THE USE OF APPLIED BEHAVIOURAL ANALYSIS
IN TEACHING CHILDREN WITH AUTISM

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*The 'Intensive Early Intervention Program for Children with Autism'
(IEIP) is a program funded by the province of Ontario. It is used to
teach/treat young children who have been formally identified as having an
autistic spectrum disorder. Intensive Behavioural Intervention (IBI)
services are provided to these children, aged 2 to 5 years, who meet
specific program requirements. The program was designed taking into
consideration the central tenets of Applied Behavioural Analysis (ABA),
which is a widely recognized and accepted method for teaching functional
skills to children with autism.*

*In this paper, we review the effectiveness of Intensive Behavioural
Intervention for teaching/treating young children with autism. The effects
of age, duration of therapy, and number of hours of therapy are examined
in an effort to determine whether or not there would be an increase in the
participants' IQ, adaptive functioning, and language abilities after
receiving intensive services from the program. With reference to this, data
on three children with autism are presented in an attempt to isolate and
more thoroughly examine outcomes.*

*Overall, the data suggests that the program does indeed work for some
young children with autism, however, unfortunately, not for all. More
specifically, two of the children demonstrated some gain in the areas
evaluated, including IQ, adaptive functioning, and language ability,
whereas, the third child did not appear to make any significant progress in
any of the formally assessed areas. Interestingly, the participants' age, the
duration of therapy, and the number of hours of therapy did not appear to
conclusively influence overall treatment outcome.*

*In a review of the literature, and, as is demonstrated by our own study,
Intensive Behavioural Intervention has been used with varying degrees of
success to treat young children with autism, however, it appears that the
effectiveness of this treatment is dependent on factors that perhaps have
not yet been discovered, or yet fully explored*

Autism is a condition characterized by a severe impairment in the ability to engage in social interactions, as well as marked deficits in communication skills and in intellectual functioning (American Psychiatric Association, 1994, p.38). According the Diagnostic and Statistical Manual of Mental Disorders, (1994), the onset of autism is in infancy or early childhood, with most cases being diagnosed between the ages of 2 and 3 years. Autism is the most common of the developmental disorders with a prevalence of four to five children per 10,000 (American Psychiatric Association, 1994, p.36). Some sources are claiming the prevalence to be as high as 1 in 300 children (Nicolson, 2003). The prevalence of autism has increased significantly over the past 40 years, the reasons for which are unknown. Most studies of autistic disorder show that males are affected three to four times as often as females (American Psychiatric Association, 1994, p.37). Symptoms, which vary widely in severity, include inability to communicate, self-injurious behaviour, impairment in social interaction, fixation on inanimate objects, and unusual responses to sensory input. Characteristic traits include lack of eye contact, being withdrawn, distracted, inordinately attached to objects, engaged in repetitive body motions, unmotivated tantrums, resistance to change in daily routine, and insensitivity to pain (Scariano & Grandin, 1986).
It is believed that autism has a biological basis as there is evidence of this in the high rates of epilepsy (33%) and mental retardation (75%) concurrent with autism (Nicolson, 2003). In addition, recent studies on brain imaging have shown regions of the brain involved in the abnormal neurodevelopment underlying autism. Nicolson (2003) reported an elevation of brain volume in early childhood and an atypical pattern of brain development in children with autism. The specifics of etiology, however, largely remain a mystery (Nicolson, 2003).

Autism is a severe, chronic developmental disorder, which almost always results in significant lifelong disability without treatment. Therefore, promoting the child's social and language development, and minimizing behaviours that interfere with the child's functioning and learning, are the main goals of treatment (Smith, 1999). Given the severity of the impairment, the high intensity of service needs, and the costs, there has been an ongoing search for effective treatment. With respect to this, a wide variety of interventions have been attempted over the years in an effort to help children with autism, however, many have been met with limited success.

