ABA for Autistic Children Over Six, Adolescents, and Adults – Survey of Supporting Literature

Introduction

This document presents a survey of scientific literature on applied behaviour analysis (ABA) with focus on effectiveness for autistic children over six years of age, adolescents, and adults.

The sources discussed include material of different types: a comprehensive study of school-based teaching methods and programs for autistic children, review papers on behavioral treatments with some reference to older children and adults, papers reporting on small sample size studies on the use of ABA to teach specific skills/behaviours to autistic persons of all ages, and large sample size studies evaluating ABA for older children.

Relevant findings are discussed briefly in the section that follows. A third section includes a table that groups references according to their type. The final section lists all references in alphabetical order.

Literature Survey

For quite some time now neurological dysfunctions have been seen as the cause of the autistic syndromes – see for example, [COHN, 1997]. Applied behaviour analysis (ABA), which has proven very successful for teaching and behavioural treatment of young autistic children (see for example [ANDR, 1999], [GREN, 1996], [MTSN, 1996], [RGRS, 1998] and the many references therein), is often dismissed as "of insignificant, or no benefit at all" for older children, adolescents or adults. One of the arguments often used to support this view is that after early childhood the human brain becomes "hard wired", and further development is negligible. An arbitrary cut-off age has been established by some government-sponsored intensive intervention programs – age six, for example, by the Government of Ontario.

In this document we review scientifically-sound research that clearly establishes the very significant benefits of ABA-based intervention for autistic individuals of all ages. We also briefly touch on the subject of brain development and recent research using advanced imaging technologies. This research is consistently proving that brain development continues well into adolescence and early adulthood.

ABA for older children, adolescents and adults

One of the most comprehensive studies on this subject is the report [NRC, 2001]. A committee appointed by The National Research Council – part of the United States' National Academy of Sciences – investigated effective approaches for the education of autistic children. The primary focus is early intervention, preschool, and school programs for autistic children. It looks at several "effective intervention programs" and discusses and documents their characteristics. A total of ten comprehensive programs, extensively documented by peer-reviewed data, were evaluated by the committee.

The following is quoted from the report's conclusions on characteristics of effective interventions: "Overall, many of the programs are more similar than different in terms of levels

of organization, staffing, ongoing monitoring, and the use of certain techniques, such as discrete trials, incidental learning, and structured teaching." As a matter of fact, seven of the ten programs are based on ABA principles.

The report is very thorough and scientifically rigorous – the committee established very precise and strict guidelines to select the scientific literature examined. There are literally hundreds of references included in this report.

In a study that looks at age and IQ at intake into a program as predictors of outcome, [HRRS, 2000] found that those children who were enrolled in the program before 48 months of age were more likely to achieve an inclusive education placement in a regular education class than those children that started after that age. However, those children who went into special education settings showed significant gains in IQ from pre to post-treatment (from a mean of 46 at entry to 59 at discharge). The paper goes on to state that "… These data should not however be taken to suggest that children 4 years of age and older should be denied intensive treatment. Their 13-point increase in IQ speaks to their capacity to benefit from their education."

In a comprehensive and fairly recent paper on discrete trial training (DTT) and autism, [SMTH, 2001] states that "... not only teachers but also professional and nonprofessional therapists, including family members, can implement DTT, and both children and adults with autism can benefit...". When discussing how much DTT children should receive, it states also that "Studies have made clear that DTT is an effective method for teaching new skills to individuals with autism at any age." The article cites [SMTH, 1993] and [NWSM, 1998] as references for the above. It indicates also that although some children may reach the point where they can succeed in the regular classroom without special assistance, others will benefit from continuing to receive DTT throughout their schooling – it cites [SMTH, 2000] as recommending 10 hours per week for children with an on-going need after age 5.

A recent study [EKST, 2002] designed to evaluate 1 year of intensive treatment for 4- to 7-year-old children with autism found that children in the behavioral treatment group made significantly larger gains than did children in the control group. Results suggest that some 4- to 7-year-olds may make large gains with intensive behavioral treatment, and that such treatment can be successfully implemented in school settings.

A large number of (small sample size) studies have demonstrated the effectiveness of ABA to teach specific skills and/or behaviours to autistic youth and adults. In [HRRS, 1990], three adolescent boys with autism were taught to offer assistance to a person stating inability to complete a task. The study used a multiple baseline across the 3 youths and a multiple baseline across three tasks for each student. Results also showed generalization to other conditions. The research in [HRNG, 1992] demonstrated a social network intervention for youths with moderate and severe disabilities, including autism. Analysis of frequency, number, and appropriateness of social interactions using a multiple baseline design, showed that intervention was successful in increasing the quantity and quality of interactions and promoted the development of friendships. The work of [DUGN, 1995] demonstrates the use of cooperative learning groups as an instructional strategy for integrating 2 students with autism into a fourth-grade social studies class. [GYLR, 1984] presents results of experiments that increased the initiations and duration of social interactions of autistic youths and non-handicapped youths. [MCMR, 1986] describes procedures to decrease immediate echolalia and increase the appropriate responding to questions of a 21-year-old autistic man. In [GENA, 1996] the authors describe the teaching of contextually

appropriate affective behavior to 4 youths with autism. Treatment effects occurred across untrained scenarios, therapists, time, and settings, suggesting that generalization had occurred. In [MCGE, 1983] a modified incidental-teaching procedure was used to increase the receptive language skills of autistic youth who had previously experienced lengthy institutionalization. The research in [MLLR, 2000] with five adolescents with autism showed that when reinforced, variability (in their sequences of responses while playing a computer game) increases significantly. The study of [TYLR, 1998] demonstrated the effectiveness of a prompting technique for a 9-year-old autistic student to make verbal initiations about his play activities.

