

### **Critical Review:**

## **The use of Auditory Integration Training to reduce aberrant behaviours in individuals with PDD**

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This critical review examines the effectiveness of using Auditory Integration Training (AIT) to reduce aberrant behaviours among persons with Pervasive Developmental Disorders. Study designs include: systematic review (1), randomized controlled trial (1), and case study (1). Overall, the examined research provides variable and equivocal evidence in support of AIT as an effective treatment for Pervasive Developmental Disorder. Thus, it is suggested that AIT be considered an experimental treatment until more empirical evidence is available.

### ***Introduction***

Pervasive Developmental Disorders, also commonly known as Autism Spectrum Disorders (ASD) are characterized by severe and pervasive impairment in several areas of development. These areas include: reciprocal social interaction skills, communication skills, or the presence of stereotyped behaviour, interests and activities (American Psychiatric Association, 2002). Many conditions fall under the umbrella term, Autism Spectrum Disorders, including: autistic disorder, Asperger's disorder, Rett's disorder, childhood disintegrative disorder, and pervasive developmental disorder not otherwise specified (American Psychiatric Association, 2002). The qualitative impairments that define these conditions vary in relation to the individual's developmental level or mental age (American Psychiatric Association, 2002). Differences in severity, number and types of symptoms, age of onset, levels of functioning and challenges with social interactions also exist across this spectrum of disorders (Autism Society Canada, 2006). Pervasive Developmental Disorders are usually evident in the first years of life and are often associated with some degree of developmental delay (American Psychiatric Association, 2002) Currently there is no known cause of Autism Spectrum Disorders; however, research suggests that genetic factors play an important role (American Psychiatric Association, 2002). The most commonly known pervasive developmental disorder is autistic disorder due to increasing public education and prevalence. Autistic

disorder affects approximately 1 in 200 individuals in Canada, and is four times more common in males (Autism Society Canada, 2006).

Given the heterogeneous population of individuals with pervasive developmental disorders, and the knowledge that there is no known etiology, a number of interventions incorporating principles from a variety of disciplines have been developed to address the more prevalent PDD conditions. Intervention strategies commonly employed with individuals with autistic disorder, Asperger's disorder and PPDNOS include, but are not limited to, Applied Behavioural Analysis, Pivotal Response Training, Project TEACH, and pharmacotherapy. Alternative therapies have also been developed for the remediation of autistic symptoms, including: gluten-free and yeast-free diets, supplementation with vitamin B6 and magnesium, and auditory or sensory integration training. Despite a lack of evidence and expert agreement in support of alternative therapies, anecdotal reports of improvement have ensured their continued use with individuals with autistic symptoms.

One such alternative treatment option that has recently gained popularity in Canada is Auditory Integration Training (AIT). AIT is based on the concept that electronically modulated or filtered music provided through headphones may be helpful in remediating hypersensitivities to sound and auditory processing deficits thought to be problematic for children with a variety of

conditions including autism (Baranck, 2002). The exact neurological mechanism underlying AIT is unknown and a comprehensive theoretical explanation as to why AIT is beneficial to individuals with autism has not been clearly established (Baranck, 2002). However, AIT claims to improve auditory processing, decrease or eliminate sound sensitivities and reduce behavioural problems in individuals with autism (Autism Society Canada, 2006). Advocates of AIT also report improved language abilities and social skills as associated outcomes to this alternative treatment approach. Currently, the average cost for 10 days of AIT therapy in Canada is 1,000 dollars (Autism Society Canada, 2006).

The methods and equipment used by AIT practitioners vary depending on the philosophical approach employed: Berard or Tomatis.

### **I. Berard Method**

The Berard method, developed by Dr. Guy Berard, is the most commonly used approach in North America for the treatment of autism. This method involves listening to 10 hours of modified music through headphones in 20 half-hour sessions over a 10-20 day period (Edelson et al, 1999). A modulating and filtering device accepts music input from CDs and modifies sounds by (a) random attenuation of high or low frequencies, and (b) filtering of selected frequencies (Baranck, 2002). Thus, attainment of a hearing profile is essential for the development of each individual's treatment plan. Sound frequencies that are 5 to 10dB different from adjacent frequencies are referred to as "peaks." These peaks are filtered out during the listening sessions (Baranck, 2002). Treatment outcomes reported with the Berard method of AIT include improved auditory hypersensitivity and auditory processing skills, as well as the enhancement of generalized behaviours such as attention, arousal, language and social interaction (Baranck, 2002).