Applied Behavioural Analysis (ABA) is one treatment that is offering some hope to children with autism, their families, and their caretakers. Applied Behavioural Analysis refers to a style of teaching which uses a series of trials to shape a desired behaviour or response (Leaf & McEachin, 1999). Skills are broken down to their simplest components and then taught to the student through a positive reinforcement system. ABA intervention consists of a tremendous amount of structure and reinforcement provided at a high rate. The programs are aimed at teaching children with autism through the use of discrete trial instruction with each trial serving as a building block which provides the basic foundation for learning (Leaf & McEachin, 1999). This type of therapy and teaching is strongly data-based and all progress or lack thereof is documented consistently on a daily basis. A key element of this approach is that services are highly intensive, typically between 30 and 40 hours per week of one-to-one intervention, provided by a highly trained therapist (Lovaas, 1987; McEachin, Smith, & Lovaas, 1993).

Significance and Purpose of the Study
The question of how to educate children with autism is one that more and more teachers face with the inclusion of this special needs population in the regular classroom. Teaching children with autism can be very difficult because many of the behaviours associated with this disability greatly interfere with the child's overall ability to learn.

While there are no foolproof methods of teaching children with autism, there are some curriculum and instructional practices that have been deemed to be more effective than others (Lovaas, 1987; Smith, 1999). Applied Behavioural Analysis is a widely used method of teaching children with autism and according to some, it is the only scientifically based treatment available (McEachin et al., 1993). With respect to this, the government of Ontario has funded an intensive province wide intervention program based on the principles of ABA. This represents a substantial financial commitment that may be well worth the investment considering that ABA appears to have a good track record when it comes to effectively treating children with autism. In short, it provides some hope where once there was very little.

The purpose of this study is to review the effects of Intensive Behavioural Intervention for children with autism and to examine the efficacy of Applied Behavioural Analysis methods. The main question this paper aims to answer is whether there is an increase in the participants' IQ, adaptive functioning, and language abilities after receiving services from the *Intensive Early Intervention Program* funded by the Ministry of Children's Services in Ontario. The effects of age, ability to speak, duration of therapy, and number of hours of therapy will also be examined to determine how these factors affect progress made by children with autism. The area of study was chosen because there is conflicting information available from various studies. In addition, there is little in the way of published Canadian studies. Through case studies and experience, the intent of this research paper is to qualitatively examine the factors involved in determining a child's progress when using Intensive Behavioural Intervention, specifically, the ABA approach used by the Ontario funded program. The following definitions are provided to ensure that some of the recurrent terms that will be used throughout this paper are well understood.

Definitions
Autism/Autistic disorder: a developmental disability resulting from a neurological disorder that affects the normal functioning of the brain. The essential features of autistic disorder as indicated in the Diagnostic and Statistical Manual of Mental Disorders, are the presence of markedly abnormal or impaired development in social interaction and in communication as well as a markedly restricted repertoire of activity and interests with onset prior to the age of three. (American Psychiatric Association, 1994).

The terms Applied Behavioural Analysis (ABA) or Intensive Behavioural Intervention (IBI) are generic terms that refer to the breaking down of skills into small, discrete tasks which are then taught using positive reinforcement in a highly structured and hierarchical manner (Leaf & McEachin, 1999). These terms are used interchangeably throughout this paper.

Review of the relevant literature
When a child is diagnosed with autism, parents want to know what they should expect. They wonder what their child will be able to learn and accomplish. They often ask if their child will outgrow autism and develop the ability to live independently. In a study conducted by Ruble and Dalrymple (1996), they found that the answers to these questions are not always easy to obtain. Parents rely on the knowledge of professionals to get these answers, however, it was found that there are at least two limitations that are likely to prevent parents from obtaining accurate and relevant information. First, they found that many professionals do not have up-to date information about autism, or an understanding of the range of longitudinal outcomes for people with autism. A second limitation discovered by their research dealt with the concept of vague or overstated outcomes, which, quite naturally seemed to disproportionately impact negatively on the overall results of the studies in question. In essence, past researchers have defined good outcomes as *the*

