

Evaluating the Tomatis® Method in promoting effective self-regulation in university students

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*Let us then fearlessly and confidently and boldly draw near to the throne of grace,
that we may receive mercy and find grace to help in good time for every need, coming
just when we need it.*

Hebrews 4:16

*I will cry to God Most High, Who performs on my behalf and rewards me [Who
brings to pass His purposes for me and surely completes them]!*

Psalm 57:2

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Summary

Evaluating the Tomatis® Method in promoting effective self-regulation in university students

Keywords: Self-regulation, listening, Tomatis® Method, interpersonal relationships, academic performance, psychological well-being, motivation, learning

This study contributed to the exploration of the applicability, value and impact of the Tomatis® Method as an instrument in promoting effective self-regulation in university students through the improvement of listening skills. Listening is a crucial aspect in self-regulation that does not appear to be adequately valued and utilised in current programmes designed to improve self-regulation skills. This study is presented in a three-manuscript format.

The first manuscript investigated the availability of scientific evidence on the nature and value of programmes in general, as opposed and in comparison to the Tomatis® Method, in promoting well-being and self-regulation of tertiary students. A systematic literature review was conducted for this manuscript. A total of 35 articles met the inclusion criteria and specific emphasis was placed on exploring the contents and limitations of interventions, conducted within tertiary learning contexts. Results indicate that although various intervention models and strategies seem to be effective in promoting students' self-regulation and well-being, actual mechanisms of change are still unknown to a large extent. Positive relationships were found between listening and aspects of self-regulation. The Tomatis® Method was shown to compare well with other interventions for the promotion of self-regulation.

The second manuscript consequently focused on evaluating the extent to which the Tomatis® Method improve self-regulation in a sample of South African university students (N=49). A

concurrent, mixed method, three-group pre-post and repeated post-assessment design, was used. The Tomatis® Method had a positive impact on hypo-responsiveness in the left ear and spatialization of the right ear, on introjected regulation and perseverance, as well as on self-regulation as a psychological and social strength (well-being). Benefits were also qualitatively observed regarding improved listening in social and academic contexts, attention and awareness, self-control and interpersonal regulation. Quantitative benefits regarding self-regulation obtained by the Tomatis group were shared to a certain extent by the Mozart group, while the benefits regarding self-regulation as psychological and social strength were only in comparison to the control group. The Tomatis® Method has potential to improve the self-regulation skills of tertiary students; however, more research needs to be done, with larger random samples to determine the extent to which the findings can be generalised, as well as to determine the possible role mediating and moderating variables play in the relationship between listening, self-regulation and psychological well-being.

The third and final manuscript aimed to develop a conceptual model that explains the perceived effect of the Tomatis® Method on students' self-regulation. Interactive Qualitative Analysis (Northcutt & McCoy, 2004) was used to identify critical factors in participants' experience of the Tomatis® Method and perceived improvement in self-regulation. The seven participants, who completed a Tomatis® Method programme, identified five themes of which 40% of the relationship pairs explained 68.085% of the variance found in the model. Findings confirmed that the Tomatis® Method is an effective mechanism for the promotion of self-regulation and behavioural change. More research is required to further explore the applicability of the Tomatis® Method as an effective approach to enhance self-regulation.

It was concluded that the study mainly contributes by addressing the gap that exists between self-regulation and auditory processing and by showing the important role it plays in attention,

specifically in relating self to self, to others and the environment on affective and general sensory integration levels.

Opsomming

Evaluering van die Tomatis® Metode in bevordering van effektiewe selfregulering in universiteitstudente

Sleutelwoorde: Selfregulering, luister, Tomatis® Metode, interpersoonlike verhoudings, akademiese prestasie, psigologiese welstand, motivering, leer

Hierdie studie het bygedra tot die verkenning van toepaslikheid, waarde en impak van die Tomatis® Metode as 'n instrument in die bevordering van effektiewe selfregulering in universiteit studente, deur die verbetering van luistervaardighede. Luister is 'n belangrike aspek in selfregulering wat blyk om nie behoorlik gewaardeer en benut te word in die huidige programme wat ontwerp is om selfregulering te verbeter nie. Hierdie studie word aangebied in die vorm van drie manuskripte.

Die eerste manuskrip ondersoek die beskikbaarheid van wetenskaplike bewyse oor die aard en waarde van programme oor die algemeen, in teenstelling en in vergelyking met die Tomatis® Metode, in die bevordering van welstand en selfregulering van tersiêre studente. 'n Sistematiese literatuurondersoek is gedoen vir hierdie manuskrip. 'n Totaal van 35 artikels het aan die insluitingskriteria voldoen en spesifieke klem is op die verkenning van die inhoud en beperkinge van intervensies geplaas, wat binne tersiêre leerkontekste plaasvind. Resultate dui daarop dat hoewel verskeie intervensie modelle en strategieë blyk effektief te wees in die bevordering van studente selfregulering en welstand, die werklike meganismes van verandering nog tot 'n groot mate onbekend is. Positiewe verhoudings is tussen luister en aspekte van selfregulering gevind. Die Tomatis® Metode het getoon dat dit goed met ander intervensies vir die bevordering van selfregulering vergelyk.

Gevolgtlik fokus die tweede manuskrip op die evaluering van die mate waarin die Tomatis® Metode selfregulering in 'n steekproef van Suid-Afrikaanse universiteitstude (N = 49) verbeter. 'n Konkurrente, gemengde metode benadering met behulp van 'n drie-groep voor-, na- en herhaalde na-assessering ontwerp, is gebruik. Die Tomatis® Metode het 'n positiewe impak op hiporesponsiwiteit in die linkeroor en ruimtelike oriëntasie van die regteroor, introjeksie van regulering en deursettingsvermoë, sowel as selfregulering as psigologiese en sosiale sterkte gehad. Voordele is ook kwalitatief waargeneem ten opsigte van verbeterde luister in sosiale en akademiese kontekste, aandag en bewustheid, selfbeheersing en interpersoonlike regulering. Kwantitatiewe voordele ten opsigte van selfregulering in die Tomatis groep word tot 'n sekere mate gedeel deur die Mozart-groep, terwyl die voordele ten opsigte van selfregulering as psigologiese en sosiale sterkte net in vergelyking met die kontrole groep was. Die Tomatis® Metode het potensiaal om die selfreguleringsvaardighede van tersiêre stude te verbeter; meer navorsing moet egter gedoen word, met groter ewekansige steekproewe om te bepaal tot watter mate die bevindinge veralgemeen kan word, sowel as om die moontlike rol van bemiddeling en modereringsveranderlikes in die verhouding tussen luister, self-regulering en psigologiese welstand te bepaal.

Die derde en finale manuskrip is daarop gemik om 'n konseptuele model wat die waargenome effek van die Tomatis® Metode op stude se selfregulering verduidelik, te ontwikkel. Interaktiewe Kwalitatiewe Analise (Northcutt & McCoy, 2004) is gebruik om kritiese faktore van deelnemers se ervaring van die Tomatis® Metode en beskoude verbetering in selfregulering, te identifiseer. Die sewe deelnemers, wat 'n Tomatis® Metode program voltooi het, het vyf temas geïdentifiseer waarvan 40 % van die verhoudingspare 68,085 % van die variansie in die model verduidelik. Bevindinge bevestig dat die Tomatis® Metode 'n doeltreffende meganisme vir die bevordering van selfregulering en gedragsverandering is. Meer navorsing word benodig om die toepaslikheid van die

Tomatis® Metode verder te verken as 'n effektiewe benadering tot die verbetering van selfregulering.

Daar is tot die gevolgtrekking gekom dat die studie hoofsaaklik bydra daartoe dat dit die gaping wat bestaan met betrekking tot die verhouding tussen selfregulering en ouditiewe prosessering aanspreek. Dit wys sodoende op die belangrike rol wat hierdie verhouding in aandag speel; spesifiek in verband met self teenoor self, teenoor ander en teenoor die omgewing op affektiewe en algemene sensoriese integrasievlakke.

Preface

This thesis is submitted in accordance with rule A.8, and specifically in article format as described in rule A.8.2.b of the North-West University.

This thesis comprises of three manuscripts, of which one has been submitted for publication by the *Journal of Psychology in Africa* (JPA) (manuscript 1).

The referencing style and editorial approach of this thesis is in line with the prescriptions of the *Publication Manual* (6th edition) of the American Psychological Association (APA). All three manuscripts have been styled according to these guidelines, but were appropriately revised to the specifications as required by the JPA.

For the purpose of this thesis, the page numbering is consecutive as a whole. Each manuscript was however numbered starting from page 1 for publication purposes.

Guidelines for authors: Journal of Psychology in Africa

The first article has been submitted to the *Journal of Psychology in Africa* for publication. The following is a copy of the guidelines for prospective authors from this journal.

Instructions to authors**Editorial policy**

Submission of a manuscript implies that the material has not previously been published, nor is it being considered for publication elsewhere. Submission of a manuscript will be taken to imply transfer of copyright of the material to the owners, Africa Scholarship Development Enterprize. Contributions are accepted on the understanding that the authors have the authority for publication. Material accepted for publication in this journal may not be reprinted or published without due copyright permissions. The Journal has a policy of anonymous peer review. Papers will be scrutinised and commented on by at least two independent expert referees or consulting editors as well as by an editor. The Editor reserves the right to revise the final draft of the manuscript to conform to editorial requirements.

Publishing ethics

By submitting to the *Journal of Psychology in Africa* for publication review, the author(s) agree to any originality checks during the peer review and production processes. A manuscript is accepted for publication review on the understanding that it contains nothing that is abusive, defamatory, fraudulent, illegal, libellous, or obscene. During manuscript submission, authors should declare any competing and/or relevant financial interest which might be potential sources of bias or constitute conflict of interest. The author who submits the manuscript accepts responsibility for notifying all co-authors and must provide contact information on the co-authors. The Editor-in-Chief will collaborate with Taylor and Francis using the guidelines of the Committee on Publication

Ethics [<http://publicationethics.org>] in cases of allegations of research errors; authorship complaints; multiple or concurrent (simultaneous) submission; plagiarism complaints; research results misappropriation; reviewer bias; and undisclosed conflicts of interest.

Manuscripts

Manuscripts should be written in English and conform to the publication guidelines of the latest edition of the American Psychological Association (APA) publication manual of instructions for authors.

Submission

Manuscripts should be prepared in MSWord, double spaced with wide margins and submitted via email to the Editor-in-Chief at elias.mpofu@sydney.edu.au. Before submitting a manuscript, authors should peruse and consult a recent issue of the *Journal of Psychology in Africa* for general layout and style.

Manuscript format

All pages must be numbered consecutively, including those containing the references, tables and figures. The typescript of a manuscript should be arranged as follows:

- Title: this should be brief, sufficiently informative for retrieval by automatic searching techniques and should contain important keywords (preferably <13).
- Author(s) and Address(es) of author(s): The corresponding author must be indicated. The author's respective addresses where the work was done must be indicated. An e-mail address, telephone number and fax number for the corresponding author must be provided.
- Abstract: Articles and abstracts must be in English. Submission of abstracts translated to French, Portuguese and/ or Spanish is encouraged. For data-based contributions, the abstract should be structured as follows: Objective – the primary purpose of the paper, Method – data source,

participants, design, measures, data analysis, Results – key findings, implications, future directions and Conclusions – in relation to the research

questions and theory development. For all other contributions (except editorials, book reviews, special announcements) the abstract must be a concise statement of the content of the paper.

Abstracts must not exceed 150 words. The statement of the abstract should summarise the information presented in the paper but should not include references.

- Text: (1) Per APA guidelines, only one space should follow any punctuation; (2) Do not insert spaces at the beginning or end of paragraphs; (3) Do not use colour in text; and (4) Do not align references using spaces or tabs, use a hanging indent.

- Tables and figures: These should contain only information directly relevant to the content of the paper. Each table and figure must include a full, stand-alone caption, and each must be sequentially mentioned in the text. Collect tables and figures together at the end of the manuscript or supply as separate files. Indicate the correct placement in the text in this form <insert Table 1 here>.

Figures must conform to the journals style. Pay particular attention to line thickness, font and figure proportions, taking into account the journal's printed page size – plan around one column (82 mm) or two column width (170 mm). For digital photographs or scanned images the resolution should be at least 300 dpi for colour or greyscale artwork and a minimum of 600 dpi for black line drawings.

These files can be saved (in order of preference) in PSD, PDF or JPEG format. Graphs, charts or maps can be saved in AI,

PDF or EPS format. MS Office files (Word, Powerpoint, Excel) are also acceptable but DO NOT EMBED Excel graphs or Powerpoint slides in a MS Word document.

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References should be cited as per the examples below:

Reference samples

Journal article

Peltzer, K. (2001). Factors at follow-up associated with adherence with adherence with directly observed therapy (DOT) for tuberculosis patients in South Africa. *Journal of Psychology in Africa*, *11*, 165–185.

Book

Gore, A. (2006). *An inconvenient truth: The planetary emergency of global warming and what we can do about it*. Emmaus, PA: Rodale.

Edited book

Galley, K. E. (Ed.). (2004). *Global climate change and wildlife in North America*. Bethesda, MD: Wildlife Society.

Chapter in a book

Cook, D. A., & Wiley, C. Y. (2000). Psychotherapy with members of the African American churches and spiritual traditions. In P. S. Richards & A. E. Bergin (Ed.), *Handbook of psychotherapy and religiosity diversity* (pp 369–396). Washington, DC: American Psychological Association.

Magazine article

Begley, S., & Murr, A. (2007, July 2). Which of these is not causing global warming? A. Sport utility vehicles; B. Rice fields; C. Increased solar output. *Newsweek*, 150 (2), 48–50.

Newspaper article (unsigned)

College officials agree to cut greenhouse gases. (2007, June 13). *Albany Times Union*, p. A4.

Newspaper article (signed)

Landler, M. (2007, June 2). Bush's Greenhouse Gas Plan Throws Europe Off Guard. *New York Times*, p. A7.

Unpublished thesis

Appoh, L. (1995). The effects of parental attitudes, beliefs and values on the nutritional status of their children in two communities in Ghana (Unpublished master's thesis). University of Trondheim, Norway.

Conference paper

Sternberg, R. J. (2001, June). Cultural approaches to intellectual and social competencies. Paper presented at the Annual Convention of the American Psychological Society, Toronto, Canada.

Solemn declaration

I, Annelize Bonthuys, declare herewith that the thesis entitled ‘Evaluating the Tomatis® Method in promoting effective self-regulation in university students’, which I herewith submit to the North-West University, Potchefstroom Campus, in compliance with the requirements set for the Ph.D. in Psychology degree, is my own work, has been language edited and has not already been submitted to any other university.

I understand and accept that the copies that are submitted for examination are the property of the University.

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University number: 12253863

Letter of permission

Permission to submit the manuscripts for degree purposes

The student is hereby granted permission to submit her thesis for the purpose of obtaining a Ph. D. degree in Psychology.

The student's work has been submitted to TurnItIn and a satisfactory report has been obtained.

Promoter:

.....

Prof. K. F. H. Botha

CHAPTER 1: INTRODUCTION, PROBLEM STATEMENT AND AIMS

Introduction

University students find themselves in a transitional phase that requires them to function as integrated social, cognitive and emotional beings, having to adjust to continuously changing environments. Developmentally, they have to establish a sense of identity and interpersonal meaning (Corey, 2009; Erikson, 1963), while academically they are simultaneously required to achieve challenging cognitive tasks through multiple deadlines within set time frames (Pekrun, Goetz, Titz, & Perry, 2002; Williams & Williams, 2011). In an effort to manage the potential conflict between this multitude of tasks, students are often confronted with additional challenges like cross-cultural issues, dysfunctional family life, poor frustration tolerance, alcohol and drugs, interpersonal conflict, and increased levels of financial distress (Archuleta, Dale & Spann, 2013; Breier, 2010; Kritzrow, 2003). Within this challenging environment students have to continuously re-adjust their goal priorities, time management, and interpersonal communication within the context of their academic priorities and personal relationships with parents, romantic partners, peers, and lecturers (Kritzrow, 2003; Mudhovozi, 2012).

Not only do they have to establish quality romantic and friendship relationships, but they also have to clearly understand and communicate with lecturers to ensure optimal academic performance. Mudhovozi (2012), in addition, found that increasing cultural, religious and language variations within university contexts are possible barriers that make communication with other students difficult. Resistance to interracial contact often occurs when students experience intergroup anxiety, leading either to avoidance of contact or to negative experience of contact with students from different cultural groups, sexual orientation or religion (Finchilescu, Tredoux, Mynhardt, Pillay, & Muianga, 2007). Such behaviour is guided by prejudice and the role of perceived threats, which are strongly related to preconceived ideas with regard to intergroup attitudes (Finchilescu et al., 2007).

These preconceived ideas were found to be the most prominent reason for the lack of interracial mixing at universities in South Africa (Finchilescu et al., 2007). Students often find it difficult to direct and adjust cognitions, emotions, and behaviour when it comes to social relationships.

Self-regulation

A critical resource in readjusting oneself and adapting to these challenging contexts is self-regulation, which literally means “changing oneself, or some aspects of oneself, to bring thinking and behaviour closer to desired rules, norms, goals or ideals” (Forgas, Baumeister, & Tice, 2009, p.4). Maes and Karoly (2005) define self-regulation as a systematic process that involves setting personal goals and directing behaviour towards achieving these goals. Good self-regulation skills are therefore of great importance in effectively managing diverse goals related to academic strategies, identity, health, and interpersonal relationships (Vandergrift, 2005). Self-regulation is a complex construct described from many different perspectives (Carver & Scheier, 1981; Ryan & Deci, 2004; Vohs & Baumeister, 2004). In this study, given the challenges university students are confronted with, self-regulation is primarily conceptualised from a multiple level perspective (Calkins & Fox, 2002) in which the individual is seen as an agent of self-change (Bandura, 2001). According to this perspective, self-regulation is the ability to effectively adjust one’s own behaviour based on monitoring, attention and feedback processes related to cognitive, emotional, and interpersonal aspects (Calkins & Fox, 2002). The ability to adjust own behaviour is associated with a sense of agency, which enables people to play a part in their own self-development, adaptation, and self-renewal (Bandura, 2001; Weehuizen, 2008). Baumeister and Vohs (2003, p.199) further indicate that agency implies reflexiveness, in that “... the self is active, involved, and responsive, intentionally engaging in volitional processes to change, alter, or modify itself” and “...the self takes action, selects a response from numerous options, filters irrelevant information, and is responsible for responses selection and enactment”. According to Distel (2013), self-regulation also involves

physical and emotional regulation in balance. Biologically it is assumed that the body adjusts itself to create balance in the sympathetic and parasympathetic autonomic nervous systems by producing fight and/or flight behaviours. When stressed, self-regulation changes the chemical balance within the brain and body, which impacts overall well-being (Distel, 2013).

Because of its potential as a human strength, self-regulation has been included as a signature character strength in the Virtue Category of Temperance (Peterson & Seligman, 2004). This category includes character strengths that protect individuals from excess and also includes Forgiveness and Mercy, Modesty and Humility, and Prudence (Peterson & Seligman, 2004). Strengths in this category share aspects of the self-management processes, which include control over cognitive, emotional and behavioural responses (Peterson & Seligman, 2004).

The effectiveness of self-regulation depends on different resources and processes, including intrinsic motivation, self-efficacy, self-monitoring, creativity and flexibility (Zimmerman, 2002). Self-monitoring, which Bandura (2001) defines as the comparison of performance with goals, standards and values in an effort to gain feedback about the success of one's behaviour (Bandura, 2001; Mousoulides & Philippou, 2005; Pintrich, 1999), is of particular importance to this study as it is dependent on the quality of an individual's levels of awareness and attention. Berger (2011, p.20) defines attention as "the mechanism that enables adaptive behaviour by selecting, integrating, and prioritizing among competing demands on cognitive and emotional systems by external as well as internally generated goals". According to Peterson and Seligman (2004), attentional processes often constitute the first step toward success or failure in self-regulation. Successful self-regulation is dependent on directing attention to own behaviour, which limits automatic behaviours, such as the prejudice that follows preconceived ideas, and subsequently produces the condition for self-change (Watson & Tharp, 2007).

It is therefore evident that self-regulation is essential for adaptive behaviour and therefore not surprising that failure in self-regulation is associated with most major social and personal problems in contemporary society, for example drug abuse, crime and violence, prejudice and stereotyping, eating and sexually-related diseases (Forgas et al., 2009). These problems are clearly relevant to student populations, who often struggle with impulsivity, impatience, distractibility, or delay behaviour such as procrastination, which negatively impact executive functioning and academic performance (Gibbons, Gerrard, Reimer, & Pomery, 2006; Rabin, Fogel, & Nutter-Upham, 2011; Steel, 2007). Effective self-regulation, in contrast, is associated with higher levels of quality of life and psychological well-being (Tavakolizadeh, Yadollahi, & Poorshafeih, 2012). Students who effectively apply self-regulation skills are known to have higher levels of self-satisfaction, are psychologically more healthy, motivated for learning, perform better academically, and are capable of pro-social behaviour (Pekrun et al., 2002; Seligman, Ernst, Gillham, Reivich, & Linkins, 2009; Williams & Williams, 2011; Zimmerman, 2002). They have also been found to be more satisfied with the quality of their lives, have meaningful relationships, and experience overall happiness (Negovan, 2010).

The role of listening in self-regulation

Although different systems are involved in attentional processes, most previous research on self-regulation has focused on visual attention, despite the fact that processing of auditory stimuli plays an equally significant role in attention, specifically in relating self to self, to others and the environment on affective and general sensory integration levels (Berger, 2011; Gomes, Molholm, Christodoulou, Ritter, & Cowan, 2000; Shinn-Cunningham, 2008; Thompson & Andrews, 1999). Due to this strong focus on visual processing, auditory dominance found in early developmental stages often goes undetected in adulthood (Robinson & Sloutsky, 2004; Robinson & Sloutsky, 2013).

Listening, as the most basic aspect of processing auditory stimuli, already starts to develop before birth, since the inner ear is fully developed and can process and integrate sound by the fifth month of pregnancy (Tomatis, 1991). The foetus is therefore capable of hearing “auditory cues within the mother’s environment”. It is therefore not surprising that new-born babies who are exposed to music and light during pregnancy, develop more structured neural and auditory pathways (Jarvis, 2014, p 28). The relationship between listening and self-regulation can already be observed when infants suck their thumbs after hearing a loud sound in order to regulate responses to the environment, therefore becoming aware of sound and responding to the feedback (Florez, 2011; Thompson & Andrews, 1999). Later, in an academic environment, self-regulation is clearly not only determined by personal processes (i.e. perception of efficacy), but also seems to include listening on external and internal levels: externally to stimuli from the environment such as encouragement from lecturers, and internally to one’s inner speech or voice, known as self-observation, assumed to affect self-judgement, which in turn affects self-reaction or self-instructive action (Zimmerman, 1989). Vandergrift (2005) also found listening to correlate positively with both intrinsic and extrinsic motivation, processes directly linked to self-regulation. This link between motivation and self-regulation is confirmed by research in self-determination theory (Legault, & Inzlicht, 2013).