### **II. Tomatis Method**

The Tomatis Method, developed by Dr. Alfred Tomatis, involves listening to filtered sounds of the maternal voice, as well as electronically

processed music through a modulating device called the Electronic Ear (Baranck, 2002). The Electronic Ear attenuates low frequencies and amplifies higher frequencies. The earphones used to deliver the auditory input have an attached bone conductor to assist in the transfer of sounds through vibration and air conduction (Baranck, 2002). Following the passive listening phase, the subject is asked to participate in active language and vocal exercises. These exercises provide the individual with feedback (through headphones) of his/her own voice. The feedback is believed to reinforce more normal auditory perception (Baranck, 2002). Treatment outcomes associated with the Tomatis Method include decreased hypersensitivity to sound, improved language and social skills, a decrease in aggressive behaviour, improved self-image and improved eye contact, among others (The Tomatis Method, 2006).

### ***Objectives***

The primary objective of this paper is to critically evaluate the existing literature regarding the effectiveness of Auditory Integration Training in the reduction of aberrant behaviours displayed by individuals with Pervasive Developmental Disorders. The secondary objective is to propose evidence-based practice recommendations for the continued use of AIT in the treatment of autism, as well as recommendations for future research.

### ***Methods***

#### **Search Strategy**

Computerized databases, including CINAHL, MEDLINE and PubMed were searched using the following strategy:

((Auditory Integration Training) OR (AIT))  
AND ((Autism) OR (PDD))

The search was limited to articles published in English between 1980 and 2006. Reference lists of articles identified through the search strategy were searched for further relevant publications.

#### **Selection Criteria**

Studies selected for inclusion in this critical review paper were required to investigate the effectiveness of AIT in the reduction of aberrant

behaviours displayed by individuals with PDD. No limits were set on the demographics of the research participants.

### **Data Collection**

Results of the literature search yielded the following 3 studies matching the previously chosen selection criteria: systematic review, randomized controlled trial, and case study.

### **Results**

Sinha, Silove, Wheeler and Williams (2006) systematically reviewed the available literature to assess the evidence for the use of AIT in the remediation of sound sensitivities and autistic behaviours in individuals with PDD, with the exclusion of individuals with childhood disintegrative disorder and Rett's disorder. Based on pre-determined selection criteria, six randomized controlled trials (including one cross-over trial) comparing AIT to a control group or similar sound therapy were identified for review. No age restrictions were set on the research participants of the included studies. Data synthesis was limited by statistical and clinical heterogeneity as included studies reported a dissimilar range of clinical outcomes, many of which were used by only one study each. Furthermore, variation in the statistical methods employed across studies, and the presentation of data in unconvertible forms prohibited the use of meta-analysis. Reviewers concluded that more empirical evidence is required to determine the effectiveness of AIT in the treatment of individuals with PDD. In the absence of definitive evidence, reviewers suggested that AIT be considered an experimental treatment option.

Bettison (1996) utilized a randomized, controlled study design with Berard's AIT as the treatment condition and a structured listening task as the control condition. Eighty children, 3-17 years of age, with autistic disorder or Asperger's disorder and mild to moderate hyperacusis were randomly allocated to the treatment or control condition. Hyperacusis, or hypersensitivity to sound, was indicated by parents and teachers in response to two non-validated questionnaires: the *Sound Sensitivity Questionnaire*, and the *Sensory Problems Checklist*. Three weeks prior