[MTSN, 1996] is a comprehensive review and evaluation of the research on behavioural treatment of autism (from 1980 to 1995). Target behaviours are divided into 5 categories – aberrant behaviours, social skills, language, daily living skills, and academic skills – and results for each category are analyzed, along with a review of relevant studies and prevalent trends for each category. Of the many studies included in this review (251), the following are just a few examples that illustrate the effectiveness of behavioural intervention techniques for autistic individuals of all ages. The research in [SCHP, 1982] presents a program to increase expressive sign language in nonverbal adults with autism. [HRNG, 1987] describes how autistic adults were taught to purchase items using prompts and positive reinforcement. In [SMTH, 1986] the authors successfully utilized positive reinforcement procedures to teach job skills to autistic persons. The study in [BLEW, 1985] discusses how autistic children were taught community skills including crossing the street, making purchases, and checking out books from the library.

Finally, another area to consider are studies that have found that ABA is most effective when started early, without concluding however that it should be stopped at any specific age. For example, as [GREN, 1996] indicates of the often cited [MCCH, 1993], the study indicates it took six years for one of the best-outcome children to reach normal functioning. Similarly, in a study of age as a predictor of treatment outcome, much earlier than [HRRS, 2000] discussed above, [FNSK, 1985] compared outcomes (school placement) of 9 children younger than 60 months at beginning of treatment and 9 children older than 60 months. Although most of the positive outcomes were for the early treated group (6/9), one of the children in the older group also achieved a positive outcome.

Brain development beyond early childhood

Recent advances in imaging technology have permitted *in vivo* studies of the human brain that demonstrate its continued growth and development into adolescence and early adulthood. The following are only a few examples of the vast research in this area.

In [THMP, 2000] the authors report the creation of "maps" of growth patterns in the developing human brain in children aged 3-15 years. Among their findings: peak growth rates in association and language cortices declined only after puberty; conversely, at ages 3-6 years the fastest growth rates occurred in networks that regulate planning of new actions.

In [SWLL, 2001] continued post adolescent brain growth (primarily in the dorsal aspects of the frontal lobe, and in the posterior temporo-occipital junction) is mapped.

[KSHV, 2002] assesses age-related changes in the size and signal intensity of the corpus callosum of individuals aged 7-32 years. Signal intensity decreases occurred during childhood and adolescence, but stabilized in young adulthood. This, together with observed increases in the size of the corpus callosum, reflect its continued maturation through young adulthood.

Using proton MR spectroscopic imaging to quantify variations in metabolite levels in the developing brain, [HRSK, 2002] found that significant changes occur in regional cerebral metabolism during childhood and adolescence. For example, in cortical gray matter regions, the ratio (N-acetyl aspertate)/(total choline) increased to a maximum at 10 years of age. Their findings are consistent with those of other studies using different neuroimaging techniques.

Summary of References, by Category

A: Comprehensive studies of teaching methods and programs B: Papers reporting on small sample size studies on ABA for specific skills/behaviours in older children and/or adults C: Large sample size studies evaluating ABA for older children	D: Review papers/books addressing behavioral treatments with some reference to older children and/or adults E: Research on brain development F: Others

	A	B	C	D	E	F
[ANDR, 1999]				✓		
[BLEW, 1985]		✓				
[COHN, 1997]				✓		✓
[DUGN, 1995]		✓				
[EKST, 2002]			✓			
[FNSK, 1985]			✓			
[GENA, 1996]		✓				
[GREN, 1996]				✓		
[GYLR, 1984]		✓				
[HRNG, 1987]		✓				
[HRNG, 1992]		✓				
[HRRS, 1990]		✓				
[HRRS, 2000]			✓			
[HRSK, 2002]					✓	
[KSHV, 2002]					✓	
[MCCH, 1993]						✓
[MCGE, 1983]		✓				
[MCMR, 1986]		✓				
[MLLR, 2000]		✓				
[MTSN, 1996]				✓		
[NRC, 2001]	✓					
[NWSM, 1998]				✓		
[RGRS, 1998]						✓
[SCHP, 1982]		✓				
[SMTH, 1986]		✓				
[SMTH, 1993]				✓		
[SMTH, 2000]				✓		

A: Comprehensive studies of teaching methods and programs B: Papers reporting on small sample size studies on ABA for specific skills/behaviours in older children and/or adults C: Large sample size studies evaluating ABA for older children	D: Review papers/books addressing behavioral treatments with some reference to older children and/or adults E: Research on brain development F: Others

	A	B	C	D	E	F
[SMTH, 2001]				✓		
[SWLL, 2001]					✓	
[THMP, 2000]					✓	
[TYLR, 1998]		✓				

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