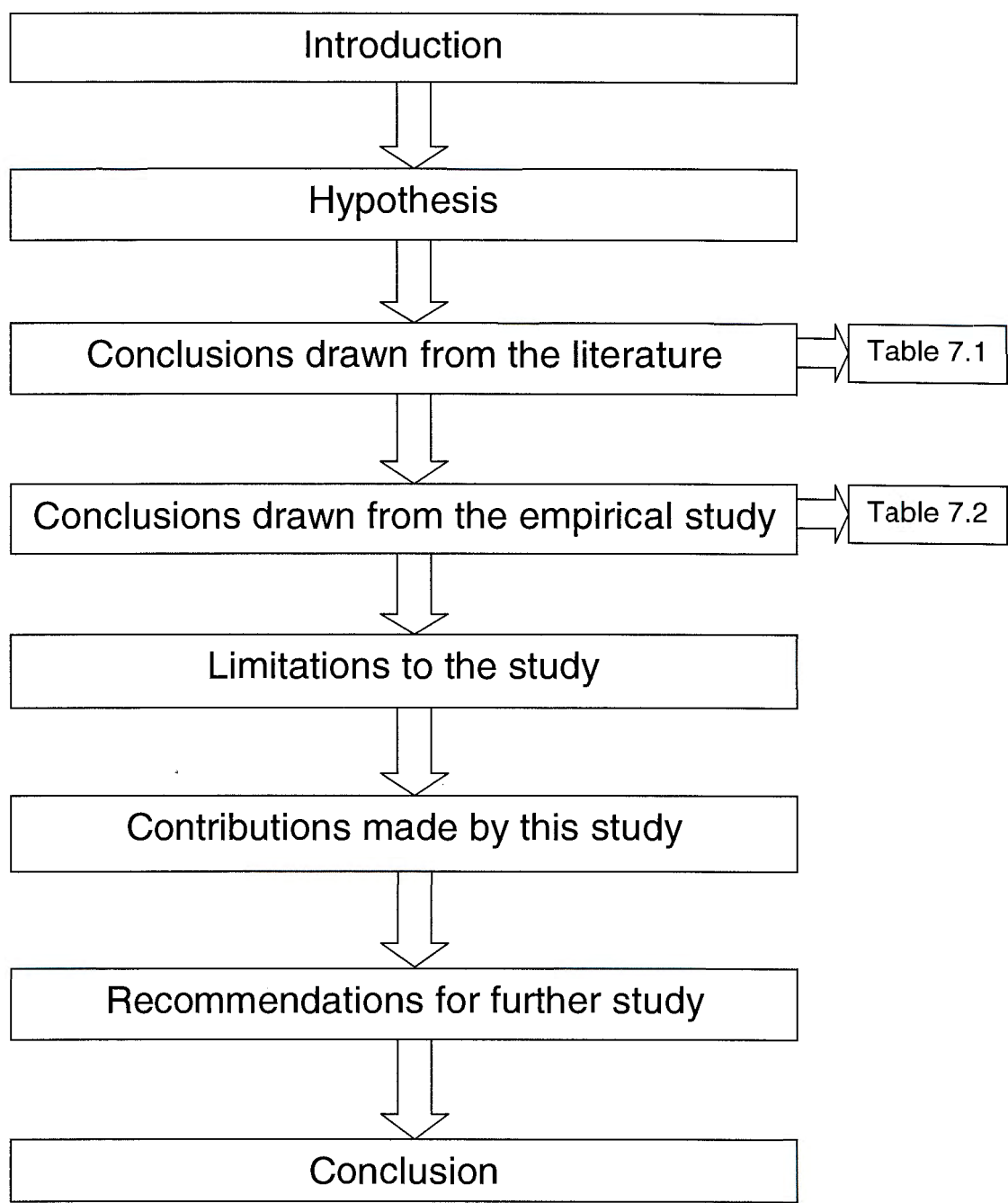




7.1. Introduction

The problem that initiated this study was the growing number of learners who experienced problems with the regulation of their attention in specific learning circumstances. This was reflected in the checklists that were completed by the parents. There are many causes of attention difficulties and it is a challenge for the parent, as well as the teacher, to address these causes so that the learner can give attention easily to a given task. If the learner can focus and shift attention as necessary, there will be a much better possibility of achieving optimal performance. Although no intervention is a 'silver bullet', every piece of the puzzle is important and should be addressed.

