27.12	9.11	0.67
Total	262.58	250.39	245.47	256.76	646.09	0.39

Table 5.29: Tennessee Self-Concept: Effect Sizes for Inter-Group Comparison (d-value)

d-value						
	A with B	A with C	A with D	B with C	B with D	C with D
Self criticism	0.30	0.17	0.18	0.13	0.12	0.01
Identity	0.56	0.65	0.27	0.09	0.29	0.38
Satisfaction	0.18	0.31	0.01	0.13	0.17	0.30
Behaviour	0.37	0.45	0.23	0.08	0.14	0.22
Physical	0.69	0.07	0.08	0.62	0.61	0.01
Moral	0.53	0.62	0.31	0.09	0.22	0.31
Personal	0.45	0.60	0.03	0.15	0.48	0.63
Family	0.09	0.32	0.04	0.41	0.06	0.36
Social	0.10	0.38	0.01	0.28	0.08	0.36
Academic	0.68	1.04	0.37	0.36	0.31	0.67
Faking good	0.44	0.26	0.01	0.18	0.44	0.27
Total	0.48	0.67	0.23	0.19	0.25	0.44

The post-tests for self-criticism, identity, satisfaction, behaviour, physical, moral, personal, family, social, academic and the total scores showed no statistically significant differences between the four groups.

Practically significant differences between groups are discussed below to determine if differences were important in practice.

- In the post-tests for **Identity** Group A indicated a trend towards practical difference when compared to Group B (d-value= 0.56) and Group C (d-values= 0.65).
- Group A indicated a trend towards practical minor differences for **Behaviour** compared to Group C (d-value = 0.45).
- In the **Physical** post-test it was Group A that illustrated trends to practical differences compared to Group B (d-value= 0.69) while Groups C and D (d-values= 0.62 and 0.61) indicated trends towards differences important in practice when compared to Group B.
- In the post-test the averages for the **Moral** scores for group A were substantially higher in practice than those of Group B with d-values of 0.53, while Group A also had a higher score than Group C (d-value = 0.62) that could be of practical significance.
- In the **Personal** post-test Group A indicated a trend towards practical difference when compared to Group B (d-value= 0.45) and Group C (d-value= 0.60), where Group D scored higher marks that is important in practice than Group B (d-value= 0.48) and Group C (d=0.63).
- In the **Family** post-test it was only Group B that showed a trend to minor differences important in practice compared to Group C with a d-value of 0.41.
- Group A had a substantially higher score than that of Group C with a d-value of 1.04, while compared to Group B (d-value= 0.68) Group A indicated trends towards practical differences. Group D also obtained trends towards practical differences (d= 0.67) comparing it to Group C in the **Academic** post-test.
- In the **Faking Good** post-test Group A scored higher than Group B (d-value= 0.48) and Group D scored higher marks than Groups B (d-value = 0.44).
- The **Totals** post-test indicated that Group A (d-value = 0.48) and Group D (d-value= 0.44) trend towards minor practical differences compared to Groups B and Group C respectively where as Group A indicated trends towards practical differences when compared to Group C (d-value= 0.67).

5.4.3.2 Musat Test

The tests discuss under ANCOVA will be the Musat Test.

Table 5.30: Musat: Adjusted Means and p-value

	Group A	Group B	Group C	Group D	RMSE of ANCOVA	p-value	
	Mean	Mean	Mean	Mean			
Interval	10.00	10.07	8.78	9.10	2.49	0.32	
Harmony	8.37	8.58	7.57	7.68	1.93	0.27	
Timbre	9.79	7.64	8.53	7.83	1.71	0.02	+
Rhythm	12.62	10.19	10.90	10.85	1.96	0.03	+
Duration	10.12	8.97	8.69	8.90	1.97	0.19	
Speed	7.60	6.04	6.69	6.13	1.65	0.08	+
Counting	6.27	5.26	5.23	4.77	1.86	0.16	
Total Musat	62.40	56.08	58.20	56.49	6.61	0.09	

+ Statistically significant on a 10% level of significance

Table 5.31: Musat: Effect Sizes for Inter-Group Comparison (d-value)

d-value	A with B	A with C	A with D	B with C	B with D	C with D
Interval	0.02	0.49	0.36	0.47	0.34	0.13
Harmony	0.11	0.41	0.36	0.52	0.47	0.06
Timbre	1.25	0.74	1.14	0.52	0.11	0.41
Rhythm	1.25	0.91	0.90	0.34	0.36	0.01
Duration	0.59	0.73	0.62	0.14	0.03	0.11
Speed	0.94	0.55	0.89	0.39	0.05	0.34
Counting	0.54	0.56	0.80	0.02	0.26	0.24
Total Musat	1.07	0.76	0.65	-0.31	0.42	0.11

The **Musat** post-test for **TN1: Interval**, **TN2: Harmony**, **TN5: Duration**, **TN6: Speed** and **TN7: Counting** as well as the **Total** scores for the Musat Test showed no statistically significant differences between the four groups.

- In the post-test scores of **Test 2: Harmony** it was Group B that indicated a higher mark than Group C that could have been important in practice (d-value= 0.52).
- The post-test for **Test 3: Timbre** pointed out that Group A obtained on average a practically higher mark than that of Groups B and D (d-value= 1.25 and 1.14 respectively) and a potentially higher mark than Group C (d-value = 0.54). Group B, however, obtained lower marks than Group C that is of practical significance (d-value= 0.52).
- Group A was on average practically significantly better than Group B, C and D (d-value = 1.25, 0.91 and 0.90) in the **Test 4: Rhythm**.
- **Test 5: Duration** indicated trends towards practical differences from Group A in comparison with Groups B, C and D (d-values = 0.59, 0.73 and 0.62).

- **Test 6: Speed** showed that Group A was on average practically significantly better than both Groups B and D (d-value = 0.94 and 0.89 respectively). Group A could also have been probably better in practise than Group C with a d-value of 0.55 in this post-test.
- In the **Test 7: Counting** it is once again Group A that scored statistically significant higher marks than Group D (d-value= 0.80). Group A indicated trends towards differences that is important in practice when compared to Groups B and C and with d-values of 0.54 and 0.56 respectively.
- Conclusively the **Musat Test** as a **Total** post-test mark, proved that Group A was on average practically significantly better than Groups B (d-value = 1.07) and Group C (d-value = 0.76). In practice Group A indicated trends towards differences when compared to Group D (d-value = 0.65).

5.4.3.3 Torrance Creativity Test

Now follow the tables and discussion of the post-test results of the Torrance Creativity Test.

5.4.3.3.1 Picture

Table 5.32: Torrance Creativity: Picture: Adjusted Means and p-value

	Group A	Group B	Group C	Group D	RMSE of ANCOVA	p-value	
	Mean	Mean	Mean	Mean			
Picture fluency	0.62	0.20	0.05	0.82	0.57	0.25	
Picture flexibility	0.72	0.16	0.07	0.88	0.80	0.09	+
Picture originality	2.42	1.91	1.63	0.50	0.79	0.28	
Picture elaboration	1.68	0.68	0.66	1.00	1.02	0.02	+
Total Picture	3.52	1.61	1.62	1.91	1.90	0.00	+

+ Statistically significant on a 10% level of significance

Table 5.33: Torrance Creativity: Picture: Effect Sizes for Inter-Group Comparison (d-value)

d-value						
	A with B	A with C	A with D	B with C	B with D	C with D
Picture fluency	0.59	0.20	0.05	0.79	0.54	0.25
Picture flexibility	0.65	0.14	0.06	0.78	0.71	0.08
Picture originality	1.45	1.15	0.98	0.30	0.47	0.17
Picture elaboration	0.81	0.33	0.32	0.48	0.49	0.01
Total Picture	1.33	0.61	0.61	0.72	0.72	0.00

The post-test for Picture fluency, Picture flexibility and Picture originality showed no statistically significant differences between the four groups.

Effect sizes that are practical and statistical significant will now be examined.

- Group A indicated a medium difference important in practice compared to Group B (d-value = 0.59) in the **Picture Fluency Post-Test** and Group B was, on the other hand, significantly better in practice in comparison with Group C (d-value = 0.79), while Group D (d-value = 0.54) showed trends towards practical differences compared to Group B.
- **Picture Flexibility** indicated that Groups A compared to Group B (d-value= 0.65), Group B compared to Group C (d-value = 0.78) and Group D compared to Group B (d-value= 0.71) trend towards practical differences.
- In the **Picture Originality** post-test Group A obtained a practically higher mark than that of Groups B, C and D (d-value = 1.45, 1.15 and 0.98 respectively).
- **Picture Elaboration** showed that Group A was on average practically significantly better than both Groups B (d-value = 0.81).
- Group A similarly illustrated practically significantly better results on average than Group B (d-value= 1.33). When compared to Groups C and D (both having d-values of 0.61) Group A indicated trends towards practical differences in **Total Picture** scores, while Group C and D, with both a d-value of 0.72, indicated trends toward practical differences when compared to Group B.

5.4.3.3.2 Circle

Table 5.34: Torrance Creativity: Circle: Adjusted Means and p-value

	Group A	Group B	Group C	Group D	RMSE of ANCOVA	p-value
	<i>Mean</i>	<i>Mean</i>	<i>Mean</i>	<i>Mean</i>		
Circle fluency	1.18	2.22	1.72	1.04	0.54	0.50
Circle flexibility	1.23	2.05	1.84	0.83	0.61	0.22
Circle originality	0.26	2.07	0.57	1.81	0.31	1.50
Circle elaboration	0.58	1.35	0.46	0.76	-0.13	0.89
Total Circle	1.59	3.89	2.11	2.31	0.53	1.78

Table 5.35: Torrance Creativity: Circle: Effect Sizes for Inter-Group Comparison (d-value)

d-value						
	<i>A with B</i>	<i>A with C</i>	<i>A with D</i>	<i>B with C</i>	<i>B with D</i>	<i>C with D</i>
Circle fluency	0.61	1.14	0.88	0.53	0.28	0.25
Circle flexibility	0.75	1.25	1.12	0.50	0.37	0.14
Circle originality	0.11	0.84	0.23	0.73	0.13	0.61
Circle elaboration	0.30	0.69	0.23	0.39	0.07	0.46
Total Circle	0.41	1.01	0.55	0.60	0.14	0.46

During the **Creativity Circle Post-Test** there were no practically significant differences in the scores between the groups.

- Group A was on average probably better in practice than both Groups B (d-value = 0.61) in the **Circle Fluency Post-Test** and practically significantly better than Group C (d-value = 1.14) and D (d-value = 0.88). In turn Group B was probably better than Group C (d-value = 0.53) in this post-test.
- Group A performed better on average than B, C and D (d=0.75, 1.25 and 1.12) in the **Circle Flexibility Post-Test**. Group B obtained higher marks that are probably of significance in this post-test with the d-value 0.50.
- In the **Circle Originality Post-Test** Group A scored lower on average than Group C (d-value = 0.84). Group B in its turn was practically better than Group C (d-value = 0.73) while Group C got lower marks than Group D (d-value= 0.61).
- The following resulted during the **Total Circle Post-Test**. Practically significantly better marks on average were found in Group A as opposed to Group C (d-value = 1.01) and only possibly significantly better marks in practice against Group D (d-value = 0.55). Group B showed possible better marks in practice against Group C (d-value = 0.60).

5.4.3.3.3 Elephant

Table 5.36: Torrance Creativity: Elephant: Adjusted Means and p-value

	Group A	Group B	Group C	Group D	RMSE of ANCOVA	p-value	
	Mean	Mean	Mean	Mean			
Elephant fluency	0.09	1.27	0.39	1.18	0.30	0.88	
Elephant flexibility	0.31	1.15	0.30	1.46	0.61	0.84	
Elephant originality	1.11	0.25	0.19	0.85	0.92	0.07	+
Elephant elaboration	0.23	0.07	0.46	0.29	0.69	0.40	
Total Elephant	0.60	1.75	0.30	2.34	0.89	1.45	

+ Statistically significant on a 10% level of significance

Table 5.37: Torrance Creativity: Elephant: Effect Sizes for Inter-Group Comparison (d-value)

d-value						
	A with B	A with C	A with D	B with C	B with D	C with D
Elephant fluency	0.04	0.68	0.21	0.63	0.16	0.47
Elephant flexibility	0.17	0.63	0.17	0.80	0.34	0.46
Elephant originality	0.61	0.14	0.10	0.47	0.51	0.04
Elephant elaboration	0.15	0.04	0.31	0.19	0.46	0.26
Total Elephant	0.18	0.54	0.09	0.73	0.28	0.45

The **Elephant Post-Test** showed no practical statistical significant differences in the average post-test scores between the four groups.

- While **Elephant Fluency** was **Post-tested** Group C (d-value = 0.68) and Group B (d-value of 0.63) indicated trends towards practical differences compared to Group A and Group C respectively.
- Group A also showed trends towards practical differences compared to Group C (d-value = 0.63) while Group B showed practically significantly higher marks than group C in the **Elephant Flexibility Post-Test** with a d-value of 0.80.
- The **Elephant Originality Post-Test** proved that Group A and Group D indicated trends towards practical differences when compared to Group B (d-value = 0.61 and d-value = 0.51 respectively).
- The total acquired from the **Elephant Post-Test** underlined the fact that Group A and B attained possible significant better results than Group C (d-value = 0.54 and 0.73.)

5.4.3.3.4 Boxes

Table 5.38: Torrance Creativity: Boxes: Adjusted Means and p-value

	Group A	Group B	Group C	Group D	RMSE of ANCOVA	p-value
	Mean	Mean	Mean	Mean		
Boxes fluency	0.04	0.86	0.74	0.90	0.78	0.12
Boxes flexibility	0.10	0.35	0.01	0.25	0.10	0.34
Boxes originality	0.15	0.59	0.43	0.44	0.29	0.16
Boxes elaboration	0.58	0.40	0.55	0.98	1.13	0.15
Total Boxes	0.80	0.42	0.33	0.38	0.47	0.09 +

+ Statistically significant on a 10% level of significance

Table 5.39: Torrance Creativity: Boxes: Effect Sizes for Inter-Group Comparison (d-value)

d-value						
	A with B	A with C	A with D	B with C	B with D	C with D
Boxes fluency	0.02	0.41	0.35	0.43	0.37	0.06
Boxes flexibility	0.05	0.17	0.00	0.12	0.05	0.16
Boxes originality	0.07	0.26	0.19	0.20	0.13	0.07
Boxes elaboration	0.37	0.26	0.36	0.63	0.73	0.09
Total Boxes	0.21	0.11	0.09	0.10	0.12	0.02

In the post-test none of the **Boxes** sub-tests of the Creativity Test showed significantly different average marks for the four groups.

- It is Group B that scored lower in practice than both Groups C and D when **Boxes Elaboration** was **Post-Tested** with d-values of 0.63 and 0.73 respectively.

5.4.3.3.5 Totals

Table 5.40: Torrance Creativity: Totals: Adjusted Means and p-value

	Group A	Group B	Group C	Group D	RMSE of ANCOVA	p-value
	Mean	Mean	Mean	Mean		
Total fluency	0.21	0.55	0.26	0.34	0.05	0.29
Total flexibility	0.80	0.45	0.22	1.25	0.58	0.67
Total originality	1.44	2.05	0.59	0.61	0.84	1.45
Total elaboration	1.29	1.42	0.95	0.13	0.34	0.48
Total of Totals	1.69	0.92	0.25	0.77	1.44	0.67

Table 5.41: Torrance Creativity: Totals: Effect Sizes for Inter-Group Comparison (d-value)

d-value						
	A with B	A with C	A with D	B with C	B with D	C with D
Total fluency	0.07	0.20	0.09	0.12	0.02	0.10
Total flexibility	0.31	0.17	0.09	0.48	0.22	0.26
Total originality	0.45	0.64	0.19	0.19	0.26	0.45
Total elaboration	0.48	0.53	0.35	0.05	0.13	0.18
Total of Totals	0.33	0.18	0.05	0.15	0.28	0.13

All the averages of post-test scores for **Total Fluency, Flexibility, Originality, Elaboration and Total of Totals** showed no practically significant results between the four groups.

- The **Total Originality Post-Test** proved that Group A indicated trends towards practical differences when compared to Group C, (d-value= 0.64), while
- In the **Total Elaboration Post-Test** it was again Group A that attained trends towards differences significant in practice when compared to Group C (d-value = 0.53).

In the next chapter the quantitative results just presented will be discussed in order to show the impact of the Tomatis Method on the enhancement of musical hearing of the Intermediate Phase learner attending the current Arts and Culture programme in schools in South Africa. Patterns apparent from the results of the quantitative measurements will be demonstrated.

DISCUSSION OF RESULTS

6.1 INTRODUCTION

In this chapter the quantitative results presented in Chapter 5 are discussed in order to show the impact of the Tomatis Method on the enhancement of musical hearing of the Intermediate Phase learner attending the current Arts and Culture programme in schools in South Africa. In this chapter the sample profile will be discussed in detail prior to the presentation of quantitative results. Patterns in the data not apparent from the results of the quantitative measurements will be clarified by descriptive case studies in the next chapter.

The results are explored and elaborated upon with reference to the research question and the accompanying sub-questions. The research question, already presented in Chapter 1, is the following:

How can didactic methods in the Arts and Culture programme be aligned with the methods of Alfred Tomatis in order to improve musical listening?

The subsidiary research questions (also presented in Chapter 1) were formulated as follows:

- ❖ Will the Tomatis Method combined with Arts and Culture teaching lead to statistically significant:
 - improvements in musical listening as evidenced by improvements in the scores of learners in Group A, obtained from the *Musat Test*, in comparison to lesser changes in the scores of learners from the other three groups?
 - enhancement of self-concept, creativity and cognitive flexibility in group A as compared to the other groups?
- ❖ Can the quantitative results be augmented by qualitative and descriptive case studies suggesting modifications to current didactic methods?

The research- and sub-questions were answered by implementing the:

- Tomatis Listening Test to indicate improvements in hearing as evidenced by changes in hearing profiles in Group A, exceeding that obtained by the other groups.
- Musat Test to indicate improvements in the scores of learners in group A in comparison to less significant changes in the scores of learners from the other three groups.
- Tennessee Self-Concept Test to indicate enhancement of self-concept in the scores of learners in group A in comparison to less significant changes in the scores of learners from the other three groups.
- Torrance Creativity Test to indicate enhancement of creativity and cognitive flexibility in the scores of learners in group A in comparison to less significant changes in the scores of learners from the other three groups.

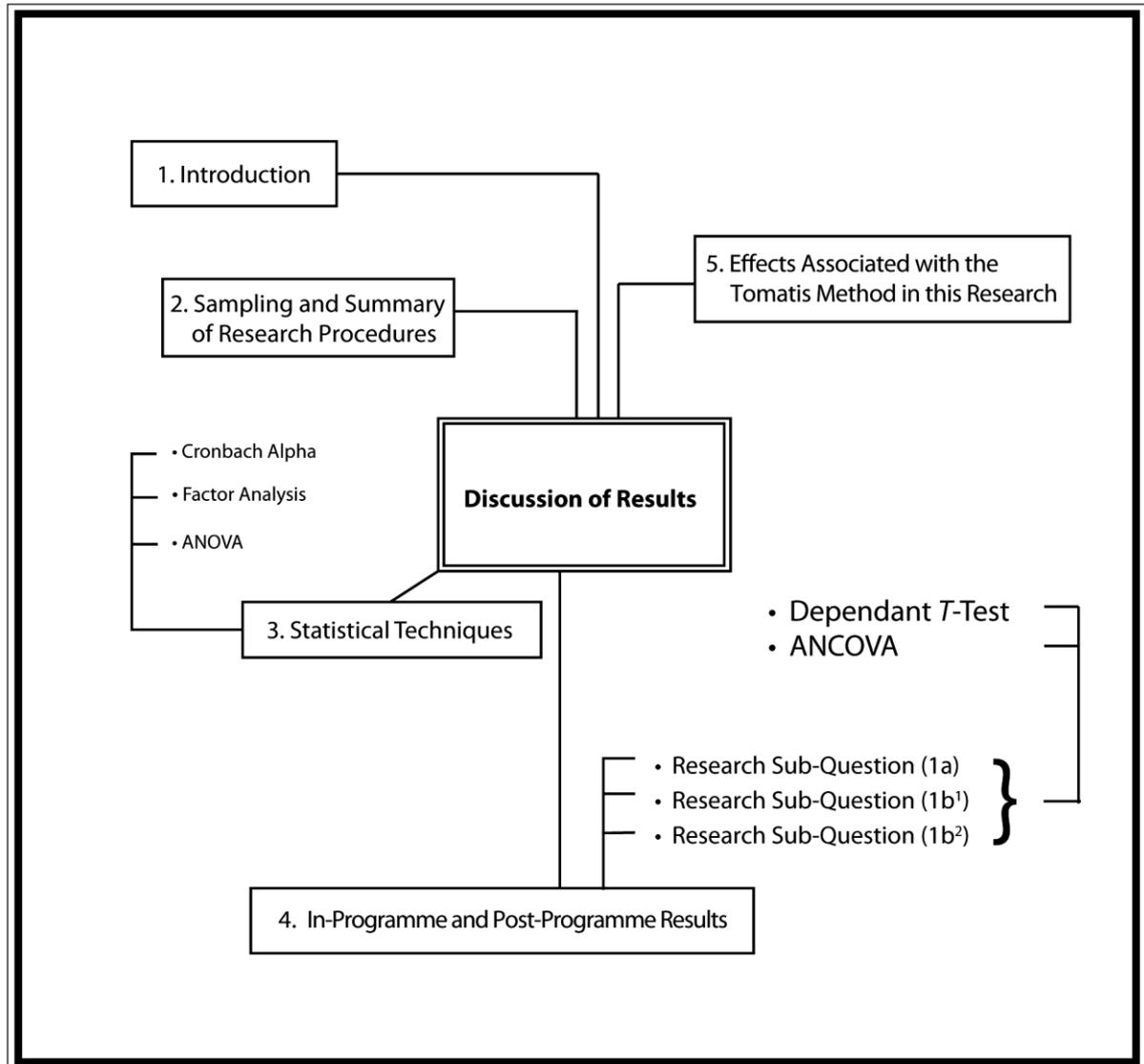
Data collection commenced pre-programme and ended post-programme. The abovementioned tests provided the quantitative data before and after the programme which were interpreted by means of the Analysis of Variance (ANOVA), Dependent *t*-test and Analysis of Co-Variance (ANCOVA).

The aim of the quantitative component of the research project was to investigate whether the application of the Tomatis Method did bring about significant change in musical hearing of the experimental group participants. To be able to accomplish this investigation, the research focused on learners of the Intermediate Phase of schooling with Arts and Culture as a compulsory subject.

Qualitative data were obtained during and after the programme and involved written reports from the psychologist and facilitators and individual interviews with parents of Group A participants. These parents were interviewed approximately one month post-programme. The aim of these interviews were to determine whether the changes were sustained after the Tomatis intervention. The collection of post-programme data was imperative to verify changes in the quantitative data of the experimental group participants which was recorded during and after the programme, as continued changes indicate that the Tomatis Method definitely improved musical hearing and that integration continues during and after the training of the ear (Tomatis, 2005:128).

The layout of Chapter 6 is presented in Figure 6.1.

Figure 6.1: Diagram of the Layout of Chapter 6



6.2 SAMPLING AND SUMMARY OF RESEARCH PROCEDURES

When choosing participants from the Christian School on the Potchefstroom Campus of the North-West University, accessibility and convenience was taken into account. This was done with the purpose of ensuring that learners, principal and parents would be readily available for interviews and tests, as well as for the intervention.