development of a normal social life and independence by adulthood (Ruble & Dalrymple, 1996, p.3). Professionals who concentrate solely on these outcomes are likely to present narrow possibilities and treatment options that essentially do not reflect practical, realistic expectations for people with autism. More specifically, the researchers were critical of the many studies that advocated independent living as a realistic outcome for people with autism, when, in fact, for many, this overall objective may not be a reasonable one because many continue to require individualized support throughout their lives. Reciprocally, the authors, by making small adjustments to overall outcomes, making them more realistic, were able to demonstrate significant rates of success. In this study, data on 46 individuals with autism were used to present an alternative view of outcomes. The results showed that many people who were predicted to do poorly as adults, (because of low verbal, cognitive, and adaptive levels), were found to be leading satisfactory lives (Ruble & Dalrymple, 1996). The reason for citing this article is to demonstrate that people with autism are not hopeless; in some cases, they can go on to lead productive and fulfilling lives with the chances of achieving good outcomes possibly being increased through early intervention and ABA methods.

There are several studies reporting the success of Applied Behavioural Analysis in teaching children with autism. Most of the studies that have been conducted suggest that autism can be managed effectively through the use of comprehensive behavioural and educational treatment programs such as the *Intensive Early Intervention Program* being implemented in Ontario (Lovaas, 1987; McEachin et al., 1993; Sheinkopf & Siegel, 1998; Harris & Handleman, 2000). However, before speaking to some of the specific details of ABA, from both theoretical and personal points of view, some of the relevant literature which has been generated within the field of autism will be reviewed.

Landmark Studies
One of the first studies, and possibly the most thorough study of the effectiveness of Applied Behavioural Analysis on children with autism, was published in 1987 by Dr. Ivar Lovaas. The study compared the progress made by three separate groups of children with autism. There were two control groups and one experimental group.
The experimental group consisted of 19 children who received an average of 40 hours per week of one-to-one Intensive Behavioural Intervention for a period of at least 2 years. The first control group consisted of 21 children who received 10 hours or less per week of Intensive Behavioural Intervention while the second control group consisted of 21 children who were not treated by Lovaas and his colleagues but instead received various services from other professionals. All children who participated in the study were under the age of 40 months, if mute, and under 46 months if echolalic, and all subjects were diagnosed with autism by professionals not associated with the study. The three groups of children studied were shown to be virtually identical before the commencement of treatment by a number of standardized tests. The results showed significant differences between the experimental group and the two control groups. The experimental group showed an average gain of 20 IQ points while the two control groups showed no gain at all. Nine children in the experimental group (47%) successfully completed regular first grade without any support and obtained IQ scores in the average to above average ranges. These nine children had an average gain of over 30 IQ points and were considered normal functioning according to all measures used. Eight of the remaining 10 children in the experimental group demonstrated substantial gains in all areas of development but were unable to attend school without support. These children completed first grade in special education or language-delayed classes. The remaining two children were placed in classes for children who were autistic or mentally retarded.

Only one child in the two control groups completed regular first grade and had an IQ score in the average range. Of the children in the control group, 53 percent were placed in classes for children who are autistic or mentally retarded. The rest of the children in this group completed first grade in special education or language-delayed classes (Lovaas, 1987).