7.2. Hypothesis

The hypothesis was that Berard AIT would change the intrinsic locus of attention control to enable the learner to pay appropriate attention without effort. Frequency changes in the encephalographs became flexible so that attention could shift from scanning incoming information, to discerning which stimuli were important enough to give attention to, to the ability to pay sustained appropriate attention. The findings of this study indicated that the hypothesis (cf. 1.6) has been shown to be true.

The Berard AIT intervention did change the intrinsic locus of attention control and the learners were able to pay appropriate attention without effort. Brainwaves did become more flexible and the learners could automatically discern which stimuli were important enough to give attention to.

The results of the research study have shown the null hypothesis not to be true (cf. 1.6). The learners did manage to pay attention with less effort and their brainwaves did become more flexible.

7.3. Conclusions drawn from the literature

The results of the literature study can be summarised as follows:

Table 7.1

Attention problems	Attention difficulties are a reality in the lives of many learners (Amen, 2001:13). These learners experience school as a place of isolation, frustration and failure and they eventually lose their self-confidence and self-esteem (Serfontein, 1995:5). If the cause of these difficulties can be unmasked and addressed, learners may avoid disappointment and disillusionment (Miller and Blum, 2000:24).
Sensory integration	Sensory integration dysfunction can cause hyperactivity and attention problems (SAIT, 2001:3; Kranowitz, 1998:19).
Auditory processing	Learners with attention problems often display problems with auditory reception and verbal comprehension, auditory discrimination, auditory memory as well as gross and fine motor co-ordination, spatial problems and distractibility (Serfontein, 1995:52). Learners who are very distractible have little ability to block out noises in order to concentrate; this may indicate that an Auditory Processing Disorder is present in children with attention deficit (Taylor, 2001:8).
Sound therapies	Auditory processing difficulties can be addressed successfully by psychoacoustic methods (McArthur et al. 2008:946). Sound based therapies do have a positive influence on the functioning of the brain (Levitin, 2006:189). Berard AIT has been found to have positive effects on people with autism (Edelson and Rimland, 1994:3) and learners with sensory integration problems (Frick and Shirley-Lawson in SAIT, 1995:2).

7.4. Conclusions drawn from the empirical study

7.4.1. Research design

An experimental study, with a pre-test versus post-test control group design, was conducted to investigate the effect that Berard AIT has on learners with attention problems. Checklists were completed and different measurements (cf. 5.6.) were conducted before the training started and repeated three months (cf. 1.5) after the training had been completed, to monitor if there had been any change in the way that

the learners paid attention. The checklists would also have indicated if there had been a positive change in the learners' problematic behaviour, if presented initially.

The process took five months. During the first month interviews were conducted with an educational psychologist, teachers and parents to identify learners with attention problems.

During the second month the researcher conducted the actual training. The learners in the experimental group listened to modulated music, played through the Earducator, twice a day for ten days. Each session lasted thirty minutes and three hours elapsed between the two training sessions in order to give the auditory system a chance to rest. Twenty half-hour sessions were completed in 12 days.

A waiting period of three months (cf. 1.5) ensued. As the majority of benefits from Berard AIT occur within three months after AIT, the initial assessments and post-tests were repeated in the fifth month of the research programme. After the initial ten days of stimulation of various parts of the brain (cf. 3.1), new neural pathways are formed and myelinated which is responsible for new behaviour and an improvement in learned skills. After ten hours of listening to specifically modulated music, the intervention elicited an effect on several levels of the learner's functioning. Behavioural changes resulted from the basic primitive reflexes changing to the re-organizing of the cortical areas of the brain.