The sampling procedure and research procedures regarding pre- and post-test as well as a summary of the interventions are presented in Chapter 4, section 4.7.1. The results of the tests are explored and elaborated on with reference to the different statistical techniques in the next section of this chapter.

6.3 STATISTICAL TECHNIQUES

In Chapter 5 (see 5.3) it was explained that the results of this research were derived from various statistical techniques. From these results the conclusion was drawn as to whether the interventions were successful and whether the purpose of the research had been attained. All these instruments are self-reporting rating scales. The subscales and properties of these instruments were described in Chapter 4.

Where significant p -values occurred, it was decided to compare the results on the basis of the size of d -values (effect sizes). The current researcher used the d -value as explained by Cohen (1988:78) as a measure of the practical significance of the treatment effect. The significance of the effects was calculated in order to determine the practical significance of the Tomatis intervention (see 5.3).

6.3.1 Cronbach Alpha

The Cronbach Alpha tests the internal consistency of the measuring instruments (see Chapter 5, section 5.2.1). It is therefore a loosely equivalent to splitting data in all ways and calculating the correlation coefficient for each split. For the purpose of the current study, different instruments were used to determine particular psychological aspects of the learners. The Cronbach Alpha values of these measuring instruments demonstrated a satisfactory internal consistency for the majority of them.

As mentioned in Chapter 5 (see 5.2.1) a reason for the lower Cronbach Alpha values for the Musat sub-tests for Harmony (sub-test 2), Timbre (Sub-test 3) and Rhythm (Sub-test 4) could be that none of the participants had been exposed to any music intervention or to effective teaching in music prior to the current research with the result that these participants did not understand the majority of the questions under the above-mentioned sub-tests or that the field of experience in music of these learners were so limited that they did not know how to answer the questions asked in these sub-tests.

In the Tennessee Self-Concept Test the sub-tests Physical and Moral also have Cronbach Alpha values lower than 0,5 indicating a lack in reliability. As the Physical sub-test presents the individual's view of his/her body, state of health, physical appearance, skills, and sexuality and because it is always on display for evaluation, physical appearance is highly associated with global self-esteem across the life span. The Moral sub-test describes the self from a moral-ethic perspective: examining moral worth, feelings of being a "good" or "bad"

person and for children, the MOR score is likely to vary over short periods of time. Both these sub-tests will be influenced by a person's environment and the circumstances in which he/she was raised. Therefore it is the opinion of the current researcher that changes in environment from the familiar school to the unfamiliar university might have influenced scores for reliability in specifically these two sub-tests.

6.3.2 Factor Analysis

Factor analysis, using Principal component factor analysis with Varimax rotation, was applied to the Musat Test data to facilitate a more complete understanding of the comparisons of the scores of each individual in the various sub-tests. As a relatively small sample was used, care must be taken when these factors are interpreted and thus it will be used for explanatory purposes only.

The general expectation when applying Factor Analysis was that all tests should have extracted only one common factor, but with the current Factor Analysis it did not happen. As indicated in Chapter 5 (see 5.2.1.3) the result showed that only one factor was extracted by Kaiser's criterion for sub-tests 5 to 7 of the Musat Test. These subtests relate to duration, speed, and counting respectively. It is to be expected that tests for these simple musical elements (corresponding to two of the design dimensions of Elliott) would show construct validity. This is not the case with subtests 1 to 4 which (according to the headings on the Musat test) test for interval, harmony, timbre and rhythm. These are more complex phenomena than duration speed and counting and thus the fact that more factors were extracted for sub-tests 1 to 4, with marked loadings >0.3 , were to be expected. In all the sub-tests (1 to 4) the different questions loaded either on Factor 1 or Factor 2. Some sub-questions of the sub-tests however, showed equally strong loadings for both the factors, or did not load on either Factors 1 or 2. The current researcher attempted to determine what musical phenomena, design dimensions or even psychological constructs these factors were, but this proved to be impossible.

For the Torrance Creativity Test construct validity was not tested because the scores for these sub-tests can not be rated on the Likert Scale of measurements (see Chapter 5, section 5.2.1.3).

6.3.3 Analysis of Variance (ANOVA)

In Chapter 5 (see 5.3.2) it was explained that this section of the statistical procedure addresses the comparability of the experimental and control groups at pre-treatment level. An ANOVA explains how much of the total variation can be explained by the independent variables. The ANOVA compares more than two groups' means to test for pre-programme group equivalence.

On the Tennessee Self-Concept Test (TSCS:2) there were no statistically significant differences (on a 10% level of significance) between the four groups prior to commencement of the interventions. Thus the groups were equivalent and comparable with regard to the sub-tests of Self-Criticism, Identity, Satisfaction, Behaviour, Physical, Moral, Personal, Family, Social, Academic, Inconsistent responding and Faking good. The validity of the participants' responses was evaluated with the Validity scores (Inconsistent Responding (INC), Self-Criticism (SC) and Faking Good (FG) scores), while the scores for Physical, Moral, Personal, Family, Social and Academic were added to obtain the Total Self-Concept (TOT) score which is the single most important score on the TSCS:2. Supplementary scores were obtained from the Identity, Satisfaction and Behaviour scores.

In the Musat Test it was clear that the groups were comparable with regard to the sub-tests of Harmony, Timbre, Rhythm and Duration as the ANOVA pointed out that no statistically significant differences occurred between the four groups in these sub-tests, although Groups A and B were on average probably better than Groups C and D in the sub-tests Interval, Speed and Counting. Conclusively, on the total mark for the Musat Test, it was Group A that obtained practically significantly better results than the other three groups. Although one could try to speculate on the reasons why participants from Group A obtained statistically better results, the research was not set up to test for these speculations. Therefore it would be misleading to draw conclusions from these specific sub-tests when interpreting the results of the ANCOVA.

The Torrance Creativity Test indicated that during the Creativity Picture pre-test there were practically significant differences between the groups regarding only one of the five subsections (in the Picture Originality) as well as the Total Picture scores. In the Creativity Circle pre-test there were practically significant differences in all but the Circle Elaboration scores between the groups. Both the Creativity Elephant and the Creativity Boxes pre-tests indicated no practically significant differences between the groups and the groups were consequently comparable in all these sub-tests. The Creativity Totals demonstrated differences that is significant in practice in the Total Originality and the Total of Total scores

between the groups. When discussing the results of the Torrance Creativity Test it would be advisable not to rely strongly upon the Creativity Circle test.

Generally speaking, regarding the degree of homogeneity of the four groups in terms of the ANOVA results of the Tennessee Self-Concept Test, the Musat Test and the Torrance Creativity Test, the researcher could make valid inferences regarding the possibility of developing musical hearing through a structured intervention such as the Tomatis Method. The fact that the results of some of the subtests of the Musat Test and of the Torrance Creativity should be interpreted with caution does not impact essentially upon the hypothesis of this research. The fact that some of the results can be reliably interpreted, allows the researcher to provide evidence for the possibility that musical listening can be developed effectively when didactic methods in the Arts and Culture programme are aligned with the theories of Alfred Tomatis, and that quantitative results of an empirical study of the development of musical hearing can be augmented by qualitative case studies which will suggest changes to current didactic methodology.

6.4 IN-PROGRAMME AND POST-PROGRAMME RESULTS

Quantitative data obtained from experimental group participants during the programme indicated positive change, which was verified with post-programme data. For this reason, in-programme and post-programme changes will be discussed as a unit. Pre-post differences within groups will be followed by a comparison between groups.

6.4.1 Pre-Post Differences within Groups: The Dependent *T*-Test

The paired *t*-test measures the comparability of the pre- to the post-test mean. The *t*-test is therefore a statistical test that evaluates the differences within groups which are statistically significant. As indicated in Chapter 5 (see 5.3.3), the effects of the Tomatis intervention as measured with the Musat Test, Tennessee Self-Concept Test and Torrance Creativity Test were determined on a pre- and post-test basis. In the current study for each of the experimental and control groups the pre-test scores were compared to the post-test scores to ascertain whether any of the scores have changed. To ascertain whether these changes were statistically significant, *t*-tests for dependent groups were performed (see 5.3.3).

Comparisons within each group indicate that there were large practical differences when tested with the battery of test instruments. Results regarding the differences occurring within the groups will therefore entail a discussion of the experimental group first followed by a discussion of the results of the control groups.

6.4.2 Analysis of Co-Variance (ANCOVA)

As explained in Chapter 5 (see 5.3.3) this section deals with the comparison of the experimental group (Group A) and control groups (Groups B, C and D) at post-treatment level controlling for pre-test differences. Furthermore it provides comparative data pertaining to pre-interventions test scores related to those of post-intervention. The reason for utilizing ANCOVA is to reduce within-group error variance and to eliminate confounds. ANCOVA is differentiated from the ANOVA in that it is used when the researcher needs to neutralise the effect of a continuous independent variable, e.g. effect of the pre-test from the post test results.

The relevance of the outcomes of the statistical results can be explained according to each sub-question:

6.4.3 Research Sub-Question (1a)

To address the sub-question,

- ❖ Will the Tomatis Method combined with Arts and Culture teaching lead to statistically significant improvements in musical listening as evidenced by improvements in the scores of learners in group A, obtained from the *Musat Test*, in comparison to lesser changes in the scores of learners from the other three groups?

participants were required to complete the Musat Test which tested the musical abilities of the learners after which the data was analysed.

6.4.3.1 Pre-Post Differences within Groups: The Dependent *T*-Test

The current researcher observed statistically significant changes as measured by the Musat Test in the experimental group (**Group A (n=9): Attending Tomatis stimulation and concurrently the Arts and Culture learning in school**). This indicates that noticeable large improvements occurred in Timbre, Rhythm and Duration within the group after the Tomatis programme. The post-programme results, in terms of the overall Musat Test indicated large practical improvements in the Total score which suggest that the Tomatis Method brought about positive changes in the experimental group participants. As a result of the Tomatis programme, a noticeable medium improvement was additionally noted in the sub-test Counting.

Taking a closer look at the test results of the control groups there was significantly less improvement in musical hearing pertaining to these participants.

The first control group (**Group B (n=9): Attending unfiltered music of Mozart and concurrently the Arts and Culture programme in school**) reflected only one large improvement. It occurred in the sub-test Rhythm, while the Harmony sub-test indicated medium improvements. The fact that Group A performed significantly better at post-intervention than Group B clearly shows that merely listening to the violin concertos of Mozart does not result in overall gains in enhancement of musical listening.

The second control group (**Group C (n=15): Attending Arts and Culture programme in school**) showed no statistically significant large changes regarding aspects of musicality as indicated by the Musat Test. The sub-test Speed showed medium improvement. Thus statistical results suggested that exposure to only Arts and Culture in school had no statistically notable effect on Group C.

The last control group (**Group D (n=15): non-intervention control group and no attendance of Arts and Culture programme in school**) indicated that in comparison with itself no noticeable large improvements of practical significance was reported through the measuring instruments and their sub-tests in this group of participants. The current researcher is of the opinion that the reason is that this group had no intervention.

6.4.3.2 Pre-post differences between groups: Analysis of Co-Variance (ANCOVA)

Participants in the experimental group (**Group A (n=9): Attending Tomatis stimulation and concurrently the Arts and Culture learning in school**) outperformed participants in the control groups as a discussion of individual case studies in Chapter 7 will indicate. The discussion will show that aspects of listening as measured with the Musat Test could be associated with an improved musical listening.

The quantitative results from the present study as measured post-programme suggest that exposure to the Tomatis Method had a positive effect on participants' musicality. After the Tomatis programme, quantitative observations indicated that the experimental group was on average practically significantly better than all the other groups in the sub-tests Timbre, Rhythm, Duration, Speed, Counting and the Totals of the Musat Test, which imply an improvement of listening skills in Group A participants

No statistically significant post-programme changes occurred within the first control group (**Group B (n=9): Attending unfiltered music of Mozart and concurrently the Arts and Culture programme in school**) regarding musical abilities as tested by the Musat Test. The scores of Group B participants remained unchanged at post-testing. Therefore the current researcher speculates that exposure to only the music of Mozart does not automatically result in enhancement of musical listening.

The second control group (**Group C (n=15): Attending Arts and Culture programme in school**) showed no statistically significant change with regard to scores of the Musat Test, which indicates that attending only the Arts and Culture programme in school did not bring about any significant changes to musical hearing as in Group A.

Results for the last control group (**Group D (n=15): Non-intervention control group and no attendance of Arts and Culture programme in school**) displayed no statistically significant differences regarding the in-programme assessments as measured by the relevant measuring instrument. Thus the quantitative results implied the expected results as this control group was not exposed to any of the interventions.

6.4.3.3 Summary of Research Sub-Question (1a)

The analysis of the data sourced from the Musat Test illustrated that only the Tomatis Method as intervention had a significant overall impact on musical hearing.

6.4.4 Research Sub-Question (1b¹)

To address the first part of the second sub-question,

- ❖ Will the Tomatis Method combined with Arts and Culture teaching lead to statistically significant enhancement of self-concept in group A as compared to the other groups?

participants were required to complete the Tennessee Self-Concept Test which tested various aspects of self-concept, after which the data were analysed.

6.4.4.1 Pre-Post Differences within Groups: The Dependent T-Test

In the Tennessee Self-Concept Test the experimental group (**Group A (n=9): Attending Tomatis stimulation and concurrently the Arts and Culture learning in school**) indicated trends towards practical significance in Satisfaction, Behaviour, Personal, Social, Academic and Faking Good while Identity, Moral and the Totals reflected large improvements once the pre-post-test means were compared. This illustrated that the Tomatis intervention did have a positive influence on the self-concept of Group A participants.

The comparison within the groups indicated that the first control group (**Group B (n=9): Attending unfiltered music of Mozart and concurrently the Arts and Culture programme in school**) displayed no statistically significant improvements regarding self-concept as measured by the Tennessee Self-Concept Test. The current researcher's observation of this trend suggests that exposure to only the music of Mozart does not enhance self-concept.

Quantitative results obtained through the Tennessee Self-Concept Test indicated that there were no noticeable large effects of practical significance in the Tennessee Self-Concept Test of the second control group (**Group C (n=15): Attending Arts and Culture programme in school**) participants. Thus attending only the Arts and Culture programme in school does not enhance self-concept.

It is apparent that the last group, (**Group D (n=15): non-intervention control group and no attendance of Arts and Culture programme in school**) not having any access to the interventions or Arts and Culture classes at school, showed no noticeable large improvements of statistical or practical significance in comparison within groups.

6.4.4.2 Pre-Post Differences between Groups: Analysis of Co-Variance (ANCOVA)

Quantitative results obtained indicated that practically significant positive improvements in the experimental group (**Group A (n=9): Attending Tomatis stimulation and concurrently the Arts and Culture learning in school**) participants' post-test scores regarding the Tennessee Self-Concept Test reflected large positive changes in relation to their Identity, Behaviour, Physical, Moral, Personal, Academic, Faking Good and Total sub-tests that are of practical significance. This is an indication of the fact that the Tomatis Method did indeed assist in the improvement of the self-concept of Group A participants.

No statistically significant changes occurred in this group (**Group B (n=9): Attending unfiltered music of Mozart and concurrently the Arts and Culture programme in school**). Results indicated that more participants in Group B needed to improve on aspects of their self-concept. It was only in the Family post-test as measured by the Tennessee Self-Concept Test that Group B showed large practical improvements. Participants quantitative reports were thus not in line with the expectation that exposure to only Mozart music will not enhance self-concept.

On the Tennessee Self-Concept Test the second control group (**Group C (n=15): Attending Arts and Culture programme in school**) indicated statistically significant negative changes regarding self-concept. Thus, statistical results confirmed that the exposure to only the Arts and Culture programme at school had no statistically notable positive impact on aspects of self-concept.

Statistical results showed that the last group (**Group D (n=15): Non-intervention control group and no attendance of Arts and Culture programme in school**) displayed no statistically significant differences regarding the post-programme assessments as measured by the Tennessee Self-Concept Test. The results suggested that this control group had a poorer outcome of performance than Group A, suggesting that the Tomatis intervention positively enhanced self-concept as this group was not exposed to the Tomatis Method.

6.4.4.3 Summary of Research Sub-Question (1b¹)

The analysis of the data obtained from the Tennessee Self-Concept Test illustrated that only the Tomatis Method as intervention had a significant overall impact on self-concept of participants.

6.4.5 Research Sub-Question (1b²)

To address the next part of the second sub-question,

- ❖ Will the Tomatis Method combined with Arts and Culture teaching lead to statistically significant enhancement of creativity and cognitive flexibility in Group A as compared to the other groups?

participants were required to complete the Torrance Creativity Test which tested various aspects of creativity and cognitive flexibility, after which the data were analysed.

6.4.5.1 Pre-Post Differences within Groups: The Dependent T-Test

On the Torrance Creativity Test the experimental group (**Group A (n=9): Attending Tomatis stimulation and concurrently the Arts and Culture learning in school**) participants indicated improvements of medium significance in the Picture Originality and the Picture Total. Large practical differences occurred in the Picture Elaboration, aspects of Originality, Elaboration and Total scores in the Circle section of the Creativity Test. The Flexibility sub-test showed medium improvement.

According to the statistical results, the experimental group's level of creativity did change as reflected in the Creativity Elephant Test where large improvements of practical significance were experienced in the Fluency, Originality and Total sub-tests and a medium improvement in the Elaboration sub-test.

According to the statistical analysis of pre-post differences, reported through the Torrance Creativity Test, the experimental group showed a significant increase with regard to the Boxes Test where large improvements of practical significance were experienced in the Originality and Total sub-tests and the sub-test of Fluency on the Boxes Creativity Test indicated a medium improvement. These statistically significant differences were also reflected on the Totals section of the Creativity Test, indicating that all the scores of the experimental group showed large improvements of practical significance. Results suggest that the Tomatis Method influenced Group A participants positively regarding creativity and cognitive flexibility.

It was only with regard to the Picture Elaboration sub-test in the Torrance Creativity Test, that a trend towards improvement was noticed in the first control group (**Group B (n=9): Attending unfiltered music of Mozart and concurrently the Arts and Culture programme in school**). The Total scores of the Creativity Test were employed to monitor Group B's progress during the music intervention (listening to the music of Mozart). The only statistically significant changes were noted in the Originality, Elaboration and Total sub-tests where large improvements were indicated, and Flexibility which showed medium improvements. This is an indication that the sound stimulation of Mozart music alone did not enhance creativity in this group of participants.

Although results from the Torrance Creativity Test indicated that the second control group (**Group C (n=15): Attending Arts and Culture programme in school**) participants' experienced positive changes during the programme, the only statistically significant changes occurred in the Picture Elaboration sub-test where large improvements were indicated. The Total Picture sub-test indicated only a medium improvement for these control group participants. Statistical results showed that the control group displayed statistically significant differences regarding the pre-post assessments as measured by the Circle Creativity Test where improvements were noted in the Flexibility, Originality, Elaboration and Total sub-tests. Only medium changes with regard to Circle Fluency were indicated. With regard to Elephant originality and Boxes originality the statistical results imply that only medium improvements in this control group have occurred. This indicates that Arts and Culture teaching at school on its own does not enhance creativity and cognitive flexibility.

The results of the last control group (**Group D (n=15): non-intervention control group and no attendance of Arts and Culture programme in school**) indicated that in the post-programme no large improvements that are of statistical and practical significance were reported through the measuring instruments and their sub-tests in this group of participants that had no intervention of any kind. Since this group underwent no intervention, no improvement was shown.

Therefore it is clear that the first part of the research sub-questions is answered regarding all aspects tested in this research project where Group A indicated statistically significantly better scores than any of the other groups.

6.4.5.2 Pre-Post Differences between Groups: Analysis of Co-Variance (ANCOVA)

The results for the experimental group (**Group A (n=9): Attending Tomatis stimulation and concurrently the Arts and Culture learning in school**) indicate that, in addition to the above, there were significant differences between the groups with regard to the subscales Picture Fluency, Flexibility, Originality, Elaboration and the Totals of the Picture sub-tests as measured by the Torrance Creativity Test. The experimental group reflected improvements larger than the other groups. The experimental group's changes with regard to these aspects took place in an opposite direction as that of the other groups, with the experimental group showing a positive change, resulting in significant differences between the groups. After the programme, quantitative results by experimental group participants' indicated change in connection with Circle Fluency, Flexibility, Originality and the Totals of the Circle sub-tests. The possibility of changes in relation to these aspects of participants' creativity being attributed to their exposure to the Tomatis programme is reflected in their post-test scores as indicated in Chapter 5 (see 5.4.3.3). This would be in line with previous research findings that indicated an improvement in perceptual processing after exposure to a Tomatis programme (Van Jaarsveld & Du Plessis, 1988:138). All experimental group participants displayed improvement of practical significance with regard to one or more aspects of their Elephant Creativity sub-tests. Therefore, the quantitative results suggest that experimental group participants benefited meaningfully from the programme in relation to some aspects of their creativity. Positive change was noticed with regard to three of the Elephant sub-tests; Elephant Flexibility, Originality and Totals. Statistical results indicated that the four groups were equivalent with regard to the subscales of the Boxes as measured by the Torrance Creativity Test. However, the experimental group's level of creativity was significantly higher than that of all the control groups during the post-test as the Totals of the Creativity tests proved that Group A could possibly be practically significantly better than the other groups in the Originality and Elaboration sub-sections.

The above-mentioned statistical results supported the observation that in the present study, exposure to the Tomatis Method contributed to an enhancement of self-concept, musicality and creativity in the experimental group participants.

The results for the first control group (**Group B (n=9): Attending unfiltered music of Mozart and concurrently the Arts and Culture programme in school**), on the other hand allowed conclusions to be drawn from the statistical results on the degree of creativity of this group indicated that the experimental group experienced improvement, while this control group experienced negative change, resulting in a statistically significant difference between

the groups. Thus, results suggested that exposure to the Tomatis programme could have contributed to the experimental group's enhancement of creativity where listening to the music of Mozart alone did not contribute to noticeable changes in this group.

The results for the second control group (**Group C (n=15): Attending Arts and Culture programme in school**) showed that there was no statistically significant difference observed in the post-programme testing regarding change in the creativity of these participants. The experimental group reflected positive change and this control group negative change. This group attended only Arts and Culture teaching, and this did not enhance creativity as the Tomatis intervention did.

The statistical results of the last control group (**Group D (n=15): non-intervention control group and no attendance of Arts and Culture programme in school**) showed that this control group reflected no statistically significant differences regarding the post-programme assessments as measured by the relevant measuring instruments. These results suggest that this control group had a poorer outcome of performance than the other control groups as well as the experimental group. Thus the statistical results implied the expected results as this control group was not exposed to any of the interventions.

6.4.5.3 Summary of Research Sub-Question (1b²)

Analysis of the data obtained from the Torrance Creativity Test illustrate that only the Tomatis Method as intervention had a significant overall impact on creativity in Group A participants.

6.5 EFFECTS ASSOCIATED WITH THE TOMATIS METHOD IN THIS RESEARCH

In this study, statistically significant results confirmed by quantitative and descriptive results suggest that the Tomatis programme benefited the experimental group with regard to all the aspects tested by the measuring instruments. The whole process in combination with the sound stimulation contributed to the improvement of musical abilities, personal growth and the augmentation of creativity of this group of participants. In-programme and post-programme interviews with the parents of these participants verified the findings, confirming

Madaule's (1976:13) supposition that exposure to the Tomatis Method may lead to the improvement of motor function and spatial awareness which in turn will enhance creativity. Furthermore, the development of the tension of the tympanic membrane (Madaule, 1976:11) moderates the action of the vagus (as the tympanic membrane and the vagus nerve are connected) resulting in a sensation of well-being, which leads to an improved self-image and therefore an improved self-concept.