Good listening skills are further crucial in paying and directing attention, the basis for inhibition, control and strategies of problem solving and self-monitoring (Berger, 2011). Self-monitoring through the process of listening does not only include cognitive, perceptual or attentional processes, as explained by the perceptual-loop theory (Levelt, 1983; Robinson-Riegler & Robinson-Riegler, 2012), but also integrates affective and emotional processes (Särkämö et al., 2008) in which listening plays a critical role. Listening should therefore be an important aspect in effective self-regulation as it provides important feedback information not available through other sensory systems.

The Tomatis® Method

The Tomatis® Method of auditory stimulation has specifically been developed with the improvement of listening skills in mind, and due to its potential value in feedback processes and sensory integration needed for effective self-regulation, may be a key aspect in addressing the current gap in knowledge. Dr Alfred Tomatis (1920-2001), a French ear, nose and throat specialist, developed this method from both a neurophysiological and psychosocial theoretical perspective (Tomatis, 1991; Tomatis, 2005). It can be described as a sound-based intervention method that stimulates sensory integration via listening to enhance learning and regulation of intentional behaviour (Vandergrift, 2005). For effective listening to take place, neurosensory integrators, specifically the vestibular, visual and cochlear systems, must be well established. Although the focus of the Tomatis® Method is on listening, the theoretical context is holistic and humanistic (Gilmor, Madaule, & Thompson, 1989). From this perspective, listening is “to actively use hearing intentionally and attentively, in a way that is acceptable on a cognitive and emotional level for the purpose of learning and communicating” (Solisten, 2009, p 18). Listening motivates action, personal growth and a healthy attitude towards the self and others (Tomatis, 2005). Many learning problems originate from poor “communication” between important parts of the ear; the vestibule and the cochlea (Sollier, 2005). When these parts of the ear work together in harmony, the brain retains energy to be attentive, learn and effortlessly convert language to be understandable (Sollier, 2005). This is known as a “good listening ear”, which plays an important part in the regulation of cognitions, behaviour and emotions, and brings about a sense of well-being (Sollier, 2005; Tomatis, 1991; Tomatis, 2005).

For the development of a “good listening ear”, Tomatis developed a device known as the Electronic Ear (EE) (Thompson & Andrews, 2000). The ears are trained by listening to music played through special earphones that combine both air and bone conduction after being modified

by the EE (Thompson & Andrews, 2000). The Tomatis® Method and EE exercise the whole ear through air and bone conduction specifically aiming to strengthen the effects of the middle ear, the inner ear, the auditory system as a whole and the central nervous system for the purpose of awakening the connections needed for the brain to fully process auditory information (MacDonald & Nicoloff, 2008; Nicoloff & Le Roux, 2011). The Tomatis® Method therefore has the potential for enhancing self-regulation skills through its focus on the improvement of listening skills that impact cognitive-judgmental and affective functioning (Akakios, 2002; Du Toit, Du Plessis, & Kirsten, 2011; Du Plessis, Munro, Wissing, & Nel, 2008). Research also found that it is possible to learn better and achieve better results when following a Tomatis programme due to its positive impact on regulating sensory integration and attention skills, factors specifically associated with self-regulated learning (Sollier, 2005).

Previous research has reported the Tomatis® Method to be an effective intervention model for addressing learning disabilities and behavioural problems (Kershner, Cummings, Clarke, Hadfield, & Kershner, 1990), attention deficit disorders (Davis, 2005), stuttering (Van Jaarsveld & Du Plessis, 1988), auditory processing disorders (Ross-Swain, 2007; Gerritsen, 2009), and psychological disorders (Du Plessis, Burger, Munro, Wissing, & Nel, 2001). Some, such as Corbett, Shickman and Ferrer (2008), have been particularly critical of the lack of clinical research on the method and its reported findings. The proponents of the Tomatis® Method also agree that further research and development are needed.

Problem statement

Although a number of self-regulation programmes are applied in different settings around the world, most are focused on effective learning in children and adolescents (Bradley, Atkinson, Rees, Tomasino, & Galvin, 2009; Hadwin & Winne, 2001; Hemingway, Carroll, & Bower, 2010), or on health-specific behaviour, for example the role of self-regulation in diet and fitness (Van Genugten,

Van Empelen, Flink, & Oenema, 2010; Wing, Tate, Gorin, Raynor, & Fava, 2006). Those that are available for educational and tertiary settings primarily emphasise aspects like goal-setting, and change and time management (Hadwin & Winne, 2001). Research done within the area of self-regulation still lacks comprehensive impact studies as much more knowledge is still needed about effective self-regulation interventions (Boekaerts, Maes, & Karoly, 2005; Vancouver & Day, 2005). Furthermore, while an intensive search on numerous databases shows that although visual information processing is often integrated in self-regulatory programmes, listening skills as a critical feedback resource, particularly within relations and academic achievement seems to be neglected, underutilised or even non-existent. Subsequently a need to explore the effect better listening skills may have on self-regulation, specifically within the context of being a university student, is prominent.

A focus on the role of auditory processing, specifically listening, in attention and self-regulation, and the relationship between enhanced listening skills and self-regulation of university students is therefore of specific importance, which will further be investigated in this study. The core question this study wants to answer is: To what extent and in what ways would the Tomatis® Method promote self-regulation in a group of South African university students? This study could bring about a new understanding of listening skills in the dynamics of self-regulation, specifically as it relates to psychological well-being and academic performance in university students.

Aims

The general aim of this study is to explore the applicability, value and impact of the Tomatis® Method as an instrument in promoting effective self-regulation in university students through the improvement of listening skills. The specific aims are to:

- explore available scientific evidence on the Tomatis® Method in promoting self-regulation in tertiary students and how it compares to other interventions with similar aims;

- evaluate the impact of the Tomatis® Method on the self-regulation of a sample of South African university students; and
- determine and explore critical factors that are relevant to how a sample of university students perceived the effect of the Tomatis® Method on their self-regulation and to develop a conceptual model based on the relationship between these critical factors and self-regulation, to finally provide guidelines on how to use this model to promote self-regulation in university students.

Overview of the methodology

For manuscript one, a systematic review was conducted in accordance with the guidelines for systematic reviews in social sciences. A narrative empirical synthesis was used to integrate the results from the retrieved studies. For manuscript two, a concurrent, mixed-method experimental design was conducted. Data were collected from self-report scales, direct measurements, observations and participants' subjective experience within a three-group pre-post, and repeated post-assessment design. Quantitative data were captured and analysed by the North-West University Statistical Consultation Services, Potchefstroom Campus while thematic analysis was done on qualitative data. For manuscript three, Interactive Qualitative Analysis (IQA) (Northcutt & McCoy, 2004) was used to explore participants' subjective experience of the Tomatis® Method in relation to their self-regulation.

Outline of the manuscript

Chapter 1 provides an introduction, the problem statement and aims of the study.

Chapter 2 presents manuscript 1, which addresses aim 1.

Chapter 3 presents manuscript 2, which addresses aim 2.

Chapter 4 presents manuscript 3, which addresses aim 3.

Chapter 5 provides an overall conclusion and recommendations for further research.

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CHAPTER 2: MANUSCRIPT 1

The value and applicability of the Tomatis® Method in the promotion of self-regulation in tertiary students: a systematic review

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Running head: SYSTEMATIC REVIEW

The value and applicability of the Tomatis® Method in the promotion of self-regulation in tertiary students: a systematic review

Abstract

A systematic review was conducted to determine the scientific evidence available on how the Tomatis® Method compares to other interventions in promoting more effective self-regulation in tertiary students. A total of 35 articles met the inclusion criteria and specific emphasis was placed on exploring the contents and limitations of interventions conducted within tertiary learning contexts. Results indicate that although various intervention models and strategies seem to be effective in promoting students' self-regulation and well-being, actual mechanisms of change are still unknown to a large extent. Positive relationships were found between listening and aspects of self-regulation. The Tomatis® Method was shown to compare well with other interventions for the promotion of self-regulation.

Keywords

Academic performance, intra- and interpersonal relationships, learning, listening, motivation, self-regulation, Tomatis® Method, well-being

The value and applicability of the Tomatis® Method in the promotion of self-regulation in tertiary students: A systematic review

What differentiates human beings from any other form of life is our ability to “communicate with a language that is based on an organized system of words, rather than merely sounds” (Lucas, 2015, p 1). Verbal communication can, however, not function without the ability to listen to what is being communicated. Effective communication therefore takes place when using words, not only to express own “impressions”, but also to “receive and remember knowledge gathered from others” (Tomatis, 1996, p 5). It is from this point of view that Dr Alfred Tomatis (1920 -2001) developed his theory of what he referred to as “the listening ear” (Tomatis, 1996).

According to Tomatis, listening, or lack thereof, influences “who we are, how we learn and how we feel about ourselves” (Sollier, 2005, p 44). The human ear can be compared to that of a “receptive antenna” that is used to balance “sensibility” and “emotionalism” (Sollier, 2005; Tomatis, 1996, p 180). Imbalance between these two parameters on cognitive and emotional levels impacts an individual’s ability to be creative and in turn converts objective judgement and perception into “incoherent and irrational coloured subjectivity” (Tomatis, 1996, p 180). In addition, this imbalance leads to the disconnection of listening to the external world, which includes interpersonal relationships (Coetzee, 2001). As a result, Dr Tomatis developed the Tomatis® Method as a “sound stimulation and educational intervention that improves listening” (Tomatis, 1996, p 197). The role of the Tomatis® Method is to attain and enhance the balance and integration of listening on an emotional and on a cognitive level for intentional behaviour to be effective and not to be driven by impulsive thoughts, emotions and/or behaviour (Sollier, 2005). The influence of auditory functioning on well-being is central to Tomatis’ theory (Coetzee, 2001). Just as listening takes place on various functional levels, sound is also received in different ways. Tomatis differentiates between

air and bone conduction of sound (Tomatis, 1991). Air conduction refers to listening to the external world, whereas bone conduction refers to listening to the self (Sollier, 2005). Good listening skills require a well-balanced and good relationship between air and bone conduction for harmony between social and inner listening, which is predominantly the focus of a Tomatis programme (Sollier, 2005).

From a Tomatis perspective, listening can be described as intentional and attentive hearing on both cognitive and emotional levels in such a way that learning and communicating is optimized (Solisten, 2009). In an academic context such as a university, students are challenged with multiple cognitive and emotional tasks, which they often fail to manage effectively due to impulsivity, impatience, distractibility and procrastination (Gibbons et al. 2006; Rabin et al. 2011; Steel, 2007), which then results in poor academic performance and high attrition rates. It makes sense therefore to link learning problems to poor “communication” between important parts of the ear; the vestibule and the cochlea (Sollier, 2005).

Listening further provides the individual with important feedback information not available from other sensory systems. It therefore holds potential for behavioural self-regulation, defined as “changing oneself, or some aspects of oneself, to bring thinking and behaviour closer to desired rules, norms, goals or ideals” (Forgas et al. 2009, p.4). Self-monitoring is the process within self-regulation that enables the individual to evaluate if adjustment in cognition, emotion or behaviour is required (Berger, 2011; Karoly, 1993). Listening is crucial in the processing of auditory stimuli and as such plays a significant role in attention (Berger, 2011; Gomes et al., 2000; Shinn-Cunningham, 2008; Thompson & Andrews, 1999), especially with regard to self in interaction with others. The function of listening is captured by the self-reflective and self-reactive capabilities required for behavioural change (Bandura, 1991). Self-reflection is defined as the “inspection and evaluation of one’s thoughts, feelings and behaviour” (Grant, Franklin, & Langford, 2002, p 821). In other words,

individuals are basically listening to their own inner voice during self-reflection. Self-reaction on the other hand is the process of taking action based on “external sources of influence” (Bandura, 1991, p 249). Self-regulation further involves the ability of an individual to monitor and evaluate progress towards a specific purpose or goal, and using the feedback of this monitoring process, which can also be described as the interplay between listening to self and listening to the external environment to enable self-directed change (Bandura, 1991; Grant et al. 2002). It is therefore evident that listening has an essential place in the process of self-regulation.

Despite the obvious link between listening and self-regulation, previous research on self-regulation has primarily focused on visual attention. Further, even though the Tomatis® Method has actively been implemented in South African contexts since the 1980’s (compare Coetzee, 2001; Du Plessis et al., 2001; Du Toit et al., 2011; Kirsten, 2007; Nel, 2005; Neysmith-Roy, 2001; Vercueil, Taljaard, & Du Plessis, 2011), not much is known about the impact it specifically has on self-regulation among tertiary level students or how it compares with other interventions in this regard.

The core question this study wants to answer is: What scientific evidence is available regarding the Tomatis® Method and promoting self-regulation in tertiary students, and how does it compare to other interventions with similar aims? Firstly, the contributed value of this study is to better understand the role improved listening skills play in enhancing self-regulation, specifically with regard to the challenges tertiary students face. Secondly, contribute to the development of more effective intervention methods for addressing poor self-regulation in students. The aim of this study is therefore to explore the available scientific evidence on the Tomatis® Method and promoting self-regulation in university students and how it compares to other interventions with similar aims.

Method

A systematic review was conducted to achieve the aims of the study (Grant & Booth, 2009). According to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement (Moher, Liberati, Tetzlaff, & Altman, 2009), this evidence-informed method uses “systematic and explicit methods to identify, select, and critically appraise relevant research” (p 1). Extracted data is then compared, evaluated and summarized to obtain transparent and reproducible results and conclusions (Smith, Devane, Begley, & Clarke, 2011). Systematic reviews are conducted through application of strict scientific pre-specified and reproducible methods that minimize researcher bias and provide reliable conclusions and identify gaps in knowledge (Centre for Reviews and Dissemination, 2008). This review was conducted in accordance with the guidelines for systematic reviews in social sciences (Petticrew & Roberts, 2006). A narrative empirical synthesis was used for integration of results from the retrieved studies (Evidence for Policy and Practice Information and Co-ordinating Centre [EPPI], 2010).

Search strategy

Two main searches were done: (a) first, the North-West University One Search portal was used to search published articles from 2003 until 2013. This portal searched within 262 databases of which the following were included: Academic FileOne, CINAHL, Cochrane Library, Communication & Mass Media Complete, eBook (EBSCOHost), HeinOnline, OAPEN Library, PsychARTICLES, PsychINFO, SocINDEX, ScienceDirect, and Google Scholar; and (b) the entire North-West University repository was searched to include unpublished masters and doctoral studies.

Although the main focus was on self-regulation, a preliminary literature review indicated that interventions often only refer to well-being and well-being constructs without mentioning self-regulation, even though they include key aspects of self-regulation like motivation and self-efficacy. There is therefore an overlap that could cause one to miss important studies that may relate to self-

regulation if well-being is not included in a search. It was therefore decided to also focus on well-being / psychological well-being.

To obtain a list of potentially relevant articles, the following keyword combinations were searched for self-regulation: “Self-regulation” OR “self-control” OR “self-monitoring” [Title]; AND “programme” OR “intervention” [Title]; AND “psychology” OR “psychological” [Title]; AND “well-being” [Title]; AND “university” OR “college” [Title]; AND “students” [Title].

For the Tomatis® Method the following keyword combinations were searched: “Tomatis” [Title]; AND “programme” OR “intervention” [Title]; AND “university” OR “college” [Title]; AND “students” [Title].

Retrieved references were limited by full text only, language, which are English only, and as mentioned above, date of publication in the case of published studies. Although earlier research on the Tomatis® Method was mainly published in French, the researcher considered the fact that critical research and books have been translated into English. Although the exclusion of original French works may hint towards a rapid review, the review process itself was comprehensive with the result that the methodology complies better with a systematic review. This process was duplicated by two additional reviewers who are experienced researchers on self-regulation and the Tomatis® Method respectively, to enhance reliability and validity of the process.

Inclusion and exclusion criteria

All titles and abstracts were initially assessed to investigate the relevance of identified articles. For inclusion in the review, articles were required to have been published between 2003 and 2013, capturing the most recent research within the tertiary education context. The articles had to be published or written in English and participant samples had to be from student populations, attending any tertiary institution such as a university or college. Studies where a programme or intervention was developed and implemented for a student population and that had a positive effect

on well-being or self-regulation in any way were included. Articles that reported on the struggles of student life and typical student behaviour were excluded if only theoretically based. If guidelines were provided for development of a programme or intervention for students, but no implementation or evaluation of such a programme was done, it was also excluded. Any articles that reported on the application of the Tomatis® Method in a student population were included, irrespective of an experimental design with a control group due to the limit or non-existing nature of such research within this area. After screening titles and abstracts, articles were fully retrieved if it met the inclusion requirements, after which articles were assessed for quality and finally, data were extracted. A flowchart (Fig. 1.) was produced to illustrate the inclusion and exclusion of articles identified for this review.

<Insert Figure 1 approximately here>

Data extraction

The following information was extracted from the strong and moderate quality studies (Petticrew & Roberts, 2006): referencing author(s), year of publication, size of the sample, context in which the study was conducted, age range of sample, programme objectives, results and limitations of the study (See Table 1 for the complete data extraction). Due to the heterogeneity of participants, the nature of interventions and results obtained, a narrative synthesis was primarily conducted for this review (Petticrew & Roberts, 2006).

Quality assessment

The quality assessment tool for quantitative studies (Thomas, 2003) was used to critically appraise the quality of all relevant articles that were retrieved (Higgins & Green, 2009). According to Petticrew and Roberts (2006), this 21-item tool is valid and reliable for the quality assessment of any quantitative study design, whether it might be randomized or non-randomized. Articles were scored as strong (1), moderate (2), or weak (3) on six different components, namely selection bias,

study design, confounders, blinding, data collection methods, withdrawals and drop-outs. A global rating was then calculated for each article and a final score obtained. A study was considered to be of good quality if no weak or at least four strong ratings were scored, those with less than four strong and not more than two weak scores were considered as moderate in quality and those with more than two weak scores were considered as a weak overall study. The two additional reviewers completed this process separately and disputes were discussed and settled by consensus to obtain a final score. Only strong and moderate articles were included in this review, while weak articles were excluded. Only one qualitative study was identified as relevant, and was assessed by means of an adapted list of questions developed by Spencer, Ritchie, Lewis, and Dillon (2003). However, this article was excluded based on the sample not representing a larger population and only consisting of one participant, who was also the first researcher of the study.

Data analysis

Narrative empirical synthesis was used to combine the results from the individual studies. This method of analysis was found to be most appropriate in synthesizing different types of empirical and experimental evaluative research (EPPI, 2010). The four main elements of a narrative synthesis was followed, namely: 1) Information of programme objectives and theories of behaviour change were gathered during data extraction, 2) a preliminary synthesis of findings were developed through tabulation and grouping of similarities between studies, 3) findings of the studies were qualitatively synthesized, and 4) the quality assessment tool for quantitative studies (Thomas, 2003) was used to assess the validity and quality of reviewed studies. Methodological triangulation was used to integrate evidence from the different studies to better understand and gain insight about the “mechanisms underlying” the reported findings (Popay et al., 2006, p 21). A summary table (Table 1) provides a combination of data that have been extracted after critical evaluation and quality assessment of each included study (EPPI, 2010). This review specifically focused on the content and

limitations of interventions, designed and implemented for the improvement of tertiary students' overall functioning and in particular their self-regulation and psychological well-being.

Validity / trustworthiness

The process of conducting a systematic review is transparent and can be reproduced with minimal researcher bias (Smith et al., 2011). A team of two additional experienced researchers in the fields of self-regulation and the Tomatis® Method reviewed the current study to help ensure relevant, reliable and quality conclusions (EPPI, 2010). Omission of relevant studies within these research fields is therefore minimized. All records of the systematic process were recorded and maintained. This enhances the transparency of conclusions, making it accessible for the additional reviewers to compare results, after following the same search and synthesis process (EPPI, 2010).

Ethical issues

The researchers adhered to the guidelines for best practice by consulting the Cochrane Handbook (Higgins & Green, 2009). All research not conducted by this research team has been referenced and cited clearly (Wager & Wiffen, 2011). Turnitin™ was used to further ensure that plagiarism was avoided. As the first author is a Tomatis consultant, the possibility of competing interest and potential bias has been controlled for by making use of multiple reviewers who independently extracted the data, ensuring accuracy, reliability and validity (Wager & Wiffen, 2011).

Results

Summary of articles retrieved

A total of 35 manuscripts met the inclusion criteria for this study. These include 33 published articles, 1 master's dissertation and 1 doctoral thesis. A PRISMA flow diagram (Moher et al., 2009) illustrates the search, exclusion and inclusion of relevant research (Fig 1).

<Table 1 approximately here>

The majority (n = 27) of included articles were published between 2010 and 2013, included both gender groups and represented a wide range of cultures and international contexts, with most studies conducted in the United States (n=14), South Africa (n=4), and England (n=4). Study population samples mainly included undergraduate students (n = 24) of which three studies specified participants as first year or freshman students. Ages ranged between 18 and 27 years, with the exception of four studies (Caldwell, Emery, Harrison, & Greeson, 2011; Caldwell, Harrison, Adams, Quin, & Greeson, 2010; Du Toit et al., 2011; Hijazi, Tavakoli, Slavin-Spenney, & Lumley, 2011) that included student participants up to the age of 49 years. Study designs ranged from randomized control trials, quasi-experimental, and surveys. Pre-post measures were reported in all retrieved studies.

Content and theoretical assumptions of interventions

Various theoretical models and intervention strategies were found to be effective for enhancing self-regulation and psychological well-being amongst the 35 studies. The Theory of Planned Behaviour (TPB) (Adams, Evans, Shreffler, & Beam, 2006; Kwan, Faulkner, & Bray, 2013; Skar, Sniehottaab, Molloyc, Prestwichd, & Araujo-Soarese, 2011), Cognitive Behaviour Therapy (CBT) (Collard, Avny, & Boniwelly, 2008; Poddar, Hosig, Anderson-Bill, Nickols-Richardson, & Duncan, 2012) and Mindfulness training (Caldwell, et al., 2010;2011; Hassed, de Lisle, Sullivan, & Pier, 2009; Kang, Choi, & Ryu, 2009) were the most prevalent theoretical frameworks used. Vázquez et al. (2012) suggested that relaxation therapy should be used in conjunction with Cognitive-behavioural programmes. Biofeedback was used in one study (Vitasari, Wahab, Othman, & Awang, 2010) as an alternative intervention strategy.

Most studies focused on a specific aspect of behavioural change to facilitate increased student well-being, either on an academic, emotional, physical, or psychological level (Adams, et al., 2006; Alwehaibi, 2012; Bendtsen, McCambridge, Bendtsen, Karlsson, & Nilsen, 2012; Collard et al.,

2008; Cunningham, Hendershot, Murphy, & Neighbors, 2012; Davidson, Feldman, & Margalit, 2012; Denering, & Spear, 2012; Ekman, et al., 2011; Hased, et al., 2009; Kang et al., 2009; Mehrotra, 2013; Short, Kinman, & Baker, 2010). Seven of the studies reported on aspects of behavioural change and increased well-being as result of interventions and programmes presented in attempt to reduce problematic substance use and abuse amongst the student population.