At the end of the fifth month the Berard AIT intervention were conducted for the ten learners in the control group. As the school year was drawing to a close, a six week holiday was about to begin and the learners were in a higher grade the following year. Therefore, no post-tests could be conducted again three months after the control group received the re-training of their auditory system.

7.4.2. Summary of the Results

Table 7.2. A comparison of the data acquired three months after the case group received the Berard AIT intervention and the control group received no intervention.

Measuring instrument	Experimental group	Control group
Listening Profile	Hypersensitivity to sound at various frequencies disappeared in each of the 6 learners where it was initially present. Improvements in the ability to perceive sound were found at most frequencies, which reached significance at two of the sound frequencies. Standard deviation reduced in 8 of 10 learners, indicating a flattening of the listening profile and an improved ability to detect sound of all frequencies at the same level of loudness.	One learner acquired hypersensitive hearing and no change in the status of the other learners who experienced hypersensitive hearing. Decreased ability to perceive sounds were found at most frequencies, which reached significance at two of the sound frequencies. Standard deviation reduced in 5 out of 10 learners.
Time*group interaction analysis indicates a role for AIT in improvement in the Listening profile with at least two frequencies attaining statistical significance and a further two frequencies showing a trend towards significance. Improvement in the hypersensitivity profile as well as improvement in the ability to hear all sound frequencies at the same level of loudness should improve the learner’s ability to absorb auditory information, and reduce the tendency to “tune out”.		

Measuring instrument	Experimental group	Control group
ABC checklist	All ten learners experienced a reduction in negative behaviour symptoms. • 9 showed reduced hyperactivity • 7 showed reduced lethargy • 7 showed reduced inappropriate speech • 5 showed reduced stereotypy • 5 showed reduced irritability Statistically significant improvement was seen in the hyperactivity, irritability and inappropriate speech.	Six learners experienced a reduction in behaviour symptoms. • 2 showed reduced hyperactivity • 3 showed reduced lethargy • 3 showed reduced inappropriate speech • 3 showed reduced stereotypy • 5 showed reduced irritability No statistically significant difference was seen in any parameter.
Time*group interaction indicated that the AIT intervention significantly impacted on the hyperactivity and stereotypy parameters, and trended towards significance in the irritability parameter. Thus improvement in a number of parameters of the ABC checklist could be ascribed to Berard AIT. Decreased hyperactivity is likely an indication of improvement in the ability to sustain attention; hyperactivity has been proposed to be a reflection of the child's need to activate his brain, and hence to pay attention, through movement.		

Measuring instrument	Experimental group	Control group
Copeland checklist	Seen as a group 71 behaviour traits improved. Statistically significant improvements were seen in the Overactivity/hyperactivity, inattention/distractibility. And underactivity parameters, with a further trend towards significance seen with Attention-seeking behaviour. No learner failed to show improvements in at least one parameter; all learners showed improvements in at least the hyperactivity parameter.	Seen as a group 38 behaviour traits improved. No statistically significant differences were found, though. At least one learner failed to show any improvements whatsoever, only one learner showed improvement in at least the hyperactivity parameter.
Time*group interaction analysis indicates that AIT was the most likely cause for the improvement in the overactivity/hyperactivity parameter, and probably for the inattention/distractibility parameter. As for the ABC checklist, reduction in hyperactivity may indicate a decreased need for the learner to activate his brain through movement; both reduction in hyperactivity and distractibility should improve his overall ability to focus attention where it is needed.		

Measuring instrument	Experimental group	Control group
Primitive reflexes	As a group 86 reflexes were inhibited to some degree. Improvement reached statistical significance for the STNR-head lift test.	As a group 49 reflexes were inhibited to some degree. Six reflexes worsened significantly.
Time*group interaction analysis indicated that AIT significantly affected the integration of the Palmar, the Sucking, the Babinski-R. The ATNR-lying down and the Fear Paralysis-push/wave test, and probably also the STNR-head lift and the Tonic Labyrinthe Reflex tests. Palmar reflex integration is likely to affect the ability of the learner to perform sustained written work, which may therefore improve his ability to finish tasks in class. Integration of the Tonic Labyrinthe reflex is likely to improve muscle tone, and hence to improve sustained posture and decrease fatigability. Intregation of the ATNR is likely to improve the ability to work in the mid-line, such as holding down the page with one hand while writing with the other. Integration of the Fear-paralysis reflex is likely to reduce stimulus-bound responses.		