The post-programme qualitative reports from parents of the experimental group participants further indicated that these participants found it easier to express what they were thinking and feeling after the intervention. The ability to voice a person's thoughts and opinion can contribute to increased self-confidence which in turn can lead to the enhancement of other aspects related to this research. Previous research and clinical observations (Nicoloff, 2004:35) support the suggestion of the above-mentioned improvements. Previous research on the effect of the Tomatis Method also reported enhanced levels of self-concept and self-esteem (Du Plessis et al., 2004:65). Therefore a more comprehensive investigation on the effect of the Tomatis Method on learners of the GDE and FET Phase of schooling and their levels of self-concept is warranted.

In addition to the above, the possibility exists that the Tomatis programme had a positive effect on academic performance of the experimental group participants as the interviews with the parents and reports from the teachers suggested that exposure to the Tomatis programme could have contributed to an improvement in the academic functioning of participants from the experimental group. Therefore it is apparent that participants who experienced improved self-concept also reported improvement in concentration resulting in the enhancement of academic performance, as Tomatis (2005:129) found through clinical research and observations. Thus, further investigation into the effect of the Tomatis Method on the concentration capacity of learners and the relation thereof to academic performance could be fruitful.

As the main aim of this research was to investigate the effect of the Tomatis Method on musical hearing it was expected that the experimental group's self-listening skills would improve after their exposure to the Tomatis Method since the most important claim of the Tomatis Method is to enhance listening skills. Filtered sounds stimulate the focusing potential of the ear, it enables the individual to perceive sound with less distortion and to analyse it more precisely over the whole frequency range. The sound stimulation trains the muscles of the middle ear to attune to the high harmonics of a sound source in order to allow more

awareness of the harmonics of the sound (Madaule, 1976:6; Van Jaarsveld & Du Plessis, 1988:138; Thompson, 2004c:56). Therefore, the effects experienced by participants were expected, and confirmed that their general listening skills improved as illustrated in their Musat Test scores.

All experimental group participants became aware of change in their listening skills in- and post-programme. They learnt to exercise deliberate control over their listening ability which enabled more focussed listening, greater sensitivity to loud sounds and enlarged awareness of their own voices. The improvement in the listening skills of the participants was particularly significant for this study as it confirmed that exposure to the Tomatis Method contributed to an enhancement of musical hearing, self-concept and creativity and that participants benefited from the Tomatis programme.

The next chapter will present four case studies in order to flesh out the statistical results.

7

DISCUSSION OF CASE STUDIES

7.1 INTRODUCTION

Presenting some of the results of this research as case studies allows the researcher to show not only **that** the musical listening of two specific participants from Group A developed more than that of two participants from Group B, but also **how**. The quantitative results (presented in Chapter 5 and discussed in Chapter 6) of the Musat Test scores suggest that the statistically significant improvements in musical listening of participants in Group A can at least in part be ascribed to the influence of the Tomatis Method. Because the environment of the learners was not completely controlled during the research, not all possible causes for improvement in musical listening could be accounted for. Nevertheless, the influence of the Tomatis Method is confirmed by the statistical analysis of the quantitative results, and thus the possibility that musical listening can be developed through a structured sound stimulation programme (termed 'sensory-neural integration training' (Tomatis Method in Chapter 1) was established in Chapters 4 and 5. In this chapter the results are interpreted again together with results from the Tomatis listening test in order to suggest ways in which didactic methods can be adapted to individual learners.

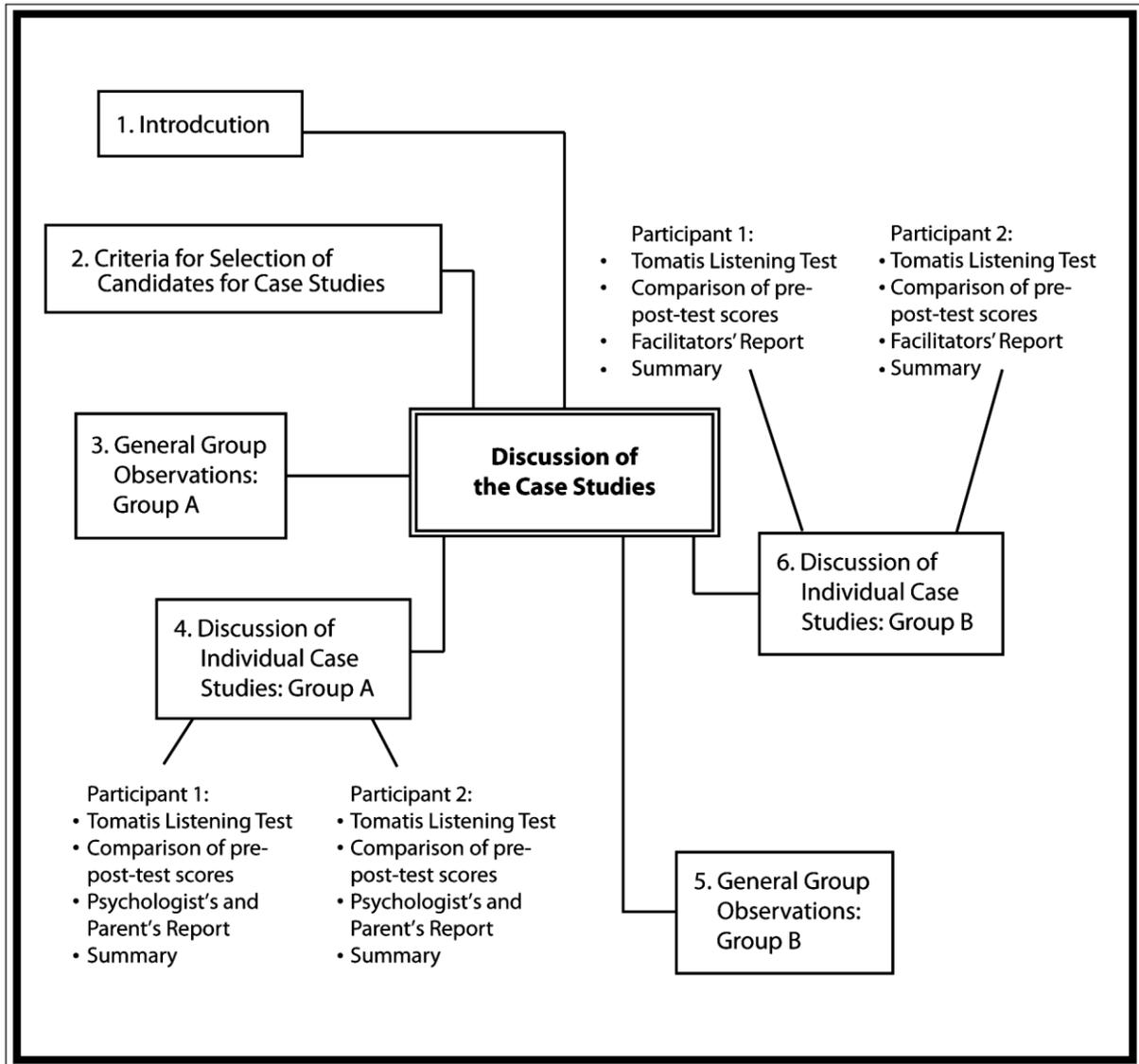
Due to the fact that the Tomatis Method is based upon well-articulated theories, the ways in which the intervention develops the musical listening of **specific** participants can be understood. This is important in music education, because generalisations do not always help teachers to teach specific learners more effectively. Presenting the results of this study in terms of case studies allows the researcher to suggest **how** the musical listening of specific candidates developed. In this chapter only four participants (two from Group A and two from Group B) are discussed as examples of how the information gathered through the research can be applied in teaching learning processes through changes to didactic methods. In order to bring into relation the ideas of Tomatis on the musical ear on the one

hand and the didactics of music teaching on the other hand, a bridge between the ideas of Tomatis and the didactics of music teaching is necessary.

This bridge was built by bringing into relation the theories of Tomatis and the praxial philosophy of music education of Elliott. This was pursued in general in Chapters 2 and 3, where correspondences between the ideas were also discussed. The correspondences between the ideas of these two writers allow the researcher in the final chapter of this report (Chapter 8) to suggest changes to didactic methods in the Arts and Culture programme that will develop musical listening. Since Tomatis did not formulate his theories as didactic principles, the widely accepted ideas of Elliott provide the basic principles for connecting the theories of Tomatis to the suggestions for didactic changes. Once again, these changes are described in terms of specific participants, because insights regarding specific learners are what teachers need in order to teach effectively.

The three paragraphs above form a summary of the basic argument which is unpacked in this chapter. The structure of this chapter – the unpacking of this argument – is illustrated in the following diagram:

Figure 7.1: Summary of Chapter 7



Before the case studies are presented, the criteria for selecting the specific participants are clearly stated. The process of selecting candidates was followed in a circumspect manner and is documented here in order to show that case studies were not selected to uncritically prove certain points.

Before each individual case study is discussed, the participant will be contextualised in terms of each group as a whole from which these particular candidates were chosen. This contextualisation was done by including the report of the psychologist who oversaw the intervention of Group A and the observations of the facilitators of Group B. The report and observations were translated and paraphrased in this chapter. This contextualisation is given in order to discuss the changes in the specific participant in terms of the dynamics of the group. This is important, because in a class situation learners interact, and for an

understanding of the ways in which a specific learner should be taught, his/her ways of interacting with teachers and peers should always be taken into consideration. This ensures that the suggestions made in this chapter regarding changes to didactic methods take into consideration the social nature of education.

Included in the discussions is the parental feedback on the children's behaviour. Due to time constraints and complexity of arrangements it was possible to only interview parents of Group A participants. The interviews gave an extra view of the change that had taken place during and after participation in the study and should not be taken as results that stand alone. The results of the interviews need to be read in relation to the pre- and post-test comparisons of tests results discussed in this Chapter. The overall picture painted by the parents was that they felt that significant changes had taken place and that they noticed major differences in their children's behaviour, observations that are supported by the data gathered with the measuring instruments.

7.2 CRITERIA FOR THE SELECTION OF CANDIDATES FOR CASE STUDIES

The selection of the participants for case studies was done systematically rather than randomly. Two types of hearing/listening were the first criteria for this selection.

- Functional hearing/Physical hearing was tested with the Tomatis Listening Test (as explained in Chapter 4), and
- musical listening was evaluated with the Musat Test.

Firstly, the functionality of hearing was determined by analysing the graphs showing the results of the Tomatis Listening Test. Participants with impaired hearing were excluded in this first screening process, because if physiological problems are present it becomes impossible to develop musical listening. Thus only participants whose hearing was not impaired during the research could be selected as case studies. As shown in Table 7.1, it was indeed necessary to exclude one participant from Group A on this ground, and four participants from Group B.

Secondly, candidates with scores from the pre-test of the Musat Totals denoting an average performance regarding musical listening were selected. For the case studies it was important to select individuals whose scores were not particularly high but also not very low in order to keep all participants in a similar range of scores. If a participant scored very high during the MUSAT pre-test, it would have been almost impossible for him/her to improve his/her score. For this research the data for such a participant would have been less valuable than the data for a participant who showed remarkable improvement. It can be argued that candidates with a very low score lack the ability to improve their musical listening. If such a candidate showed remarkable improvement in the score, it could also have been considered as a sign that they understood the test better the second time, and not an indication that their musical listening had developed dramatically.

A comparison between the pre-test and the post-test Musat scores was then made to find the individuals with the most noticeable changes. These were then ranked according to individual improvement. The screening during this phase was based on this ranking order where in Group A (Tomatis intervention) improvements of 4 and above were chosen and in Group B (who listened to Mozart's music) all participants with positive improvements were selected. The reason for the difference in criteria was that several participants from Group B were already 'eliminated'. Participants with noticeable changes in the Musat scores were selected because small changes of one point on a Musat score do not reliably indicate an improvement in musical listening. The larger the difference between the pre- and post-test scores the more certain the researcher can be that the musical listening of a participant did indeed develop.

Thirdly, the screening was done by using the scores for 'Inconsistent Responding' and 'Faking Good' from the Tennessee Self-Concept Test. The score for consistency should be high to verify reliability of answers and the score for 'Faking Good' should be low to eliminate untruthful answers. For the third screening process, these scores were ranked and three of the participants with the highest scores were selected. Since the results of the Tennessee Self-Concept Test are employed in the presentation of the case studies to suggest changes to didactic methods, the researcher needed to be sure that the most reliable test results were used in order to select a specific participant as case study.

The final screening to choose the two case studies from Group A and Group B was done by choosing the two participants from each group who had the lowest 'Faking Good' results. This was once again done to ensure that the researcher could rely on the other results of the Tennessee Self-Concept Test. The selection process is summarized in tables 7.1 and 7.2.

Table 7.1: Selection of Two Participants from Group A

Participant Number	Rank Order 1	Rank Order 2				Rank Order 3		Rank Order 4	
	Tomatis Listening Test	Musat				Tennessee: Inconsistent Responding		Tennessee: Faking Good	
	Include / Exclude	Pre-test	Post-test	changes	Ranking	Score	Ranking	Ranking	Score
A9	Include	67	75	8	3	84	1	27	2
A10	Include	66	68	2	5	79		26	
A30	Include	63	73	10	1	75	3	24	1
A33	Include	56	65	9	2	74	4	23	
A35	Include	65	67	2	5	65		23	
A39	Exclude	58	61	3		80		27	
A43	Include	66	70	4	4	83	2	30	3
A48	Include	68	69	1	6	79		27	
A49	Include	64	66	2	5	62		22	

Table 7.2: Selection of Two Participants from Group B

Participant Number	Rank Order 1	Rank Order 2				Rank Order 3		Rank Order 4	
	Tomatis Listening Test	Musat				Tennessee: Inconsistent Responding		Tennessee: Faking Good	
	Include / Exclude	Pre-test	Post-test	changes	Ranking	Score	Ranking	Score	Ranking
B18	Include	54	61	7	1	79	2	30	3
B27	Exclude	51	50	-1		69		31	
B28	Exclude	67	59	-8		72		25	
B34	Include	58	64	5	2	67	4	23	
B40	Include	60	61	1	4	92	1	23	1
B44	Exclude	48	41	-7		72		26	
B46	Include	63	57	-6	5	75		28	
B47	Include	67	69	2	3	68	3	27	2
B50	Exclude	65	65	0		69		21	

In Group A participant A9 and A30 were selected as case studies, and in Group B, B40 and B47. The case studies of the candidates use slightly different data sets, depending upon the group from which they were selected. Case studies from both groups are based upon a discussion of data from the Tomatis Listening Test, comparison of pre- and post-test scores for the Musat test, for the Tennessee Self-Concept Test and for the Torrance Creativity Test. Whereas the case studies from Group A use the psychologist's report to contextualise, the case studies from Group B uses the facilitator's report. Parents' reports are used only for case studies from Group A, since for participants in Group B parents' reports were not accessed due to tight work schedules. The three instruments that were employed to gather data for all four case studies can be summarised as follows.

The Tomatis Listening Test

Chapter 4:24 – 34 contains a detailed discussion of the Tomatis Listening Test in terms of background, description and rationale for inclusion in this study. Important topics are discussed, namely the Leading Ear, Hearing Thresholds, Selectivity, Specialization Evaluation, bone conduction curve (BC) and air conduction curve (AC), as well as important information about the different areas of the curves, referring especially to the importance of the left and the right curves and the application of the Tomatis Listening Test. Since such a detailed discussion has already been given, no further explanation or additional information on the Tomatis Listening Test will be included in this chapter.

However, it needs to be mentioned that laterality could not be tested in the post-test due to a technical breakdown of the Audiometer.

Musat Test

Chapter 4:20–24 contains a comprehensive discussion of the Musat Test. In addition to that information the reader needs to keep the following regarding the subtests in mind when interpreting the results of the Musat Test (Wegelin *et al.*, 1977:5) in the case studies.

Subtest 1: Interval

A given interval is compared with two to four other intervals. The candidate has to indicate which interval is equal to the one given. All intervals of an item are played from the same tone and in the same direction. The candidate listens to the music and marks the appropriate correct answer on his answer sheet. There are three practice examples and fifteen items which are played on the piano.

Subtest 2: Harmony

In this sub-test, a harmonised musical phrase is played twice. The second time the final chord may either be the same or different. The candidate should indicate same or different. This subtest contains three practice examples and twelve items which are played on the piano.

Subtest 3: Timbre (Tone colour)

The candidate is asked whether two successive organ tones have the same or a different timbre. An A above middle C is played on Dulcian or Rohr Flute registers of a pipe organ. The candidate should mark same or different on the answer sheet. There are two practice examples and thirteen items.

Subtest 4: Rhythm

Two successive rhythmic patterns are played. The candidate should indicate whether the rhythmic pattern was the same or different when played the second time. There are two practice examples and fifteen items which are played on various percussion instruments.

Subtest 5: Duration

A musical phrase is played twice. The final tone is either longer or shorter than the second time. The candidate should indicate 'longer' or 'shorter' in this question. In this subtest there are two practice examples and fifteen items which are played on the flute, clarinet, oboe or cello.

Subtest 6: Speed

The tempo of a given rhythmic pattern is accelerated or retarded or remains the same and the candidate should indicate on his answer sheet which is the case. There are two practice examples and ten items for this subtest, which are played on the rhythm section of a Kimball organ.

Subtest 7: Counting

Music usually accentuates the first beat of the bar. Beats are divided and the result could be duple, triple or quadruple time. A melody in one of these meters is played and the first beat of most of the bars is indicated with the sound of a triangle in order to assist with the counting. The candidate marks one of the numbers 2, 3 or 4 on his answer sheet. The subtest consists of three practice examples and ten items which are played on the horn, flute, clarinet, violin or cello.

Tennessee Self-Concept Test

These Tests are discussed in Chapter 4 under the subheadings:

- Background
- Description
- Rationale
- Motivation
- Reliability and Validity
- Application

It is nevertheless important to add the following information. When the scores of these tests are unusually high or low, it is often useful to visually inspect the item responses for atypical or noncompliant response patterns. The reason for unusual validity scores may be explored

using interview, clinical history, or other data that may indicate an extraordinary orientation to the content of the test items or to the test-taking situation (Fitts and Warren 1988:21).

Inconsistent Responding:

The Inconsistent Responding (INC) score indicates whether there is an unusually wide discrepancy in the individual's responses to pairs of items with similar content. Such a discrepancy is often due to haphazard or careless responding. It may, on the other hand, reflect some peculiarity in the individual's life circumstances that is referred to by the content of particular item pairs. In either case, unusually high INC scores indicate that an individual's TSCS:2 profile should be interpreted with caution.

Self criticism:

The items that contribute to the Self-Criticism (SC) score are all mildly derogatory statements. If the SC score is too low, the protocol may be invalid.

Faking Good:

The scale is an indicator of the tendency to project a falsely positive self-concept. A high FG score indicates a possibly invalid protocol, especially in conjunction with a low SC score.

Physical:

The PHY score presents the individual's view of his or her body, state of health, physical appearance, skills, and sexuality. Because it is always on display for evaluation, physical appearance is highly associated with global self-esteem across the life span.

Moral:

The MOR score describes the self from a moral-ethic perspective: examining moral worth, feelings of being a 'good' or 'bad' person, and (for adults) satisfaction with their religion or lack of it. For children, the MOR score is likely to vary over short periods of time, whereas adolescents and adults tend to express a more consistent view of themselves from a moral standpoint.

Personal:

The PER score reflects the individual's sense of personal worth, feeling of adequacy as a person, and self-evaluation of the personality apart from the body or relationships to others. This score is a good reflection of overall personality integration, and particularly well adjusted individuals will obtain a high score on this scale.

Family:

The FAM score reflects the individual's feelings of adequacy, worth, and value as a family member. It refers to the individual's perception of self in relation to his or her immediate circle of associates. For children, the family self-concept strongly influences how they perceive their relationships with teachers. It is also strongly related to how they view their own conduct and to how they view their academic capabilities and performance.

Social:

Like the FAM score, the SOC score is a measure of how the self is perceived in relation to others. It reflects in a more general way the individual's sense of adequacy and worth in social interaction with other people. The social self-concept tends to be associated with the physical self-concept for people of all ages. For children, the social self-concept refers uniquely to peers in the school or neighbourhood environment, apart from family and teachers. For younger children, the social self-concept seems to be related to issues of appropriate conduct and to reflect the number of people whom the child can count as friends. During adolescence, the emphasis of the social self-concept appears to shift from the number of positive social connections and conduct issues to the quality of social connections in terms of the degree of intimacy and satisfaction derived from them.

Academic:

The *Academic/Work Self Concept (ACA)* score is a measure of how people perceive themselves in school and work settings, and of how they believe they are seen by others in those settings. It is the most strongly related of all the TSCS:2 scores to actual academic performance. People with high ACA scores feel confident and competent in learning and work situations. They are comfortable when approaching new tasks. They are not unduly disturbed by the early failures that usually accompany new learning or creative activity, and they tend to seek out mentors, relevant information, and opportunities to practice new skills.

TOTAL:

In Chapter 4 it is explained that the *Total Self-Concept (TOT)* score is the single most important score on the TSCS:2. It reflects the individual's overall self-concept and associated level of self-esteem. For children younger than ten years the excellent reliability of the TOT score is especially important. This is because although younger children can differentiate between various facets of self-concept they often may not do so as strongly as do older children, adolescents, and adults. Individuals with high TOT scores tend to define themselves as generally competent and to like themselves. They feel that they are people of value and worth; they have self-confidence and they act accordingly.

Supplementary Scores:

The supplementary scores are groups of TSCS:2 items from each Self-Concept subscale that have historically been classified as expressing one of three primary messages: (a) This is who I am, this is how I identify myself, or Identity (IDN); (b) This is how satisfied I am with myself, or Satisfaction (SAT); and (c) This is what I do, this is how I behave, or Behaviour (BHV). These are scores that have been delineated on a theoretical basis only, and they are assumed to represent an internal frame or reference within which the individual describes him- or herself. As their name implies, the Supplementary scores are traditionally compared with each other in an effort to supplement the interpretation of the TSCS:2 TOT score.

Identity:

The items that contribute to the Identity (IDN) score are the “who I am” items with which the individual describes his or her basic identity. Such items are used to determine the IDN score.

Satisfaction:

The Satisfaction (SAT) score is derived from items which describe how satisfied the individual feels with his or her perceived self-image. In general, this score reflects the level of self-acceptance.

Behaviour:

The BHV score measures the individual’s perception of his or her own behaviour or the way he or she functions.

Torrance Creativity Test

As with the other Tests, Chapter 4:40–46 depicts a detailed explanation of the Torrance Creativity Test:

- Background
- Description
- The Verbal- and Figural Activities
- Rationale of the Verbal- and Figural Test Battery
- Motivation
- Reliability and Validity
- Application

No further information on this test and no discussion will be offered in this chapter and only interpretations of the results of the individual case studies will be rendered.

7.3 GENERAL GROUP OBSERVATIONS: GROUP A

The psychologist Report of Group A (Tomatis Group: May / June) contains the following information.

Week 1: The group was very unsettled and difficult to handle. They fought about everything – especially over the booths with the beds. They were very active and continuously asked for new assignments to keep themselves busy. There was a lack of concentration and overall the irritability level seemed to be extremely high. They preferred group activities. Despite of the above-mentioned problems, they made good contact with the psychologist and her helper and were not shy or withdrawn. The boys and girls played together.