to intervention, parents and teachers of the participants completed the questionnaires and an independent psychologist administered the *Autism Behavior Checklist (ABC)*, the *Leiter International Performance Scale (LIPS)*, and the *Peabody Picture Vocabulary Test (PPVT)* to each participant. Audiometric testing, including an immittance test to check middle ear function, was also conducted prior to intervention at the nearest hearing centre. The results of the each participant's audiogram were converted to a mean score and a standard deviation score to reflect variability. The audiogram scores were treated as a dependent variable. Each participant attended 2 half-hour listening sessions, at least 4 hours apart, each day for 10 consecutive days. During intervention, parents completed a daily checklist to assist in identifying any unwanted side effects. All assessments and questionnaires were repeated at 1, 3, 6, and 12 months post-intervention. The LIPS, PPVT, and audiometric tests were discontinued at 1 month to minimize practice effect. Results indicated that both groups demonstrated significant and equal amounts of improvement across all measures at 1 month post intervention. However, by 12 months most of the improvements noted reverted to initial post-treatment levels taken at 1 month. It should also be noted that negative side effects were documented for two of the participants with co-existing psychiatric disorders.

Neysmith-Roy (2001) used a case study design to document the progress of 6 severely autistic males, ages 4 to 11 years, receiving the Tomatis Method of AIT to assist in alleviating the severity of aberrant behaviours associated with autism. The participants were consecutive referrals to a certified Tomatis Treatment centre in a Midwestern Canadian city. Each participant proceeded through his independent treatment program at his own pace and continued until the program was completed or a decision to terminate treatment was made. Twenty-minute video samples were taken of each child during solitary and parent-structured play at the completion of each treatment period. At the end of one year, all video samples were randomized and scored using the *Childhood Autism Rating Scale (CARS)* by trained raters who were naïve to the treatment program and unfamiliar with the

research participants. An interview with the parents was also conducted at the end of each treatment period to record and monitor changes that had occurred in the participants' behaviour. Of the 6 boys, 3 demonstrated positive behavioural changes by the end of the treatment period. One participant was no longer considered to be autistic, and 2 participants displayed mild autistic symptoms. It should be noted that the children who demonstrated behavioural change were 6 years of age or younger at the onset of the intervention program.

### ***Recommendations***

Methodologically stronger replication studies are required to determine the effectiveness of Auditory Integration Training in the reduction of aberrant behaviours in individuals with pervasive developmental disorders. Sinha et al (2006) highlighted a number of common methodological weaknesses across studies after critically reviewing 6 randomized controlled trials. Based on Sinha et al (2006) critical analysis of the research, it is recommended that future research focus on the following in order to provide higher levels of evidence:

1. Gold-standard criteria for the diagnosis of autism should be included in the sample selection criteria to ensure that treatment and control groups are homogeneous at baseline. This will allow for comparisons to be made between groups and across studies. Currently, the *Autism Diagnostic Interview-Revised* is considered to be the "gold-standard" for the diagnosis of PDD (Ozonoff, Goodlin-Jones & Solomon, 2005).
2. A sample size capable of detecting differences, if these exist, should be utilized. Currently, Bettison's (1996) study is the only one to include a power analysis in the research design to determine the appropriate sample size.
3. A smaller age range should be considered, as it is a belief that early intervention is best. Thus, it is possible that greater improvements would be seen in a younger sample simply due to their age.
4. Information regarding potential confounders, such as co-occurring therapies, should be

collected and controlled for so that between-group equivalence can be established.

5. Intellectual ability and severity of symptoms should be measured using valid standardized tests pre- and post-treatment, to further ensure homogeneity of groups.
6. Clinically valid outcome measures, which can be objectively measured, should be chosen so that empirical data can be collected and appropriately analyzed.
7. A standardized protocol should be developed for the administration of AIT so that reliable results can be generated and replicated in future studies.
8. Audiological testing should be performed by an audiologist prior to intervention to obtain a hearing profile for each participant. This is necessary to determine the absence or presence of hearing loss, as well as to determine the presence and degree of hearing sensitivity.

### ***Conclusions***

The current available literature provides variable and equivocal evidence in support of Auditory Integration Training as an effective treatment for the reduction of aberrant behaviours in individuals with pervasive developmental disorders. Given the numerous flaws in design methodologies, and a lack of empirical data, it is suggested that AIT be considered an experimental treatment option until more definitive evidence is available.

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