TPB was found to be statistically significant in changing perceived behavioural control and behavioural intention (Adams, et al., 2006). Motivational Interviewing (MI) taught students self-confrontation, which increased awareness of thoughts, feelings and behaviour related to drinking and other substance-related problematic behaviour (LaBrie, Thompson, Huchting, Lac, & Buckley, 2007).

Only four studies, of which three included either Mozart Music or the Tomatis® Method, made use of sound stimulation (Bowman, Punyanunt-Carter, Cheah, Watson, & Rubin, 2007; Dyalan, Subramanian, & Elango, 2010; Du Toit et al., 2011; Vercueil et al., 2011).

Mechanisms of interventions

Behavioural change has been found most effective when self-monitoring is applied (Denering, & Spear, 2012). Self-monitoring takes place when awareness of the risks of problematic behaviour and benefits of increased well-being are followed by receiving feedback (Bendtsen, et al., 2012; Denering, & Spear, 2012). Self-monitoring, an important mechanism of self-regulation (Calkins & Fox, 2002) is therefore crucial for behavioural control and change. The value and applicability of self-monitoring was also observed in studies that focused on alleviating anxiety and stress (Hased, et al., 2009; Kang et al., 2009; Mehrotra, 2013).

Literature reports that good listening skills are crucial for self-monitoring on both the cognitive and emotional levels (Berger, 2011; Levelt, 1983; Robinson-Riegler & Robinson-Riegler,

2012; Särkämö et al., 2008). Enhancing listening skills would therefore have a positive impact on self-monitoring.

Studies that focused more on the academic functioning of students found that aspects related to Self-regulated learning (SRL) are most effective for improvements in academic performance (Lee, Lim, & Grabowski, 2010; Rosário, et al., 2010; Venter, 2011). A positive and statistically significant relationship was found between Core self-evaluation (CSE) and Multidirectional learning motivation (Kim, Oh, Chiaburu, & Brown, 2012). CSE influences learning performance by “boosting self-regulatory processes, generating increased levels of both motivational and emotional control” (Kim, et al., 2012, p 266). Listening can also be linked to motivational factors and was previously found to have a positive correlation with intrinsic, extrinsic motivation and self-regulation (Vandergrift, 2005).

Alwehaibi (2012) highlighted the importance of critical thinking and metacognition relating to students' academic functioning. Metacognitive feedback and control are important factors for improved self-regulation and learning achievement (Lee et al., 2010). Rosário et al. (2010) made use of a Narrative-based intervention programme for SRL strategies. This study found that students who are “metacognitively, motivationally, and behaviourally engaged in learning” (p 413) benefit the most. Bowman et al. (2007) indicate that this relationship also exists between listening and enhanced cognitive brain functioning. In this study, participants who listened to slow Mozart music outperformed all other groups on listening comprehension scores. This sound stimulation prepared the participants to listen and enhance their readiness for receiving information. Information processing is therefore enhanced through improved listening comprehension (Bowman et al., 2007).

Greater changes in Mindfulness was recurrently associated with greater changes in self-efficacy, which was then associated with enhanced academic performance and psychological well-being (Breso', Schaufeli, & Salanova, 2010; Caldwell, et al., 2010; 2011; Collard et al., 2008;

Davidson, et al., 2012; Poddar, et al., 2012; Pool, & Qualter, 2012). According to Ando (2011) self-efficacy beliefs *regulate* human functioning through cognitive, motivational, affective, and decisional processes. An interesting study by Hijazi et al. (2011) combined expressive writing, reflecting on stressors, and assertiveness training to regulate behaviour, thoughts and feelings, in a programme to assist international students with acculturative stress when adjusting to new environments. It was found that emotional regulation increased as a result of this combined programme. Using the Tomatis® Method, the study of Du Toit et al. (2011) found positive results with regard to participants' "mood states, tendency towards increased vigour, and extraversion" (Du Toit et al., 2011, p 263). Participants reported behavioural and emotional changes with regard to enhanced extraversion to be "more outgoing, *assertive*, active, talkative, cheerful, energetic and optimistic" (Du Toit et al., 2011, p 264).

The Tomatis® Method compared to other approaches

Similarities were found between results of Mindfulness training and the Tomatis® Method (Caldwell, et al., 2011; Vercueil et al., 2011). Application of Mindfulness practices and the Tomatis® Method are both associated with increased self-regulation, psychological well-being, and self-awareness. Venter (2011) describes that the process of learning takes place when there is reciprocal interaction between "personal factors, behaviour, and the environment", regulated through cognitive processes (p 25). Connections to the self and personal factors, as well as connection to the environment are both aspects enhanced through listening and application of the Tomatis® Method (Tomatis, 2005).

Limitations of the interventions

Studies evaluated for this systematic review reported various limitations. These included the lack of a true longitudinal experimental design (Neal, & Carey, 2004), lack of true control groups (Adams, et al., 2006; Collard et al., 2008; Denering, & Spear, 2012; Hassed, et al., 2009; Kwan et

al., 2013), and often relying only on self-reporting measures to obtain data (Acee, & Weinstein, 2010; Bresó et al., 2010; Kwan et al., 2013; Poddar, et al., 2012; Short et al., 2010). The concern with self-reporting measures is that participants may be prone to provide socially desirable responses, leading to biased results (Kimberlin, & Winterstein, 2008). Eighteen studies reported that samples were too small, and/or contained a skewed male/female ratio, limiting generalization to students from other populations (Acee, & Weinstein, 2010; Adams, et al., 2006; Ando, 2011; Bresó et al., 2010, Collard et al., 2008; Cunningham, et al., 2012; Davidson, et al., 2012; Du Toit, Du Plessis, & Kirsten, 2011; Ekman, et al., 2011; Hijazi, et al., 2011; Kang et al., 2009; Kwan et al., 2013; Neal, & Carey, 2004; Poddar, et al., 2012; Short et al., 2010; Skar, et al., 2011; Vázquez, et al., 2012; Vercueil et al., 2011). Struggling to engage the student population and maintaining their interest also seems to be a problematic factor. Kwan et al. (2013) reported that not many students responded to the call for participating in research, retaining the ones who do respond is a problem, and those who are retained find it difficult to comply with requirements set out for a research study.

It was also reported that longer timeframes are needed for interventions and follow-up assessments to obtain true impact results (Acee, & Weinstein, 2010; Ando, 2011; Du Toit et al., 2011; Hassed, et al., 2009; Kang et al., 2009; Kwan et al., 2013, Neal, & Carey, 2004; Prinsloo, 2008; Rosário et al., 2010; Vázquez, et al., 2012).

Seven of the studies were completed with an online instruction component, indicating increased intention to change, but the application of self-regulation theory within these studies were not found to be a successful indicator of actual mechanisms of change (Adams, et al., 2006; Bendtsen, et al., 2012; Cunningham, et al., 2012; Ekman, et al., 2011; Kwan et al., 2013; Poddar, et al., 2012; Skar, et al., 2011).

With the lack of randomized assignment to experimental and control groups, as well as the lack of baseline assessment of participant groups, some observed differences between pre- and post-

measures, could not be allocated to the impact of intervention or programme presented (Adams, et al., 2006; Ando, 2011; Caldwell, et al., 2011; Collard et al., 2008; Kim, et al., 2012).

Discussion

The studies within this systematic review have attempted to address aspects of contextual challenges that students experience as indicated in the literature introduction and review of this study (Archuleta et al., 2013; Breier, 2010; Kritzrow, 2003), some with more success than others.

Reviewed studies generally focused on either reducing problematic behaviour, or enhancing the emotional and psycho-social functioning of students. Both *decreasing* psychosocial and emotional stressors, as well as *enhancing* well-being are necessary for most effective and true mechanisms of change within developmental (intra-, and interpersonal) and academic functioning of students. Some of the studies have attempted this more holistic approach (Ando, 2011; Bresó et al., 2010; Poddar et al., 2012; Vitasari et al., 2010) but with limited impact. In this regard, the Tomatis® Method is known for its holistic approach and effects on behavioural change on these multiple levels of functioning (Gerritsen, 2009). This is confirmed by the positive relationships this review found between listening and aspects of self-regulation.

Based on the findings and mechanisms of change, it is evident there is a lack of true longitudinal research studies with pre-post measures obtained from comparing experimental and control groups, within the area of enhancing student overall functioning and self-regulation in particular. Actual mechanisms of change have therefore not strongly been captured or reported within the articles reviewed. Larger sample sizes across different ages, cultures and learning contexts have been recommended by these studies for future research that focus on the student population.

It is further evident that a great number of studies have been conducted to identify problem areas and suggestions are made on how to address these within the student context. However, more

research reporting on the development and implementation, as well as assessment of these interventions and programmes are required for reliable and valid conclusions about its effectiveness for students.

It can be concluded that aspects of self-regulation, such as increased self-awareness, self-efficacy, and motivation to achieve set goals, critical thinking, self-understanding, interpersonal interactions and mindfulness, are present in outcomes and results of reviewed studies. Literature therefore confirms that self-regulation is a critical process that students have to master in order to effectively adapt to their challenging contexts (Forgas et al., 2009). Although application of the Tomatis® Method within a tertiary environment is limited, the studies that were reviewed showed promising potential compared to results from general programmes developed to enhance student well-being and self-regulation. This systematic review therefore indicated the potential value and applicability of the Tomatis® Method in the promotion of self-regulation.

More evidence to support this conclusion is highly recommended and further investigation through longitudinal and experimental research, based on representative samples of culturally diverse student contexts, is required.

From this discussion it is evident that both listening and self-regulation function on multiple cognitive, behavioural and affective levels. This review identified relationships between listening and self-regulation, as well as academic functioning and well-being. Implementation of the Tomatis® Method was shown to compare well with more known and researched methods for promoting student well-being and self-regulation, such as TPB, Cognitive, Behavioural, and Mindfulness training due to its multi-level and more holistic approach of enhancing listening skills.

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Appendix

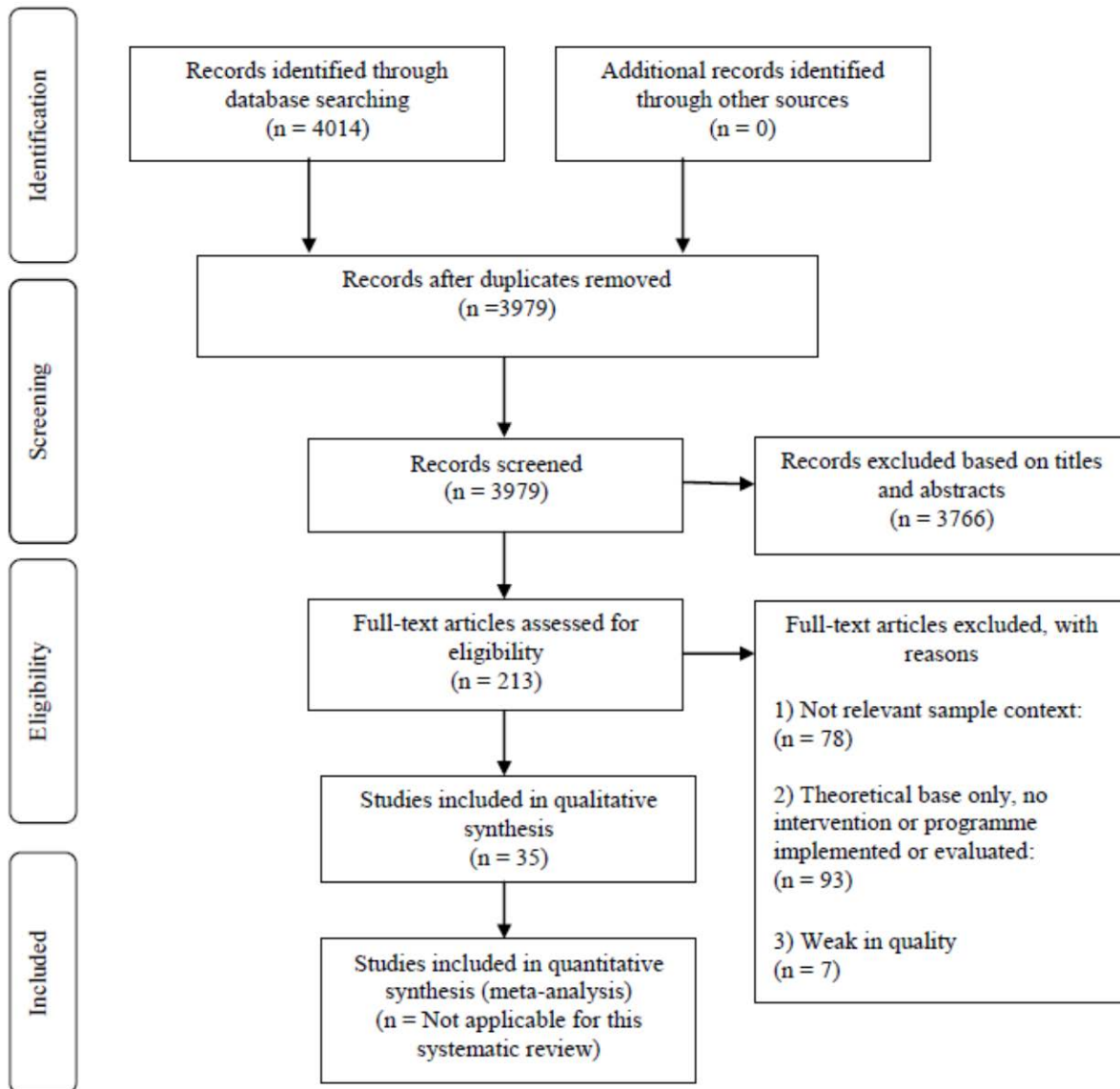


Fig. 1 PRISMA flow diagram

Table 1 Qualitative synthesis of research findings

Table 1: Qualitative synthesis of research findings						
Reference	n	Context	Age in Years	Programme Objectives	Results	Limitations
Acee & Weinstein (2010)	82	Intro to stats course, psych dept of a university in the U.S.A.	21.43 (average)	To design a value-reappraisal intervention and investigate its effects on self-report measures.	VR intervention was effective at helping students to place greater importance on the tasks, increased thoughts on usefulness of developing knowledge in the attainment of future goals. The VR intervention was powerful enough to influence students' choices 4 weeks after receiving the intervention. Perception and choice behavior can be modified through self-regulation interventions. Preexisting value perceptions about learning can be improved by presenting messages and guiding students in using self-regulatory strategies to explore the value of learning.	Increased number of sections (at least 10) would allow for between class variance to be modeled hierarchically with participants at a lower level. The sample was primarily women.
Adam et al (2006)	34	Freshman at a university	-	Examine the effects of a TPB-based, peer education intervention for binge drinking on behavioral attitudes, subjective norms, perceived behavioral control, and behavioral intentions.	Curriculum and aim of the intervention based on the Theory of Planned Behavior, addressing gap of previous attempts to alter drinking behavior due to lack of theoretical formation. Curriculum delivered by a trained undergrad peer health educator, more likely to engage freshmen around alcohol behavior.	Non-randomized and relatively small sample, no comparison group, intervention relatively low intensity
Alwehaibi (2012)	80	2nd year college students	20 (mean)	Investigate the effect of a proposed critical thinking program on developing critical thinking skills.	Graphic organizers and thinking maps could have contributed to the superiority of the critical thinking instruction and leads to successful improvement in test results and quality indicators (Hyrtle, 2000).	None reported
Ando (2011)	222 (111 IG, 111 CG)	Japanese university students	-	Evaluated the impact of a preventive intervention program focused on self-understanding and interpersonal interactions to prevent psychosocial distress.	Both female and male students in the treatment group reported a significant increase in social self-efficacy in interpersonal relationships from Time 1 to Time 2, no significant changes in the control group. Anxiety significantly decreased from Time 1 to Time 2, and no difference in depression was noted in the female treatment group. Anxiety and depression significantly increased in the female control group. The intervention program effectively prevented some aspects of psychosocial distress.	Small, one-school research participation, the short observation period, and its design. Some differences of the targeted variables in the two groups before the intervention. Limited number of classes and lack of true randomization.
Bendtsen et al (2012)	5227	University in Sweden	-	To evaluate the effectiveness of electronic screening and brief intervention.	Overall, 44.69% targeted completed follow-up. Attrition was similar in groups 1 and 2 and lower in group 3. Intention-to-treat analyses regardless of baseline drinking status revealed found no differences between groups in all alcohol parameters at 2-month follow-up. Per-protocol analyses of groups 1 and 2 suggested possible small beneficial effects on weekly consumption due to feedback. Small benefits may follow the actual uptake of feedback intervention in students who are risky drinkers, the precise target group.	The approach used involves deception, consider whether less-ethically problematic methods could be used.

Reference	n	Context	Age in Years	Programme Objectives	Results	Limitations
Bowman et al (2007)	207 T1, 109 T2	Undergrad students of university	20.10 (mean)	This study attempts to replicate, in part, research that tested the Mozart Effect on listening comprehension abilities. Also included in this study is an examination of control group issues in current day research.	Subjects who listened to slow (alpha - A) Mozart music were better prepared to listen than those who listened to fast (beta - B) Mozart music. Mozart A group scored higher than the other music-listening groups. Participants in the silence and crossword control groups scored significantly higher than the rock and roll group, but not higher than the Mozart B control group. Results indicate that being involved in an activity that produces alpha brain wave patterns (such as listening to Mozart A music, meditating, or completing crossword puzzles) may prepare students to listen to class material better than other activities.	None reported
Breso', Schaufeli & Salanova (2010)	71 (EG = 21, Stressed CG = 23, Healthy CG = 27)	University students	18-26	To decrease the anxiety the students coped with before exams in order to increase their beliefs of self-efficacy.	Self-efficacy, engagement and performance increased in the intervened group. Decreases in Burnout in both intervened and stressed control groups, not in the healthy control group, over time. Improved performance in all of the groups in T2, the "healthy" control group performed best. The intervention had the expected effect only on self-efficacy and engagement, and not for burnout.	Only used self-reporting. Students in the intervened group knew that the intervention focused on self-efficacy, burnout, engagement and performance, they might have answered with a 'positive bias.' A small sample size.
Caldwell et al (2010)	166 (P 80, T 38, G 48)	Students enrolled for elective physical activity courses	18 - 41 (mean 21.29)	Examined whether mindfulness increased through participation in movement based courses and whether changes in self-regulatory self-efficacy, mood, and perceived stress mediated the relationship between increased mindfulness and better sleep.	Participation in Pilates, Taiji quan or GYROKINESIS® showed increases in overall mindfulness. Changes in acting with awareness and observing sensations, perceptions, thoughts and feelings varied by class, but each class did show increases in multiple aspects of mindfulness. Increases in mindfulness associated with improved sleep, self-regulatory, self-efficacy, mood, and perception of stress. The effect of increases in mindfulness on sleep quality was mediated through four variables: Tiredness, Negative Arousal, Relaxation and Perceived Stress. Increased mindfulness has important mental and behavioral health implications, for mood and sleep quality specifically.	It may be easier for students to be mindful when they are sleeping better and other factors account for improvements in sleep quality at the end of the semester. The development of mindfulness may also be part of a normal developmental process in college students.
Caldwell et al (2011)	208 (EG 76, CG 132)	Public university students	18-48	Determine whether participants in taijiquan classes would report increases in mindfulness greater than that of a comparison group, and whether changes in mindfulness were associated with improvements in mood, perceived stress, self-regulatory self-efficacy, and sleep quality.	Increases in total mindfulness scores occurred only in the taijiquan group. All wellbeing variables showed a pattern of improvement in the taijiquan group, with either stability or decline over time in the control group. Increases in mindfulness were significantly correlated with improvements on all wellbeing measures and with sleep quality. Relative to a recreation control group, taijiquan classes for college students are associated with increased mindfulness and improved sleep quality, mood, and perceived stress, but not self-regulatory self-efficacy.	Selection bias due to lack of random assignment to the two groups

Reference	n	Context	Age in Years	Programme Objectives	Results	Limitations
Collard, Avny & Bonitwelly (2008)	15	Counselling students at university	-	Address the gap in the literature considering empirical evidence in support of the assumption that Mindfulness is the mediating factor in the positive outcomes of Mindfulness Based Cognitive Therapy (MBCT) and Mindfulness Based Stress Reduction (MBSR) programmes, and to further examine the link between Mindfulness and Subjective Well Being.	Participants' level of Mindfulness significantly increased by the end of the MBCT programme. Positive Affect remained unchanged; Negative Affect significantly decreased. Increase in participants' Satisfaction With Life but failed to reach a statistically significant level; Mindfulness and Negative Affect were significantly negatively correlated, while Mindfulness and Satisfaction With Life were not found to be associated. A longer practice time of Mindfulness during the programme was found to be significantly correlated with a higher level of Mindfulness at the end of the programme.	Pre-disposition of the participants in self-reflecting might have assisted in picking up quickly and effectively the skill of Mindfulness, relating to their professional and personal lives. Small sample and no control group with drop outs. Baseline assessments not done, therefore the robustness of the findings cannot be asserted without further replication.
Cunningham et al (2012)	37	University students	-	Evaluate whether providing voluntary access to web-based personalized feedback interventions would have an impact on drinking.	There is a need to conduct more pragmatic trials of the potential real-world influence of web-based personalized feedback interventions before we can confidently make the claim that these interventions will have an impact on problem drinking in college students when these interventions are offered in a voluntary participation manner.	The study was underpowered therefore much lower sample size than was anticipated.
Davidson et al (2012)	43	1st year students of an undergrad college	25.27 (mean)	Examine the outcomes of a focused workshop targeting the promotion of hope, sense of coherence, and self-efficacy for enhancing students' academic adjustment as expressed through their grades.	Students' scores were significantly higher following the intervention on the hope and self-efficacy measures compared to initial scores. Higher scores on self-efficacy and SOC after 1 month. The large and significant immediate increase in the hope measure after the workshop lost its significance during the month that passed between assessments. Participants who had achieved high hope scores following the workshop maintained those high scores. Self-efficacy scores after 1 month reduced somewhat yet remained significantly different from scores before the workshop.	Workshop was too short. Sample selection drawn from a single small college, individuals volunteered to participate in the study.
Denering & Spear (2012)	453	UCLA Access to Care project	18-24	Preliminary evidence of the effectiveness of the Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST) and ASSIST-linked brief intervention in a college mental health clinic.	Slight reductions in the rates and number of days (in the prior 30 days) of binge drinking and marijuana use were found. Routine screening and brief intervention procedures in a mental health setting may reduce problematic substance use among college students.	No control group. Unable to obtain ASSIST scores on all students. No access to clinical records, therefore it could be that students who received the ASSIST reduced their use of alcohol and drugs because of their ongoing mental health therapy.
Du Toit, Du Plessis & Kirsten (2011)	18 (EG) 9, CG 9)	Educational Interpreters at university	19 - 36	Determine the impact of the Tomatis Method on educational interpreters and explore their experience of the Tomatis programme.	Significant improvement in Interpreting Technique in the experimental group. Improved interpreting efficiency, speech production and listening skills, decreased Fatigue-Inertia; increased Extraversion, Activity and Vigour, and experiences of enhanced relaxation. Positive feedback about the enriching effect of the Tomatis programme on personal lives strengthened the value of the TM for individual growth and PWB. Control group showed some enhancement in aspects of interpreting and sub-domains of personality, and outperform the experimental group on the Feelings (Openness of the NEO-PI(R)). The Tomatis programme had a significantly positive impact on interpreters' performance.	Small sample size due to limited number of Electronic Ears available. Control group did not complete the POMS assessment due to non-availability of participants. No follow-up, results may not reflect the true impact of the TM.