Week 2, 3: The psychologist experienced on a daily basis that the group became more peaceful. Fewer activities were requested. They could concentrate on a specific task for a longer period of time thus indicating improvement in their concentration. They became more emotional and there was even a tear or two. The pupils thought of their own ways to keep themselves busy and this showed that more initiative was taken. The girls were remarkably calmer than the boys. The boys and girls also started to play apart. The fighting over the rooms reduced. It was mainly the girls who started activities like dancing and singing. Wednesday's were 'sleep' days – the first Wednesday only two children slept. By the Wednesday of week three approximately six children slept without arguing about it. The need for communication with the psychologist and helper increased progressively. They started to ask more questions and made more jokes.

Week 4: During these weeks much more individual playing started to take place. They started to bring their suitcases along to the sessions to do homework. Very little activities were requested. No playing together took place any more. Overall they were restful. Some of the learners slept out of own choice. A lot more self-control than in Week 1 was observed. At this stage they started to sing in tune when listening to music. There was also complaining about the sound that hurt their ears; especially where volume was applied. They were much more inquisitive during these two weeks about what the other group does (i.e. Mozart Group). They ate and spoke about food more and brought more food to the sessions than any other week. There seemed to be more spontaneous communication although this was never a problem area. The games definitely became more focused. They started with clay and colour work and that progressed into their homework. Memory games and the building of puzzles seemed to be favourites.

7.4 DISCUSSION OF INDIVIDUAL CASE STUDIES: GROUP A

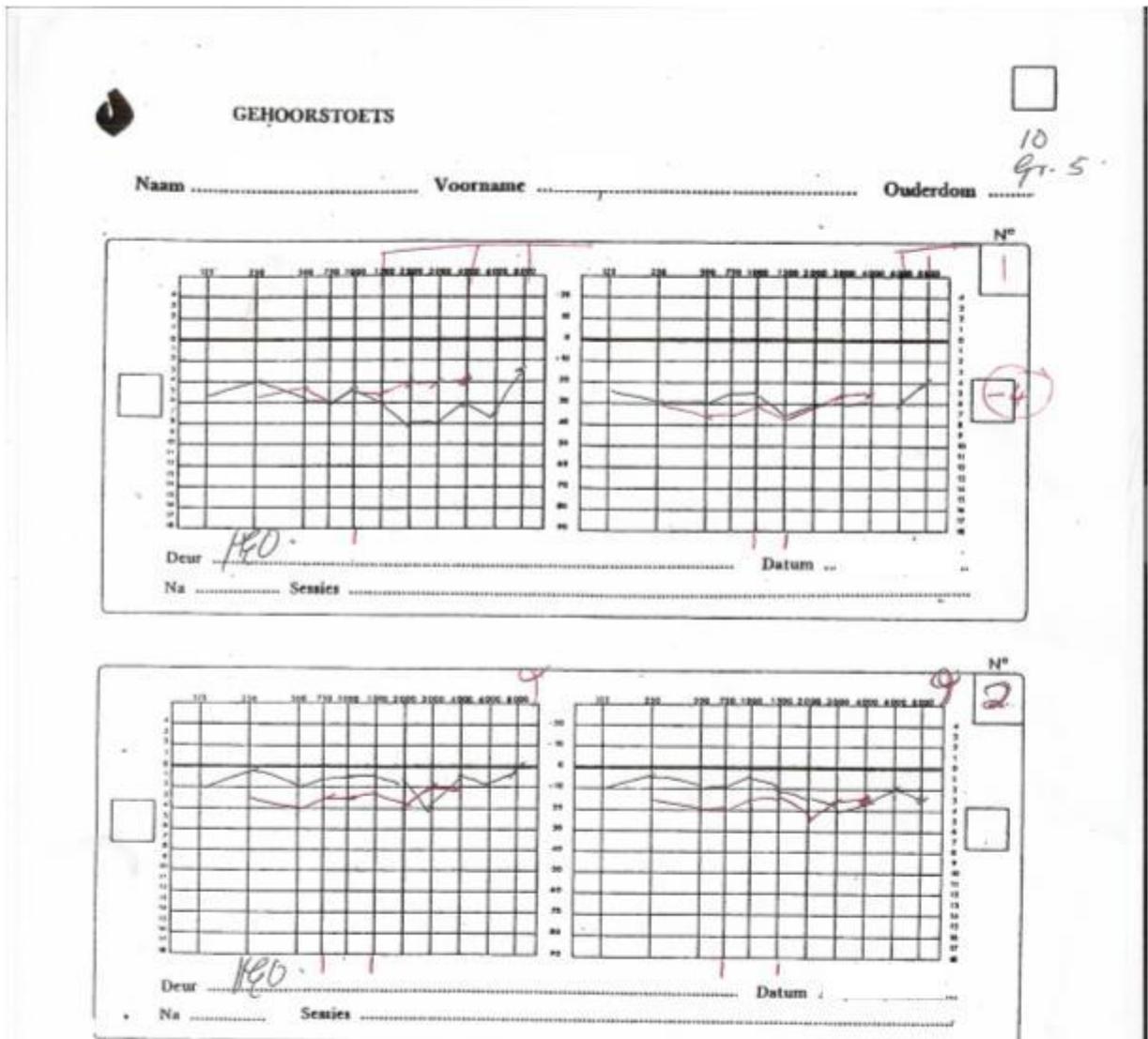
From Group A the choice, as indicated above, of candidates to be discussed as case studies is A9 and A30. These two students will be discussed according to:

- Tomatis Listening Test (pre- and post-).
- Comparison of pre- and post test scores of the Musat Test, Tennessee Self-Concept Test and Torrance Creativity Test.
- Psychologist Report.
- Parents' Feedback.

7.4.1 Participant 1 from Group A (Participant A9)

7.4.1.1 Tomatis Listening Test (TLT)

Figure 7.2: TLT of Participant A9



During the pre-test this participant, a boy of ten years old, displayed left ear dominance, indicated by the '- 4' in the top graph. As explained in Chapter 3, this tendency is crucial for the listening ability because sound has to travel a longer route to reach the language area and some information may get lost along the way, because procession of information will take longer.

The selectivity test shows a closure at 1500 Hz with the result that the right ear was blocked for certain frequencies: although the frequencies are heard, the analysis of sound is affected. As a result language information may be lost.

The darker black line from left to right on the page serves as a kind of norm. The curves of this candidate lie quite low and it is an indication that the level of hearing acuity may not be good at all. The crossing points of the black and red curves could further denote possible conflicts. Combinations of factors suggest that this participant's attention capabilities as well as the possibility to concentrate are diminished. The small red lines indicate localisation errors; two in the left ear and one in the right ear, which point towards concentration problems.

In the post-test it is obvious that the blockage in selectivity has disappeared in both the right and left ear. The pattern of sound perception is also much sharper as the curve lies much higher than in the pre-test. Positive changes suggest that this candidate has become more dominant in the right ear and less dominant in the left ear. Concentration might still be a slight problem, but with less severe effects as the listening curve has improved considerably.

The improved listening curve without any selectivity errors is a strong indication that this candidate has indeed become right ear dominant. This view is supported by the enhanced Musat scores.

The results of the Tomatis Listening Test and the Musat Test together suggest strongly that the hearing of this candidate indeed improved and that these changes were caused by the Tomatis Method. In the next section the discussion tries to establish if these changes in hearing resulted in enhanced musical listening.

7.4.1.2 Comparison of Pre-Post-Test Scores of the Musat Test, Tennessee Self-Concept Test and Torrance Creativity Test

Table 7.3: Musat Test Scores for Participant A9

	<i>Test 1 Interval (15)</i>	<i>Test 2 Harmony (12)</i>	<i>Test 3 Timbre (13)</i>	<i>Test 4 Rhythm (15)</i>	<i>Test 5 Duration (12)</i>	<i>Test 6 Speed (10)</i>	<i>Test 7 Counting (10)</i>	TOTAL
Pre-Test	15	10	8	11	5	10	8	67
Post-Test	15	9	13	11	9	10	8	75

In *Test 1-Interval*: Participant A9 had a perfect score and further interpretation is not possible.

Test 2-Harmony: This test showed a lower mark in the post-test score. Taking into consideration that this was the only one out of 87 items where a decrease occurred, this decrease could easily be seen as a relapse of concentration and should not be interpreted as a weakening of the musical listening ability.

Test 3-Timbre: The score of this subtest reveals a remarkable improvement. Since the Arts and Culture teaching programme did not present any training in the recognition of timbre, this improvement in the score for subtest 3 of the Musat Test can be ascribed to the effects of the Tomatis Method. The listening profile of this participant indicated that he became more sensitive for higher frequencies and therefore the recognition of timbre would have been easier.

Test 4-Rhythm: As this score was already high (73%) a dramatic change was not expected. The fact that this score did not change suggests that rhythm is one aspect of music that could be well developed despite the fact that the person is not properly trained in music. One can argue that this participant already had informal training in musical listening skills regarding rhythm and that further sensory-motor integration training would not have influenced this further.

Test 5-Duration: The improvement in this score is marked and can suggest that the candidate possibly changed from left to right ear dominance. This conjecture is based upon the fact that subtest 5 demands a fine analysis of sound through the comparison of two sounds. When this is processed through the right ear, less information gets lost and therefore it is easier to hear and remember accurately the duration of the notes at the end of a passage.

Test 6-Speed: The participant had a perfect score and therefore it does not allow for any further interpretation.

Test 7-Counting: The mark obtained in the pre-test was already high thus the fact that it did not change is not too remarkable.

The improvements in the two subtests (3-timbre and 5-duration) suggest that changes in hearing as measured by the Tomatis listening test can be related to changes in musical listening as recorded by the Musat Test. The greater sensitivity to higher frequencies would have aided the recognition of timbre, and the change in laterality would have made the analysis of the durations of sounds easier. Since the marks for the other subtests showed either no change or not enough change to be regarded as significant, the conjecture that the participant's hearing changed because of the Tomatis Method and that this resulted in improvements in musical hearing cannot be disproved using the available data.

Table 7.4: Tennessee Self-Concept Test Scores for Participant A9

	Inconsistent responding	Self criticism	Faking good	Physical	Moral	Personal	Family	Social	Academic	TOTAL	Identity	Satisfaction	Behaviour
Pre-Test	84	30	27	56	31	37	51	39	32	235	80	63	71
Post-Test	85	38	27	52	38	51	47	44	46	278	92	64	76

This participant reflected stable pre- and post-test scores in Inconsistent Responding, Self Criticism and Faking Good. Thus the three Validity scores indicate that no concern exists that his protocol may be invalid, and that the results can be interpreted with confidence.

The six scores that determine the Summary Score (Total Self-Concept (TOT) score) are Physical, Moral, Personal, Family, Social and Academic. As argued earlier in this chapter the Total Self-Concept (TOT) score is the single most important score on the TSCS:2. In this candidate's case the Total score increased dramatically after the Tomatis intervention and reflects a radical improvement in his overall self-concept and associated level of self-esteem. From the fact that this participant had such a high Total score it is clear that he likes himself and tends to define himself as generally competent. He feels that he is a person of value and worth. Evidence of self-confidence exists and he acts accordingly.

The positive improvement in the MOR score shows that this participant has a feeling of being a 'good' person. His standpoint of his 'self' from a moral-ethic perspective is positive and solid.

A statistically significantly higher score is detected in the PER scale and reflected his sense of personal growth, his feeling of adequacy as a person and his self-evaluation. This participant seemed to be particularly well adjusted, because as argued above particularly well adjusted individuals will obtain a high score on this scale.

The scores for PHY and FAM remained stable (four points difference in each section do not indicate a significant decrease in scores) and point toward a healthy view that this candidate has of his body, state of health, physical appearance, skills and sexuality. It further reflects feelings of adequacy, worth and how positively he sees himself as part of his family.

In a general way this child's sense of adequacy and worth in his social interaction improved. This conclusion is based upon the enhanced SOC score. This can also indicate improved interaction with peers in school or neighbourhood environment and that his friendships became more valued.

As the ACA score is the most strongly related of all the TSCS:2 scores to actual academic performance there is evidence that the Tomatis intervention had a positive effect on this participant regarding his perception of school work and how he believes he is seen by others at school. It is clear that with such a high ACA score he feels confident and competent in his learning situation. He is comfortable when approaching new tasks and tends to seek out opportunities to practice new skills. He is not disturbed by early failures that usually accompany new learning or creative activity.

The three supplementary scores from each Self-Concept subscale are Identity (IDN), Satisfaction (SAT) and Behaviour (BHV). The IDN score with which the participant described his basic identity shows a large improvement. His level of self-acceptance also improved, indicated by the SAT score which describe how satisfied he feels with his perceived image. The *Behaviour* (BHV) score, which measures his perception of his own behaviour and the way he functions, demonstrated an enhanced score.

Table 7.5: Torrance Creativity Test Scores for Participant A9

		Fluency	Flexibility	Originality	Elaboration	TOTAL
Picture	Pre-Test	10	10	7	15	42
	Post-Test	10	10	17	11	48
Circle	Pre-Test	10	10	15	2	37
	Post-Test	13	11	30	6	60
Elephant	Pre-Test	8	9	16	2	35
	Post-Test	12	7	18	3	40
Boxes	Pre-Test	6	4	6	2	18
	Post-Test	12	9	17	3	41
Total	Pre-Test	37	32	54	21	144
	Post-Test	44	38	72	23	177

In the Torrance Creativity Test this participant shows overall improvement (as was expected from participants in Group A), with major improvements in the scores of the Circle and Boxes sections. It is clear that this participant displays enhanced creativity.

If the improved scores of all four the measuring instruments are brought into relation with the hypothesis of this study, one can deduce the following. The candidate's hearing improved, which lead to improved musical listening. The improved listening and the improvements in self-concept and creativity will likely enable the participant to develop his musical skills in the Arts and Culture learning area. The specific changes will suggest to the teacher specific adaptations to didactic methods that will allow this learner to make great gains in the teaching learning process.

7.4.1.3 Psychologist's and Parent's Reports

Candidate: A9

The psychologist experienced this candidate at the start of the intervention as a very difficult child. He showed behavioural problems which decreased by the end of the second week. His behaviour worsened during the next week. He wanted to break all rules. She had to reprimand him severely and thereafter he was very emotional and avoided her for half a day. The remorse was of short duration as he reverted to his old self. His main aim was to speak over the microphone and everyday he fought to get a room with a bed. He struggled to keep himself busy and did not sleep once. He constantly wanted to do new things and play with the favourite toys. He shared with difficulty and was involved in fights many a time.

He showed very little improvement at the beginning but during the course of the programme his behaviour as well as his attitude improved in such a way that his mother asked for him to be seen by the psychologist on a regular basis after the completion of the empirical research. The mother explained that he had not been doing well at school in the past. He talked a lot and was not attentive in class.

The Tomatis intervention helped him to improve concentration and to focus on schoolwork. Fidgeting, typical of him, seemed to be something of the past. His mother explained that before the Tomatis intervention he used to be very angry with his father, who was uninterested. After the intervention he seemed to be more accepting of his father's lack of interest. She was of the opinion that he liked to play more. He related better with his mother, was closer to her and talked a lot more to her. He asked more questions and was not shy to ask questions about sex. He ate less, slept more during the day, was more confident, and was much more interested in schoolwork.

The changes observed by the psychologist and the mother are reflected in the scores of the Tennessee Self-concept Test and the Torrance Creativity Test.

7.4.1.4 Summary of Participant A9

An overall evaluation of this participant shows that he was influenced positively by the Tomatis intervention. He had most probably changed from left to right ear dominance and his sensitivity to higher frequencies improved. The improved listening curve indicates improved hearing that can be the explanation for the enhancement of all the fields of his musical ability as assessed by the Musat Test.

The improvement of his self-concept, demonstrated on the Tennessee Self-Concept Test, reflects a more effective learner and as a result his self-confidence increased. This is proven by both the Personal and Academic sub-sections that enlarged with points in the scores of the post-tests. This indicates that should the self-confidence increase, the person becomes a more attentive learner. The Torrance Creativity Test indicates major improvements in his creative ability.

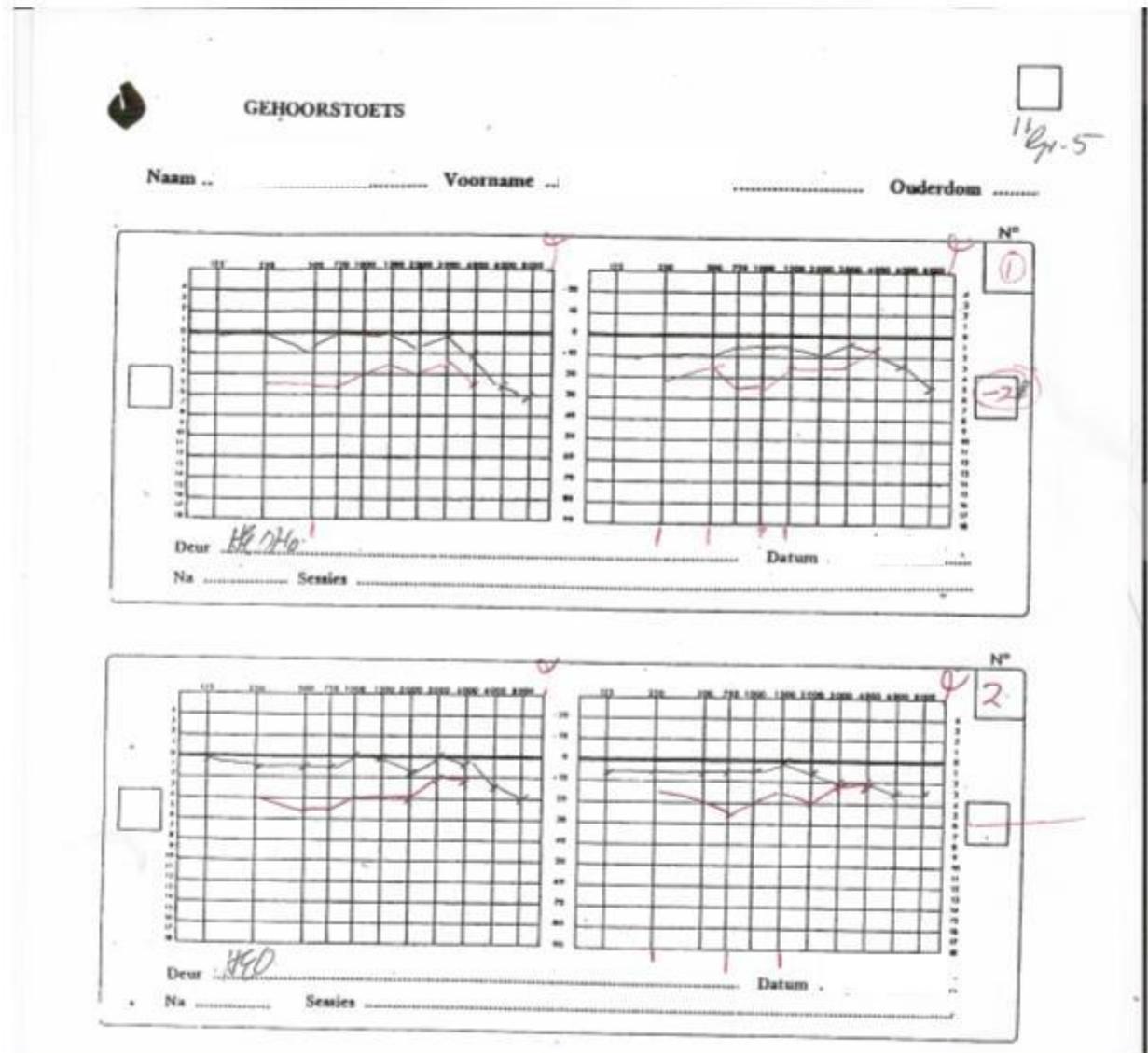
All improvements mentioned above will be beneficial in especially the Arts and Culture classes, where the listening ability is called upon on a constant basis. Any learner with listening problems would not be able to reach the outcomes as stated in the Arts and Culture syllabus (see Annexure C). Typical Arts and Culture classes are known to be a space where social interaction takes place and where a demand is made on the learners' creativity.

The ideal learner would then be a child with good listening abilities, a well-developed self-concept and a person who is creative. Such a student should demonstrate concentration and accurate listening abilities, have high moral values, strong cultural beliefs and respond to aural, oral, visual, tactile and kinaesthetic stimuli. After the Tomatis intervention, candidate A9 seems to be such a learner.

7.4.2 Participant 2 from Group A (Participant A30)

7.4.2.1 Tomatis Listening Test (TLT)

Figure 7.3: TLT of Participant A30



In the pre-test this participant, a girl of ten year old, displayed a mild left ear dominance, but with no selectivity closure. The listening curve lies closer to the dark black line which indicates that this participant will have had better listening abilities than participant A9. There are four localization errors – one in the right and three in the left ear. Where the speech therapist has placed a '?' it means that there is definitely an error but it is uncertain whether it is in the right or the left ear. This, in combination with the left ear dominance, could indicate concentration problems.

In the post-test there is still no selectivity closure. The curve indicates a slight improvement in the perception of the higher frequencies in the right ear and localization errors are limited to three in the left ear. Results suggest limited change but slightly improved listening. The feedback by this candidate's mother suggests that left ear dominance has changed to right ear dominance because love for music is strongly influenced by right ear dominance.

7.4.2.2 Comparison of Pre-Post-Test Scores of the Musat Test, Tennessee Self-Concept Test and Torrance Creativity Test

Table 7.6: Musat Test Scores for Participant A30

	<i>Test 1 Interval (15)</i>	<i>Test 2 Harmony (12)</i>	<i>Test 3 Timbre (13)</i>	<i>Test 4 Rhythm (15)</i>	<i>Test 5 Duration (12)</i>	<i>Test 6 Speed (10)</i>	<i>Test 7 Counting (10)</i>	TOTAL
Pre-Test	12	8	10	7	10	8	8	63
Post-Test	15	7	13	11	12	8	7	73

In general this participant showed a larger development in musical hearing (ten points) than participant A9 (eight points). It is not possible to state that this is significant, since the scores obtained by the two participants fall within the same range. The impression created by the Tomatis Listening Test that candidate A30 had better hearing abilities than candidate A9 could not be confirmed.

Test 1-Interval: The results indicate a considerable improvement from and already high score up to a perfect score in the post-test. This subtest is one that demands the ability to analyse musical sounds. The Tomatis Listening Test showed that this candidate was able to discriminate between sounds.

Test 2-Harmony: A lower mark was obtained in the post-test, but taking into consideration that this was only one of two subtests out of 87 items where a decrease of only one point occurred, it can easily be seen as a relapse of concentration (as in the case of candidate A9) and should not be interpreted as a weakening of the listening ability.

Test 3-Timbre: The results of the listening profile of this candidate suggest improved listening abilities. The curve indicates a slight improvement in the perception of the higher frequencies in the right ear and therefore, as with the first participant of Group A (participant A9), the recognition of timbre will be easier. This is confirmed by the improvement in the post-test score of participant A40.

Test 4-Rhythm: A dramatic improvement (46.6% to 73.3%) is reflected in the scores for this sub-section. This possibly indicates that rhythmic discrimination is one of the fundamentals of the practice of music and in the case of this participant it just needed to be awakened by the Tomatis intervention.

Test 5-Duration: As in the case of candidate A9, these test scores also showed an improvement up to a perfect score in the post-test. This serves as an indication that the candidate possibly changed from left to right ear dominance which facilitated the analysis of sounds.

Test 6-Speed: As this score was already high (80%) a large change was not expected. The fact that the pre- and post tests scores are similar, indicate that this participant already had an acute ability to perceive and memorise tempo which is indispensable for the appreciation and performance of music.