Measuring instrument	Experimental group	Control group
QEEG	As a group the positive brain state shifts were 24 in total. No learner failed to show at least one positive brain state shift, most showed multiple positive brain state shifts. 4 learners showed improvement in left vs right frontal as well as left vs right brain hemisphere balance.	With this group 7 positive shifts were recorded. Three learners failed to show even one positive brain state shift; the rest all manifested only one positive brain state shift. No learners showed improvements in left vs right frontal as well as left vs right brain hemisphere balance.
Better asymmetry between the left and right frontal regions may lead to improved processing of scholastic <i>information</i> and execution of analytical function, in a manner analogous to the role of clear hand-dominance. Although there were changes in the QEEG assessment of the ten learners in the experimental group, the changes in the measured brainwaves at each point of assessment were not really indicative of major improvements in the ability to control attention. The researcher is of the opinion that the influence of the intervention should also have been measured at six months post-AIT. Structural neurological changes most probably take longer than three months to be reflected in a change of brainwave intensities.		

Measuring instrument	Experimental group	Control group
IVA	Improvements as a group, 63 All learners improved in the Response Control quotient as well as the Sustained Visual attention quotient. No learner failed to show improvement in at least one parameter. Statistically significant improvements were seen in the Response Control quotient, particularly the auditory component; the Attention quotient, particularly the Visual component, as well as the Sustained Visual Attention quotient.	Improvements as a group, 44 Only 3 learners improved in the Response Control quotient, and 6 in the Sustained Visual attention quotient. No learner failed to show improvement in at least one parameter. No improvements reached statistical significance.
Time*group interaction analysis indicated a trend towards significance for the Response Control quotient, the visual component of the Attention quotient, as well as the Sustained Visual Attention quotient. To be able to give visual and auditory attention is vital for learning. To be able to shift the attention from the visual to the auditory stimulus and respond appropriately is necessary for effective intake and output of information (Levine, 2002:65).		

A very important point to remember is that all the learners were in school and receiving instruction during the three month waiting period. Most of the positive changes that were experienced by the control group could be attributed to dedicated teachers, who had to teach the learners, despite the learners’ inability to pay sustained attention.

According to Table 7.2. the experimental group improved significantly in all the modalities tested in relation to the control group. This superior functioning was reflected in the scores of every measuring device used. This information correlates with the research that Edelson and Rimland (SAIT 2001:2) conducted (cf. 1.7). Moreover, the data appear to reflect an internally-consistent model: Reduction in auditory hypersensitivity is likely to lead to reduction in irritability (as seen with the ABC) and distractibility (as seen with the Copeland). Improved ability to hear all sound frequencies at the same level of loudness and reduction of sounds lost to processing by triggering of the acoustic reflex due to auditory sensitivity, should improve the ability to respond appropriately to auditory information (as seen with the

Response Control quotient, auditory component of the IVA). This may also affect the ability to control inappropriate speech (as seen with the ABC). Furthermore, improved encephalograph frequency balance between the left and right hemispheres, as well as appropriate asymmetry between the left and right frontal regions (as seen with the QEEG) may improve the ability to process speech sounds and to respond appropriately (as seen with the Response Control quotient of the IVA and the inappropriate speech parameter of the ABC).