Reference	n	Context	Age in Years	Programme Objectives	Results	Limitations
Dyalan, Subramanian & Elango (2010)	42 (EG) 21, CG 21)	Healthy undergrad med students from Med Col and Uni	21 (mean)	Assess the effect of Mind Sound Technology (MST), an intelligence enhancing program, on psychological well-being of medical undergraduates during exam stress.	MST practitioners were able to manage their stress and anxiety levels even during examination. General and social health scores improved after practicing MST, might be due to increased self-awareness, sense of self-worth or esteem, and reduction in mind chatter during MST practice. MST Students performed better in their academic examinations. Benefits such as more coherent and harmonic brain patterns, better communication between left and right hemispheres of the brain. Improved academic performance and enhanced problem solving ability is also reported in transcendental meditation.	None reported
Ekman et al (2011)	(IG = 80 and CG = 78).	Swedish University students	-	Compare differences in alcohol consumption over time after a series of e-SBIs was conducted students who were considered risky drinkers.	Significant decrease in the average weekly consumption for the IG over time but not for the CG, differences between the groups were non-significant. Significant decreases in HED over time within both groups; equal differences in both groups at the 6-month follow-up. The proportion of risky drinkers decreased by about a third in both the CG and IG at the 3- and 6-month follow-ups. The shorter, generic brief intervention appears to be as effective as the longer one including normative feedback.	Small sample. Assessment reactivity might have been underestimated in design of the study. The IG received a longer, more conventional, brief intervention in contrast to the control group who received a very short summary of their drinking with no advice about reducing consumption.
Hassed et al (2009)	148	1st-year undergrad medical students	18 - 22	Describes the development, implementation and outcomes of the Health Enhancement Program (HEP)	Self-care through mindfulness-based stress management and lifestyle programs can improve student wellbeing, even during high stress periods. Students graduating should be healthier and more resilient than when they came into studying.	No control group. This study only followed students for a 6-week period and longer-term follow-up is planned. Conclusions about long-term benefits should be interpreted with caution.
Hijezi et al (2011)	108	International students at an urban university in the Midwest United States	18 - 49	Investigated whether individual differences moderated the effects of Expressive Writing and Assertiveness Training.	Greater acculturative stress at baseline predicted greater improvement from both interventions. Women benefited more from AT than EW, except that EW improved women's physical symptoms. Men benefited more from EW than AT. Students with limited emotional awareness and expression tended to benefit from both. Nation of origin cultural differences generally did not predict outcomes.	Subsets of students also engaged in another intervention (e.g., the combined group). Limited generalization to students from other nations and cultures. Individual differences investigated are only associated with outcomes and do not cause them.
Kang, Choi & Ryu (2009)	41 (EG) 21, CG 20)	Junior and senior nursing students at university.	-	Examined the effectiveness of a stress coping program based on mindfulness meditation on the stress, anxiety, and depression experienced by nursing students in Korea.	Significantly reduced stress levels, while stress levels in a control group significantly increased over the same period. The results suggest that a meditation-based stress management program is effective in stress management. The developed program significantly reduced the anxiety score in the experimental group.	Sample not completely representative. Pre-intervention values were not equal between the two groups despite random assignment. Small sample size, some subjects were excluded.
Kim et al (2012)	631	An introduction management class at a university in the U.S.A	-	Examined whether core self-evaluations (CSEs) affect learning motivation and performance beyond individual-level established predictors of general mental ability and conscientiousness.	Support for the proposed model, indicating the usefulness of CSE as another important, indirect predictor of performance in a learning setting via multiple dimensions of learning motivation: self-efficacy, goal setting, and goal commitment. Indicate the superiority of the multidimensional over the unidimensional model of learning motivation as a mediator.	Data collected from an academic population. Data collected only posttest.

Reference	n	Context	Age in Years	Programme Objectives	Results	Limitations
Kwan, Faulkner & Bray (2013)	65 to IG and CG	Prospective university students	18.51 (mean)	To test the feasibility and efficacy of a theoretically informed, website-delivered physical activity intervention aimed at students entering university.	Significant declines in broader students' physical activity behaviors, attitudes, and perceived behavioral control. Significant interaction effect for intervention usage and time on perceived behavioral control between intervention users and non-users. Positive results found 75% of the students living in the selected residences had initially expressed interest. Implementation of the website-delivered physical activity intervention on campus is feasible and of interest to students. Students may be generally ambivalent about their physical activity levels.	Poor intervention usage, therefore poor engagement of the student population. Struggling to maintain student interest over the duration of the intervention. Limited financial resource. Self-report measures are susceptible to recall errors and social desirability bias. A small sample size. Exclusion of a true control group. Short follow-up period.
LaBrie et al (2007)	110	1st offenders of campus alcohol policies at a university	18.94 (mean)	Intervention focused on female-specific reasons for drinking and included decisional balance, goal setting and other exercises.	Findings support the use of an MI-based intervention to reduce both alcohol consumption and consequences among adjudicated females. Alcohol use was reduced by 29.9% and negative consequences reduced by 35.87% from pre-intervention to 3-month follow up. Intervention appeared to successfully initiate change in the heaviest drinkers.	Not reported
Lee, Lim & Grabowski (2010)	261	Undergrad students at university in northeastern U.S.A.	-	Examine the effects of two scaffolding strategies—generative learning strategy (GLS) prompts and metacognitive feedback (MCF)—on learners' comprehension and self-regulation.	GLS prompted with MCF improved learners' self-regulation and use of GLS and learning performance, but GLS prompts without MCF did not. GLS & MCF equally effective in improving quality of learners' GLSK use, even though the GLS prompts alone were not effective in improving learners' self-regulation. Learners have different levels of self-regulatory skills and prior domain knowledge.	None reported
Mehrotra (2013)	171 (EG 62, CG 59)	3 Colleges	17-25	Examining the efficacy of a mental health promotive intervention program.	Significant self-report changes (efficacy to manage motivation to work on goals, manage obstacles in goal pursuit, anger, anxiety & sadness). Possible sleeper effect and positive effects of the program related partly to enhanced self awareness & opportunities to experience enhanced motivation to actively work on their goals. Self regulation as a possible mechanism of impact in positive interventions were discussed.	Short duration of program. Self reports based on single item measures, obtained 1 & 4 mths following intervention program. Different outcomes (e.g., academic/work performance) and psychological outcomes to be further researched.
Neal & Carey (2004)	92	University students	-	Determine whether techniques developed for discrepancy are valid and to compare methods of developing discrepancy on intention to reduce alcohol use indices.	PNF group showed significantly higher levels of self-other discrepancy and intention to reduce alcohol use than attention-control group. Significantly higher levels of behavioral intentions did not translate to significantly lower levels of drinking during follow up. Discrepancy was positively correlated with intention and drinking behavior, and negative affect was not related to any outcome. SR theory appears less useful for identifying actual mechanisms of change.	Not designed as a true longitudinal experiment. Baseline assessment not the same as post testing. Unmeasured differences between the groups. Small sample size. One week of self-monitoring may have been too short to observe change.

Reference	n	Context	Age in Years	Programme Objectives	Results	Limitations
Poddar et al (2012)	211 (107 EG, 104 CG)	2 health-related classes at university	20.2 (mean)	Use of Self-regulation Theory to improve social support, self-efficacy, outcome expectations, self-regulation, and behavior related to dairy intake in college students.	Participants in the intervention group reported higher intake of total dairy foods (P 0.012) and improved use of self-regulation strategies for consuming three servings per day of total dairy (P 0.000) and low-fat dairy foods (P 0.002) following the intervention. Nutrition education via electronic mail based on an SCT model improved total dairy intake and self-regulation. Participants reported increased dairy intake and better use of self-regulation strategies.	Self-reported dietary intake may not have reflected actual intake and may have led to overestimation or underestimation. Limited generalizability of the results to racially/ethnically diverse populations, and limited generalizability of the results to young adults not enrolled in college.
Pool & Qualter (2012)	134 (EG 66, CG 68)	Undergrad students from a university	22-24 (mean)	Investigates whether it is possible to improve levels of emotional intelligence and emotional self-efficacy in university students through a teaching intervention.	Positive changes in EI and ESE were seen across the intervention group in both male and female participants. It appears possible to improve ability EI particularly in relation to understanding and managing emotion. Significant improvements in 'understanding emotion' and 'managing emotion', but no significant improvements in 'perceiving' and 'using'. Results show that it is possible to increase a person's self-efficacy in relation to their emotional functioning by increasing their knowledge and understanding in this area.	Reliance on data gathered from a single source. Further research to compare students from science and arts subjects.
Prinsloo (2008)	20	University students	-	To assess the impact of a Go MAD® training programme on the self-regulation of a group of students.	Experimental group's (EG) Long Range Career Oriented Expectancy, Personal Growth, Approach-Avoidance Style and general Problem Solving skills practically improved. The EG also had practically better Approach-Avoidance Style compared to the control group (CG) after exposure to Go MAD®. Most participants perceived themselves as having been able to successfully achieve specific selected goals through applying Go MAD® principles, and regarded Go MAD® as easy to follow as well as useful in establishing and developing new skills. Those who chose unrealistic, non-feasible goals and who had to deal with unresolved emotional issues found it hard to attain their goals. Potential as a valid tool to foster self-regulation and assist in achieving goals.	The timeframe and type of goals Sustainability could not be measured, time and structural limitations made it impossible to do further post-test assessments.
Rosário et al (2010)	Spain (44 EG, 40 CG) Portugal (48 EG, 44 CG)	University (Spain) and University (Portugal).	17 - 27	A programme to enhance first-year college students' self-regulated learning strategies.	Confirm programme efficacy to teach efficient learning strategies and to promote self-regulation. Improved declarative knowledge of learning strategie, & self-regulation competences, & reduced use of surface approaches to learning. No significant changes related to use of deep approaches in any of the experimental groups. The programme contents proved to meet students' expectations and immediate academic challenges' (time mgnt, procrastination, note taking, academic distracters, goals setting and volition).	Self-regulation and approaches to learning were assessed as aptitudes, measuring general dispositions and missing a real approach to the process. Follow up too short to assess long-term impact of the programme.
Short, Kinnman & Baker (2010)	65 (EG 32, CG 33)	Final year psychology students at university	25 (mean)	Examine the effectiveness of a peer coaching intervention on aspects of well-being in students.	Helping students manage wellbeing during a potentially stressful period. Ongoing follow-up research to extend this technique in university settings. Most common topics covered were relationships, health and career issues and 67 per cent of the sample found the intervention to be at least moderately effective. A short programme may be beneficial for students at a stressful times. Some protection from increase in psychological distress & enhanced personal problems during a stressful period.	Small sample size, a cohort from 1 year group self-report data only. Data reflects a subjective estimate of the competence of the peer coach rather than an objective measure of the benefits provided.

Reference	n	Context	Age in Years	Programme Objectives	Results	Limitations
Skar et al (2011)	1273	University campus	22.8 (mean)	Examined the efficacy of two types of planning interventions (action plans and coping plans) in increasing physical activity levels when they are delivered via the internet.	Did not change self-reported physical activity, attendance at campus sports facilities or TPB measures. Planning interventions under investigation are ineffective in changing behaviour when delivered online to a sample of participants unaware of the allocation to different conditions. Possible moderators of the effectiveness of planning interventions in changing health behaviours are discussed.	Low-response rates to the invitation to participate with dropout rates between 40 and 52% limit the generalisability of this study.
Vázquez et al (2012)	133	University students	23.3 (mean)	Compare results of relaxation training (RT) with that of a cognitive-behavioural programme (CBT) for prevention of depression in university students with elevated depressive symptoms.	By itself, intervention had no significant effect on either depression or anxiety scores. The scores were lower at the follow-up time points with respect to pre-intervention scores. Effect size was greatest between pre- and immediately post-intervention scores for CBT, and between pre- and 6-month post-intervention scores for RT. Anxiety symptoms significantly improved by both interventions at 3-month follow-up, and by CBT at 6-month follow-up also. In the medium term (3-6 months), relaxation training produced similar reductions in depressive and anxiety symptoms as a more complex cognitive-behavioural programme.	The results not applicable to other populations of young people. Short follow-up period. Female, male ratio.
Venter (2011)	2421	University students	18.5 (mean)	Develop strategies for Self-regulated learning skills of first year university students.	Motivation, Time management and Information processing were the best LASSI predictors of academic success. Unsuccessful students did not manage time well and were not motivated. Grade 12 marks, age and gender correlated better with the first year students' academic achievement than the LASSI subscales. Successful students realised at the onset of studies that they had to and did adapt their study methods to meet the challenges, they had knowledge of themselves and different study in this context (Use different study methods and describe learning styles and preferences clearly, set realistic academic goals). Unsuccessful students did not consider their own study preferences or the academic requirements of the university.	Not reported
Verqueil, Taljaard, & Du Plessis (2011)	13 (EG 7, CG 6)	Sophomore-to-postgraduate student pianists from university	-	The effect of the Tomatis Method on psychological well-being (PWB) and piano performance of student pianists was studied from different perspectives, to develop a more comprehensive picture of this new field of study.	Student pianists' PWB was not statistically significantly enhanced. Qualitatively most of the experimental participants reflected increased autonomy, improved interpersonal relationships and increased self-confidence, indicating enhanced PWB. Signs of enhancement in relation to other dimensions of psychological well-being (self-acceptance, environmental mastery, coping ability and sense of direction) were also noted in a minority of experimental participants. Positive change was noticed in only one control participant. Qualitative results suggest that the Tomatis Listening Program facilitated enhanced PWB in these students, even though effects were not statistically significant.	Small sample size, as exploratory study, it was not designed to evaluate the impact of the Tomatis Method on specific aspects of psychological well-being or piano performance. Regarding these aspects, participants' profiles therefore differed, which limited control over dependent variables, and thereby the possibility of statistically significant findings
Vitarsari et al (2010)	12	Healthy students from 5 engineering faculties at University	-	A study anxiety intervention program is designed to manage students study anxiety in order to improve academic performance among students is proposed.	Experiment groups performed better in coping anxiety levels as well as increasing academic performance compared to the control groups. Based on these results, study anxiety intervention can be concluded as an effective program to improve academic performance among university students. Participants should practice these techniques effectively to cope with study anxiety.	Not reported

CHAPTER 3: MANUSCRIPT 2

The effect of the Tomatis® Method on self-regulation in a sample of South African university students

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Abstract

Aim: To evaluate the extent to which the Tomatis® Method improves self-regulation in a sample of South African university students (N=49). *Method:* A concurrent, mixed-method approach using a three-group pre-post, and repeated post-assessment design, was used. *Results:* The Tomatis® Method had a positive impact on hypo-responsiveness in the left ear and spatialization of the right ear, on introjected regulation and perseverance, as well as on psychological and social well-being. Benefits were also qualitatively observed regarding improved listening in social and academic contexts, attention and awareness, self-control and interpersonal regulation. Quantitative benefits regarding self-regulation obtained by the Tomatis group were shared to a certain extent by the Mozart group, while the benefits regarding well-being were only in comparison to the control group. *Conclusions:* The Tomatis® Method has potential to improve the self-regulation skills of tertiary students. However, more research has to be done, with larger random samples to determine the extent to which the findings can be generalized, as well as to determine the possible role mediating and moderating variables play in the relationship between listening, self-regulation and psychological well-being.

Keywords

Academic performance, intra-interpersonal relationships, learning, listening, motivation, Self-regulation, Tomatis® Method, South African context

The effect of the Tomatis® Method on self-regulation in a sample of South African university students

An alarming 33% of students do not return to the higher education system in South Africa after their first year of enrolment (Kamal, 2014). The South African attrition rate therefore increased since 2001 when the dropouts of first year student averaged 25% (Kalenga & Samukelisiwe, 2015). This is more than double the 10 to 15% reported by Ethiopian universities with similar higher educational structures (Sewasew, 2014), and five times more than the 6% in the United Kingdom (Parr, 2015), but similar to the 31.3% dropout rate in the USA in 2013 (National Student Clearinghouse Research Center, 2014).

The high attrition rate of South African universities can mainly be ascribed to low socio-economic backgrounds, psycho-social difficulties such as a lack of support and poor transitioning and adjustment to the tertiary environment (Kalenga & Samukelisiwe, 2015). Other contextual challenges such as “cross-cultural issues, dysfunctional family life, poor frustration tolerance, alcohol- and drugs, interpersonal conflict, and increased levels of financial distress” were highlighted as key aspects that influence students’ ability to effectively self-regulate their cognitive, emotional and behavioural functioning (Bonthuys & Botha, 2015a, p. 1-3).

A psychological strength in readjusting oneself and adapting to challenging contexts is self-regulation, which Maes and Karoly (2005) define as a systematic process that involves setting personal goals and directing behaviour towards achieving these goals. Good self-regulation skills may therefore be of critical importance to students in effectively managing diverse goals related to academic strategies, identity, health, and interpersonal relationships (Vandergrift, 2005). Studies within the South African context have confirmed the importance of effective self-regulation regarding positive affect, subjective well-being, fortitude, and coping (Botha, 2013; Keyes et al., 2008; Khumalo, Wissing, & Temane, 2008). An interesting finding was the sense of collective

efficacy that related to self-regulation within Black South African communities (Van Straten, Temane, Wissing, & Potgieter, 2008). Self-regulation can therefore be described as an intra-and interpersonal construct that can assist students to manage and decrease psychosocial and emotional stressors, as well as enhance well-being (Bonthuys, & Botha, 2015b). Human-Vogel (2013) indicates a strong relationship between self-regulation and identity processes in students, specifically as reflected in their level of commitment. This is very valuable when considering the developmental phase that students find themselves in.

According to Erikson (1963, 1968b), individuals experience specific developmental conflicts that can make the transition between life stages, such as students who are in the process of moving from adolescence to young adulthood, difficult (Sokol, 2009). During college or university life, students are confronted with important questions about “occupation, friendships, romantic relationships, religion and political beliefs” (Sokol, 2009, p 5). Self-regulation is therefore a critical factor during these developmental stages where they have to set and commit to goals in these various domains.

From a neurological perspective, self-regulation consists of different micro-skills and processes of which attentional control is a key factor also found in active listening skills (Rueda, Posner, & Rothbart, 2005). Listening provides important feedback information that is not available from other sensory systems. For this reason, a strong relationship exists between listening and self-regulation, already from early childhood (Bonthuys & Botha, 2015a; Florez, 2011; Thompson & Andrews, 1999; 2000). The relationship between listening and intentional behaviour is central to the work and research on auditory functioning and sensory integration of Dr Alfred Tomatis (1920-2001). He developed the Tomatis® Method based on the functioning of the ear and active listening (Tomatis, 2005). This method differentiates between hearing and active listening by defining that a sound message can be “correctly heard (hearing) but poorly analysed in an emotional framework

(listening)” (Tomatis Développement Société Anonyme [TDSA], 2015). Although his initial treatment with this method was focused on improving voice and sound production of opera singers, clinical application later included social adjustment, emotional problems, and communication disorders (Madaule, 1994; Vercueil et al., 2011). Tomatis based his theory on three laws, namely, 1) “the voice only contains the harmonics that the ear can hear, 2) if hearing is modified, the voice is immediately and unconsciously modified, and 3) it is possible to durably transform phonation when auditory stimulation is maintained over a certain time” (Tomatis, 2005, p 72; Solisten, 2009, p 5-7).

Based on these laws, Tomatis indicated that sensory, cognitive and motor neurons are functionally linked by the same neural network. The term “Audio-psycho-phonology” was developed from this understanding (Tomatis, 1991, p 88). Through his research Tomatis discovered that language develops when neural networks, also referred to as “listening integrators” activates the connection between perception, action and cognition (Tomatis, 1996, p 168). Further research found that the Tomatis® Method is not only applicable to language development, but can also be valuable for promotion of high-level cognitive functions (memory & attention), as well as understanding goals or intentions of others (Solisten, 2009). There are 11 auditory control loops in the brain that stimulate certain muscle groups to transfer sensory information from the body back to the brain, which is done through air and bone conduction (Tomatis, 2005).

Apart from neurophysiology, active listening also has a motivational component. Human beings have a desire to communicate and hear actively by selecting acoustic sounds and inhibiting irrelevant sounds at the same time in order to form a message. This control over a message is constantly evaluated and readjusted (Solisten, 2009). According to Tomatis (1991), everything in life involves some sort of dialogue. Poor listening would therefore have the effect of disharmony on overall integration, impacting relationships with other and the self (Tomatis, 1991).

Although the Tomatis® Method has been applied to many South African contexts (compare Coetzee, 2001; Du Toit et al., 2011; Du Plessis et al., 2001; Nel, 2005; Neysmith-Roy, 2001; Van Jaarsveld & Du Plessis, 1988; Vercueil et al., 2011), the potential contribution of improved listening skills through the Tomatis® Method could have on effective self-regulation in university students has up to this point not been adequately addressed. Limited proof exist of experimental and control conditions within research related to the Tomatis® Method, and controversial research on the “Mozart effect” (Jenkins, 2001; Steele, Bass, & Crook, 1999; Thompson, Schellenberg, & Husain, 2001) further expose the current gaps in Tomatis research.

Bonthuys and Botha (2015b) also indicated that interventions aimed at improving self-regulation and well-being in tertiary students have mostly used self-reporting measures, while direct skills assessment is largely absent. Despite these shortcomings, it is clear that an increase in effective self-regulation may address challenges that contribute to student dropout and enhance their well-being on multiple levels of functioning (Bonthuys, & Botha, 2015b). In addition, it is recommended that longitudinal and experimental designs based on representative samples of culturally diverse student populations are needed for sound empirical research. Based on these gaps in knowledge, the aim of this study is to evaluate the impact of the Tomatis® Method on the self-regulation of a sample of South African university students.

Method

Design

A concurrent, mixed-method experimental design (Hanson, Creswell, Plano Clark, Petska, & Creswell, 2005) was conducted for this study. Data was collected using a three-group pre-post, and repeated post-assessment design. Pre-measures took place a week before the intervention, post-measures within a week after the intervention was completed, and repeated post-measures four months later (see Figure 1).