McEachin et al. (1993) conducted a follow-up investigation several years after the termination of treatment in an effort to determine the durability of the gains achieved in the 1987 Lovaas study. The assessment procedure included ascertaining school placement and administering three standardized tests to the subjects used in the original study. Adaptive behaviour scales and a personality inventory were also used to provide a comprehensive evaluation of social and emotional functioning. A blind administration and scoring of tests was conducted for the nine best outcome subjects. All other subjects were evaluated by staff members in the treatment program or by outside agencies. At the time of follow-up, 47 percent of the subjects in the experimental group were still in regular classroom environments, a numerical proportion unchanged from the original study. In the control group, none of the 19 children were in a regular classroom, as had been the case at the end of the original study. The difference in classroom placement between the experimental and the control group was statistically significant (p< .05). The intellectual functioning scores for the experimental group were significantly higher than those of the control group, indicating that the experimental group had maintained its overall gains in basic intellectual functioning. The adaptive functioning scores were consistently higher for subjects who were in the experimental group across all three subscales; communication, daily living, and socialization (McEachin et al, 1993). In summary, general conclusions reached by both the Lovaas (1987) and McEachin (1993) studies strongly suggested that, in essence, those children who received Intensive Behavioural Intervention maintained most of their gains in all measurable areas. As might be expected, both the Lovaas and McEachin studies are important ones for those who work extensively with children with autism because they show that Intensive Behavioural Intervention can not only make an immediate difference in the life of a child with autism, but any gains made can also be retained, and, by extension, built upon. However, this is not to imply that these particular studies and their authors are not without serious detractors. For example, both Lovaas' original study (1987), and the follow-up study conducted by McEachin et al. (1993) have been heavily criticized for methodological problems (Gresham & MacMillan, 1998; Schopler, Short & Mesibov, 1989 as cited in Smith, 1999). These criticisms include the absence of random assignment, threats to external validity, and general ambiguity with regard to the number of hours required to ensure a child's progress. In addition, it has been noted that the male to female ratio reported by Lovaas differed greatly from the general population of children with autism, and thus, it has been seriously questioned as to whether such a difference would serve to invalidate the study in its entirety (Gresham & MacMillan, 1998). In their critique of the original Lovaas study, several also made note of the fact that the subjects were assigned on the basis of therapist availability, rather than by a more arbitrary procedure. In addition, different children received different intelligence tests at intake, as personally selected by their individual examiners. As a direct result, it is the view of some, that the fact that the Lovaas sample functioned at a higher level at intake than is typical of children with autism, at best, needs to be seriously scrutinized (Schopler et al., 1989 as cited in Smith, 1999). Further, it has been suggested that the follow-up assessments may have failed to detect residual problems in areas such as social skills and regulation of emotions (Mundy, 1993 as cited in Smith, 1999). Gresham and MacMillan (1998), in a somewhat scathing indictment, specifically question Lovaas on his choice of outcome measures, the general criteria used in his subject selection, the overall intellectual capabilities of his subjects, and finally, the general procedure utilized in designing his control groups. As a

consequence, Gresham and MacMillan conclude that with respect to the Lovaas study, due to methodological aberrations, it was not possible to determine the true effects of the designed intervention.

Likewise, Miller and Zwaigenbaum (2001) reported that the results documented by Lovaas and his colleagues, although very promising initially, were of very little use to the larger research community due to profound abnormalities intrinsic to the study. They further claim that this, for a time, created a real dilemma in the study of autism, in trying to balance the need for effective intervention against the need for clear information on how certain outcomes are specifically related to particular treatment elements and program intensity. As might be expected, Lovaas and his colleagues have certainly admitted to problems with regard to subject assignment and intake assessment, however, they have strongly disputed all other criticisms (Lovaas et al., 1989 as cited in Smith, 1999).

More recently, a replication of Lovaas' 1987 study was conducted by Sallows and Graupner (1999), in Wisconsin. This study would appear to be a more scientifically sound reproduction of Lovaas' treatment and findings, with the exception that aversives were not used. In brief, many of the criticisms of Lovaas' original study seem to have been adequately addressed, with researchers garnering similar results. Preliminary findings were reported after one year of treatment (Sallows & Graupner, 1999). The study examined the progress of 24 children with autism between the ages of 24 and 42 months with a ratio estimate of Mental Development Index (MDI) of 35 or higher. Measures of IQ, adaptive behaviour, as well as developmental scales were used to assess the subjects participating in this study. Children were assigned to one of two treatment conditions by matched pair random assignment, using age and ratio MDI as the matching variables. Treatment for the experimental group consisted of 40 hours of treatment per week, with 6 to 10 hours per week of supervision by experienced staff. Treatment for the control group consisted of parent-directed therapy where parents were allowed to decide the number of hours per week of therapy. Supervision for this group was 6 hours per month with unlimited phone consultation. Treatment for both groups began with a six-hour workshop where staff and parents were trained to implement the treatment program. Changes in overall pre and post-test scores for both the clinic-directed and parent-directed groups after one year of treatment showed an average gain of 22 IQ points. Nineteen of the children matched Lovaas' study. Eight children showed a gain of 45 IQ points, raising them into the average range. The children with the best outcome represented 42 percent of the matched group (Sallows & Graupner, 1999). As with other studies, the researchers found that outcome was somewhat predicted by pre-treatment IQ. Children with pre-treatment IQs below 40 showed limited progress. The progress of children with pre-treatment IQs between 45 and 60 was more pronounced, while the relationship between IQ and one year outcome was moderate. One finding that seems to contradict results from other studies was a difference of four points in IQ at post treatment, which seemed to favor the parent-directed group. The investigators concluded that this difference may have been attributable to the fact that some parents were providing nearly continuous therapy to their children. To summarize though, after 3 to 4 years of treatment in the Wisconsin Early Intervention Project, nearly half the children with autism acquired near normal functioning in language, performance IQ, and adaptability. Several studies, although partially replicating Lovaas' original study, nevertheless make distinct adjustments with respect to their overall experimental designs. For example, in one makes direct reference to Sheinkopf & Siegel (1998), and Luiselli, Cannon, Ellis, & Sisson (2000), the most noteworthy differences, (when compared to the Lovaas model), were that children in these replication studies received an average of 18 to 25 hours a week of treatment as opposed to 40 hours per week, and