Test 7-Counting: The mark obtained in the post-test became reduced with only one point. As with *Test 2: Harmony*, it does not suggest that this participant did not have the ability to count in music; the lower score could rather be attributed to a moment's lack of concentration or any other physical or psychological reason.

As with participant A9, the results of the Tomatis Listening Test and of the Musat Test taken together suggest strongly that the musical listening of this candidate (already well developed before the intervention) improved and that these improvements were brought about by the Tomatis Method. The fact that the hearing profiles of the two participants in Group A differed, allows the researcher to draw tentative conclusions.

Both participants improved in subtest 3-Timbre and subtest 5-Duration. Both these subtests require an acute differentiation between sounds. An improvement in hearing caused by the Tomatis Method could be a cause of this increased ability.

Whereas participant A9 obtained a perfect score for subtest 1-Interval, the score of participant A30 improved considerably to become a perfect score. This subtest demands fine discrimination between sounds. It is not clear why the candidate identified by the Tomatis Listening Test as the candidate with lesser hearing abilities obtained a better score, but the improvement by participant A30 was to be expected because of the well-developed hearing abilities identified by the Tomatis Listening Test. Similar conclusions can be drawn from the different results of both participants of subtest 4-Rhythm.

Table 7.7: Tennessee Self-Concept Test Scores for Participant A30

	Inconsistent responding	Self criticism	Faking good	Physical	Moral	Personal	Family	Social	Academic	TOTAL	Identity	Satisfaction	Behaviour
Pre-Test	75	30	24	45	31	36	43	41	44	240	74	53	69
Post-Test	79	28	28	41	37	34	43	50	47	252	81	51	73

This participant's protocol is valid as she reflected stable pre- and post-test scores in Inconsistent Responding, Self Criticism and Faking Good. Thus the three Validity scores indicate that her profile can be interpreted with confidence.

At this point it must be mentioned again that the Total Self-Concept (TOT) score is the single most important score on the TSCS:2. The six scores that determine this Summary Score are that of Physical, Moral, Personal, Family, Social and Academic. This candidate had an increase of 12 points in her Total score after the Tomatis intervention. This shows that there had been a radical improvement in her overall self-concept and associated level of self-esteem. The increase in her Total score positively impacts her liking of herself and the fact that she saw herself as generally competent made her feel that she is a person of value. This participant experienced her 'self' from a moral-ethic perspective as positive. She had a feeling of being a 'good' person which is reflected in the positive improvement of her MOR score.

The scores for PHY and PER remained stable (4 points and 2 points difference respectively in each section do not indicate any significant lowering of scores) and point toward a healthy view that this candidate had of her body, state of health, physical appearance, skills and sexuality. Like the scores for candidate A9, her scores reflect a positive sense of personal growth, a feeling of adequacy as a person and positive self-evaluation.

No change occurred in the FAM score and it is therefore a reflection of this participant's already positive feelings of adequacy, worth, and value as a member of her family. She felt optimistic about her relation with her immediate circle of associates and teachers, her academic capabilities and her performance in school.

As with the previous candidate the increase of the SOC score proposed an improved sense of adequacy and worth in her social interaction. The higher score is also an indication of enhanced interaction with peers at school or neighbourhood and suggests that friendships became closer.

It is important to mention (as in the case of the first candidate) that the ACA score is the most strongly related of all the TSCS:2 scores to actual academic performance. With the improved ACA score it is clear that the Tomatis intervention had a positive effect on this particular participant regarding her perception of school work and of how she believed she is seen by others at school. She felt confident and competent in a learning situation and was comfortable when approaching new tasks. She looked forward to new learning or creative activities and was not disturbed by early failures.

Identity (IDN), Satisfaction (SAT) and Behaviour (BHV) form the three supplementary scores from each Self-Concept subscale. As with candidate A9, this participant's IDN score with which she described her basic identity had a large improvement. She was less satisfied with her perceived image as indicated by the SAT score which showed a slight decrease. Like the previous candidate the *Behaviour* (BHV) score, which measured her perception of her own behaviour and the way she functioned, reflected an enhanced score.

Table 7.8: Torrance Creativity Test Scores for Participant A30

		Fluency	Flexibility	Originality	Elaboration	TOTAL
Picture	Pre-Test	10	9	11	18	48
	Post-Test	10	10	13	47	80
Circle	Pre-Test	15	12	25	12	70
	Post-Test	30	30	65	44	169
Elephant	Pre-Test	11	10	8	1	30
	Post-Test	17	15	21	17	70
Boxes	Pre-Test	16	15	13	2	46
	Post-Test	26	20	33	15	94
Total	Pre-Test	52	46	57	39	194
	Post-Test	83	75	132	123	413

This candidate also showed remarkable improvement in all creativity aspects of these tests. The picture and circle tests seemed to be her greatest improvements.

When the improved scores obtained by this participant with all four measurements are brought into relation with the hypothesis of this research, the following conclusions can be drawn. The candidate's already well-developed hearing abilities improved through the intervention and this led to clear developments in musical hearing. Improved musical listening skills as well as improvements in self-concept and creativity will enable her to take advantage of the teaching learning process in the Arts and Culture learning area. Specific changes uncovered by the research will suggest ways of adapting didactic methods to this specific learner.

A comparison of the developments in hearing, musical listening, self-concept and creativity of participant A9 and A30, suggests that the conclusions drawn in the case studies can be trusted.

7.4.2.3 Psychologist's and Parent's Reports

Candidate: A30

The psychologist experienced this candidate as very positive. She states that she crept into her and her helper's hearts from the beginning. Being slightly overweight, she was rejected by the other girls. This resulted in her playing mostly with the boys which made her very rough in her dealing with other children. In the second week she was very emotional, to such an extent that on the third day of that week the psychologist did not allow her to listen to any of the Tomatis CDs. Responding to the question of why she had such an emotional reaction, she said that she could not see herself completing the project because she missed her mother. The psychologist's opinion was that she personally thought the days were too long for this child. In the end she completed the programme and missed out on only one day. She was one of the children who slept regularly and was woken with difficulty. She is very intelligent but continuously looking for acceptance by trying to be funny. From the beginning she was very relaxed and calm, had excellent concentration abilities but was very emotional at times.

After the Tomatis intervention her mother experienced her as much closer to her than before. She developed into a very affectionate and loving person who laughed a lot. She used to be touchy, but at the time of the interview with the parents, her mother specifically mentioned how relaxed and in control she had become. Before the intervention she would accept responsibility for anything that went wrong. After the intervention she could defend herself. Her mother mentioned that she is much more open and inquisitive. She asked questions about sex which shocked her mother because she had never shown any interest in this particular topic. She insisted on sleeping in her own room whereas previously she slept in her mother's room.

She read the newspaper daily and became much more aware of her environment. She seemed to be more insistent in getting the answers she needed. Her school work improved drastically and she constantly asked for study tips from her older sister in Grade 11. She also became more independent in the field of cooking and often prepared food for the whole family. Her uncle, who lives with the family, also noticed positive changes in her. He said that she became more confident. Before the intervention she would allow people to walk right over her, but afterwards she started to fight for her own rights.

After the intervention she loved music even more. She asked many questions about the types of voices, style periods, etc. and demanded answers. Her voice also sounded different when she wanted something. Her mother noticed that she used her voice more effectively. She expressed more emotion in her voice than before. She often danced and sang and performed like her sister. Her mother deliberately enquired whether other children could take part in this particular empirical research as it meant so much to her daughter.

The changes noticed by the mother and uncle of participant A30, as well as by the psychologist are confirmed by the scores obtained with the measuring instruments.

7.4.2.4 Summary of Candidate A30

Candidate A30 was, like candidate A9, positively influenced by the Tomatis intervention. As mentioned earlier the post-test of the Tomatis Listening Test of this candidate indicates that the curve points toward a slight improvement in the perception of the higher frequencies in the right ear. These results suggest improved musical listening as the listening curve lies closer to the dark black line which indicates that this candidate will have better listening abilities. The above-mentioned facts could then be the explanation for the enhancement of most of the fields of her musical listening as tested by the Musat Test. The improved scores for this candidate are in the sections Interval, Timbre, Rhythm and Duration, basic design dimensions of musical works. It explains her greater interest in singing and dancing. Her increased interest in music as a whole is also explained by these scores.

All the scores in the Tennessee Self-Concept Test showed improvements of an average of at least six points per sub-section and the Total with an impressive 12 points. Like candidate A9 the improvement of her self-concept creates a more effective learner and as a result her self-confidence increased. With her self-confidence restored, this girl became a learner that could study independently and as a result it reflected in improved school marks.

Her creative ability, measured by the Torrance Creativity Test, indicates major improvements and as she was part of Group A (Tomatis intervention) it comes as no surprise.

In the Arts and Culture classes at school the above-mentioned improvements would assist this learner. With her newly gained confidence she would be able to contribute to the class and especially with her enhanced listening ability she would be able to interact and respond to different aural, oral, visual, tactile and kinaesthetic stimuli.

7.5 GENERAL GROUP OBSERVATIONS: GROUP B

The Facilitators' Report of Group B (Mozart music Group: May / June) was compiled by Honours students in Psychology who acted as facilitators. To assist these facilitators in compiling the report the following instructions were given to them:

Please describe each and every observation during the listening sessions which the group as a whole experienced. You may consider the following:

- *Were there any 'phases' noticeable in the process; for instance initial chaos in comparison to gradually better behaviour?*
- *Were there special communication situations between you and a specific learner/individual?*
- *Were there special group interactions between specific participants?*
- *Were there underlying conflict situations?*
- *How do you think they experienced the process?*

Provide feedback of any other observation even if not mentioned here.

Week 1: In the beginning there was a lot of chaos but it gradually improved and it became easier to control the children. The children had serious disciplinary problems and were very difficult to manage. The boys tended to be highly uncontrolled and difficult to keep occupied. The learners' concentration was weak, they got bored very easily and many a time they did not complete an activity e.g. to colour in a picture or build a puzzle.

Week 2 - 3: The girls communicated more than the boys and were more loving. Some boys were especially difficult and rebelled against the 'discipline' and did not listen at all. They tended to cause trouble all the time. This situation improved as control was gained by the end of the third week. The girls definitely had close circles of friends which most probably came from school. One little girl was an extremely quiet and introverted kind of person and played mostly on her own or with her best friend. Another girl was very domineering and wanted to be in control all the time. She also wanted to be the centre of attention. The boys sometimes fought but it was not too serious. What was worrying was that the last mentioned girl was mostly part of these fights.

Week 4: Overall there were no drastic behaviour changes except that they became more co-operative and obedient from day to day. The facilitators' overall impression was that they struggled to keep the children busy because they were not interested in anything else except to play with a ball. They (the facilitators) enjoyed the whole experience, however and learned a lot from it.

7.6 DISCUSSION OF INDIVIDUAL CASE STUDIES: GROUP B

From Group B the selection, as indicated above, of participants as case studies were participants B40 and B49.

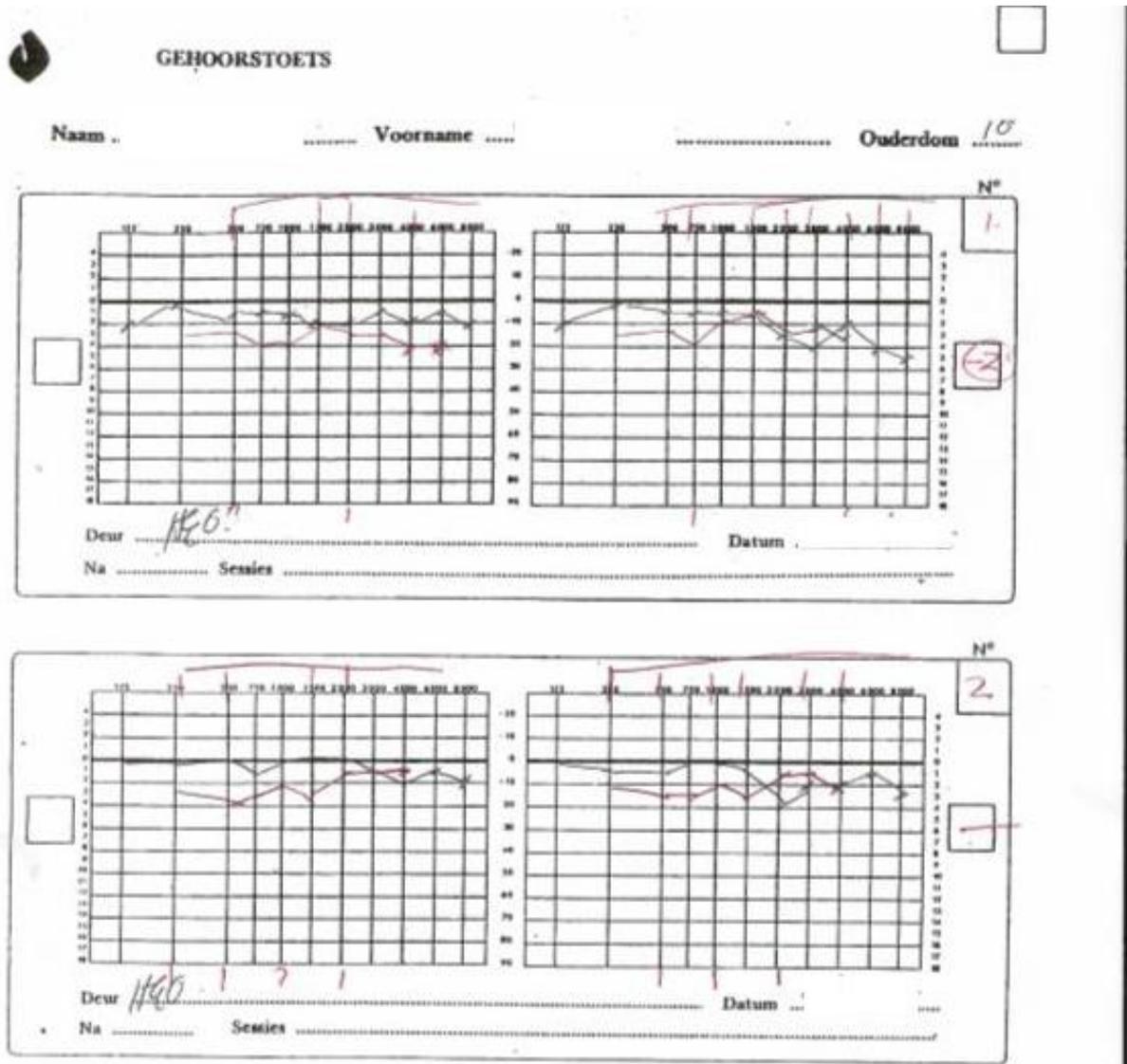
These two participants will be discussed according to:

- Tomatis Listening Test (pre- and post-).
- Comparison of the pre-post-test scores of the Musat Test, Tennessee Self-Concept Test and Torrance Creativity Test.
- Facilitators' Report.

7.6.1 Participant 1 from Group B (Participant B40)

7.6.1.1 Tomatis Listening Test (TLT)

Figure 7.4: TLT of Participant B40



This participant, a girl of eleven years old, showed a closed selectivity from 500 Hz in both the right and left ears. It became worse in the post-test where it extended from 250 Hz to 8000 Hz. Since this participant did not attend the Tomatis interventions there was no force to counteract the closed selectivity.

The listening curves do not demonstrate major differences and the localization errors increased slightly.

7.6.1.2 Comparison of Pre-Post-Test Scores of the Musat Test, Tennessee Self-Concept Test and Torrance Creativity Test

Table 7.9: Musat Test Scores for Participant B40

	<i>Test 1 Interval (15)</i>	<i>Test 2 Harmony (12)</i>	<i>Test 3 Timbre (13)</i>	<i>Test 4 Rhythm (15)</i>	<i>Test 5 Duration (12)</i>	<i>Test 6 Speed (10)</i>	<i>Test 7 Counting (10)</i>	TOTAL
Pre-Test	8	9	10	13	9	7	4	60
Post-Test	13	10	8	11	8	7	4	61

This participant's overall score was only 2 points lower than that of participant A30, but it showed no significant improvement.

Test 1-Interval: This participant had a positive improvement in the post-test, but this was the only subtest which showed an improvement. It is not clear why such a dramatic improvement occurred for this subtest, since it is in fact a test that demands fine discrimination between sounds and auditory memory.

Test 2-Harmony: This test showed a slight positive improvement in the post-test score. However, an increase or decrease of one point is not taken as significant for this research in the interpretation of the Musat scores.

Test 3-Timbre: The listening profile of this candidate indicated that she had selectivity errors in both the left and right ears which increased with the post-test. A decrease in the score of *Test 3-Timbre*, *Test 4- Rhythm* and *Test 5-Duration* comes as no surprise and fits in with the Listening curve, especially with localization errors that increased slightly in the post-test.

As an improved listening ability did not occur in the post-testing according to the Tomatis Listening Test, the fact that the scores for *Test 6-Speed* and *Test 7-Counting* remained the same, is not unexpected.

Table 7.10: Tennessee Self-Concept Test Scores for Participant B40

	Inconsistent responding	Self criticism	Faking good	Physical	Moral	Personal	Family	Social	Academic	TOTAL	Identity	Satisfaction	Behaviour
Pre-Test	92	28	23	56	40	51	51	61	46	305	100	69	92
Post-Test	85	27	24	47	26	48	53	73	41	288	83	62	88

The three Validity scores that could possibly indicate that this candidate's profile should be interpreted with caution are those of Inconsistent Responding, Self Criticism and Faking

Good. As there is not too much of a discrepancy in these scores the participant reflected stable pre- and post-test scores and as a result her protocol will be interpreted as valid.

As indicated in the previous two case studies, the scores of Physical, Moral, Personal, Family, Social and Academic add up to determine the Total Self-Concept (TOT) score (Summary Score). This score is the single most important score on the TSCS:2. The Total score decreased in the post-test and reflected a radical declining of her overall self-concept and associated level of self-esteem. The drop in the Total score could be a sign of her disliking herself and she could tend to define herself as incompetent. Consequently her feelings of value and worth would also lessen and evidence of impaired self-confidence could emerge.

When the TOT score decreased in the post-test it was anticipated that the scores for PHY, MOR, PER and ACA would also be lowered. This was a sign of her dissatisfaction with her body, state of health, physical appearance, skills and sexuality. It reflected a lack of personal growth. She had a feeling of inadequacy as a person and portrayed very little positive self-evaluation. It was also clear from the lower score in the MOR post-test that this child has a feeling of being a “bad” person and for that reason her moral-ethic perspective of her ‘self’ was negative.

Her lack of academic performance was reflected in the low post-test score of the ACA sub-test (This score is, as indicated before, the most strongly related of all the TSCS:2 scores to actual academic performance). Her perception of her school work and how she believed she was seen by others in the school is of grave concern. She did not feel confident and competent in any learning situation and was uncomfortable when approaching new tasks. She tended to avoid opportunities to practice new skills.

These changes in the scores suggest that passive listening to the Music of Mozart did not have the comparable benefits for this participant as the Tomatis intervention had for participants A9 and A30.

There is evidence of positive improvements in the scores of FAM and SOC. It reflected her feelings of adequacy, worth and how positively she saw herself as part of her family. She felt optimistic about her relation with her immediate circle of associates and teachers. In a general way this child’s sense of adequacy and worth in her social interaction improved, considering the SOC score. This could also be an indication of her improved interaction with

peers in the school or neighbourhood environment and an indication of how she valued her friendships more. Since the listening session (with Mozart's music) created opportunities to interact with her peers in a new and stimulating environment, these changes can be explained at least in part.

As expected from the overall picture the three supplementary scores from each Self-Concept subscale have decreased. The IDN score with which the participant described her basic identity showed a decline. Her level of self-acceptance, indicated by the SAT score which describes how satisfied she felt with her perceived image, decreased. The *Behaviour* (BHV) score, which measures her perception of her own behaviour and the way she functions, demonstrated a lower score.

Table 7.11: Torrance Creativity Test Scores for Participant B40

		Fluency	Flexibility	Originality	Elaboration	TOTAL
Picture	Pre-Test	9	9	14	16	48
	Post-Test	10	10	15	12	47
Circle	Pre-Test	21	18	36	7	82
	Post-Test	14	12	18	5	49
Elephant	Pre-Test	16	12	19	17	64
	Post-Test	6	6	7	10	29
Boxes	Pre-Test	16	16	21	17	70
	Post-Test	9	5	7	5	26
Total	Pre-Test	62	55	90	57	264
	Post-Test	39	33	47	32	151

Notably, the Creativity Test shows very little or no improvement at all after listening to the music of Mozart.

The few positive changes in the scores obtained for this participant with the four measuring instruments as compared with the positive changes in the scores of the two participants in Group A, confirm the hypothesis that hearing abilities and musical listening would be developed with a structured sensor-neural integration training such as the Tomatis Method, and not by passive listening alone.

7.6.1.3 Facilitators' Report

Candidate: B40

This candidate was experienced as a very outspoken girl with a will of her own but with good manners. She appeared to be very intelligent. She did not show much change at the beginning but only at the end of the programme. She slept regularly and was one of the few

pupils who requested less tasks as the weeks went by. She took all these tasks very seriously and completed them thoroughly. She became very energetic at times but also preferred to be completely on her own. She was the only girl who kept herself busy all the time. She was absent only one day during the course of the programme due to illness.

7.6.1.4 Summary of Candidate B40

Candidate B40 was one of the learners in Group B who was exposed to only the music of Mozart. It was anticipated that the post-test scores for the Musat Test of participants from Group B would not be as high as that of Group A who had completed the Tomatis intervention. Therefore enhanced scores in only two sub-sections of the Musat, Interval and Harmony, were to be expected. This child would at least be able to perceive a melody and even sing it, but would have difficulty in all the other sub-sections of her music application.

Her self-concept deteriorated and in an Arts and Culture surrounding she would not be able to do her best as there is no proper listening ability, taking into consideration the selectivity and localization errors in the listening curve. With the absence of self-confidence this learner will not meet the outcomes that, in the Arts and Culture class, are mostly based on a good listening ability and the application thereof.