<Insert Fig. 1 approximately here>

Sampling / Participants

A purposive sample of 49 first-year undergraduate students from the Potchefstroom Campus of the North-West University participated in the study. This sample consisted of 13 males and 36 females, of whom 25 were White, 23 Black and 1 Coloured. A full biographical profile of the study population is provided in Table 1. Participants were randomly assigned to an Experimental group (group E) (n=18) who underwent the basic Tomatis programme, a first control group that listened to Mozart music, but without the gating effect of the Tomatis® Method (group M) (n=16), and a second control group that did not listen to any music (group C) (n=15). Of the 49 participants, only 26 (E, n = 8; M, n = 9; C, n = 9) were available to complete the post- and 21 (E, n = 9; M, n = 6; C, n = 6) to complete the repeated post-assessment phases.

< Insert Table 1 approximately here>

The Listening Programmes

Selected participants for Group E and M reported to the Audio-psycho-phonology facilities at the Institute of Psychology and Well-being at the Potchefstroom Campus of the North-West University (NWU). Group E took part in the standard fundamental, previously known as the basic Tomatis programme. The researcher is a qualified Tomatis practitioner and presented the programme with the technical assistance of an intern psychologist. The Tomatis® Method is played through a portable Solisten® device that reproduces the gating effect of the Electronic Ear (EE), which Tomatis developed for the stimulation of listening skills (Tomatis, 1991). This device has been created with 2 sessions of 30 hours each for good follow-up scope, but can be combined and connected in accordance with the needs of the participant (Solisten, 2009). For the purposes of this study the programme consisted out of 2 sessions of 25 hours each. The sessions consisted of 2 hours a day over a period of 15 days (session 1) and 10 days (session 2). During the programme

participants listened to various Mozart compositions (Appendix A), modified by the gating effect of the EE (Tomatis, 1991; Madaule, 1994). Tomatis found the rich harmonics of Mozart's violin concertos ideal and necessary for the mechanism of electronic gating to work (TDSA, 2015). Group M were given the same amount of time listening to the Mozart compositions without the gating effect of the EE. Participants could perform activities such as drawing, painting, building puzzles or just relaxing during listening. These activities have been proposed for participants not to get bored and it enhances the integration of reflex and tactile sensory systems (Thompson & Andrews, 1999). These activities were, however, not collected or interpreted as data.

Procedure and Ethical Issues

This study forms part of a research project titled "The dynamics of self-regulation as psychological strength in the South African context", which has been ethically approved by the NWU (ethics number NWU 00103-11-S1).

The research study was advertised on the NWU through contact with lecturers, who acted as gatekeepers. The researcher were granted some time before the start of lectures and provided information about the planned research to students during that time. The same information were placed on the eFundi online student portal and ensured all relevant students received an equal opportunity to take part in the study. Research was conducted in accordance with the research protocol of the NWU and the aims and ethical guidelines of the umbrella project. Informed consent for this study was obtained from all participants prior to conducting research through signing of a consent form. Participation within the study was voluntary and anonymous, research codes were allocated for each participant, rather than using their actual names. No students who are/were lectured by the researcher took part in the study. Participants could withdraw at any stage during the research process without explaining why. Participants were informed that the results of the study may be published, but that no identities will be disclosed during such process.

Participants were randomly assigned into the three experimental conditions, after which data were gathered during a pre-post and repeated post-stage. The two control groups received the opportunity to complete the Tomatis programme after all data were captured. Psychometric tests were administered by the researcher, who is a qualified and registered practitioner in terms of the regulations set out by the Health Professions Council of South Africa (HPCSA). Captured data was stored and is locked securely at all times providing access to the researcher only. The listening programmes were conducted by the researcher, who is a trained Tomatis Consultant. Both groups M and C were also invited to follow a Tomatis programme after completion of the research study.

Data Generation

Biographical information (Solisten, 2009)

The Adult Solisten® Programme Background Questionnaire provided a biographical profile of the study population (Table 1).

Listening Skills

Tomatis® Listening Test (TLTS: Tomatis, 1991; 2005; Sollier, 2005)

This TLTS is a direct outcome of Tomatis' distinction between hearing and listening (Du Plessis et al., 2001). The TLTS establishes air and bone conduction thresholds, the effect of spatialization and auditory selectivity, as well as ear dominance and auditory laterality. Frequencies ranging from 125 to 8000 hertz are evaluated by means of comparing air and bone conduction curves in relation to each other in each ear (Du Plessis et al., 2001). The test reflects how the desire to listen is utilized or resisted, therefore revealing listening strengths or listening weaknesses (Du Plessis et al., 2001). The TLTS is performed using a Diagnostic Audiometer AD 229b and has mainly been used as a clinical tool to monitor progress (Krügel, 2011). Aubert-Khalifa et al. (2010), however, found the test to be valid and reliable for research purposes.

Self-Regulation

Due to the complex nature of self-regulation and different ways in which it is expressed, it was decided to explore it from different perspectives including self-report scales, direct measurements, observations and participants' subjective experience.

Shortened Self-Regulation Questionnaire (SSRQ: Carey, Neal, & Collins, 2004; Potgieter & Botha, 2009)

The SSRQ is a 31-item scale designed to measure a person's average ability to regulate his or her behaviour to achieve a desired goal. Potgieter and Botha (2009) have proposed a factor structure relevant in a South Africa context, and criterion-related validity and reliability reported a Cronbach alpha value of 0.90. This seven-factor structure has been successfully used within the South African context (Cloete, 2010). For the current study two Cronbach alpha values below 0.60 were obtained and the decision was made to exclude them from the study. The other constructs obtained Cronbach alpha values between 0.61 and 0.83 in the current study.

CogLab 2.0 (Francis, Neath, & Van Horn, 2008)

CogLab 2.0 is a set of computer-based cognitive experiments that allows better understanding of certain cognitive functions, including self-regulation as part of the brain's executive functions. For the purpose of the study, participants completed the Attention and Working Memory subtests. Access to computers was made available for participants to complete the required experiments. Previous research found reliability and validity indices between 0.72 and 0.96 for various experiments of CogLab (Shah & Miyake, 1996).

Academic Motivation Scale (AMS-C 28: Vallerand et al., 1992)

The AMS-C 28 was used to determine participants' academic motivation. The AMS consists out of seven subscales and was developed to measure intrinsic motivation on three levels (to know, to accomplish things and to experience stimulation), extrinsic motivation on three levels (external,

introjected and identified regulation) and amotivation within an educational context. This 28-item questionnaire has shown Cronbach alpha values for the seven subscales between 0.62 and 0.86 (Vallerand et al., 1992). The current study compared favourably with earlier studies, obtaining Cronbach alpha values between 0.50 and 0.88 on the seven subscales.

Zin Obelisk Problem Solving Task (ZIN: Francis & Young, 1979)

The object of the ZIN is for participants to complete a task by solving a problem together as a group. This problem is structured in a way that each individual in the group receives important information that can only be communicated by means of clear dialogue to the rest of the group. Group members must listen attentively to each other's ideas about how to solve the problem. This complex task, which should be completed within a time limit, contains some irrelevant and ambiguous information and can therefore provide the stage for conflict to arise (Francis & Young, 1979). This method was used to assess participants' interpersonal self-regulation. A previous study conducted by Du Plessis (1996) found the ZIN to be of specific importance for evaluating interpersonal communication and listening skills. These interactions were audio-visually recorded, observed and documented by a panel that consisted out of the researcher and two additional observers – all three are familiar with the ZIN and how to assess interpersonal self-regulation. Specific focus was paid to listening skills during the interactions.

Self-reflective journals

Participants in groups E and M were asked to keep a self-reflective journal to record their subjective experience of change throughout the listening programmes. Reflective journals are a valuable and relevant method of collecting qualitative data for the purpose of gaining insight into the participants' views, thoughts and feelings about the listening programmes (Rossouw, 2014). Each participant were provided with an A2 notebook before the intervention, and given the instructions: "You may notice an increase in sensitivity and emotionality, either initially and/or as the programme

progresses. This is in response to the sensory input and is only temporary. Any of the areas / activities below could be affected by this input and changes could occur quickly or over time. Take care to note any little detail in your emotions / mood, energy level, academic work, organizational skills, communication; interactions with peers / friends, family members; social, behaviour, and any additional information you might feel to mention”. The researcher was aware of the possibility that the suggestion of change could have biased participants. However, when conducting experimental research, participants have to be informed about what they can expect during the intervention (Greeff, 2015). To reduce bias the researcher did not disclose which research group they were assigned to and provided the same instructions and information to both groups.

Semi-structured interviews

Semi-structured interviews allow participants the freedom to express themselves in their own words, consequently providing reliable qualitative data for the purpose of comparing the subjective experience of the participants (Cohen & Crabtree, 2006). Individual and group interviews were conducted with participants in group E and M during the last week of the intervention stage. During the individual interviews the focus was more on specific areas of functioning, similar to what was asked for the reflective journals: “You may have noticed an increase in sensitivity and emotionality, either initially and/or as the programme progressed. This is in response to the sensory input and is only temporary. Any of the areas / activities below could be affected by this input and changes could occur quickly or over time. Could you share any little detail?” Participants were asked to discuss their emotions/mood, energy levels, academic work, organizational skills, communication, interaction with peers/friends, family members, social, behaviour, or any other area of functioning they felt to discuss. During the group interview participants were asked: “We want you as a group to just talk a little bit amongst yourselves of what your experience of the programmes has been so far”. All interviews were audio-recorded and transcribed.

Well-being

The following measures of well-being were included to explore self-regulation as a psychological and social strength (Peterson & Seligman, 2004).

Mental Health Continuum – Short Form (MHC-SF: Keyes, 2006; Keyes et al., 2008)

The MHC-SF consists of 14 items that place positive mental health along a continuum from languishing to flourishing, and consists of three subscales namely: 1) Emotional well-being, 2) Psychological well-being, and 3) Social well-being. Emotional well-being refers to the experience of more pleasant emotions and less unpleasant emotions, as well as happiness in the sense of how satisfied individuals believe they are with life in general (Lamers, Westerhof, Bohlmeijer, ten Klooster, & Keyes, 2011). Psychological well-being in the MHC is based on Ryff's (1989) model, and indicates enhanced functioning in the six areas of self-acceptance, personal growth, purpose in life, positive relations with others, autonomy and environmental mastery. Social well-being indicates improvements in the five specific areas of social integration, contribution, coherence, actualization and acceptance (Keyes, 2002). Flourishing individuals would have high levels of personal well-being, emotional vitality, and positive feelings towards themselves and positive psychological and social functioning, while languishing individuals would experience a life of emptiness, stagnation and feelings of being hollow, and have a low score on the scale (Keyes, 2002; Khumalo, Temane, & Wissing, 2012). The MHC-SF has shown to be reliable and valid for use in an African context (Keyes et al., 2008). Cronbach alpha values of 0.74 (Keyes et al., 2008) and 0.84 (Khumalo et al., 2012) have been reported. In this study the Cronbach alpha values were between 0.74 and 0.80.

Social Support Questionnaire 6 (SSQ6: Sarason, Sarason, Shearin, & Pierce, 1987)

This 6-item questionnaire is a shortened version of the Social Support Questionnaire (Sarason, Levine, Basham, & Sarason, 1983), designed to measure social support. Each question has a two-

fold answer firstly asking participants to list all the people that fit the description for that question, and secondly to indicate to what extent they are satisfied with the people they listed. This scale showed good internal consistency in previous studies with Cronbach alpha values ranging between 0.83 (Gourounti, Anagnostopoulos, & Sandall, 2014) and 0.92 (Kafetsios, 2006). The Cronbach alpha value in this study was 0.84.

Data Analysis

Quantitative analysis.

Quantitative data were captured and analysed by the North-West University Statistical Consultation Services, Potchefstroom Campus using SAS 9.3 (SAS Institute Inc., 2011; 2015). Cronbach alpha reliability coefficients were computed for all the subtests of measuring instruments to determine reliability, while confirmatory factor analyses were done to confirm construct validity. Analyses of variances (ANOVA) were done to determine if differences existed among group means. Dunnett's (Field, 2009, p 345) post hoc, one-sided tests were done, using the Tomatis group as control, to determine if the two control groups differ statistically significantly from the Tomatis group. These tests were done at a 0.05 significance level. As a result of small groups in this study, non-parametric Kruskal Wallis and multiple comparison tests were also done to confirm and compare results obtained by the ANOVA's and Dunnett's test results.

Qualitative analysis.

The three observers used a self-compiled rating scale as a guideline to assess participants' interpersonal self-regulation during the ZIN. Participants were rated as *good* when they displayed the ability to listen empathically, giving others the opportunity to speak, and assertively communicated their own ideas; *poor* when participants did not take part in the discussion, interrupted others in the group, or overpowered the group; and *average* when they did not clearly comply with the criteria for either good or poor. This was done to standardize observations between

the three observers and not for statistical purposes. The observers also wrote down their observations for each participant. Blinded observation and evaluation were done with two of the panel members not knowing which group the participants were from, as well as which phase they were observing.

Thematic analysis was done with ATLAS TI © (Muhr, 1994) on the transcribed data of the ZIN, reflective journals, individual and group interviews. Through this method patterns or themes are identified and analysed across the data sets (Wilson & MacLean, 2011). Investigator triangulation was done as the researcher and a co-reviewer completed thematic analysis independently, where after themes were compared, reviewed and refined, named, defined and a final report compiled (Braun & Clarke, 2006; Leech & Onwuegbuzie, 2007). Trustworthiness was ensured through the keeping of notes and memos during the analysis. By making use of different sources of qualitative data, additional reviewer and observers, data triangulation were used as quality assurance method (Wilson & MacLean, 2011).

Results

Reliability and validity of the quantitative measures

All possible reliability indices were computed for subscales as captured in Table 2. Two subscales yielded α -values < 0.60 , namely SSRQ Self-evaluation and SSRQ Creativity. These were not used for further analyses, but are included in the table for transparency (Field, 2009, p 821).

<Insert Table 2 approximately here>

Between one and two factors were retained, explained by each confirmatory factor analysis on each construct of the SSRQ and MHC-SF. The decision was made to keep the constructs according to the scoring instructions of the standardised SSRQ and MHC-SF, especially due to the fact that these constructs had Cronbach alpha values higher than 0.60 (Field, 2009).

ANOVA

Repeated measures ANOVAS as well as paired t-tests were done to detect in-group differences. Inconsistent results were found concerning statistically significant differences between pre-, post- and delayed post measures within groups. As a result of the fact that the main objective of the study was to evaluate the Tomatis against the other two methods the decision was made to report and discuss only between group differences. Between-group differences (tables 3 & 4) were compared by subtracting the pre-results from the post-results (difference 1 = Diff1), and the pre-results from the post-post results (difference 2 = Diff2) to determine the longevity of the results. The parameters of listening as measured by the TLTS (table 3) show statistically significant differences ($p < 0.05$) in Diff1 on AC/BC Hypo responsiveness in the left ear between groups E and M, and groups E and C. Group E showed an increase in mean scores, while both groups M and C showed a decrease in mean scores. On Diff2 statistically significant differences ($p < 0.05$) were found between groups E and C on Spatialization of the right ear, with a decrease of spatial errors in group E and an increase in group C.

<Insert Table 3 approximately here>

Statistically significant differences ($p < 0.05$) were also found in Diff1 on Psychological Well-being (MHC_PWB), and Social Well-being (MHC_SWB) between group E and group C (table 4). Scores indicated an increase in Psychological Well-being and Social Well-being in group E, and a decrease in Psychological Well-being and Social Well-being in group C. Finally, statistically significant differences ($p < 0.05$) were found in Diff2 on Perseverance (SSRQ) between group E where scores increased and group C where scores decreased, and on Introjected regulations (AMS) between group E where scores increased and group M where scores decreased (table 4).

<Insert Table 4 approximately here>

Qualitative results

In the analysis of the journals and interviews of participants from groups E and M, it is clear that some direct, short-term emotional and physical changes were perceived by all participants. Emotional changes included initially feeling more emotional and emotionally drained, followed by frustration, irritation and impatience, but later on a calming and relaxed effect. Physical changes included increased energy levels for some, decreased energy levels for others, and initial discomfort like headaches and feeling tired. Some participants mentioned that they slept much better while at least one participant also felt that his appetite had increased.

The results of the ZIN, self-reflective journals and interviews are combined to provide an integrated view on perceived longer-term changes within participants. Four themes were identified, namely improvement in listening skills, awareness and attention, interpersonal self-regulation, and self-control. Although participants from both groups E and M reported improved listening skills, it was more prevalent in participants from group E. Both groups experienced improved attention and awareness, as well as improved interpersonal self-regulation. Lastly, improved self-control was reported primarily by participants from group E. These themes will briefly be discussed.

Improved listening

The majority of group E participants, and a few participants from group M experienced improvements in their hearing and listening ability. They seemed to have become more in tune with everyday sounds, which they did not pay attention to previously. Participant E1, for example, explained: *“I realized I hear, I would not say a frequency, I heard a sound like in the car when you switch on the indicator...it sounded to me as if I hear it more clearly”*, while Participant E17 explained: *“...like I can pick up okay that person actually said the sky is blue, for example, where else previously I would just hear it as background noise.”* Participant M8 experienced this as follows: *“Something that I’ve realised is that my hearing abilities have improved, like I can hear*

sounds that are subtle and stuff...At first I didn't hear sounds that were low, I couldn't hear them but it take time to like hear them and be specific about them but now I am more aware of sounds that are low..."

Improvement in listening was specifically noted in participants' social relationships.

Participant M7, for example, said: *"My listening, like at first I would like miss some words when someone was speaking and asking what were you saying? Pardon? You didn't get that. Like now I can like, I hear every word that she says and respond."* Participant E1 said: *"When someone talks to me, I am inclined to pay attention...where I struggled previously."* He further explains his experience by saying: *"Definitely in the last week I realized I catch more things that she (wife) tells me. I pick it up; I hear it and can answer her."* Improved listening ability was also experienced regarding their academic work, for example, Participant E8 reported that: *"Yes, I think I listen better now in classes",* and *"I don't get bored in class, because now I hear...Yes, because I can hear what the lecturer is saying"*. Participant E9 said: *"Yes, I understand, well I think listening in class now it's a bit better, so I understand the lecturer explaining, I'm not just sitting there like I was just going to be done. At least I've got a better understanding, yes."*

Improved interpersonal self-regulation

Changes in interpersonal self-regulation were clearly noted by observers in the ZIN and by participants themselves as evident from the interviews and their self-reflective journals. All three groups displayed similar interactional and problem-solving patterns during the pre-intervention phase in the ZIN. During post-intervention, improvements were observed in all three groups. Some improvements were shared by groups E and M, while others were unique to all three groups.

Participants from groups E and M felt that they were now comfortable in social situations and able to be more self-assured after the intervention. Participant E9 specifically felt that: *"I think I'm a bit calmer now and I can talk to people and even in my interview, last week, yes, I was nervous, but I*

could like you know... sell myself if I can say that?", while Participant M8 said: *"Well in my perspective thinking I used to be like more antisocial, but now I am not scared of talking to anyone, yes I can just speak to anyone that I don't know."* Participants from groups E and M also experienced a higher tolerance for social interaction. Participant E8, for example, said: *"Yes, I think it's like the first time when someone says something I'll just agree, just so that they can stop talking to me and stuff...Now I don't mind, they can talk"*, while Participant M4 indicated that: *"Like when someone talks to me, like a friend about her problems, then usually I would get irritated quickly, but now I am more calm and listen to what she says and try to help her."*

Other improvements were unique to each group. However, these were more notable in participants of group E compared to those in the other two groups. They were less overpowering in interpersonal problem solving and more open to provide others the opportunity to take part in the discussion, for example during the ZIN they: *"Share own ideas also very well. Debate with others well, remember others' detail, structure, try to engage everyone."* Participants in group M specifically displayed improved ability to be open and to engage the group. One observer noted, for example during the ZIN that: *"Listen well to everything, engages others, summarize talks over others at times"*. This was experienced by Participant M11 as: *"Yes, I can be open to them now...I used to mind my own business, I don't interfere with people or I don't bother people with my problems, but then now I can talk openly to them."* Participants in group C displayed some improvements with recalling information that others have shared about the problem. One observer noted during the ZIN: *"Remembers what other shared, discuss and engage well, get lost at times, but engage again and share ideas"*. As group C did not take part in any intervention. The only possible reason for these observed changes is that they have gained some experience from the first ZIN.

During the repeated post-intervention only Group E participants showed further improvements, more specifically in their ability to listen, to reflect, and in their openness to discuss

problems and provide various solutions. Examples from the notes by the observers include: “Open to discussion, give guidance, use humour”, “...listen well and reflect beautifully”, “Contribute to discussion, listen well and appropriate contributions”, “Sensitive, divide info in constructive manner, listen well”, and “Share own ideas, debate thoughts and verbalise them, assertive”.

Improved attention and awareness

Participants indicated that they became more able to pay and sustain attention, for example Participant E18 said that: *“Now able to concentrate on one thing at a time.”* Some related this to being more in the moment, Participant M12, for example, mentioned: *“You are just in this moment so when you do, you focus on what you do now or on the people there, what you are doing”*, while Participant E17 explained: *“...but I would say I’m a bit more alert. ..it’s like an eye opening, I see things or realise things better, or notice.”*

Participants mentioned a number of perceived benefits due to their improved attention and awareness. Firstly, they felt they have a better understanding of and are more actively involved with their studies. Participant M8 mentioned: *“I have been able to understand most of my work so far better than I did before and it is all because of the focus that I am to have busy with the sessions”* while Participant E4 said that the programme: *“Help you stay focused...refreshed for classes ready to learn and listen to teachers.”* Participant M7 discovered that: *“This programme helped me like to realise that I have the ability to actually sit for two hours and study a day now.”* Participant M6 further said: *“... my knowledge intake is far more than previously”*, and Participant E9: *“I understand, well I think listening in class now it’s a bit better, so I understand the lecturer explaining, I’m not just sitting there like I was just going to be done. At least I’ve got a better understanding.”*

One reason for getting more involved seemed to be that they perceive their attitudes toward their studies as starting to change, and that they have become more motivated. Participant M17

mentioned: *“I decided to put more effort in.”* This was also experienced by Participant E16 who said: *“I am a little more motivated to go to class.”*

Finally, this has further contributed to improved academic performance, as illustrated by Participant M1, who reported: *“I’ve done better in my tests... 20%”*; while Participant M11 indicated that: *“I studied for one test here and I got 77%”*. When asked about previous results, the participant answered: *“I had 50’s, 60’s.”* Participant E16 said: *“Since I have been on the programme my first test I got 70.”* When the interviewer enquired about previous results the participant explained it as follows: *“The previous marks were up and down...I did not get 70 in a whole year ... Always about in the 50’s.”*

Improved self-control

Improved self-control regarding thoughts and emotions were primarily experienced by participants in group E. Participant E18 experienced this as being better able to control his aggression after the intervention: *“It is really not what I thought I would take liking to, it’s always playing in my head making it hard for me to be loud and aggressive like I usually was.”* Participant E4 was more able to adapt own behaviour to circumstances when emotional control was in place and explained that the Tomatis programme helped to: *“Forget about stresses”* and *“...give a different way to look at problems while calm and refreshed.”* Participant E17 said: *“...since I’ve been listening, I’ve been teaching myself to relax a bit more. I’m a very tense person, so it’s like I will be doing something, but already I’m thinking 500 things that I’m going to have to go and do. So I’m trying to relax a bit more and focus on what I’m doing that very moment, so I’ve been practising that, or teaching my brain to do that.”* Participant M6 also experience more control over behavioural reactions: *“Well like with situations, like if something arises, it’s more of an okay, calm down and think of a solution for it, than before it was always like just going to a solution without thinking it through thoroughly.”*

From Participant E14's perspective the increase in control led to improved decision-making: *"Before I used to make decisions and wonder afterwards if I made the correct one, now I summarize a situation better and can therefore make the right decision."* This had resulted in: *"... I make less subjective decisions, and "take all factors into consideration."* Finally, both participants E3 and E8 experienced better self-discipline and organisation. They respectively indicated that: *"I find it easier to apply self-discipline"*, and *"I think it's different because obviously my organising skills have changed a bit, so how I do things has changed; it's not like the normal routine that I did before"*.