Integration of the Fear-paralysis reflex, which is thought to underlie appropriate tactile processing, may lead to fewer tactility issues, which may again reduce irritability as well as some forms of hyperactivity (squirming and fidgeting). Integration of the Tonic Labyrinthine reflex may influence the proprioceptive system in such a way as to improve muscle control, and thus may reduce fatigue, and so improve underactivity (as seen in the Copeland). This improved muscle tone may also involve the muscle tone of the eyes, and thus allow more optimal eye movement control, which in turn will improve the visual component of attention (as seen in the Attention quotient, visual component and Sustained Visual Attention quotient of the IVA). Integration of the ATNR may improve the ability to work in the mid-line, while integration of the Palmar reflex may improve the ability to sustain fine-motor control in the act of writing; together these may improve the learner's ability to complete tasks in the class, and thus lead to an impression of lesser distractibility in the classroom (as seen in the Copeland).

Both checklists indicate a particularly strong role for AIT in the reduction of hyperactivity; this may reflect that after AIT the brain is activated more appropriately (as seen in the QEEG) so that the need to activate the brain through movement (which leads to increased production of dopamine and gamma-amino-butyric acid, which facilitate learning and focussed attention) (Hannaford, 2002:195) is reduced.

7.5. Limitations to the study

The study has the following limitations:

- The results of the study will be more valid if more participants were included in the study. Because of the small number of participants, generalization is limited.

- A more intensive screening for the possible cause of attention difficulties is necessary. Information about family dynamics, lifestyle, dietary intake and past trauma will result in choosing learners for the project whose attention difficulties are not due to environmental influences.
- Since the symptoms and characteristics of learners with attention problems differed, external validity might not have been as high as one would wish for. Although it is not possible to see ten learners as a representative sample of the population that needs help, it does indicate whether it is feasible to do a more in-depth study on the effect that auditory stimulation has on the improvement of attention control.

7.6. Contributions made by this study

- Through the years several studies have been done to show the validity of Berard AIT (cf. as an intervention. Not one of the studies has used such an extensive testing procedure to detect all the possible changes that could be elicited by the retraining of the auditory system.
- It is the first time that primitive reflexes were tested before and after the Berard AIT intervention. The positive effects of the intervention on the inhibition of aberrant reflexes shows that Berard AIT has an influence on the cellular-neural connections. As these are the first reflexes to emerge in utero, it can have very positive effects if the intervention can work at such a basic level.
- The results from the ABC and Copeland checklists indicated a significant reduction in behavioural problems in the experimental group by the third month following the listening sessions. This finding is consistent with studies conducted by Edelson and Rimland (1994:2). The improvements after three months were in line with what Berard had reported earlier, based on his work with thousands of patients (Berard, 1993:97).
- The IVA has not been used as a pre- and post test in a Berard AIT study before. The IVA indicated huge improvements for the experimental group in sustained attention over time.

- The biggest contribution that this study offered, was the use of several physical and neuro assessments to validate the efficacy of Berard AIT as an intervention to assist learners with attention difficulties. The more scientific evidence functions to validate the claims made by parents and practitioners, and may lead to broader acceptance of this intervention.
- Hypersensitivity to sound has been addressed in all the learners as well as auditory processing problems in most of the learners. Focusing deficits has also been solved in some learners with the result that the learner is able to pay sustained attention.

7.7. Recommendations for further study

- This study supported the hypothesis. A study with more participants would carry more validity.
- Berard AIT is seen as a complete intervention only three months after the intervention. Berard saw changes up to a year after the initial music stimulation. It is recommended that post-tests are repeated not only at three months past intervention, but also at six, nine and twelve months after the initial intervention. Such tests should also include QEEG.
- Research recommendations: Other barriers to learning that could possibly be addressed by Berard AIT would be eye-hand coordination problems, sensory disorder, visual co-ordination problems, dyslexia, balance problems in children (Stehli, 2004:3). Such parameters should also be evaluated in future studies.
- Because of the encouraging results (cf. chapter 6) a bigger study can be done, involving learners to be more representative of the population of learners with attention problems.

7.8. Conclusion

Berard AIT had a positive effect on the attention control of most of the learners involved in the research study, indicating that Berard AIT has a definite place in the

support of learners. If the learners can manage to control their attention and have more flexible brainwaves, it is possible for them to obtain their optimal learning performance.

REFERENCES