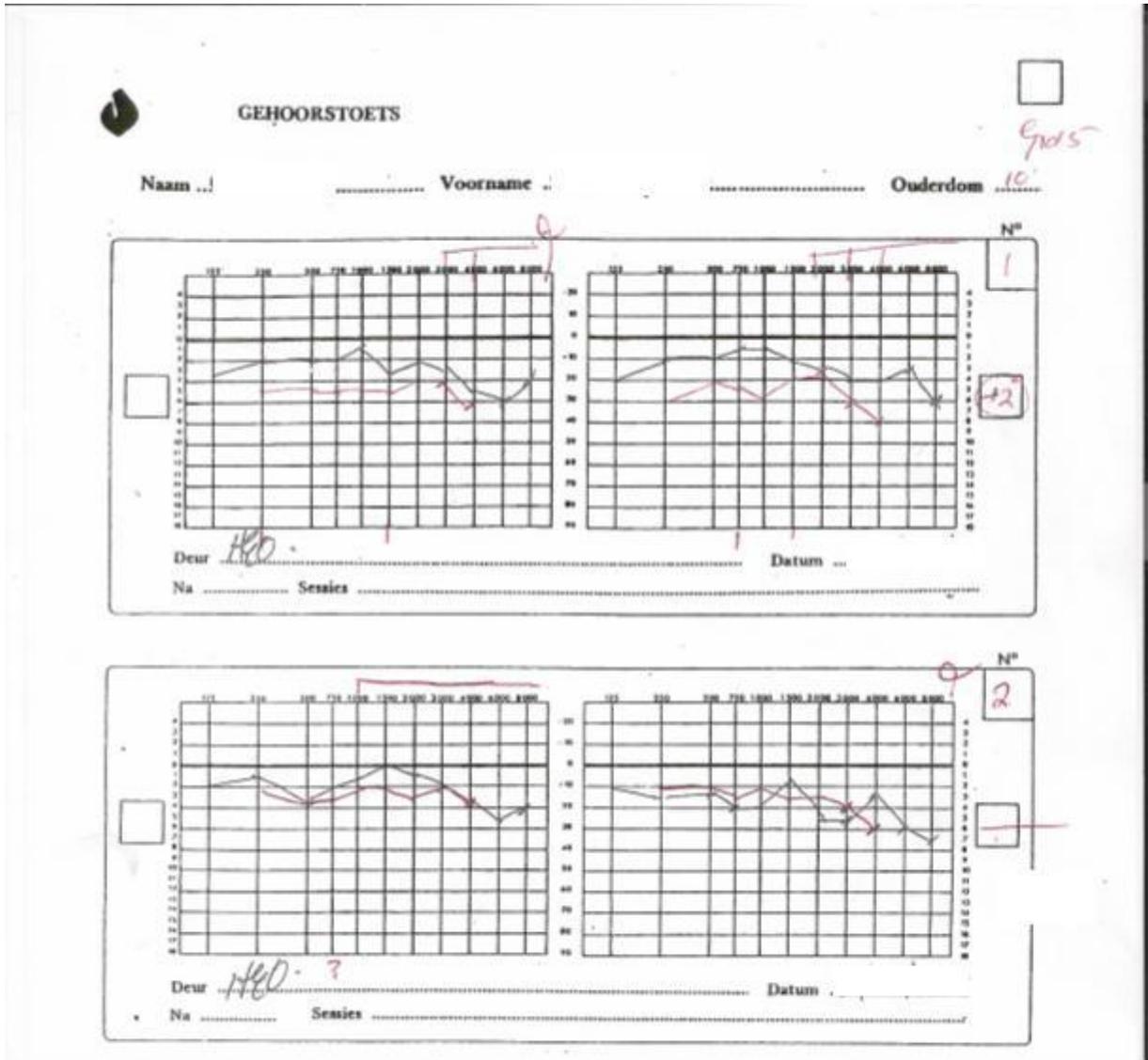
The score for her creativity also seemed to have decreased, leaving this candidate in an unfortunate position, especially in a class where there is such an emphasis on creative participation and the demand for good listening skills.

It is clear from this case study that learners such as this one definitely need a structured teaching learning environment to develop their musical listening and other skills necessary to succeed in the challenging environment of our schools. The need identified in Chapter 1 for informed and reflective practice by music educators is confirmed. Research such as the present study is essential if teachers wish to act responsibly when teaching learners.

7.6.2 Participant 2 from Group B (Participant B47)

7.6.2.1 Tomatis Listening Test (TLT)

Figure 7.5: TLT of Participant B47



This candidate, a girl of ten years old, showed selectivity closures in the right ear from 3000 to 8000 Hz which were extended in the post-test from 1000 to 8000 Hz, while in the left ear the initial closures from 2000 to 8000 Hz have disappeared in the post-test. The overall pattern of the curves did not change drastically and the localization errors in the pre-test, where three have been noted, disappeared in the post-test and showed only one uncertainty at 750 Hz.

7.6.2.2 Comparison of Pre-Post-Test Scores of the Musat Test, Tennessee Self-Concept Test and Torrance Creativity Test

Table 7.12: Musat Test Scores for Participant B47

	<i>Test 1 Interval (15)</i>	<i>Test 2 Harmony (12)</i>	<i>Test 3 Timbre (13)</i>	<i>Test 4 Rhythm (15)</i>	<i>Test 5 Duration (12)</i>	<i>Test 6 Speed (10)</i>	<i>Test 7 Counting (10)</i>	TOTAL
Pre-Test	12	9	7	12	9	10	8	67
Post-Test	12	11	7	13	11	6	9	69

Overall this candidate showed a higher score than A30 and B40, but little improvement. This again confirms the hypothesis that only a structured sensory-neural training programme will benefit the development of musical listening.

Test 1-Interval: As this score was already high (80%), a dramatic change was not expected. The same score indicates that this participant already has, like candidate B40, the ability to recognise intervals which is a basic aspect of music and a prerequisite for the perception of melody.

Test 2-Harmony: This test indicated an improved mark in the post-test, demonstrating the ability of this candidate to perceive small differences in a concord which plays an important part in Western music.

Test 3-Timbre: There was no improvement in the score of this sub-test. Selectivity closures, however, were detected in the listening profile of this candidate ranging from 3000 to 8000 Hz in the right ear which increased in the post-test from 1000 Hz to 8000 Hz. This could be the reason why she struggled to hear higher frequencies and therefore recognition of Timbre was problematic.

Test 4-Rhythm: A slight improvement occurred in this sub-section. Rhythmic ability is one of the fundamentals of the practice of music and is clearly present in this candidate.

Test 5-Duration: An improved mark in the post-test score serves as an indication that this candidate has a feeling for differences in duration.

Test 6-Speed: The significantly lower score in the post-test indicates that this candidate did not possess the ability to perceive and memorise tempo which is indispensable for the appreciation and performance of music.

Test 7-Counting: There was a slight increase in the mark obtained in the post-test, but it is not taken as significant for this research. This candidate can clearly differentiate between duple, triple and quadruple time, but this ability did not develop through passive listening.

Table 7.13: Tennessee Self-Concept Test Scores for Participant B47

	Inconsistent responding	Self criticism	Faking good	Physical	Moral	Personal	Family	Social	Academic	TOTAL	Identity	Satisfaction	Behaviour
Pre-Test	69	30	27	47	28	40	42	47	30	234	74	53	77
Post-Test	74	26	27	38	32	42	47	42	28	229	76	56	69

This participant reflected stable pre- and post-test scores in the sub-sections Inconsistent Responding, Self Criticism and Faking Good, the three Validity scores that could possibly indicate that her profile should be interpreted with caution. As a result her protocol was interpreted as valid.

The six scores that determine the Summary Score (Total Self-Concept (TOT) score) are that of Physical, Moral, Personal, Family, Social and Academic. As mentioned in the discussion of each case study, this score is the single most important score on the TSCS:2. In this candidate's case the Total score had deteriorated and reflected no improvement in her overall self-concept and associated level of self-esteem. The decline in the Total score could be a sign of her disliking herself and defining herself as incompetent. Her feelings of value and worth were obviously decreasing with no evidence of self-confidence.

As anticipated, the scores for PHY, SOC and ACA would be lower in the post-test if the TOT score decreased. It indicated that this candidate was not satisfied with her body, state of health, physical appearance, skills and sexuality. She reflected a negative sense of personal growth.

With the decrease of the SOC score it is clear that this child's sense of adequacy and worth in her social interaction decreased. The lower score is also an indication of her deteriorated interaction with peers in school or neighbourhood and is an indication of friendships that became less important.

The score most strongly related of all the TSCS:2 scores to actual academic performance is the ACA score. Her lack of academic performance is reflected in the lower post-test score.

This could indicate that she might not feel confident and competent in a learning situation and was uncomfortable when approaching new tasks. She tended to avoid opportunities where she could practice new skills.

It is clear from the positive improvement in the MOR score that this child had a feeling of being a 'good' person. She had a positive view of her 'self' from a moral-ethical perspective.

A slight increase is detected in the PER scale which reflected her sense of personal growth, feeling of adequacy as a person and self-evaluation.

The scores for FAM improved and points toward a healthy view that this candidate had of her body, state of health, physical appearance, skills and sexuality. It further reflects her feelings of adequacy, worth and how positively she sees herself as part of her family.

The three supplementary scores from each Self-Concept subscale are Identity (IDN), Satisfaction (SAT) and Behaviour (BHV). The IDN score with which the participant described her basic identity improved. Her level of self-acceptance had also improved, indicated by the SAT score which describes how satisfied she felt with her perceived image. The *Behaviour* (BHV) score, which measures her perception of her own behaviour and the way she functions, showed a lower score.

Table 7.14: Torrance Creativity Test Scores for Participant B47

		Fluency	Flexibility	Originality	Elaboration	TOTAL
Picture	Pre-Test	6	6	4	5	21
	Post-Test	4	3	3	2	12
Circle	Pre-Test	15	15	13	7	50
	Post-Test	8	6	2	2	18
Elephant	Pre-Test	2	2	4	1	9
	Post-Test	4	2	1	5	12
Boxes	Pre-Test	7	7	9	3	26
	Post-Test	12	8	7	5	32
Total	Pre-Test	30	30	30	16	106
	Post-Test	28	19	13	14	74

Better scores were obtained in some of the sub-sections of the post-tests of this candidate's creative abilities. It is, however disquieting to note that the scores for the Totals in the Torrance Creativity Test have not improved during the post-test.

The results from all the measuring instruments taken together confirm the conclusions drawn regarding participant B40.

7.6.2.3 Facilitators' Report

Candidate: B47

This candidate is an extremely quiet and introverted kind of person and played mostly on her own or with only one of her friends. She is obedient and plays and sings while listening to the music. She felt that she could not sing before, but she enjoyed singing after the listening sessions of Mozart music. The facilitators observed that she did her schoolwork more independently and did so well that the mathematics teacher called the parents in to explain how well she did and also commented on the number of questions that she asked in class.

7.6.2.4 Summary of Candidate B47

In comparison to candidate B40 this candidate had slightly better scores on the Musat Test although she was also exposed to only the music of Mozart. Rhythm, Duration and Counting have enhanced scores. These three sub-sections are inter-related, and serve as verification that rhythmic ability is one of the fundamentals of the practice of music, from the most primitive to the most sophisticated and could be developed despite the fact that the person is not properly trained in music (as mentioned before). Furthermore there was no evidence of right ear dominance in the Tomatis Listening curve and therefore her listening ability could be impaired. Constructive listening would thus be problematic for this learner and it could be the reason for the poor post-test scores in the other fields of the Musat post-tests.

There was very little or no evidence at all of enhancement of her self-concept, taking in consideration the Tennessee Self-Concept post-test scores. She will thus struggle to be an effective learner and typical Arts and Culture classes, known to be a space where social interaction takes place and a huge demand is made on how a learner should conduct herself, would be difficult for her.

The exposure to only the music of Mozart did not seem to enhance any creative ability in this learner. The post-test scores of the Torrance Creativity Test are less than the pre-tests and point toward a learner with limited creative abilities. However, she could have benefited from the social interaction during the Mozart music stimulation. This girl seems to have no proper listening abilities, very poor self-concept and will struggle with tasks that require creativity. In a vibrant, creative surrounding where it will be expected of her to 'think on her feet' she will need a lot of support and help from the teacher.

In conclusion the final chapter presents a summary of the results of the study, indicates methodological limitations and give recommendations for future research.

8

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

8.1 INTRODUCTION

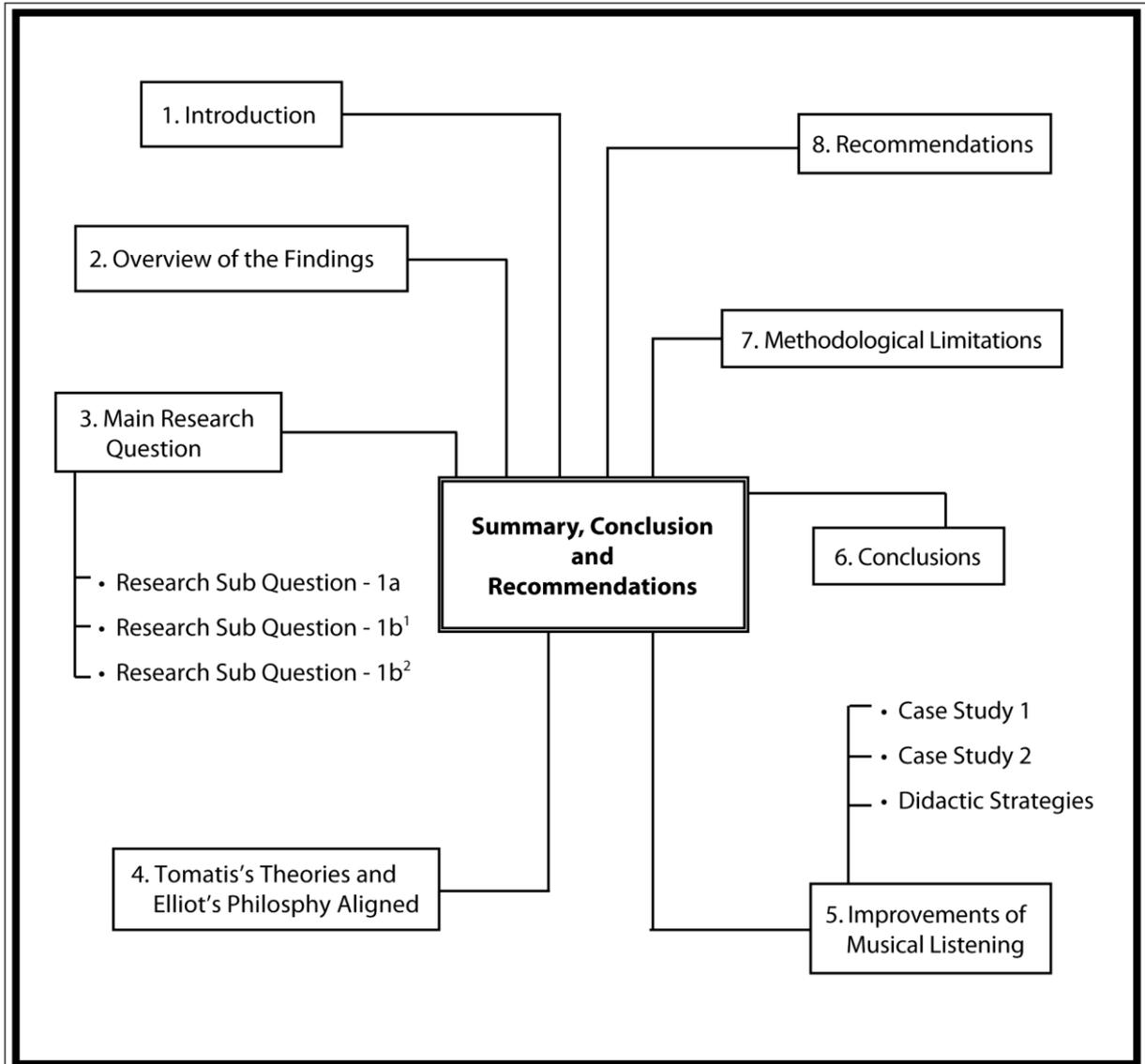
The purpose of this study was to determine how didactic methods in the Arts and Culture programme can be aligned with the methods of Alfred Tomatis in order to develop musical listening. The current researcher argued that improvements in musical listening would impact positively on teaching-learning in the Arts and Culture learning area, and specifically in music.

It is important to realise that the current researcher does not suggest that all school children, or even learners in the intermediate phase, should attend Tomatis listening sessions or even other intervention programmes based upon the Tomatis Method. This study did not aim to prove that the Tomatis Method can supplant or even supplement Arts and Culture teaching. It aimed firstly to show that musical listening can be improved through the Tomatis Method and secondly to explore how an understanding of some of the principles of the Tomatis Method can guide a teacher who aims to develop didactic methods in the Arts and Culture learning area. The current researcher does not claim that the alignment of didactic methods with the methods of Alfred Tomatis is the only course of action for Arts and Culture teachers, but the results of this study show that the research actions were not misguided, and that the choice of the Tomatis Method as a way of developing musical listening was meaningful.

This study was also not designed with the aim of developing methods and strategies for teachers. Through the “how can” in the research question (see Chapter 1), the current researcher hoped to determine in the first instance whether it is possible to pursue this alignment, and secondly to provide indications of the forms such an alignment can take. The exact formulation of alignments is a didactic matter and cannot be pursued in this research.

A summary of the results of the study, an indication of methodological limitations, conclusions, and recommendations for future research are given in this chapter as illustrated below in Figure 8.1.

Figure 8.1: Overview of Chapter 8



8.2 OVERVIEW OF THE FINDINGS

The hypothesis of this study is that musical listening can be developed when didactic methods in the Arts and Culture programme are aligned with the theories of Alfred Tomatis. It was further postulated that the statistical results of an empirical study on the development of musical listening can be augmented by descriptive case studies, and that the results of this

research will suggest modifications to current didactic methods. Since the above-mentioned hypothesis consists of several claims, each of these claims will be discussed separately under separate headings 8.4 to 8.8.

The parts of the hypothesis are cumulative. The study first aimed at proving that musical listening can indeed be developed through the Tomatis Method and music teaching. If this proved to be true, then the next step was to explore whether self-concept, creativity and cognitive flexibility (characteristics needed by learners in music) could also be increased. These first two parts of the hypothesis had to be proved through statistically significant results. Thereafter the third part (to augment the statistical results through case studies) could be undertaken.

The human psyche consists of dynamic processes characterised by complex interactions between so-called subject and so-called learning environment. It is therefore clear that many of the discussions below can be considered as speculative. Nevertheless, the researcher tried to base speculations upon the results of the research and not vague impressions or untested beliefs. Careful consideration of the results may enable teachers to gain some understanding of the possible application of insights gathered through this research. Consequently, the implications of the results of this study should ideally be worked out and even tested in classroom situations. It is the first study of its kind, and the current researcher believes that the potential opened up through this is needed and very valuable in the field of music education, and specifically in the Arts and Culture learning area.

The research question for this study was formulated because various problems were perceived in the delivery of Music in the learning area Arts and Culture; this was supported by personal experience and confirmed through discussions with other educators and by a literature review. It was therefore deemed necessary to identify the problems which are impacting on the development of skilful musical listening in music teaching within the Arts and Culture Learning Area, and to try to find solutions. The point is made in Chapter 2 that it is the Curriculum – poorly assembled and vaguely formulated and containing insufficient information on didactic methods regarding the teaching of proper listening skills – that cause some of the problems. Problems of implementation in schools were referred to, but did not form the focus of this study. If the assessment standards (the minimum level at which learners should demonstrate their achievement of the learning outcome) are not conducive to defining and supporting the teaching-learning environment, the complex system of teaching-learning in the schools and teacher training cannot function effectively or even function at all.

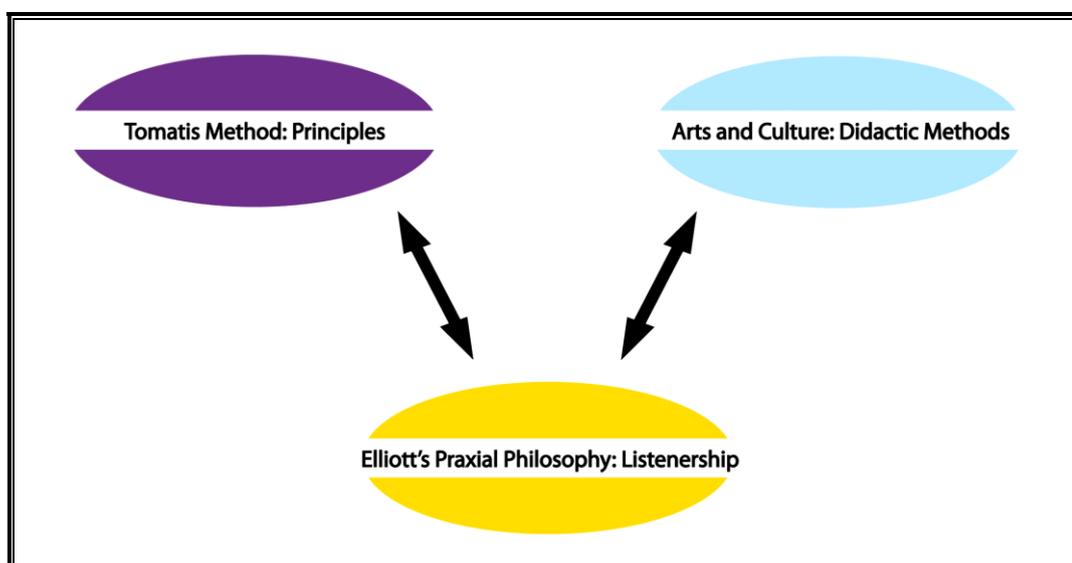
It is clear that educators are hampered by a curriculum that lacks proper didactic methods and does not promote teaching-learning in terms of skills and knowledge in Music. Learners will not be exposed to the development of skilful listening if the educator does not possess the skills for the effective teaching-learning of such skills in Music. Then the art forms, and in particular Music, cannot take their rightful place in everyday practice.

Since the current researcher views the lack of training effective listening skills in the Arts and Culture Programme as the most basic problem, the main research question was formulated from this perspective.

8.3 MAIN RESEARCH QUESTION

The main research question of this study places it clearly within the field of music education: How can didactic methods in the Arts and Culture Programme be aligned with the methods of Alfred Tomatis in order to improve musical listening? Although interdisciplinary this study is firstly embedded in music education. Elliott's praxial philosophy of music education is used as the intermediary between the principles of the Tomatis Method and the alignment of didactic methods for two reasons. Firstly the Tomatis Method is not a didactic method in music education and secondly the ideas of Tomatis and of Elliott are compatible. The research question, which relates the Tomatis Method and didactic methods in the Arts and Culture learning area, is thus answered by bringing both these aspects in relation to Elliott's praxial philosophy as illustrated in figure 8.2.

Figure 8.2: Relating Tomatis, Elliott and Arts and Culture



As stated in Chapter 1, the research question and subsidiary research questions were formulated primarily on the basis of the researcher's first-hand observation that in the Arts and Culture learning area, listenership is impacted negatively because of the curriculum and because of insufficient and unsuitable didactic methods. In order to answer the first two subsidiary questions it was necessary to quantify the data obtained through pre- and post-tests and interviews. The data is regarded as primary data because the current researcher had designed an empirical study which followed procedures utilising measuring instruments, such as the Musat Test, Tomatis Listening Test, Tennessee Self-Concept Test and Torrance Creativity Test at the core of the methodology. In order to answer the main research question, it was necessary that the answers to the first two subsidiary questions had to be based upon statistically significant results in order to show that musical listening can indeed be improved.

Because statistically significant changes were indeed observed, the third subsidiary question could be answered using the results of the descriptive case studies. Taken together the answers to the three subsidiary questions not only proved **that** didactic methods in the Arts and Culture learning area can be improved when these methods are aligned with the theories of Tomatis, but also suggests **how**. The ways in which didactic methods can be aligned for specific learners are discussed as part of section 8.5 of this study that once again relies upon Elliott's views on listenership.

An overview of how the discussions in each chapter contributed to answering the research question is given below.

In Chapter 1 it was pointed out that, for the majority of South African learners studying under Curriculum 2005, the Learning Area Arts and Culture will be the only formal music education to which they will ever be exposed. It was argued further that effective listening skills should be employed and developed in the Arts and Culture Programme, because Music, one of the interrelated strands of this learning area, is a field that is strongly based on musical listening. Other problems identified in Chapter 1 regarding Arts and Culture teaching did not form the focus of this study, and was therefore not discussed. The discussion only involved uncovering the possibility of aligning didactic methods in the Arts and Culture programme with the theories of Tomatis in order to improve musical listening.

In Chapter 2 the National Curriculum Statement for the Arts and Culture learning area was discussed in order to provide a context within which the results of this study could be discussed. This researcher did not suggest that the current National Curriculum Statement

(NCS) for Arts and Culture (Music) is insufficient in every aspect. However, it was shown that the NCS lacks the didactic clarity that is needed for the effective teaching and learning of skilful listening in the Arts and Culture learning area. Although it may seem at first that the NCS addresses aspects of the development of musical listening, the findings of this research indicate that it does not support several important principles of the development of musical listening. The development of musical listening as based upon the theories of Tomatis and the philosophy of Elliott thus formed the basic framework of this research.