Discussion

This study evaluated the extent to which the Tomatis® Method improved self-regulation in a sample of university students. Two subscales, SSRQ Self-evaluation and SSRQ Creativity yielded α -values < 0.6 and were excluded from further analyses.

Using the ideal listening curve as reference point, a global view of the listening curves as measured by the TLTS is obtained by focusing on various parameters that highlight listening strengths and weaknesses (Sollier, 2005). In the current study, changes that occurred in participants' desire to listen are reflected in the statistical significant difference of hypo-responsiveness in the left ear of the Tomatis group, compared to both the Mozart and Control groups. These results showed improvements in the Air/Bone conduction (AC/BC) relationship of the listening curves. According to Tomatis (Solisten, 2009) a good AC/BC relationship is characterized by the balance between energy invested internally (BC) and energy invested externally (AC), with BC situated below AC. A close AC/BC relationship, without touching or crossing each other, translates as functional harmony between the stirrup and hammer muscles found in the middle and inner ear (Solisten, 2009). The functioning of these two muscles is controlled by the 5th and 7th cranial pairs, which are directly linked to the amygdala (Solisten, 2009), which plays an intricate role in self-regulation (Banks et al., 2005; Heatherton, 2011). As highlighted by Thompson and Andrews (2000), the stimulation that

takes part during a Tomatis programme improves the interconnections between the ear, the nervous system, and the brain, which leads to better integration in human behaviour.

Why these changes were only significant in the left ear, may firstly be due to the neurodevelopmental principle that underlies the Tomatis® Method. The stimulation promotes nerve growth, which happens over a period of time (Thompson & Andrews, 2000). Students, due to their developmental stage and level of differentiation, are often confronted with adjustment and emotional challenges (Bonthuys & Botha, 2015a). Therefore, it is not surprising that the results portray improved integration of pathways between the ear and the brain, providing a wider ability to receive, accept and process an acoustic message and also created more of a desire to connect and communicate with the outer world (Solisten, 2009; Thompson & Andrews, 2000).

A second reason for the significant change of hypo-responsiveness in the left ear might be that all sound traveling through the left ear is projected to the right hemisphere of the brain (Hughdahl, 2005). Based on the knowledge that the right hemisphere is regarded as the dominant emotional processing hemisphere (Lindell, 2013), it is not a surprise that participants of group E experienced improvements in this area. Davidson, Fox and Kalin (2007) explains that emotions regulate “adaptive behaviour and decision making in response to salient events” (as cited in Lindell, 2013, p 1). Tomatis (Solisten, 2009; Tomatis 1991; 2005) also describes left ear laterality in terms of the ear’s connection with the brain. The improvement in AC/BC relationship in the left ear therefore also improved the participants’ ability to be emotionally more available to themselves, others and the environment.

Statistical significant results on Diff2 of right ear spatialization further indicated a decrease in the spatial errors made by the participants in the Tomatis group to locate sounds, whereas the Control group showed an increase in the same parameter. This indicates that the Tomatis® Method had a positive effect on the participants' ability to locate sounds which has a direct impact on their

levels of energy, memory and attention" (TDSA, 2010). Sollier (2005) explains that spatialization errors are still frequent during times of auditory stimulation and could be seen as a form of defence by distancing "threats" of change to make it seem less threatening. Thus, even though spatial errors were not totally eliminated in group E, the statistical difference in comparison to the control group clearly shows the effect the Tomatis® Method had. The results on the TLTS were confirmed by participants' subjective experience. They noted improvements in their general ability to hear (more in tune with everyday sounds) and to listen, specifically within social contexts and within class (able to better follow lectures).

Regarding self-regulation, participants from group E were found to have statistically better long-term (Diff2) Introjected regulations regarding academic motivation in comparison to participants of group M. Introjected regulation represents an extrinsic or controlled type of motivation, as opposed to intrinsic or autonomous motivation, in which people experience volition, or a self-endorsement of their actions. It refers to when action has been partially internalized and is energized by factors such as an approval motive, or avoidance of shame or guilt (Deci & Ryan, 2008). The individual therefore engages in activities not for the pleasure of the activity itself, but out of obligation (Clarke & Schroth, 2010). This result is in line with previous research on motivational factors of potential student dropouts. Meyers, Pignault, and Houssemand (2013, p.274) found that "potential dropouts have less intrinsic motivation, *less* introjected regulation, more amotivation and less academic self-efficacy." The improved introjected regulation of participants in group E therefore reflects a stronger sense of responsibility and obligation to perform academically, which is better than being amotivated, although it would have been more beneficial if the motivation was more intrinsic in origin (Ryan & Deci, 2000). At this point in research it is unsure whether or not the direction in which the motivational orientation of participants who completed the Tomatis® Method

is moving towards or away from intrinsic motivation. Further research should be considered for clarification.

Participants of group E further showed a statistically significant longer term (Diff2) increase in Perseverance on the SSRQ, compared to the decrease in group C. Perseverance is the ability to remain focused on a task and not be shifted by distractions (Prabhu, Sutton, & Sauer, 2008). The improvement in perseverance seems to be related to the improvement in introjected regulation. Skinner and Edge (2002) indicate that perseverance is based on an introjected style of regulation in which the individual, in response to environmental demands, is subjected to strong internal pressures to submit. In a negative sense perseverance may reflect rigid compliance, conformity or submission. However, perseverance may also reflect a strength as it relates to commitment and confidence to achieve goals even in the face of adversity (Carver & Scheier, 2003), while it could also positively reinforced intrinsic motivation (Prabhu, et al., 2008). This compares favourably with the finding by Meyers et al. (2013) that potential student dropouts “have less perseverance of effort, poorer learning strategies, and less resistance to peer influence” (p 274). Because of the potential disadvantages and advantages of perseverance, the secret would be to flexibly apply it, based on Brandtstädter and Rothermund’s (2002, p 212) definition of adaptive flexibility: “The ability to flexibly switch between different means for reaching a goal, whether persevering, changing, or even disengaging from a goal, depending on what would be most appropriate or effective in any given situation”.

Improved self-regulation was also subjectively perceived by participants. Participants from groups E and M further perceived improved attention and awareness, often in the form of being able to better self-reflect on their academic work, and being able to listen and understand their lecturers better. Diehl, Semegon and Schwarzer (2006, p.306) emphasize the importance of attention to self-regulation when they refer to attention as a person’s “ability to focus his or her attention on a given

task, to control and regulate external and internal distractions, and to work toward a desired goal or outcome”. Brown, Ryan and Creswell (2007, p.216) further propose that directing attention to subjective mental, emotional, and physical experience is key to healthy self-regulation, while Luszczynska, Diehl, Gutiérrez-Doña, Kuusinen and Schwarzer (2004) specifically indicate that attention regulation organizes incoming stimuli in order to, for example, maintain a calm state of mind, delay gratification, and tolerate change. The ability to successfully direct attention is therefore often the first step towards successful self-regulation (Peterson & Seligman, 2004). As participants from both groups E and M reported better attention, however, it would be difficult to conclude that the difference was due to the Tomatis® Method only.

Improved self-control was reported primarily by participants from group E. Self-control is a pivotal function within the self-regulation process, and refers to the ability to simultaneously “maintain distance from tempting stimuli and proximity to goal-related stimuli, in order to increase the likelihood of adhering to long-term goals” (Fishbach & Shah, 2006, p.821). Effective self-control relies on self-observation or the extent to which the individual accurately generates and interprets feedback (Zimmerman, 2000). Gibbons et al. (2006, p.51) further indicate that good self-control includes the ability to self-reflect, for example “I like to plan things ahead of time”, and “I think before I act”, while Solso, Maclin and Maclin (2008) emphasize the importance of inner speech in self-reflection. This result emphasizes the potential importance Tomatis may have for self-control through improving self-listening (Sollier, 2005).

Improvements were further observed in the quality of interpersonal self-regulation in participants of group E and to a lesser extent in participants of group M. Self-regulation is extremely important in interpersonal relationships. According to Leary (2004) being accepted by others provides an adaptive advantage, while rejection has adverse consequences. As a result, Leary (2004) indicates, human beings developed a psychological system for regulating their relationships that

monitors and responds to events that are relevant to interpersonal acceptance and rejection.

Fitzsimons (2006) further explains that interpersonal monitoring enhances self-regulation ability, which allows individuals to more effectively achieve goal fulfilment by selectively engaging in beneficial social relationships and social situations. It would therefore make sense to argue that participants' improved interpersonal abilities may be the result of their improved listening skills and better ability to monitor themselves interpersonally.

Given the changes in listening and self-regulation, it is not surprising that significant statistical differences were found between the Tomatis and Control groups on Psychological and Social Well-being regarding pre- and post-measures (Diff1). Qualitatively, Nel (2005) reported enhanced Psychological Well-being and interpersonal communication as a result of the effects of the Tomatis® Method on a boy with Asperger Syndrome. Coetzee (2001), Du Plessis et al. (2001) and Vercueil et al. (2011) also measured and reported significant increases in Psychological Well-being of participants who completed a Tomatis programme.

These differences indicate that exposure to the Tomatis® Method lead to at least short-term improved well-being, in comparison to participants who did not receive any sound stimulation. From a Tomatis perspective the improvement in Psychological Well-being would be seen as an improvement in self-listening and the improvement in Social Well-being as an improvement in external listening (Sollier, 2005).

Conclusion, limitation and recommendations

The findings of this study indicate that the Tomatis® Method had a positive impact on hypo-responsiveness in the left ear and spatialization of the right ear, which implies that participants had a stronger desire to listen, and were more able to locate sounds, on introjected regulation and perseverance, as well as on psychological and social well-being. Benefits were also qualitatively observed regarding improved listening in social and academic contexts, attention and awareness,

self-control and interpersonal regulation. The difference in listening skills clearly benefitted the Tomatis group in comparison to both the Mozart and control groups. However, the benefits regarding self-regulation were shared by the Mozart group, while the benefits regarding self-regulation specifically as psychological and social strength (well-being) were only in comparison to the control group. As a result, the differentiation between Tomatis® Method and listening to Mozart music needs further explanation and perhaps further research. Research have found evidence that suggest listening to unmodified Mozart music to be just as effective as the Tomatis® Method (Thompson & Andrews, 2000). Thompson and Andrews (2000), however, argue that listening to Mozart music does not have the “integrated neurological response” of the Tomatis® Method, which explains why the Tomatis group benefitted more than the Mozart group in this study. Although some questions still exist regarding the lateralization of improved listening skills, and spatial errors have not been eliminated in total, as well as the implications of improved introjected rather than intrinsic regulation, the general consensus is that the results are promising indeed.

The study was not without limitations, however. Even though a proper design was followed, the small sample size limits the generalizability of the findings. The sample also consisted of a group of relatively well functioning university students, which limited the scope/range for improvement in self-regulation. Even though every effort was made to ensure participation in the listening sessions, the total numbers of hours spent by each participant on the Mozart and Tomatis programmes varied between 12 and 44. However, research indicated that stimulation between 30 and 60 hours are sufficient for a Tomatis programme (Thompson & Andrews, 2000), depending on the type of training needed.

It can thus be concluded that the Tomatis® Method had a positive impact on specific aspects of self-regulation in a small group of tertiary South African students. The Tomatis® Method therefore clearly holds positive potential to improve the self-regulation skills of tertiary students.

However, more research has to be done, with larger random samples to determine the extent to which the findings can be generalised, as well as to determine the possible role mediating and moderating variables play in the relationship between listening, self-regulation and psychological well-being.

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Appendix

Appendix A: Mozart compositions used in the Tomatis® Method

CLMNF: Quintet in A Major, for Clarinet and string quartet, K.581

HAMNF: Symphony n° 35 « HAFFNER » K.385, in D major

IMNF: « EINE KLEINE NACHTMUSIC » K. 525, Serenade in G major.

SMNF: Concerto for flute and harp K.299.

LMNF: Violin Concerto n°1 K 207, in B flat major; Rondo in B flat major K.269.

HAMNF: Symphony n° 32 K. 318, in G major.

AMNF: Symphony n° 41 « JUPITER » KV.551, in Ut majeur.

BMNF: Symphony N° 36 « LINZ» K425 + KA90 (580b)

GMNF: K 261, K373, K269, K467

KMNF: Concerto for Oboe & orchestra Kv.314, in C major

MMNF: Violin Concerto n°2 K. 211, in D major.

OMNF: Violin Concerto n° 4 K.218, in D major.

PMNF: Symphonia concertante for violin & viola K. 364, in E flat major.

EMNF: Violin Concerto K219, in A Major.

NMNF: Violin Concerto K. 216, in G major.

PM1 MNF: Serenade n° 4 K .203, in D major.

QMNF (MD3): Symphony n° 1 K.16, in E flat major; Symphony n° 4 K19, in D major; Symphony n° 5 K.22, in B flat major.

FMNF: Symphony n° 12 in G Major K.11; Symphony n° 13 in F Major KV.112, in F major.

TMNF: K297b + K 373

JMNF: Symphony N°11 K84, N° 14 K114, N°2 K17

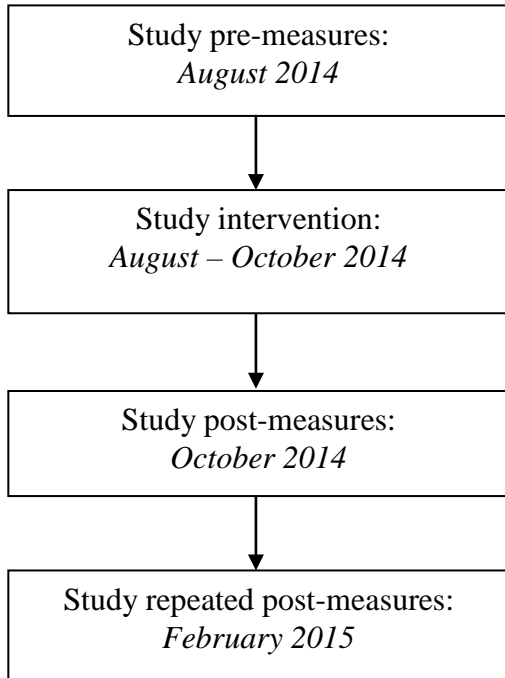


Fig. 1: Study Design

Table 1*Biographical Profile of Study Population*

	Frequency	%
Gender:		
<i>Male</i>	13	26.53
<i>Female</i>	36	73.47
Population Group:		
<i>White</i>	25	51.02
<i>Coloured</i>	1	2.04
<i>Black</i>	23	46.94
Residential Status:		
<i>Private</i>	32	66.67
<i>Hostel</i>	16	33.33
Highest Qualification:		
<i>Senior Certificate</i>	41	93.18
<i>Diploma</i>	1	2.27
<i>Degree</i>	2	4.55
Marital status:		
<i>Single</i>	45	91.84
<i>Married</i>	1	2.04
<i>Widow</i>	1	2.04
<i>Partner</i>	2	4.08
Tested lenses:		
<i>Yes</i>	12	25.00
<i>No</i>	25	52.08
<i>For reading</i>	11	22.92
Impaired hearing:		
<i>Yes</i>	2	4.08
<i>No</i>	47	95.92
Colour blind		
<i>No</i>	49	100.00
Handedness:		
<i>Right</i>	42	85.71
<i>Left</i>	4	8.16
<i>Both</i>	3	6.12
Functioning difficulties:		
<i>ADD/ADHD*</i>	2	4.10
<i>None reported</i>	47	95.90

Note: ADD/ADHD = Attention Deficit Disorder/Attention Deficit and Hyperactive Disorder

Table 2
Reliability analysis

Variable	Cronbach- α
SSRQ_Monitoring	0.83
SSRQ_Decision Making	0.61
SSRQ_Learning from mistakes	0.76
SSRQ_Perseverance	0.69
SSRQ_Mindful awareness	0.69
SSRQ_Self-evaluation	0.20*
SSRQ_Creativity	0.33*
SSQ6_TOTAL	0.84
AMS_Intrinsic Motivation towards knowledge	0.78
AMS_Intrinsic Motivation towards accomplishments	0.82
AMS_Intrinsic Motivation towards stimulation	0.88
AMS_External motivation	0.79
AMS_Introjected regulations	0.80
AMS_Identified regulations	0.64
MHC_EWB	0.80
MHC_SWB	0.74
MHC_PWB	0.76

Note: * Cronbach α -values < 0.6, not used for further analysis; SSRQ = Shortened Self-Regulation Questionnaire; AMS = Academic Motivation Scale; MHC= Mental Health Continuum; EWB= Emotional Well-being; SWB= Social Well-being; PWB= Psychological Well-being.

Table 3
Between group differences in listening test parameters

Group	Mean of diff	SD of diff	ANOVA <i>F</i> value	Degrees of freedom	P – value (One-sided Dunnett test)	
<i>Hypol (Diff1)</i>						
E	0.28	0.78	4.73	(2;23)	C with E	<0.05*
M	-0.98	1.02			M with E	<0.05*
C	-0.61	0.80				
<i>Right_ear_sp (Diff2)</i>						
E	-0.83	1.62	2.76	(2;17)	C with E	<0.05*
M	-0.67	0.98				
C	0.80	0.84				

Note: Hypol = Hypo-responsiveness left ear; Right_ear_sp = Right ear spatialization; Diff1 = Difference 1, subtraction of pre- from post-measures; Diff2 = Difference 2, subtraction of pre- from post-post measures. SD = standard deviation.
 *Statistically significant on a 0.05 level.

Table 4
Between-group differences in self-regulation and well-being

Group	Mean of diff	SD of diff	ANOVA <i>F</i> value	Degrees of freedom	P – value (One-sided Dunnett test)	
<i>MHC_SWB (Diff1)</i>						
E	4.50	5.48				
M	1.44	4.88	2.43	(2;23)	C with E	<0.05*
C	-0.67	4.15				
<i>MHC_PWB (Diff1)</i>						
E	2.75	4.33				
M	-1.56	4.10	4.48	(2;23)	C with E	<0.05*
C	-2.56	3.05			M with E	<0.05*
<i>AMS_Introjected regulations (Diff2)</i>						
E	1.14	1.11				
M	-0.50	2.08	2.81	(2;18)	M with E	<0.05*
C	0.08	0.58				
<i>SSRQ_Perseverance (Diff2)</i>						
E	1.22	2.39				
M	0.00	1.87	2.67	(2;17)	C with E	<0.05*
C	-1.50	2.26				

Note: MHC_SWB = Mental Health Continuum, Social Well-being; MHC_PWB = Mental Health Continuum, Psychological Well-being; AMS_Introjected regulations = Academic Motivation Scale, Introjected regulations; SSRQ_Perseverance = Shortened Self-regulations Questionnaire, Perseverance; Diff1 = Difference 1, subtraction of pre- from post-measures; Diff2 = Difference 2, subtraction of pre- from post-post measures. SD = standard deviation.
 *Statistically significant on a 0.05 level.

CHAPTER 4: MANUSCRIPT 3

The perceived effect of the Tomatis® Method on university students' self-regulation: Towards the development of a conceptual model

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Running head: TOMATIS, SELF-REGULATION MODEL

The perceived effect of the Tomatis® Method on university students' self-regulation: Towards developing a model

Abstract

This study aimed to develop a conceptual model that explains the perceived effect of the Tomatis® Method on students' self-regulation. Interactive Qualitative Analysis (Northcutt & McCoy, 2004) was used to identify critical factors in participants' experience of the Tomatis® Method and perceived improvement in self-regulation. The seven participants who completed a Tomatis® Method programme identified five themes in which 40% of the relationship pairs explained 68.085% of the variance found in the model. Findings support the value the Tomatis® Method has for the promotion of self-regulation and behavioural change. More research is required to further explore the applicability of the Tomatis® Method as an effective approach to enhance self-regulation.

Keywords: Behavioural change, intrapersonal, interpersonal, Interactive Qualitative Analysis (IQA), listening, Self-regulation, Tomatis® Method

The perceived effect of the Tomatis® Method on university students' self-regulation: Towards developing a model

Self-regulation is the ability to flexibly adjust and direct own behaviour towards a preferred goal or outcome (Maes & Karoly, 2005). Effective self-regulation takes place when attention, monitoring and feedback processes interact in such a way that a person is able to play a role in self-development on cognitive, emotional and interpersonal levels (Calkins & Fox, 2002; Park, Edmundson, & Lee, 2012). The process of self-regulation is characterized by a continuous “reciprocal interaction” between behaviour, the environment and personal variables (Venter, 2011, p 25). As a skill, self-regulation seems to be critical in enabling students to adapt to challenges they are faced with on a daily basis (Park et al., 2012). According to Park et al. (2012), students need to constantly change their thinking, feeling and acting behaviour to effectively face contextual challenges. The availability of good self-regulation skills therefore seems to be a critical factor in student adjustment (Park et al., 2012).

Students entering tertiary learning environments usually have certain goals they want to achieve on multiple levels, which include but are not limited to academic, social and personal functioning. These goals are seen as “mechanisms for directing attention and effort” (Kozlowski & Bell, 2008, p 17). Strategies for striving and progressing towards goal attainment requires self-regulation skills like monitoring the self and evaluating feedback (Kozlowski & Bell, 2008; Wrosch, Scheier, Miller, Schulz, & Carver, 2003). This interaction process of self-regulation and behaviour is directed towards improving performance (Kozlowski & Bell, 2008).

The interactional process between monitoring, paying attention and receiving feedback, contributes to effectively adjust own behaviour and improve critical thinking skills (Calkins & Fox, 2002; Uzuntiryaki-Kondakçi, & Çapa-Aydin, 2013). Lang and Heckhausen (2006) further identified effective problem-solving skills, appropriate emotional regulated reactions and sense of mastery as

three important self-regulatory processes that students use to effectively cope with challenges and to obtain a sense of wellbeing whilst adjusting to their ever-changing environment (Park et al., 2012).