In Chapter 2 the Assessment Standards of the Arts and Culture curriculum were analysed in terms of the *roles of musical listening, the design dimension of musical works, conceptual progression, and listenership*. Elliott's praxial philosophy of music education, in which Listenership equals Musicianship, was used as a foundation, since the current researcher views Listenership as the key issue in aligning the didactic methods in the Arts and Culture programme with the theories and methods of Tomatis.

Chapter 3 presented the theories of Tomatis, especially theories regarding the 'musical ear;' or musical listening.

Chapters 4 to 7 presented the statistical findings and descriptive case studies.

The statistical methods used to analyse the data obtained through the measuring instruments allowed the researcher to reflect critically on the results of the study. The current researcher used advanced statistical methods to ensure that the results would be valid and reliable, especially because of the participants involved. The patterns observed in the data are summarised below in terms of each of the sub-questions.

8.3.1 Research Sub-Questions

In order to answer the main research question, the interpretation of the results is discussed according to the research sub-questions.

It is clear that the first two of the research sub-questions (below) are answered affirmatively regarding all aspects tested in this research where Group A reflected statistically significantly better scores, reflecting more substantial changes than any of the other groups. This allowed the current researcher to answer the third sub-question also affirmatively.

8.3.1.1 Research Sub-Question (1a)

Will the Tomatis method combined with Arts and Culture teaching lead to statistically significant improvements in musical listening as evidenced by improvements in the scores of learners in group A, obtained on the Musat Test, in comparison to lesser changes in the scores of learners from the other three groups?

It is clear from the statistical results that the improvements in the scores of learners in Group A, obtained on the *Musat Test* were statistically significantly better in comparison to lesser changes in the scores of learners from the other three groups.

8.3.1.2 Research Sub-Question (1b¹)

Will the Tomatis Method combined with Arts and Culture teaching lead to statistically significant enhancement of self-concept, creativity and cognitive flexibility in group A, compared to the other groups?

Chapter 5 (Section 5.4.3.1) presents proof that the Tomatis Method combined with Arts and Culture teaching lead to the enhancement of self-concept (obtained on the Tennessee Self-Concept Test), and creativity and cognitive flexibility (obtained on the Torrance Creativity Test).

8.3.1.3 Research Sub-Question (1b²)

Can the statistical results be augmented by qualitative and descriptive case studies suggesting modifications to current didactic methods?

The discussion of the four case studies in Chapter 7 showed that it is indeed possible. More specific suggestions as to the form these modifications to the Arts and Culture curriculum can take are presented in section 8.5.

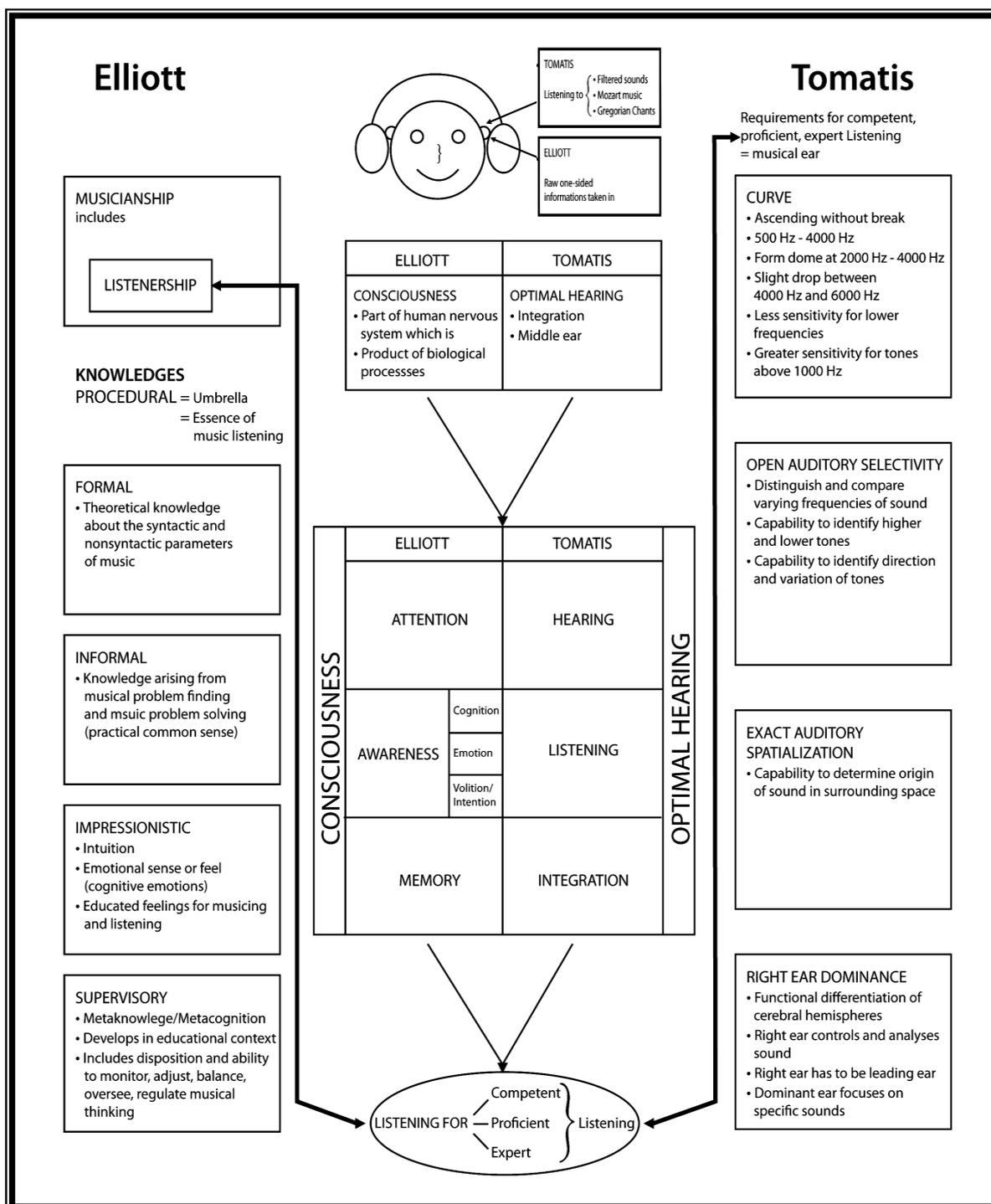
Because the modification of didactic methods according to Tomatis's theories depends upon the alignment of Tomatis's theories with Elliott's philosophy, this alignment is discussed next.

8.4 TOMATIS'S THEORIES AND ELLIOTT'S PHILOSOPHY ALIGNED

Passive listening to music does not automatically result in enhancement of musical listening. In order to develop musical listening, which forms the basis of any music education programme, didactic methods ought to incorporate active listening. This is the opinion of Tomatis and Elliott, as well as many other music educators. Both Tomatis and Elliott write extensively concerning their views on musical listening (as discussed in Chapter 2 and Chapter 3). The empirical results of this research confirm the theories of Tomatis and the philosophy of Elliott: the results show that active listening-for (Elliott's term) during the Tomatis intervention did enhance not only musical listening but also, for example, other characteristics such as integration (Tomatis's term of which the equivalent in Elliott's philosophy will be consciousness), self-concept and creativity which are concepts in both Tomatis's theories and Elliott's philosophy.

In Figure 8.3 below the diagram is an illustration of how the theories of Tomatis are aligned in this study with the philosophy of Elliott. Listenership, from Elliott's perspective, consists of 'listening-for' which develops competent, proficient and expert listening and in the opinion of the current researcher this development of listening is what happens when the ideal curve of the 'musical ear' is achieved through the Tomatis Method.

Figure 8.3: Alignment of Tomatis’s Theories and Elliott’s Philosophy



Elliott (1995:80) points out that within audition a distinction can be made between passive hearing and active listening-for. ‘Listening-for’, according to Elliott (1995:80), is ‘Listenership’. This involves attention, awareness and memory which constitute consciousness (see Figure 8.3 above). Tomatis (2005:43) also distinguishes between hearing and listening by indicating that hearing is a passive, automatic and purely sensory act, while listening is an active voluntary act. Listening is thus a transition from mere awareness to perception. He (1996:97)

emphasises that active listening is 'Optimal Hearing' and is a process of three overlapping actions which are hearing, listening and integration. Tomatis' concept of integration can be taken as referring to some aspects of Elliott's concept of thinking-in-action and knowing-in-action. Tomatis's concept of integration can also include Elliott's thoughts on awareness (cognition, emotion and intention). Personal understanding and beliefs mediate the auditory process as listening is thoughtful and knowledgeable (Elliott 1995:78, Tomatis, 1973:11; 1996:198).

The diagram (Figure 8.3) illustrates that during acts of listening raw, one-sided information is taken in (Elliott, 1995:78) and processed during what is in Elliott's view fundamentally a concealed form of thinking-in-action and knowing-in-action. The application of the combined powers of the five forms of musical knowledge produces revised and enhanced representations of this information (Elliott, 1995:80). Tomatis accordingly understands listening as an active, focusing process where sounds that are heard are analysed quickly and precisely, thus a high level activity which has its origins in the most complex of brain functions (Gilmor *et al.*, 1989:18).

According to Elliott (1995:56) listenership and musicianship can only be understood accurately if its procedural nature is understood. Procedural knowledge form the umbrella under which all other knowledge will function. This is the essence of music listening, and functions together with the four other kinds of musical knowledge which contribute to the procedural essence of music making and listening. Elliott's views on listenership and the dynamic interaction of the five forms of knowledge are interpreted by the current researcher as Elliott's attempt to understand "the neuro-physio-psychological processes underlying musical expression" (Gilmor *et al.*, 1989:91) which, according to Gilmor, is understood better in light of Tomatis's theories.

As explained above, Listenership is active listening-for and involves competent, proficient and expert levels of music listening. Elliott's profile of expert levels of music listening depends upon Tomatis's profile of good hearing which he called the 'musical ear'¹. The current researcher believes that expert musical listening depends upon the characteristics of Tomatis's concept of the musical ear. In this regard the two case studies from Group A are relevant. The two participants' listening curves became more like the ideal curves (after the intervention) and their scores on the Musat Test showed that they became more competent, proficient and expert listeners to music.

¹ The 'musical ear' has special features already discussed in Chapter 3.

Four of Elliott's five forms of musical knowledge are nonverbal. He believes that performers "think nonverbally in action, reflect-in-action, and know-in-action" (Elliott, 1995:56), while Tomatis posits that "listening is a very high-level perceptual function" (Tomatis, 2005:25, 43) even though it influences communication through language.

8.5 IMPROVEMENT OF MUSICAL LISTENING

The results of this study presented to this point showed that didactic methods in the Arts and Culture programme **can** be aligned to a meaningful extent with the theories of Alfred Tomatis. This answered the first aspect of the main research question. The **how** of the alignment referred to in the main research question still remains to be answered. Answers to this 'how' question will contribute to teachers' insights regarding the ways in which the musical listening of specific learners can be improved in ways that will make the learners more receptive and more productive in the Arts and Culture programme. The alignments that need to be made for specific learners are discussed in this section in terms of the case studies of the two participants from group A.

The main research question is thus answered in this section in terms of the results from two of the descriptive case studies. Teachers do not work with percentages or results regarding groups but with individual learners. Each learner in an Arts and Culture class has a unique self-concept, creativity and musicality. They each have an individual personality, specific talents and personal levels of intelligence which must be taken into consideration when applying didactic principles.

To achieve a competent level of listening and to create music competently, proficiently and expertly, each learner has to acquire critical thinking-listening abilities. These abilities develop through assessing and testing the outcomes of the particular learner's musical choices in a classroom environment that is focused, structured and meets the requirements of fundamental education. In music education the environment should primarily be auditory, and well-structured.

Even though the alignment of didactic methods is discussed in terms of specific learners, there are aspects applicable to all learners that were highlighted in this research. These aspects pertain to musical listening, the teaching-learning environment and the curriculum. In order to contextualise the suggestions made below regarding the specific learners, these interrelated aspects are briefly discussed.

Music listening is a matter of minding, as Elliott and various other music educators and music philosophers argue. It involves various cognitive processes, and therefore music makers (always also listeners) benefit from formal knowledge about the syntactic and nonsyntactic parameters of music (see Chapter 2). However theoretical knowledge should not be the focus of teaching-learning activities. Knowledge should in the first instance be knowledge-in-action: informal knowledge, impressionistic knowledge, supervisory knowledge and procedural knowledge. The cognitive processes of musical listening need enabling environments to grow. The results of this research indicated that the National Curriculum Statement (NCS) for Arts and Culture (Music) lacks depth and focus and does not assist learners to identify, construct, organise, and analyse successive and simultaneous musical patterns **aurally** in order to become competent, proficient and expert listeners. The current research highlighted the teacher's responsibility in creating these enabling environments and is convinced that such attempts can be beneficial in terms of improvements in musical listening.

As argued in Chapters 1 and 2, the haphazard environments engendered by problems in Arts and Culture teaching necessitate reliable research and reflective practice. These practices should aim to create classroom situations where passive hearing, which is an automatic and purely sensory act, will be transformed into active listening-for, a voluntary act, in order to establish the transition from mere awareness to perception as achieved in the Tomatis Method. Therefore musical listening will be enhanced when:

- Elliott's five kinds of musical knowledge form the root of the curriculum and lesson planning. This will allow for a focus on musicing, and more specifically, listenership.
- the Arts and Culture Curriculum promote aptitude, knowledge and skill.
- learners are not bombarded with sound patterns of which they can only process to a limited degree.
- the learning environment actively counteracts thoughtless listening by including specific music with high frequencies to which the learners will be exposed (i.e. Gregorian chants and violin concertos of Mozart).
- the outcomes of the Arts and Culture syllabus (Music) are based upon the cognition of auditory patterns that are conducive to attending, scanning, identifying, interpreting, constructing and comparing sounds.
- the understanding of auditory patterns are promoted.
- conceptual progression, as explained in Chapter 2, is a foundation of the curriculum.
- auditory information is transferred to learners in such a way that they can grasp and understand it through hearing in the first place. This will involve tailoring didactic strategies according to degrees of attention, awareness and memory.

Although not critical to the initial development of **proficient and excellent** musicians, the following are contributing factors to the development of **competent** listeners. The broader everyday environment can greatly impact on the teaching-learning environment and therefore questions such as the following will also have an effect on the delivery of Music in the Arts and Culture learning area. A discussion of the implications of these questions, however, does not form part of this research.

- Are learners from an environment rich in stimuli?
- Are learners from previously disadvantaged environments?
- Are learners exposed to resources like televisions where they can watch programmes on music, instruments, etc. and do they have access to radios, CD players and other sound equipment? Are these resources sustainable?
- Is there transport available to take learners to music performances, concerts and other music activities?

Answers to the questions above will influence curriculum planning. Elliott (1995:99) suggests that a music education curriculum should be based on systematic efforts to appreciate and make music competently. This will place learners at the centre of the belief system that honours different musical practices. Music education should be focused on creating opportunities for learners to experience challenges within an environment conducive to the progressive development of competent, proficient, and excellent musicians/listeners (see Elliott, 1995:96), an environment in which their critical dispositions and educated feelings for the music will be developed.

Against this background brief summaries of the case studies of the Group A participants are given in order to outline didactic strategies consistent to their level of musical listening.

8.5.1 Case Study: Participant A9

This male participant reflected positive change with regard to the fact that the blockage in selectivity disappeared in both the right and the left ears as indicated in the Tomatis Listening Test after exposure to the Tomatis Method. His hearing acuity seems much higher than in the pre-test. Positive changes suggest that he became more dominant in the right ear. His concentration might still have been a slight problem, but with fewer effects as the listening curves improved drastically. The improved listening curves without any selectivity errors were a strong indication that he had indeed become right ear dominant.

At commencement of the intervention the psychologist experienced him as a very difficult child who showed little improvement at first but during the course of the programme his behaviour and attitude improved in such a way that his mother asked for him to be seen by the psychologist on a regular basis after completion of the empirical research. She explained that he did better at school and was more interested in school work after the intervention because of improved concentration and focus. Also his family relations improved: he developed greater tolerance for his father's disinterestedness and related better with his mother. He asked more questions and was more confident. Thus, the case study is a good portrayal of the effect of the Tomatis Method on listening enhancement.

8.5.2 Case Study: Participant A30

The Tomatis Listening Test curves indicate a slight improvement in the perception of higher frequencies in the right ear and localization errors are limited to three in the left ear only. Results suggested improved listening. Feedback by this girl's mother suggested that left ear dominance changed to right ear dominance because she became more fond of music which is strongly associated with right ear dominance. After the Tomatis intervention she asked many questions about the types of voices, style periods, etc. and demanded answers. Her voice also sounded different when she wanted something. Her mother noticed that she used her voice more effectively. She expressed more emotion in her voice than before. She danced and sang more often and became a performer like her sister. After the Tomatis intervention, she developed excellent concentration abilities, became relaxed and in control and more confident. Therefore the results suggested that the Tomatis Listening Programme contributed to enhancement of aspects of her musical listening, self-concept and creativity. Progress as far as development of listening and associated positive effects is illustrated in this case study.

8.5.3 Didactic Strategies

In order to explain the didactic strategies that a teacher should consider when teaching these specific learners, the current researcher will employ the same categories as in Chapter 2 (see 2.5.2) and two of these categories will be discussed. A category 1 assessment standard that can be taken as an example is 5) *Recognizes the letter names of notes on lines and in spaces on a treble staff and their differences in pitch*. Knowing letter names is an example of formal knowledge. Informal and impressionistic knowledge will be developed simultaneously

with formal knowledge once the teacher makes this assessment standard more practical when these learners are requested to echo the notes played by the teacher on a recorder and then to write the symbols on staff notation.

The didactic strategy used will ensure that these two learners will have to judge their own effectiveness in notating the pitches. The improvements in musical listening as well as in the other characteristics of both participants suggest that they will be able to judge their own effectiveness in didactic situations more competently than before the intervention: their abilities to discriminate pitches improved as well as their ability to concentrate and their interest in academic work and play. When the teacher helps them to develop learning strategies and enable them to become more self-directed, their supervisory knowledge can develop. As a result their self-esteem (already positively impacted by the intervention and aligned didactic strategies) will be enhanced because (see Section 2.4.2) their self-growth, self-knowledge and enjoyment will increase when the knowledge required for meeting significant challenges in a particular context or domain of effort is developed.

The didactic activity suggested involves only a small aspect of musicing (namely the use of symbols for pitches), and for this reason it will not contribute greatly to the development of procedural knowledge. As suggested in Chapter 2, it should be combined with other activities (such as those suggested below) that involves performance, composing, arranging, and conducting. Augmenting the didactic strategies to include opportunities to perform will likely be very successful in the case of participant A30 who (after the Tomatis intervention) became fonder of performing, according to her mother's feedback. Participant A9, who became more right ear dominant, will enjoy these musical activities more than before, because these suggested didactic strategies give him the opportunity to exercise his new listening abilities in authentic contexts.

An assessment standard from the category 2 list that will be discussed is *14) Reads and sings or plays the scale and simple melodies in C Major*. In the new teaching-learning activity suggested for this assessment standard (see Chapter 2 Section 2.5.2), formal knowledge becomes embedded in a more authentic context of musicing. Since the strategy suggested once again involves music performance, and because learners can judge their own achievements through listening, this strategy will develop both informal and impressionistic knowledge. As above, a teacher's guidance of learners' reflection on their actions will help these specific learners to develop supervisory knowledge. Because this didactic strategy involves musicing it will develop procedural knowledge through musical listening. The

changes observed in the two participants' musical listening and other characteristics will (as in the case of the previous didactic strategy) facilitate their musical learning.

Therefore "what goes on in consciousness during the making of creative products involves the same kinds of cognitive strategies used in metaphorical, analogical, and lateral forms of thinking" (Elliott, 1995: 223-224), thus "the roots of ordinary thought are also the roots of the kind of thinking that yields creative achievements." It is clear from the improved scores obtained by both participants on the Torrance Creativity Test that the enhancement of musical listening according to the principles of Tomatis also enhances creativity. When the didactic strategies allow learners to exercise the improved creative abilities, a virtuous cycle can be set in motion: better learning increases creativity, and increased creativity becomes the basis for better learning. Musical creativity apply to achievements of musical composing, improvising and arranging that are original and significant within the context of a particular musical practice. Employing the five kinds of knowledge and continuously making efforts in a specific domain of practice are the main sources of creative achievements (Elliott, 1995:217). The two learners under discussion will thus thrive in creativity as well as cognitive flexibility once the teacher, as one of her didactic strategies, lets them perform, compose, arrange and conduct.

In schools where the Tomatis Method is obviously not available it is suggested that teachers focus more strongly on stimulating learners with music like the music of Mozart and Gregorian chants. Teachers should be realistic and understand that for change to take place it will take longer and will be slower.

Furthermore the teacher should be aware of the posture of the learners in class as upright posture is more conducive to benefit from music containing higher frequencies. The teachers should realise the impact of their own body language and also focus on their own posture and concentrate on the delivery of a good quality voice.

Most important is the active listening-for instead of passive listening that should be facilitated in the Arts and Culture classes.

8.6 CONCLUSIONS

Firstly, it is concluded that the Tomatis Method was successfully applied to experimental Group A concerning improvement of musical listening, compared to Group B who was only exposed to recordings of Mozart music, as well as Group C (exposed to the Arts and Culture programme), and Group D, the non-intervention control group. The significance of the results regarding the improvement of musical listening is amplified when one considers the fact that Group A's scores also exceeded those of the other groups on self-concept, creativity and cognitive flexibility.

Secondly, the identification of a potential research problem emanated from the researcher's involvement in the Arts and Culture programme as a music teacher who sensed that the programme did not provide methods to develop musical listening. Empirical demonstration that musical listening can be developed, given the necessary stimulation (Tomatis Method in this case) thus constitutes a second conclusion; namely that the results produced by the study can be used to facilitate the process of addressing the didactic weaknesses in the Arts and Culture programme.

Thirdly, it is concluded that the alignment of Tomatis's theories and Elliott's praxial philosophy is justified, based on the outcome of the current study and viewed in the context of the Arts and Culture programme.

Finally, despite the fact that the results of this study cannot be generalised beyond the current participants, it provides a framework within which suggestions can be applied in small scale experiments to test the effect of the practical alignment of Tomatis's theories and Elliott's praxial philosophy on learners in the Arts and Culture programme.

The impact of the Tomatis Method and the benefits to be gained from exposure to this Method were identified in the current research. In view of the fact that the National Curriculum Statement (NCS) for Arts and Culture (Music) is unclear about the role of musical listening, this research touched the core of one of the problems in the current Arts and Culture programme and provided information that may contribute to solving some of the problems.

8.7 METHODOLOGICAL LIMITATIONS

The methodological limitations are listed briefly.

- As the main research was confined to forty eight previously disadvantaged Grade 4, 5 and 6 learners from the Christian School on the Potchefstroom Campus of North-West University, the results of this study cannot be generalised.
- During post-testing the Audiolaterometer that measures laterality malfunctioned. The result was that the current researcher could not obtain any data regarding this very important aspect of the Tomatis Method and interpretations regarding laterality had to be speculative.
- Feedback from parents proved to be an important source of information. Had the current researcher obtained feedback from parents of other participants, and not only Group A, it would have enabled the researcher to draw even more meaningful conclusions. However, the scope of the research and complexity of the method obviated the researcher from pursuing this step.
- Due to a Tomatis programme in progress participants in this study could only commence their listening sessions from 16H00 onwards. This meant that they were tired and cold by the time they attended the listening sessions which commenced during late autumn. This could have limited the benefits of the Tomatis intervention.
- A statistical consultant at the Potchefstroom Campus of North-West University recommended that a significance level of 10% should be used as the data sets may not be large enough to indicate significance at a 5% level.

8.8 RECOMMENDATIONS

The following recommendations are made in relation to the target group of this research. Solving the research problem can contribute in important ways to solving the other problems in the Arts and Culture learning area identified in this study.

- Seeing that the focus of this research was more on the effects of the Tomatis Method, the deficiencies in the National Curriculum Statement (NCS) for Arts and Culture (Music) can be investigated more thoroughly in other studies.
- Because of the presence of an optimal integration effect of the Tomatis programme, it is recommended that future research designs, where participants include Intermediate Phase learners, would make provision for follow-up data collection at six and twelve months post-programme.

- The outcomes obtained by a limited number of teachers utilising the alignment between the theories of Tomatis and Elliott's praxial philosophy over a number of months can be compared to results obtained by group of teachers who simply continue to teach Arts and Culture form the existing curriculum.
- Replication studies involving larger groups are advised.

ANNEXURE A

INFORMED CONSENT

Consent

Title of project:

**Developing musical listening according to the principles of the Tomatis Method:
An application in the Arts and Culture learning-area.**

I, the undersigned(full names) read the information regarding the project mentioned and I declare that I understand the information. I was given the opportunity to discuss aspects of the project with the project leader, and I hereby give consent that my child may participate in this project. I indemnify the University, any employees and/or students of the University, of any liability against the participant mentioned, which may occur during the course of the project. I furthermore agree not to submit any claims against the University regarding damage of any kind or personal detrimental effects due to the project, the University, its employees and/or students, or any other participants, unless it is a direct consequence of negligence by the University, its employees and/or students.

Signature of parent /guardian.....

Signed at on.....

Witnesses

1.

2.

Signed at on.....

ANNEXURE B

CONFIDENTIAL QUESTIONNAIRE FOR PARENTS

We are grateful that you have allowed your child to participate in the recent research project. If you noted any changes /differences in your child since the beginning of the project, we would like to know about that. Therefore we would appreciate it if you would kindly respond to the following statements and questions:

NAME OF PARENT:-----

NAME OF CHILD: ; Grade:

Instructions:

Please tick the relevant box

- i. I have observed nothing significant, either positive or negative in my child's behaviour, since participating in the project
- ii. My child has changed emotionally, since participating in the project: he/she is more difficult, irritable, moody since participating in the project.
- iii. My child has become more manageable since participating in the project: he/she is more relaxed, easy going, friendly
- iv. My child has become more communicative since participating in the project: he/she is talking more, tells me more about what is happening in school, for instance, talks more with brothers and sisters.
- v. My child is more quiet since participating in the project: does not speak as much as before, is more on his/her own; keeps to him/herself.
- vi. My child is more disruptive since participating in the project: fights more, is troublesome, demands attention.
- vii. My child is more peaceful since participating in the project: plays happily, gets on better with others, more obedient.
- viii. Since participating in the project, I have noted changes in my child's daily habits: he/she sleeps more peacefully, has a better appetite, concentrates better.
- ix. Since participating in the project, my child is more loving: wants me to hug him/her; snuggles against me and seeks my attention more than in the past.
- x. Since participating in the project, my child is becoming more independent.
- xi. What is the birth order of your child who participated in the project:
Eldest
Middle child
Youngest child
Only child
Late lamb
Other?
- xii. Is your child reasonably healthy?
Yes
If not, what illness(es) did he/she currently have?
State briefly:

- xiii. How is your child currently performing academically at school?
Well
Reasonably well
Poorly
- xiv. Has your child suffered any traumatic (shocking) experiences?
Yes
Please explain briefly
- No, none.
- xv. What is your child's attitude towards music?
Very fond of listening to music
Not so fond of music
Fond of music and plays a music instrument.
- xvi. What is your personal attitude towards music?
Very fond of listening to music
Not so fond of music
Fond of music and plays a music instrument
- xvii. About your marital status:
Are you married and is your husband living in your home with you?
Are you divorced and living as a single mother?
Are you a widow?
Do you have a live-in (saamwoon) partner?
Have you never been married?
- xviii. Is your total combined income:
Between R500.00- R2 000.00 per month
Between R2 100.00- R5 000.00 per month
Between R5 100.00 –R10 000.00 per month
R10 000 +

Thank you for completing this **confidential** parent questionnaire

Reply slip

NAME OF PARENT:

I confirm that I have received the Confidential Parent Questionnaire.
I undertake to return the completed questionnaire to the Christian School.

BIBLIOGRAPHY

ADAMS, GS. 1966. Measurement and evaluation in education, psychology and guidance. New York: Holt, Rinehard & Winston.

ANASTASI, A. 1976. Psychological testing. 4th ed. New York: Macmillan.

ARMSTRONG, P.I., ROUNDS, J. & HUBERT, L. 2007. Re-conceptualizing the past: Historical data in vocational interest research. *The Journal of Vocational Behavior*, 72(3): 284-297.

BAMFORD, A. 2004. The wow factor: Global research compendium on the impact of the arts in education. München/Berlin: Waxmann Münster.

BLATRIX, S. 1999. <http://www.cochlea.org/in/spe/inner-ear.html> Date of access: 28 Oct. 2011.

BOHRNSTEDT, G.W. & KNOKE, D. 1981. Statistics for social data analysis. Illinois: f.e. peacock.

BOSHOFF, T. 2006. The compilation and evaluation of a creativity programme for children in middle childhood. Potchefstroom: NWU. (Thesis – Ph.D.).

BROWN, F.G. 1976. Principles of educational and psychological testing. New York: Holt Rinehart & Winston.

BRUNER, J. 1996. The culture of education. Cambridge, MA: Harvard University Press.

BURGER, S. 1999. Die effek van 'n gestruktureerde oudiopsigofonologiese program met musikale jong volwassenes. Potchefstroom: PU for CHE (Thesis – M.A.).

CAROLUS, M. 1995. Musical creativity as an aspect of aesthetic education towards a "Mandela" approach in transforming music education in South African schools. *Conference proceedings of the SAMES conference 1995: Transformation through music education*. Johannesburg: University of the Witwatersrand, 55-60.

CHARLES, C.M. 1995. Introduction to educational research. 2nd ed. New York. Longman.

- CHIA, J., & MATTHEWS, J. 1995. A window on an art classroom. *INSEA News*, 2(1):4-7.
- CHISHOLM, L. 2000. South African curriculum for the twenty-first century. Report on the review committee on curriculum 2005. Presented to the Minister of Education, Professor Kadar Asmal: Pretoria. 31 May 2000. <http://www.policy.org.za> [Date of access: 17 July 2007]
- CLAUSER, G. 1971. Die vorgeburtliche Entstehung der Sprache als anthropologisches Problem. Stuttgart: Ferdinand EnkeVerlag.
- COHEN, J. 1988. Statistical power analysis for behavioural sciences. 2nd ed. New York: Lawrence Erlbaum.
- COHEN, L., MANION, L. & MORRISON, K. 2002. Research methods in education. 5th ed. London: Routledge Falmer.
- CRONBACH, L.J. & MEEHL, P.E. 1955. Construct validity in psychological tests. *psychological bulletin*, 52(1):281-302.
- CRONBACH, L.J. 1970. Essentials of psychological testing. New York: Harper & Row.
- DE KLERK, J.E. 2003. Hypnotherapeutic ego strengthening with coronary artery bypass surgery patients and their spouses. Potchefstroom: PU for CHE. (Dissertation – M.A.).
- DE VOS, A.S. & STRYDOM, H. 2009. Research at grass roots: for the social sciences and human service professions. 3rd ed. Pretoria: Van Schaik.
- DREVER, J. 1976. *A dictionary of psychology. Revised edition.* Middlesex, England. Penguin Books, Ltd.
- DU PLESSIS, W.F., VERMEULEN, C.M. & KIRSTEN, D.K. 2004. The impact of a combined psycho-educational program on weight preoccupied, female South African students. *Ricochet: International Journal of Tomatis Method research*, 1(1):63-74, May.
- DU PLESSIS, W.F., WISSING, D.P., MUNRO, M., BURGER, S., & NEL, W. 2001. Multimodal enhancement of culturally diverse, young adult musicians: a pilot study involving the Tomatis method. *South African Journal of Psychology*, 31(3):35-42.

- DURRHEIM, K. 2002a. Quantitative measurement. Cape Town: University of Cape Town Press.
- DURRHEIM, K. 2002b. Research in practice. Cape Town: University of Cape Town Press.
- EDUCATION AFRICA FORUM. 1997. 1st ed. Johannesburg: Education Africa.
- EISNER, E. 1999. The national assessment in the visual arts. *Arts Education Policy Review*, 100(6):16-19.
- ELLIOTT, D.J. 1995. Music matters. New York: Oxford University Press.
- ELLIOTT, D.J. 2005. Praxial music education, reflections and dialogues. New York: Oxford University Press.
- FIELD, A. 2005. Discovering statistics using SPSS. London: SAGE.
- FITTS, W.H. & WARREN, W.L. 1988. Tennessee self-concept scale. TSCS:2. 2nd ed. Los Angeles, California.
- FOUCHÉ, C.B. 2003. Research workshop: Qualitative and quantitative approaches (*Class notes*).
- FRENCH, J.W. & MICHAEL, W.B. 1966. The nature and meaning of validity and reliability. New York: MacMillan.
- GHISELLI, E.E. 1964. Theory of psychological measurement. New York: McGraw-Hill.
- GIDISH, L. 1998. Die mozart-effek. *Leeftyd*: 20-22, Feb-March.
- GILMOR, T. 1999. Efficacy of the Tomatis Method with learning and communication disorders: a meta-analysis. *International Journal of Listening*, 13:12-23.
- GILMOR, T., MADAULE, P., & THOMPSON, B. 1989. About the Tomatis Method. Toronto: The Listening Centre Press.
- GORDON, E.E. 2006. Music learning theory: Resolutions and Beyond. Chicago: GIA Publications.

- GUBA, E., & LINCOLN, Y. 1994. *Competing paradigms in qualitative research*. California: Sage.
- GUILFORD, J.P. & FRUCHTER, B. 1984. *Fundamental statistics in psychology and education*. 6th ed.. Singapore: McGraw-Hill
- GUION, RM. 1965. *Personnel testing*. New York: McGraw-Hill.
- HARGREAVES, D.J. & ZIMMERMAN, M.P. 1992. *Developmental theories in the new handbook of research on music teaching and learning: A project of the music educators' national conference*.
- HARRIS, T. s.a. <http://static.howstuffworks.com/gif/hearing-2.jpg> Date of access: 09 Nov. 2005.
- HELMSTADTER, G.C. 1964. *Principles of Psychological Measurement*. New York: Appleton-Century-Crofts.
- HOADLEY, U. & CHISHOLM, L. 2005. Report A: An analysis of the strengths and shortcomings of the current orientation documents for the implementation of the revised national curriculum statement in the senior phase. (Report for the curriculum Directorate, National Department of Education, South Africa). Pretoria: Government Printer.
- HOWELL, D.C. 1999. *Fundamental statistics for the behavioural sciences*. 4th ed. London. Brookes.
- HUGO, L. 2005. *The development and evaluation of a self-concept enrichment programme for children age 7-9 years*. (Thesis – M.A.).
- HUYSAMEN, G.K. 1976. *Beskrywende statistiek vir sosiale wetenskappe*. Pretoria: Academica.
- HUYSAMEN, G.K. 1980. *Inferensiele statistiek en navorsingsontwerp*. Pretoria/Kaapstad: H&R Academica (Edms.) Bpk.
- HUYSAMEN, G.K. 1989. *Psychological & educational test theory*. Abridged Edition. Bloemfontein: G.K. Huysamen, UOFS.
- HUYSAMEN, G.K. 1998. *Psychological & educational test theory*. Bloemfontein: Van Schaik.
- JACKSON, S.L. 2003. *Research methods and statistics: A Critical Thinking Approach*. Wadsworth: Thompson.

JAKUES-DALCROZE, E. 1967. Rhythm, music education. London: Riverside Press.

KAZDIN, E.A. 1986. Comparative outcome studies of psychotherapy: Methodological issues and strategies. *Journal of consulting and clinical psychology*, 54(1):95-105.

KELLY, S.N. 2009. Teaching music in American society: A social and cultural understanding of music education. Routledge: New York.

KERLINGER, F.N. 1992. Foundations of behavioural research. 3rd ed. Forth Worth, TX: Harcourt Brace College.

KERLINGER, F.N. & LEE, H.B. 2000. Foundations of behavioural research. 4th ed. Forth Worth, TX: Harcourt College.

KLOPPER, C.J. 2004. Variables impacting on the delivery of music in the learning area arts and culture in South Africa. Pretoria: UP. (Dissertation – Ph.D).

LEEDY, P.P. & ORMROD, J.E. 2001. Practical research, planning and design. 7th ed. New Jersey: Prentice Hall.

LEUNG, C.C. 2004. A theoretical framework in music education for the advancement of traditional cultures under the thrust of globalization. *Finnish Journal of Music Education*, 7(1):22-35.

LINCOLN, Y.S. & GUBA, E.G. 1985. Naturalistic inquiry. Thousands Oaks, CA: Sage.

LINDBLAD, S. & POPKEWITZ, T. 2004. Education restructuring: international perspectives on travelling policies. Greenwich: Information Age Publishing.

MADAULE, P. 1976. Audio-psycho-phonology for singers and musicians. Potchefstroom: PU for CHE.

MADAULE, P. 1993. When listening comes alive: a guide to effective learning and communication. Ontario Canada: Moulin Publishing.

MADAULE, P. 1994. When listening comes alive: a guide to effective learning and communication. 2nd ed. Canada: Moulin Publishing.

MADAULE, P. 2001. Listening training and music education. *The South African Music Teacher*, 137:10-13, July.

MAGNUSSEN, D. 1966. Test theory. Ontario: Don Mills.

MARK, 2007. Human Hearing: Amplitude Sensitivity Part 1
http://www.audioholics.com/education/acoustics-principles/human-hearing-amplitude-sensitivity-part-1/clip_image001.gif/image_preview
Date of access : 17 July 2007.

MCBURNEY, D.H. & WHITE, T.L. 2004. Research methods: Validity. 6th ed. Wadsworth: Thomson.

MITCHELL, M.L. & JOLLEY, J.M. 2004. Research design explained. 5th ed. Toronto: Wadsworth/Thomson Learning.

MOULTON, J. 2001. How to succeed in your master's and doctoral studies: a South African guide and resource book. Pretoria:Van Schaik.

NEUMAN, W.L. 2003. Social research methods: Qualitative and quantitative approaches. 6th ed. Boston: Pearson Education.

NICOLOFF, F. 2004. Case studies of children with dyspraxia following intervention with the Tomatis method program. Ricochet: *International Journal of Tomatis Method research*, 1(1): 30-35, May.

OPPENHEIM, A.N. 1992. Questionnaire design, interviewing and attitude measurement. London: Continuum.

PARKINSON, M. 2008. How to master psychometric tests. 4th ed. London & Philadelphia: Kogan Page.

PRATT, G. 1990. Aural awareness: principles and practice. Philadelphia: Open University Press.

REGELSKI, T. A. 2005. Curriculum: Implications of aesthetic versus praxial philosophies. New York: Oxford University Press.

ROLF, A.S. 1998. Die Evaluering van 'n oudiopsigofonologiese verrykingsprogram vir psigologiestudente. Potchefstroom: PU for CHE (Dissertation – M.A.).

ROSENTHAL, R., & ROSNOW, R.L. 1999. Beginning behavioural research: A conceptual primer. 3rd ed. Upper Saddle River: Prentice-Hall.

RUDESTAM, K.E. & NEWTON, R.R. 2001. Surviving your dissertation: A comprehensive guide to content and process. 2nd ed. California: Sage Publications, Inc.

SANDERS, L.D. 2010. Discovering research methods in psychology. West Sussex: BPS Blackwell.

SCHWEIZER, K. 2011. On the changing role of Cronbach's alpha in the evaluation of the quality of a measure. *European Journal of Psychological Assessment*, 27(3):143-144.

SELLTIZ, C, WRIGHTSMAN, L.J., & COOK S.W. 1976. Research methods in social relations. 3rd ed. New York: Holt, Rinehart & Winston.

SHAHIDULLAH, S. & HEPPEL, P.G. 1992. Hearing in the fetus: Prenatal detection of deafness. *International Journal of Prenatal and Perinatal Studies*, 4(3/4):235-240.

SHAUGHNESSY, J.J., ZECHMEISTER, E.B. & ZECHMEISTER, J.S. 2006. Research methods in psychology. 7th ed. New York: McGraw-Hill.

SMITH, S.M. 2004. The time is right: a syllabus assessment program for the US. *Visions*, 24-27. August.

SOUTH AFRICA. 1994. White paper on the reconstruction and development programme. Cape Town: Government Printers.

SOUTH AFRICA. 1995a. Education and training in a democratic South Africa: First steps to develop a new system. *Government Gazette*, 16312, 15 March 1995.

SOUTH AFRICA. 1995d. White paper on education and training. Government gazette No.16312. Pretoria: Government Printers.

SOUTH AFRICA. 1996a. Lifelong learning through a national qualifications framework. Pretoria: Department of Education.

SOUTH AFRICA. 1997a. Curriculum 2005. Pretoria: Department of Education.

SOUTH AFRICA. 1997c. Draft proposals for policy documents concerning music in schools in the province of the Eastern Cape.

SOUTH AFRICA. 1997d. Policy document: senior phase (Grades 7 to 9). Pretoria: Department of Education.

SOUTH AFRICA. 2000. Revised national curriculum statement. Grades R-9 (Schools) Policy: Arts and Culture. Pretoria: Department of Education.

SOUTH AFRICA. 2002b. Revised national curriculum statement grade r-9 (schools) policy overview: Arts and Culture. Pretoria: Department of Education.

SPATA, A.V. 2003. Research methods, science and diversity. New York: John Wiley & Sons.

STEVENS, S.S. 1951. Handbook of experimental psychology. New York:Wiley & Sons.

STEYN, AGW. , SMIT, CF., DU TOIT, SHC. , STRASHEIM, C. 1996. *Moderne statistiek vir die praktyk*. Pretoria: JL Van Schaik Uitgewers.

STUTT, H.A. 1983. The Tomatis Method: A review of current research. Montreal: McGill University.

SUNDBERG, N.D. 1977. Assessment of persons. New Jersey: Prentice-Hall.

SWANWICK, K. 1991. Music curriculum development and the concept of features. *Journal of Aesthetic Education*, 25(3):147-162.

TATUM, J.M. 2004. Tomatis-assisted speech therapy. *Ricochet: international journal of Tomatis Method research*, 1(1):37-41, May.

TAYLOR, N. 1997. Curriculum 2005: Some issues. *Joint Education Trust Bulletin*, 7:1-3, October.

THOMPSON, B. 1996. Listening: More than hearing. *Hearing Health Magazine: The Cutting Edge: Pushing the Boundaries of Hearing Science*. Ingleside, TX: Voice International Publications.

THOMPSON, B.M. 2004. The Tomatis Method, listening test, and the electronic ear. *Ricochet: International Journal of Tomatis Method Research*, 1(1):55-58. Phoenix, AZ.

THOMPSON, M. 2004a. The Tomatis Method, listening test, and electronic ear. *Ricochet . International Journal of Tomatis Method Research*, 1(1):55, May.

THOMPSON, B.M. 2004b. Tribute from members of IARCTC to dr. Alfred A. Tomatis (1920 – 2001). *Ricochet: International Journal of Tomatis Method Research*, 1(1):43-48, May.

THOMPSON, B.M. 2004c. The Tomatis Method, listening test, and electronic ear. *Ricochet: International Journal of Tomatis Method Research*, 1(1):55, May.

THOMPSON, B.M., & ANDREWS, S.R. 1999. The emerging field of sound training. *IEEE Engineering in Medicine and Biology*, 18(2): 89-96, March.

THOMPSON, B.N., & ANDREWS, S.R. 2000. A historical commentary on the physiological effects of music: Tomatis, Mozart, and neuropsychology. *Integrative Physiological and Behavioural Science*, 35(3):174-188, July.

TOMATIS, A.A. 1972. *La liberation d'Oedipe*. Paris: Les Editions ESF.

TOMATIS, A.A. 1978. *Education and dyslexia*. Friburg: A.I.A.P.P.

TOMATIS, A.A. 1987. *The ear and the voice*. Maryland: Scarecrow Press, Inc.

TOMATIS, A.A. 1991. *The conscious ear*. New York: Station Hill Press, Inc.

TOMATIS, A.A. 1996. *The ear and language*. Ontario: Moulin Publishing.

TOMATIS, A.A. 2005. *The ear and the voice*. English translation by Roberta Prada. Maryland: Scarecrow Press.

TORRANCE, E.P. 1974. *Torrance tests of creative thinking*. (Norms-technical manual). Lexington/Massachusetts: Personnel Press.

TORRANCE, E.P. & DAUW, D.C. 1965. Mental health problems of three groups of highly creative high school seniors. *Gifted Child Quarterly*, 9:123-127.

TORRANCE, E.P. & HALL, O.E. 1984. Torrance test of creative thinking streamlined (revised) manual. (Figural A & B). Bensenville, IL: Scholastic Testing Services.

TRUMPS, M. 2004. Tomatis Method: integrator of rehabilitation in a traumatic brain injury (TBI) case study. *Ricochet: international journal of Tomatis Method research*, 1(1):23-29, May.

VAN DER BERG, A.M. 1993. Die effek van 'n kreatiwiteitsprogram op enkele persoonlikheidsaspekte van milieugestremde kinders. Potchefstroom: PU for CHE. (Thesis – PhD).

VAN DER MERWE, C. 2009. Evaluating conceptual progression of music assessment standards. *Musicus*. 37(2):13-31.

VAN JAARSVELD, P.E. 1981. Oudiopsigofonologie: 'n teoretiese en eksperimentele benadering. Potchefstroom: PU for CHE. (Unpublished Lecture/Manuscript).

VAN JAARSVELD, P.E. 1982. Die toepaslikheid van 'n oudiopsigofonologiese program in 'n instituut vir kinder- en volwasseleiding. Potchefstroom: PU for CHE.

VAN JAARSVELD, P.E. & DU PLESSIS, W.F. 1988. Audio-psycho-phonology at Potchefstroom: a review. *South African journal of psychology*, 18(4):136-143, Dec.

VERCUEIL, A.C. 2010. The effect of the Tomatis Method on the psychological well-being and piano performance of student pianists. Potchefstroom: North-West University. (Dissertation – M.Mus).

WATKINS, J.A. 2003. A Practical guide for students to the preparation of written presentations of academic research. Johannesburg: Private Publication.

WEGELIN, A.W. *et al.* 1977. Handleiding vir die junior musiekaanlegtoets. Suid-Afrikaanse Raad vir Geesteswetenskaplike Navorsing. Pretoria: RGN.

WERNER, H. 1957. Psychology of mental development. New York: International Universities Press.

INTERVIEWS

DU PLESSIS, W.F. 2011. Personal communication. Institute for Psychotherapy and Counselling: North-West University, Potchefstroom Campus.

ELLIS, S. 2011. Personal communication. Department of Statistical Services: North-West University, Potchefstroom Campus.