Although the application of self-regulation is not a new concept within the educational context (Bonthuys et al., 2015), the concept of improving self-regulation through the process of a sound stimulation programme and listening has not been adequately explored before. Most strategies implemented to enhance students' self-regulation skills are based on behavioural adjustment through behaviour therapies such as mindfulness, meditation (Tang et al., 2007), and cognitive therapies such as metacognition (Uzuntiryaki-Kondakçi, & Çapa-Aydin, 2013), or a combination of aforementioned therapeutic approaches (Baumeister, Gailliot, DeWall, & Oaten, 2006). The fact that listening skills may be a key factor in self-regulation is subsequently a yet unexplored relationship. The relationship between self-regulation and listening skills are observed through the shared processes of directing attention, self-monitoring, and adjusting behaviour according to evaluation of feedback received (Berger, 2011). Listening should therefore be an important aspect to consider in self-regulation.

The Tomatis® Method of sound stimulation was developed by Dr Alfred Tomatis to enhance listening skills, which he defined as “the active use of hearing, intentionally and attentively, in a way that is acceptable on a cognitive and emotional level for the purpose of learning and communicating” (Solisten, 2009, p 18). This method is understood to contribute to other skills such as memory and attention, and assist with overcoming pathology related to listening, such as adjustment and emotional problems (Vercueil et al., 2011). Tomatis found that for optimal listening to take place, three overlapping actions are required, which are hearing, listening and integration (Van Jaarsveld, & Du Plessis, 1988; Vercueil et al., 2011). A person can have good hearing, but be a poor listener, or can listen but without integration, which impacts all areas of functioning.

A systematic review (Bonhuys & Botha, 2015b) concluded that the Tomatis® Method has value and is applicable in the promotion of self-regulation due to the improvement of listening skills through this method. The review further revealed promising similarities between the Tomatis® Method, student wellbeing and self-regulation.

Problem Statement

It is clear that a strong relationship exists between listening and self-regulation processes (Bonhuys & Botha, 2015b; Florez, 2011; Thompson & Andrews, 1999; Vandergrift, 2005; Zimmerman, 1989). However, the nature of this dynamic relationship between improved listening and self-regulation is still not understood. The importance of understanding this dynamic relationship is based on the view that systems have two broad components, namely elements and relationships among the elements (Northcutt & McCoy, 2004). To better understand how improved listening may have improved self-regulation, one should focus on the nature of the relationship between the two as a system, and not merely on the fact that a relationship exists. Furthermore, self-regulation is not a static trait, but rather a dynamic system of unfolding elements organized in feedback loops (Carver & Scheier, 1998) and a contextualized skill that often varies across contexts (Cleary, Callan & Zimmerman, 2012). It made sense therefore to explore self-regulation from a systems perspective.

To achieve this, Northcutt and McCoy (2004) suggest that a researcher should identify and describe the elements of the system under investigation, and to understand how the elements and relationships dynamically interact to result in different states of the system. Once the elements and the nature of the relationships among elements are defined, systems differ primarily in their structure or systems topology. Based on this approach, Northcutt and McCoy (2004) developed a research methodology called Interactive Qualitative Analysis (IQA) that aims to help the researcher in developing a model of a phenomenon under investigation. This would help the researcher to

understand how participants perceive the relationship between their improved listening skills and self-regulation, in terms of 1) the extent to which the relationship is strictly linear, in other words no branching exists; 2) the extent to which branching does exist, in other words more than one possible path in how listening influences self-regulation; and 3) the existence of feedback or recursion loops, in other words if elements later in the system feeds back to elements earlier in the system (Northcutt & McCoy, 2004, p.30-31).

This article therefore focuses on exploring and developing a conceptual, yet hypothetical model that could direct further research in better understanding this. The questions this study wants to explore are: What are the critical factors that are relevant to how a sample of students perceive the effect of the Tomatis® Method on their self-regulation? What conceptual model can be developed that shows the relationship between these critical factors?

Aim

This study aims to:

- 1) determine and explore critical factors that are relevant as to how university students perceive the effects of the Tomatis® Method on their self-regulation;
- 2) develop a conceptual model based on the relationship between these critical factors, and
- 3) provide guidelines on how to use this model to promote self-regulation among university students

Method

Research Design

Interactive Qualitative Analysis (IQA) (Northcutt & McCoy, 2004) was used to explore participants' subjective experience of the Tomatis® Method in relation to their self-regulation. IQA uses a systems approach to investigate meaning, where meaning refers to socially constructed shared understanding of a concept (Bargate, 2014; Northcutt & McCoy, 2004). This methodology,

described as an innovative approach to qualitative research, seeks to reduce power relations and biases usually associated with qualitative research (Bargate, 2014).

Participants actively take part in the data collection and analysis by organizing categories of meaning, referred to as *affinities*, which they then arrange according to their perceived relationship and influence of these on each other to ultimately represent the group's experience with the phenomenon (Bargate, 2014; Northcutt & McCoy, 2004). In this study, IQA was used to obtain a visual representation of a group of students' experience of how the Tomatis® Method improved their self-regulation (Lasserre-Cortez, 2006).

Participants and context

The 18 registered full-time first year students who participated in the experimental group and completed the Tomatis® Method sound stimulation programme were recruited for this part of the study, hereby excluding any other participants from the previous control groups M and C who did not complete the Tomatis® Method. From this group, six were available and attended the focus group. The focus group consisted of male (n=1) and female (n=5), black (n=2) and white (n=4) participants. All six, including an additional black, female participant (n=7) who could not attend the focus group but completed the listening programme, completed the required questionnaire based on the identified themes of the focus group.

Procedure and ethical issues

This study forms part of a research project titled "The dynamics of self-regulation as psychological strength in the South African context", which has been ethically approved by the North-West University (ethics number NWU 00103-11-S1). Research was conducted in accordance with the research protocol of the North-West University and the aims and ethical guidelines of the research project. Informed consent for this study was obtained from all participants prior to conducting research through signing a consent form. Participation within the study was voluntary.

Participants remained anonymous with research numbers assigned to each participant to ensure anonymity.

All captured data for this study has been stored on a password protected computer for safekeeping. Two additional reviewers assisted in the facilitation process to ensure that the IQA protocol was accurately followed. The IQA methodology addresses trustworthiness inherently by facilitating a process through which participants identify and develop themes themselves (Northcutt & McCoy, 2004; Tabane, 2009; Tabane, & Human-Vogel, 2010).

The listening programme

The programme is discussed in detail in Bonthuys et al. (2015), therefore only a summary is provided here. Participants attended a 50-hour, basic Tomatis programme at the audio-psycho-phonology facilities at the Institute of Psychology and Wellbeing at the North-West University, Potchefstroom Campus. The programme was divided into stimulation for two hours a day for 15 consecutive days, excluding Saturdays and Sundays, an integration period of one month where no listening was done, followed by another stimulation of two hours a day for 10 consecutive days, excluding Saturdays and Sundays. During the programme participants listened to Mozart music, modified by the gating effect of the Electronic Ear (EE). This means that music is presented through special headphones which make use of both air and bone conduction to stimulate auditory pathways (Gerritsen, 2009). Participants could perform activities such as drawing, painting, building puzzles or just relaxing. These activities were not collected or interpreted as data. The researcher, a trained and qualified Tomatis consultant, presented the programme. The effect of the programme was also reported by Bonthuys et al. (2015). This manuscript therefore focuses on participant's subjective experience of how the programme improved their self-regulation.

Data collection

Data was gathered during a two-hour focus group session that included six participants. The facilitator posed the following question: “What are the most important factors related to your experience of the Tomatis® Method, specifically in relation to how you perceive yourself, your relations and your academic performance from before starting the programme to now?” An open discussion followed, with participants capturing their experiences, thoughts and feelings related to the question on note cards. No limit was placed on the number of note cards each participant may produce. A total of 14 note cards were produced, which participants clarified, if required, by reading aloud and explaining what his/her experience, thought or feeling meant. The facilitator then placed these notes randomly on the wall of a lecture room for all participants to see.

Through the process of Axial Coding, participants were then asked to classify the notes generated into similar themes or *affinities* (Northcutt & McCoy, 2004). The researcher facilitated this process to ensure that the emerging themes describe a single construct or topic, can easily be defined, and are exclusive concepts that do not overlap with other themes (Northcutt & McCoy, 2004). Refining the placement of note cards into the relevant affinities produced five common themes. These were: being aware; improved concentration; taking perspective; self/personal reflection; and boldness.

The participants then completed a questionnaire that was developed to assess the perceived cause-effect relationships between the five produced themes (Botha, 2014; Northcutt & McCoy, 2004). All participants received a detailed description of developed themes (Table 1) and then completed the questionnaire, which was also sent to the other participants of the experimental group that completed the Tomatis programme.

The participants were then required to indicate how they experienced the direction of influence between two themes as indicated in the questionnaire. For the five themes, 10 questions

were compiled, placing the themes against each other. Each question had three possible options to choose from: a) theme 1 causes theme 2; b) theme 2 causes theme 1; or c) the themes do not cause each other. From the completed questionnaires the frequency of each of the three directional influence options chosen were counted, recorded on a spread sheet and sorted in descending order (Northcutt & McCoy, 2004).

Data analysis

Once the completed questionnaires had been submitted, the researchers and a reviewer calculated the frequency of affinity pair relationships to record the total number of votes for each and to place it in a descending order (Northcutt & McCoy, 2004). The next step was calculating cumulative totals and percentages for each relationship according to the Pareto principle (Northcutt & McCoy, 2004). The fewest optimal relationships that accounted for the maximum power of variation were then selected and conflicting relationships identified (Northcutt & McCoy, 2004). The conflicting relationships with the lowest frequency in directional influence were noted and reconciled within the model at a later stage (Northcutt & McCoy, 2004).

From this an Interrelationship Diagram (IRD) (Northcutt & McCoy, 2004) was developed, indicating whether an affinity is perceived as a cause or an effect within each pair, using arrows to indicate these influence directions. The number of arrows facing towards an affinity (IN) was subtracted from those facing upwards (OUT) to obtain Delta values, which were used to assign specific roles to each affinity. Northcutt and McCoy (2004) indicated that affinities with positive deltas (more OUT than IN arrows) are known as Drivers, and those with negative deltas (more IN than OUT arrows) are known as Outcomes. The role of Primary Driver is assigned to those affinities with the highest positive delta with many OUT but no IN arrows. A Secondary driver is assigned when there are IN and OUT arrows, but then OUT arrows are more. Pivots are indicated when there is an equal number of IN and OUT arrows.

Those affinities with positive deltas (more “outs than ins”) are known as *drivers* or *causes* and those with negative deltas (more “ins than outs”) are referred to as *effects* or *outcomes* (Northcutt & McCoy, 2004). These are further entered into primary or secondary categories. Affinities are categorized as Primary drivers when only “outs” and no “ins” are assigned, and secondary drivers when more “outs” than “ins” are assigned. The same concept accounts for primary and secondary outcomes, but with reverse effect (no “outs” only “ins”; less “outs” than “ins”). When an affinity has an equal amount of “ins and outs”, it is referred to as a *pivot* (Northcutt & McCoy, 2004).

“(?)” Indicate affinity relationship pairs put into suspension due to ambiguous relationship found.

The role of Primary outcome is given to those affinities with many IN but no OUT arrows, and Secondary outcomes to those with both IN and OUT, but more IN than OUT arrows (Northcutt & McCoy, 2004). The themes were then arranged in descending Delta value order to assign tentative System Influence Diagram (SID) placements, thereafter a cluttered SID was developed where ambiguous relationships were indicated and used to structure the final SID (Northcutt & McCoy, 2004).

Results

Participants initially generated 14 ideas they felt to be of relevance to their experience of the Tomatis® Method. These were then clustered together into five distinctive themes (as indicated in Table 1), through facilitation within the group. The five themes are a) being aware (the ability to notice things on auditory, visual and emotional level, in general and within their interpersonal relationships); b) improved concentration (ability to sustain attention, to get more work done, better concentration in class context and improved academic performance); c) taking perspective (being able to step back, to think before they speak); d) self-reflection (ability to take time out from work and responsibilities and make time for reflecting, relaxing, not being overwhelmed by responsibilities, but rather taking time out for the self); and e) boldness (the ability to step out of

comfort zones, and experience open-mindedness and creativity). Experiences not strongly shared amongst the group, or those that could not clearly be plotted in any of the other themes, were excluded.

<Insert Table 1 approximately here>

Table 2 shows that a total number of 47 votes were cast for 20 possible relationships. Some relationships did not receive any votes, while others received split votes, where participants indicated two themes to influence or cause each other an equal number of times. Cumulative frequencies and percentages for both the total number of relationships and votes were calculated. By comparison no conflicts were found between the researchers' and reviewer's calculations. The analysis was therefore found to be trustworthy. Power reached a maximum value of 28.085 (Table 2, column 6) at the 8th relationship pair, accounting for 40% of the total number of 20 relationships pairs (Table 2, column 3), and explaining 68.085% of the variance (Table 2, column 5). The two highest frequencies were found for relationship pair 4→2, with 6 participants perceiving that Theme 4 (Self/personal reflection) caused Theme 2 (Improved concentration), and relationship pair 4→5, with 5 participants perceiving that Theme 4 also caused Theme 5 (Boldness).

<Insert Table 2 approximately here>

Included in the 8 pairs were bidirectional affinities 3 (1←2) and 7 (1→2). These ambiguous relationships should be addressed by only using the one with the highest frequency, in this case affinity 3 (1←2) (Northcutt & McCoy, 2004, p163 & 290). Affinity pair 3 was therefore coded with an arrow due to its higher frequency, and affinity pair 7 with a question mark and put into "suspension" until the Systems Influence Diagram (SID) was created, as advised by Northcutt and McCoy (2004). Examination of the SID (Fig. 1.2 – 1.3) revealed a feedback relationship between Themes 1 and 2, which accounts for ambiguity (Northcutt & McCoy, 2004). For the sake of

transparency the influence between Themes 1 and 2 (1→2) were thus added by means of a secondary cause-effect arrow.

The Interrelationship Diagram (IRD; Table 3) indicates the direction of perceived relationships between the five themes and allocated positions in the model. No primary drivers were found. Theme 4 (Delta = 2) and Theme 3 (Delta = 1) were assigned as secondary drivers, Theme 1 (Delta = -3) was assigned primary outcome and Theme 5 (Delta = 0) as pivot. Theme 2 can either be assigned the role of secondary outcome when taking relationship 1→2 into account (Delta = -1) or a pivot if this relationship is left out. Placement has been made according to the frequency of influence.

<Insert Table 3 approximately here>

Figure 1.1 shows the initial positions of themes, with all arrows, before redundancy.

<Insert Fig 1.1 approximately here>

A cluttered SID was then developed and spread out in a circular fashion and redundant links (4 → 1; and 3 → 1) removed (Fig. 1.2). Link 4 → 1 was considered as redundant and removed because of two alternative routes from 4 to 1 (4 → 2 → 1 and 4 → 5 → 3 → 1), while 3 → 1 was found redundant because of the alternative route 3 → 4 → 2 → 1.

Removing redundant links created a simpler system with “optimum explanatory power” (Bargate, 2014).

<Insert Fig 1.2 approximately here>

Figure 1.3 shows the final conceptual model. According to the model, participants experienced the Tomatis programme to have led to more boldness, taking perspective and self/personal reflection, with no clear starting point. These three abilities are interrelated via a feedback loop in which boldness leads to more perspective taking, which in turn leads to more self-reflection, and in turn leads to more boldness. This feedback loop can continue indeterminably. However, a second

cause-effect linear path also exist from self-reflection - instead of feeding back in to the boldness/perspective taking loop, it may cause improved concentration, which in turn may cause the final outcome, namely improved awareness. Because it was decided to include the ambiguous, bidirectional $1 \leftarrow 2$ and $1 \rightarrow 2$, a secondary feedback loop exists, indicating that improved awareness may feed back into the system by enhancing concentration.

<Insert Fig 1.3 approximately here>

Discussion

The model that was developed appears to have two co-existing processes, namely (a) a triad consisting of self-reflection, taking perspective and boldness, illustrating primarily an inward (intrapersonal) process; and following from this, (b) improved concentration and being aware, illustrating primarily an outward (interpersonal) process. The first triad of themes are clearly more inward in nature, although not exclusively so. Participants emphasized aspects related to these themes that reflect an inward orientation, even though it might have benefits for their social relations. Improved concentration and being aware, in comparison, were more often described as directly related to their relationships, more specifically in terms of being receptive and listening better to others. Taken together, self-reflection and taking perspective may be an indication that participants experienced improvement in mindfulness. Brown, Ryan and Creswell (2007, p.212) define mindfulness as a “receptive attention to and awareness of present events and experience”. According to Langer (2009), when people are mindful they become sensitive to the context and perspective, being increasingly situated in the present. The reason for this, Brown et al. (2007) explain, is because mindfulness allows immediacy with events as they occur, without the restriction that discriminative, categorical, and habitual thoughts often bring. As a result, “consciousness takes on a clarity and freshness that permits more flexible, more objectively informed psychological and behavioral responses” (p.212).

The findings further support Du Toit et al. (2011) regarding the impact of Tomatis on feeling bolder, more secure and willing to take on more challenges as a result of being more comfortable with their selves. This effect of being bolder, can also be explained from the assumption that participants experienced improvement in mindfulness. According to Langer (2009), mindfulness facilitates receptiveness to change and loosens the grip of an evaluative mind-set so that the individual is able to tolerate uncertainty much better. Boldness itself can be interpreted in many ways. One possibility is to relate it to “courage” as a character strength described by Peterson and Seligman (2004) from a Positive psychology perspective. They define courage as “the exercise of will to accomplish goals in the face of opposition” (p. 199), and includes bravery, integrity, vitality, or persistence. Participants in this study, however, clearly emphasized the fact that they feel more “creative” and “open-minded” and that they are more comfortable to step out of their comfort zone after completing the Tomatis programme, without directly linking their experience to obstacles or adversity. It therefore seems to suggest that their boldness relates more to relaxation of a certain restrictive mind-set, opening up “new ways of doing”, rather than to courage as character strength.

How does one understand the perceived improvement in concentration and awareness, flowing from the triad of inward processes? Brown et al. (2007) indicate that mindfulness clearly serves a self-monitoring or observer function. Self-monitoring elicits feedback, a crucial aspect of self-regulation, which according to Calkins and Fox (2002) is required to effectively adjust behaviour. Mindfulness can be considered an enhanced attention to and awareness of current experience or present reality, more specifically open or receptive awareness and attention, which may be reflected in a more regular or sustained consciousness of on-going events and experiences (Brown & Ryan, 2003). It is therefore not surprising that it led to improved concentration and awareness as experienced by participants in this study. In this study improved concentration lead to being more aware, but there is also a possibility that being more aware lead to improved concentration, thus

having a circular effect. Furthermore, being more mindful also made them feel bolder, which in turn also made it easier to adjust some of their old ways of doing. This is evident from one participant who said: "...having the feeling that more can be done than I usually could..." suggesting a change in attitude, specifically toward their studies.

This supports Tomatis (2005) who indicated that listening motivates a "healthy attitude" towards the self and others (p 43). It also partially supports research that confirms that self-reflection contributes to metacognitive development and academic performance (Alwehaibi, 2012; Desautel, 2009), as well as the Tomatis perspective that listening takes place on internal and external levels. Internally there is a connection to one's own voice and inner dialogue and externally there is a connection with the environment and others (Solisten, 2009; Zimmerman, 1989). This is a very interesting result and supports the Ecological Model of Health Behaviour (Glanz, Rimer & Viswanath, 2008), which identifies multiple levels of influence on health behaviour of which intrapersonal and interpersonal are both included. A core principle of the Ecological Model is that influences on behaviour interact across the different levels. As expected, this study illustrates this interaction (Glanz et al., 2008). Multi-level interventions, such as the Tomatis® Method's holistic approach (Gilmor et al., 1989), should therefore be most effective in changing behaviour (Glanz et al., 2008).

It therefore seems that the Tomatis® Method contributed, according to the participants, in becoming more effective agents of self-change (Bandura, 2001). This enabled them to adjust their behaviour accordingly, and evidently applying better self-regulation skills (Bandura, 2001; Calkins & Fox, 2002; Weehuizen, 2008).

Although this study provided promising results, the input of all 18 participants of the experimental group would have been more sufficient and is seen as a limitation. A second and third focus group with the two control groups could have provided a more comparative study and will be

considered for future research. Although the IQA methodology is not widely used with limited resources to consult, it has proven to be a valuable approach.

Conclusion and recommendations

This study aimed to explore and identify critical factors that participants' perceived to be related to how the Tomatis® Method impacted on their self-regulation. A conceptual model based on the relationships between these factors was developed through the IQA approach (Northcutt & McCoy, 2004). According to the students, improvement of listening skills through the application of the Tomatis® Method caused a perceived improvement in their ability to self-reflect, take perspectives and act with more boldness. This in turn positively affected their connection with their environment by means of improved concentration and enhanced awareness. It was further argued that the Tomatis® Method basically improved participants' level of mindfulness, which facilitates receptiveness to change and contributed to them feeling bolder. By being bolder, they were able to change their attitude towards their studies, which improved their concentration and awareness.

Identified factors seem to support the theoretical links between the Tomatis® Method and self-regulation (Bonthuys & Botha, 2015b), specifically in terms of the interaction between intra- and interpersonal functioning of students. The researchers are further convinced that the Tomatis programme is an effective mechanism for the promotion of self-regulation and behavioural change, but cannot make the assumption that it was fully optimised within this study due to the limitations alluded to earlier. It is also important to emphasize again that this is only a conceptual or hypothetical model, and as a result, no generalizations can be made. The model should therefore be seen as an initial building block in exploring new avenues in the relationship between listening and self-regulation. Much more research is needed to test the effectiveness of this model on additional student populations, as well as to further explore the applicability of the Tomatis® Method as an effective approach to enhance self-regulation.

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Appendix

Table 1
Description of Themes

Nr	Theme	Description
1	Being aware	<p>Based on their experiences, participants decided to cluster “more attentive”, “notice” and “listen” together under this theme. They considered combining concentration with being aware, but settled on making it two separate themes. They felt that they can have awareness without active concentration. Participants perceive that the listening sessions enhanced their ability to notice things that they normally would have missed in general and in interpersonal relationships where they began to listen more to the other person / people in a conversation or social setting. They experienced that noticing not only happens on an auditory level, but also on a visual and emotional level, being able to pick up quickly on a message that is meant for you. Participants perceive themselves to be more present in group conversations, as well as hearing more sounds, small details and information during interactions with their environment and everyday life. They became more aware of their own emotions while interacting with others on a social and interpersonal level. They felt that overall listening has improved both in relationships and academic contexts, being able to attend more to detail in both contexts.</p>
2	Improved Concentration	<p>They felt that “concentration”, and “concentrate for longer time” fit well together under this theme. Their perception is that overall concentration improved. The participants felt that they can work longer on a topic and get more work done in less time with regard to academic functioning.</p> <p>While studying, they felt that more information could be processed in shorter timeframes. They reported more effective results in their academic performance due to better concentration in class, focusing on the message and content of the lecturer and lecture. They felt that they could therefore pay better attention in class and during study time. This focus and attention could be maintained from the start of a lecture or study time, which proved to them that they can focus more and quicker in these contexts. Increased processing of information was also reported. One example was that a participant managed to read a book in half a year, which usually took much longer in the past.</p> <p><i>*Taking notes was considered to be part of this theme, but the participants decided not to include this experience due to not being a strongly shared experience and could also not clearly be plotted in any of the other themes.</i></p>

Nr	Theme	Description
3	Taking perspective	<p>Participants clustered “objective”, “listen to understand not respond” and “think before you speak” under this theme.</p> <p>They felt that the listening sessions improved their ability to listen for understanding and not just to respond in conversations. Being able to step back and take perspective, therefore thinking before just speaking. The participants felt that being able to listen to understand is to be objective and to listen to respond is subjective.</p> <p>They explained this perception as an increased ability of being more objective, more willingness and ability to listen to others opinions, not just deciding on their own what the outcome of a discussion should be, leaving room for someone to convince you otherwise. From their perspective it also relates to the willingness to receive new information and not stick to a preconceived idea in conversations or arguments. For them it meant to in a sense delaying judgement and staying neutral in these situations.</p>
4	Self/personal reflection	<p>This theme was developed from “find and make time for myself – relax, -disconnect from responsibilities”.</p> <p>During the listening sessions there was a realization that more me-time is needed and participants felt that they started to make more time to relax and disconnect from responsibilities during this time. It is an inward experience about themselves and not about the outside world at that point in time. They felt that the sessions therefore increased their ability to take time out from work and responsibilities and make time for reflecting, relaxing, not being triggered by responsibilities, but rather taking time out for the self.</p> <p><i>*Creativity was considered to be added to this theme but the participants felt that it fit better with boldness from their experiences. Their final thought was that creativity does not necessarily mean that you are reflecting, it can relate to any form of expression. Moving outside your normal space and being bolder.</i></p>
5	Boldness	<p>Participants felt that “creativity”, “I can do anything” and “open-minded” fit well together under this theme. They felt that the listening sessions made it more possible to step out of comfort zones, being more creative and open-minded, having the feeling that more can be done than they usually could or were used to allow themselves to do. They felt more secure in own assertiveness and creativity, where there used to be more self-doubt and fear to think outside the box. They accept challenges more as a result of being more comfortable with themselves.</p>

(*) indicates a theme that were considered, but on final decision left out due to lack of strong shared experience

Table 2*Frequency and power analysis of themes in relation to each other*

AFFINITY PAIRS	Frequencies	Cumulative Frequency	Cumulative % (Relation)	Cumulative % (Frequency)	POWER
2←4	6	6	5	12.76	7.76
4→5	5	11	10	23.40	13.40
1←2	4	15	15	31.91	16.91
1←3	4	19	20	40.42	20.42
3→4	4	23	25	48.93	23.93
1←4	3	26	30	55.31	25.31
1→2*	3	29	35	61.70	26.70
3←5	3	32	40	68.08	28.08
2←3	2	34	45	72.34	27.34
1→3	2	36	50	76.59	26.59
1→4	2	38	55	80.85	25.85
1←5	2	40	60	85.10	25.10
2→5	2	42	65	89.36	24.36
2←5	1	43	70	91.48	21.48
3→5	1	44	75	93.61	18.61
1→5	1	45	80	95.74	15.74
2→3	1	46	85	97.80	12.87
4←5	1	47	90	100	10
2→4	0	47	95	100	5
3←4	0	47	100	100	0

Note: Relational pairs that were excluded due to higher frequency in reverse direction are indicated with *. Numbers in bold indicate relational pairs for final model development. Theme 1: Being aware; Theme 2: Improved concentration; Theme 3: Taking perspective; Theme 4: Self/personal reflection; Theme 5: Boldness.

Table 3*Interrelationship Diagram (IRD)*

THEME	1	2	3	4	5	OUT	IN	DELTA	ASSIGN
1	x	←(↑?)	←	←		0	3	-3	Primary Outcome Secondary Outcome /
2	↑(←?)	x		←		1	1	0	Pivot
3	↑		X	↑	←	2	1	1	Secondary Driver
4	↑	↑	←	x	↑	3	1	2	Secondary Driver
5			↑	←	x	1	1	0	Pivot

Note: (↑?) indicates the secondary cause-effect relationship between Themes 1 and 2

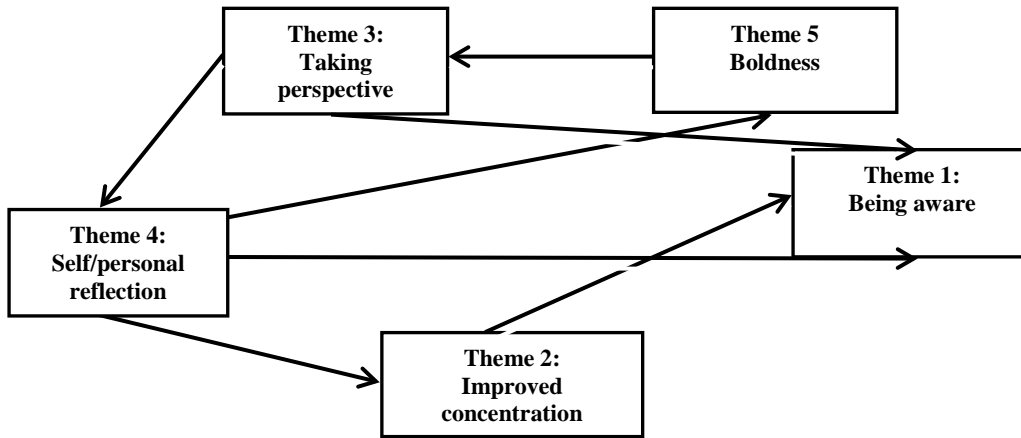
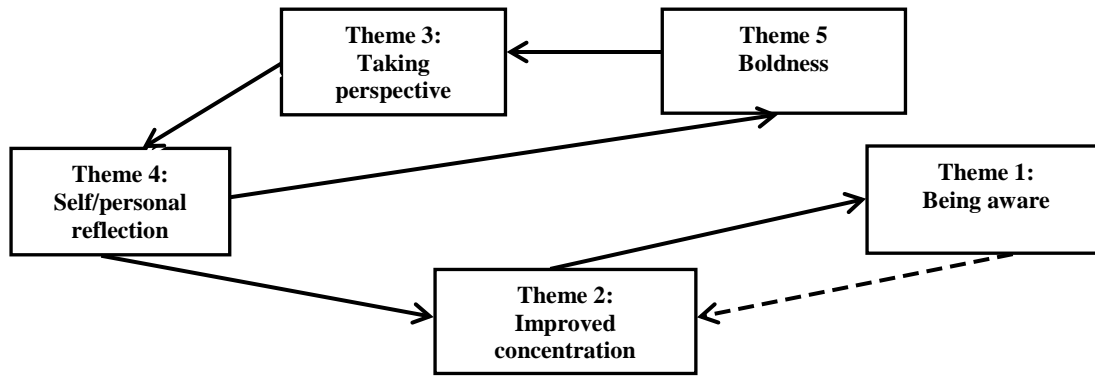
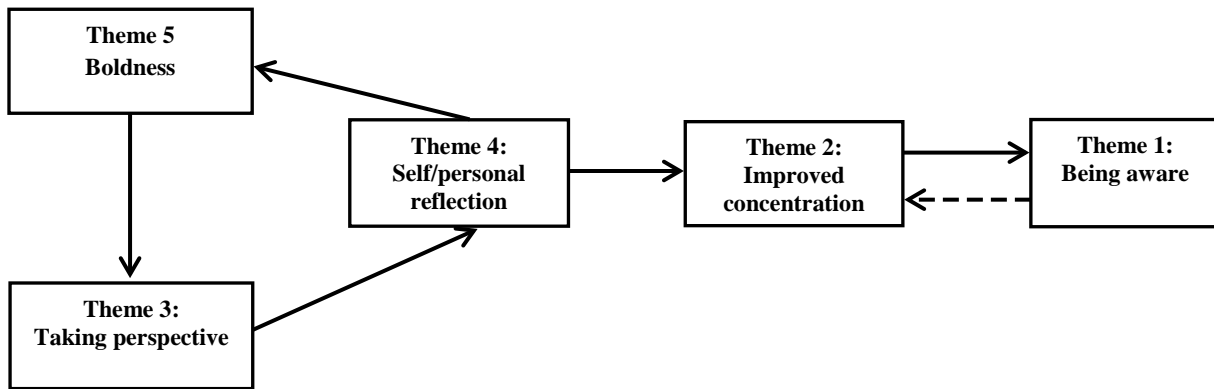


Figure 1.1: Tentative SID Assignments



←----- Ambiguous relationship (1 → 2) added

Figure 1.2: Cluttered SID



← - - - Ambiguous relationship (1 → 2) added

Figure 1.3: Final SID

CHAPTER 5: CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

Chapter one argues that university students, given their developmental phase, find themselves in a challenging transitional phase that requires them to function as integrated social, cognitive and emotional beings. A critical resource in readjusting oneself and adapting to challenging contexts, and central to this study, is self-regulation, which is the ability to adjust aspects of oneself to bring behaviour closer to norms, goals or ideals. There are different approaches to self-regulation. In this study it was conceptualized firstly from a (i) multiple level perspective, and secondly from a (ii) self as agent perspective. In practice this means that the ability to adjust behaviour according to different processes like self-monitoring and feedback on the cognitive, emotional, and interpersonal levels, elicits a sense of agency within the individual, in other words, the sense that the individual is actively and intentionally involved in self-development, -adjustment and -renewal.

Self-regulation relies on different resources and processes, of which attention, due to the important role it plays in self-monitoring, is crucial towards goal achievement. Although a strong knowledge base exists regarding the role visual attention plays in cognitive-related self-regulation processes, there seems to be a lack of research data on aspects related to auditory attention. Theoretically, listening is crucial to self-regulation as it influences self-observation, self-judgment, intrinsic motivation, plays a key role in maintaining and shifting attention, and helps to integrate affective and emotional processes in ways other sensory systems are not able to. From a self as agent perspective, the value of listening can hardly be disputed. Solisten (2009) defines listening as "...to use one's hearing intentionally and attentively..." (p 18), while Tomatis (2005) indicates that listening motivates action, personal growth and a healthy attitude towards the self and others. Based on this, the Tomatis® Method was developed in which the ear, auditory system and central nervous

system is stimulated through air and bone conduction to optimize the processing of auditory information.

Even though more research is needed, the Tomatis® Method has been indicated as an effective intervention model for addressing a number of problems related to auditory processing and even psychological disorders. Furthermore, while visual information processing is often integrated in self-regulatory programmes, listening skills seem to be a neglected, underutilized or even non-existent resource. There is subsequently a need to explore the effect better listening skills may have on self-regulation, specifically within the context of being a university student. As such this study could bring about a new understanding of listening skills in the dynamics of self-regulation, specifically as it relates to the challenges university students face.

The general aim of this study therefore was to explore the applicability, value and impact of the Tomatis® Method as an instrument in promoting effective self-regulation in university students. Three specific aims were explored, each addressed in a different manuscript. These are now discussed and thereafter integrated into a final conclusion and critical appreciation of the contribution of this study.

Chapter 2 / Manuscript 1:

The aim of chapter two was to explore the available scientific evidence on the Tomatis® Method in promoting self-regulation in tertiary students and how it compares to other interventions with similar aims. A systematic review was conducted according to valid guidelines for systematic reviews in social sciences, while a narrative empirical synthesis was used for integration of the results. A total of 35 manuscripts met the inclusion criteria for this study, varying in scope, sample size and cultural context. Programmes within the reviewed studies generally focused on either reducing problematic behaviour, enhancing emotional and psycho-social functioning, or, to a lesser extent enhancing students' self-regulatory skills. Most studies, however, included specific aspects of

self-regulation, such as self-awareness, self-efficacy, goal-motivation, critical thinking, self-understanding, interpersonal interactions and mindfulness.

Although application of the Tomatis® Method within a tertiary environment is limited, the review showed promising potential compared to results from general programmes. Implementation of the Tomatis® Method was shown to compare well with approaches like TPB, Cognitive, Behavioural approaches, and Mindfulness training. It was argued that the multi-level and holistic approach Tomatis® Method provides plays a critical role in this. It was furthermore clear from the review that there is a promising, yet underexplored link between listening skills and self-regulation, and that enhancing self-regulation is strongly associated with improvements in psychological well-being. The review further showed a lack of well-designed, truly longitudinal research studies, with the result that actual mechanisms of change have not been captured convincingly. Most of these studies recommended future research with larger sample sizes across different ages, cultures and learning contexts.

As individual-context interaction (Bronfenbrenner, as cited in Spencer, 2008) is of great importance when taking into account that the university context is a diverse setting that provides unique challenges (Spencer, 2008), it can be concluded that self-regulation is a critical process that students have to master to effectively adapt to their challenging contexts. Students are active participants in the system and they find themselves “shaping environments, evoking responses from them, and reacting to them” (Darling, 2007, p 204). The student’s relationship to self and the environment should therefore be a central focus of interventions aimed to enhance student well-being.

The implications of the findings from the review, namely 1) that true mechanisms of change occur when stressors are reduced and well-being enhanced within student functional systems, 2) the positive relationship between the holistic Tomatis® Method approach and other intervention

strategies, and 3) the positive relationship between listening and self-regulation; formed the foundation of the experimental design developed for Manuscript two. In addition to these implications, methodological limitations of previous research, such as the lack of true longitudinal experimental designs, the lack of random selection of participants, and using only self-reporting measures, also informed the development of Manuscript two.

Chapter 3 / Manuscript 2:

Chapter three aimed to evaluate the impact of the Tomatis® Method on the self-regulation of a sample of South African university students. A concurrent, mixed-method, pre-post, and repeated post-assessment experimental design was conducted. The sample consisted of 49 first-year undergraduate students from the Potchefstroom Campus of the North-West University, randomly assigned to an Experimental group (group E), (n=18) who underwent the basic Tomatis® Method programme; a first control group that listened to Mozart music (group M) (n=16), but without the gating effect of the Tomatis® Method; and a second control group (group C) (n=15) that did not listen to any music. It was found that the Tomatis® Method significantly improved hypo-responsiveness in the left ear and spatialization of the right ear, introjected regulation (regarding academic motivation) and perseverance, as well as self-regulation as psychological and social strength (well-being). Participants also subjectively perceived benefits regarding improved listening in social and academic contexts, attention and awareness, self-control and interpersonal regulation.

Significant differences were found in left ear hypo-responsiveness in the Tomatis group compared to both the Mozart and Control groups, indicating a stronger desire to listen in the Tomatis group. It was argued that these changes were prominent in the left ear, due to the fact that all sound traveling through the left ear is projected to the right hemisphere of the brain, which is the dominant emotional processing hemisphere. It was explained, based on the neurodevelopmental principle underlying the Tomatis ® Method, that stimulation promotes nerve growth, and that

students in this study specifically benefitted more from right hemisphere stimulation giving the fact that students, due to their developmental stage and level of differentiation, are often confronted with adjustment and emotional challenges and that they were therefore more susceptible for improvements in this area.

Statistically significant results on Diff2 of right ear spatialization further indicated a decrease in the spatial errors made by the participants in the Tomatis group, whereas the Control group showed an increase in the same parameter. This indicates that the Tomatis® Method had a positive effect on the participants' ability to locate sounds which has a direct impact on their levels of energy, memory and attention (TDSA, 2010).

It was indicated that Introjected regulation represents an extrinsic or controlled type of motivation, implying that the actions of students in the Tomatis group actions are partially internalized and motivated by approval, obligation and avoidance of shame or guilt. Although it would have been more beneficial if their motivation was more intrinsic in origin (Ryan & Deci, 2000), they at least reflected a stronger sense of responsibility and obligation to perform, which is better than being amotivated, and which is in line with previous studies that suggested introjected regulation as beneficial to academic achievement. It was suggested that further research is needed to clarify the impact of Tomatis on intrinsic motivation as such. The improvement in perseverance was in retrospect not surprising, as it is perceived by some authors (for example, Skinner & Edge, 2002) as an introjected style of regulation. It was therefore concluded that although improvement in perseverance may be beneficial as it contributes to intrinsic motivation (Prabhu, et al., 2008) and goal achievement in the face of adversity (Carver & Scheier, 2003), it could also reflect rigid compliance, conformity or submission. For both introjected regulation and perseverance, Tomatis therefore seems to be effective. However, it is not clear to what extent this improved a sense of agency, or intrinsic / autonomous motivation. Aspects of agency were, however, observed in the

qualitative results. Finally, although there was an improvement in self-regulation as psychological and social strength (well-being) further research needs to be done to explore the mediating and moderating relationships between listening, self-regulation and psychological well-being.

Chapter 4 / Manuscript 3:

The relationship between listening and self-regulation processes that are suggested in Manuscript one and confirmed by Manuscript two required further examination to better understand the nature of this dynamic relationship. Manuscript three therefore aimed to determine and explore critical factors that are relevant to how a sample of university students perceived the effect of the Tomatis® Method on their self-regulation and to develop a conceptual model based on the relationship between these critical factors and self-regulation. The aim was based on the nature of self-regulation as a dynamic system unfolding over time through feedback loops (Carver & Scheier, 1998) and as contextualized skill that varies across contexts (Cleary, et al., 2012). As a result, Interactive Qualitative Analysis (IQA) (Northcutt & McCoy, 2004) was used to achieve the aims. Seven student participants who completed a 50-hour Tomatis listening programme, took part in the study. Five themes were identified in a focus group session after which a frequency analysis based on participants' account of the cause-effect relationships between the five themes were done in order to develop a model.

The model showed that students perceived the Tomatis® Method to have caused a perceived improvement in their ability to self-reflect, take perspectives and act with more boldness. This in turn positively affected their connection with their environment by means of improved concentration and enhanced awareness. It was argued that improved listening through the Tomatis® Method appears to have improved their mindfulness, a skill that facilitates receptiveness to change, specifically, to be less uncertain in response to change and to be bolder in decision making. This could have contributed to the change in their attitude towards their studies, which in turn improved

their concentration and awareness. Although the Tomatis programme seems to have positive potential to promote self-regulation in university students, it is important to emphasize that the model is only hypothetical, and as a result, generalizations to other populations cannot be made. It should rather be seen as first step in exploring new avenues in the relationship between listening and self-regulation.

Limitations of the study

No study can claim absolute perfection. In this study, a number of limitations existed that should be taken into consideration before a final conclusion can be made. For Manuscript one, a systematic review was followed, but languages other than English were excluded from the search. Even though critical works have been translated to English, this may still be a limitation, specifically the knowledge that emerged regarding the application and effectiveness of the Tomatis® Method in comparison to other approaches.

For Manuscript two, the main limitation was the relative small sample size. A larger sample size would have been preferable. However, to compensate for this, non-parametric Kruskal Wallis and multiple comparison tests were also done to confirm and compare results obtained by the ANOVA's and Dunnett's test results. Furthermore, the facilities available and the way in which the Tomatis group is structured and presented, does not allow for groups larger than eight per Solisten® device, and for this study one device per study group was available. In a way, the small sample was therefore a compromise between statistical- and intervention optimality - as a result, one should be careful in generalising the results. It does, however, not make the results less valid, but one can probably only be sure that the findings would be appropriate within tertiary settings and populations similar to the one used in this study.

Manuscript three was envisioned right from the outset as explorative, therefore the small number of seven participants who took part in this phase of the study is not perceived to be a major

obstacle. The only possible limitation is that the Mozart group, as they also experienced some improvements, did not also take part in this phase. It could have been interesting to see how their perception and experience of the Mozart intervention had influenced their self-regulation, if at all.

Overall, even though a number of limitations did exist, this study still contributed to a better understanding of, and new questions regarding the relationship between improved listening and self-regulation in student samples.

Integrated conclusion

Taken together, this study found that the Tomatis® Method holds underutilized potential to facilitate self-regulation through improved listening skills. It confirmed previous research that the Tomatis programme does indeed improve listening skills, specifically hypo-responsiveness in the left ear indicating a stronger desire to listen, as well as right ear spatialization, indicating a positive effect on the ability to locate sounds.

It further improved introjected regulation regarding academic motivation, perseverance as well as self-regulation as psychological and social strength (well-being). Although the effectiveness of the self-regulatory skills depends on context, the results clearly underline why it is expected that improving the “listening ear” should facilitate self-regulation, as well as bringing about a sense of well-being (Sollier, 2005; Tomatis, 1991; Tomatis, 2005).

The display of more integrated listening skills by the participants in the Tomatis group further indicates that they became more available to themselves and the environment (Sollier, 2005). From Bronfenbrenner’s perspective (Bronfenbrenner & Morris, 2007) this finding suggests that participants appeared to have become more active in controlling their own individual system within the university system, therefore experiencing a stronger sense of agency. The findings therefore strongly indicates that students who are relatively in tune with their own inner voice and in harmony with their contexts are also better able to self-regulate and to experience psychological well-being

(Sollier, 2005; Tomatis, 1996). This study also placed specific emphasis on the interplay between listening to self and listening to the external world and how it enables self-directed change in self-regulation (Bandura, 2001; Grant et al 2002).

In an effort to understand how this improvement in listening impacts on self-regulation, a hypothetical model was developed that suggests better listening causes improved mindfulness, consisting of being better able to self-reflect, take perspective and act with more boldness, which eventually facilitated improved concentration and enhanced awareness. This model may help to plan future studies and should be verified within other contexts to assess its generalizability.

Contribution of the study

The study's main contribution is that it addresses the gap that exists regarding self-regulation and auditory processing and showed the important role it plays in attention, specifically in relating self to self, to others and the environment on affective and general sensory integration levels (Berger, 2011; Gomes, Molholm, Christodoulou, Ritter, & Cowan, 2000; Shinn-Cunningham, 2008; Thompson & Andrews, 1999).

The study further emphasises the need for a more integrated intervention model for student self-regulation. It contributed in providing an alternative perspective to combining different approaches for obtaining such an integrated model. Findings have highlighted that listening in itself is a starting point and connected to most, if not all functional processes that students have to master, which in actual fact could simplify intervention strategies. Through the identified benefits of enhanced listening when following a Tomatis® Method for self-regulation, this study further contributes by having laid a foundation for future researchers to build on by presenting a hypothetical model that suggests initial changes in inner-directed attention and subsequent changes in external-directed attention.

Recommendations for further research

For the Tomatis practitioner, this study informs about the benefits of a Tomatis® Method, informing practitioners of the value this method and practice. With this study the researcher would like to motivate practitioners when continuing with the practice of the method, to complement it with conducting research. In this way the Tomatis® Method can become more of an evidence-based practice approach. The findings of this study hold various implications for future research and intervention efforts focused on enhancing student self-regulation and well-being. More experimental and longitudinal exploration of the applicability of the Tomatis® Method as effective intervention approach to enhance self-regulation and the well-being of students are needed. The hypothetical model that was developed during this study may help to plan future studies and should be verified within other contexts to assess its generalizability.

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