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the people providing treatment received less frequent supervision. However, despite these differences, each study reported significant gains in IQ scores. More specifically, Sheinkopf and Siegel (1998) reported that children who received treatment averaged 28 IQ points higher than the children in the comparison group who did not receive treatment. In this study, the investigators found no significant differences between those children receiving 25 hours of treatment and those receiving 35 hours of treatment. This suggests that perhaps treatment need not be as intensive as previously reported. However, there continues to be serious debate over how many hours of early intervention are required for children with autism to make significant gains in the diverse areas of cognitive and adaptive functioning.

IQ and Age
According to the Diagnostic and Statistical Manual of Mental Disorders, overall intellectual level is one of the strongest factors related to ultimate prognosis within the realm of autism (American Psychiatric Association, 1994). It is also believed that age is another strong predictor in treatment outcome for children with autism. Consistently, research has shown that children who begin treatment at a younger age make more progress in terms of overall IQ and adaptive functioning than children who start treatment when they are older (Eikeseth, Smith, Jahr, & Eldevik, 2002; Harris & Handleman, 2000; Fenski et al., 1985). There have been myriad studies which have been designed to specifically measure IQ as it relates to age for children with autism who receive ABA treatment. For example, Anderson, Averey, Dipietro, Edwards, and Christian (1987) conducted a study to examine the progress made by children with autism of differing ages who received 25 hours per week of Intensive Behavioural Intervention. There were 14 children with autism who participated in this study. The participants had a mean chronological age of 4 years and 8 months, while the mean mental age at intake was about 2 years. The mean entry language level was 22 months and 21 months for social age. In this study, trained therapists provided 15 hours of direct service to each child per week. The parents were also required to provide a minimum of 10 hours of therapy per week (once they had been properly trained), which represented a total of 25 hours per week of direct treatment to each child. The mean gain in mental age after one year of therapy was approximately ten months, while at 2 years the measured gain was 23 months. Similar gains were reported for social and language skills acquisition. For the youngest children at intake, the gain at one year was 12 months. For the oldest children at entry, the gain at one year was 9.8 months. When juxtaposed to the Lovaas study (1987), the children in this study were generally older at intake and were generally more developmentally disabled. Without question, this study lends support to the theory that age is a factor with reference to the amount of progress a child with autism will ultimately make when undergoing ABA treatment. Specifically, the younger the child, the more progress can be expected.

Eikeseth et al. (2002) found that children who began treatment before the age of 7 years also did well, provided the baseline IQ score was 50 or above. In terms of ABA treatment for children with autism, the age of 7 would be considered a very late start. In fact, in Ontario the *Intensive Early Intervention Program* is only formally funded for children aged 5 and under, generally recognizing that when it comes to autism, significant gains primarily happen in the earliest years. The above study by Eikeseth et al. (2002) examined the progress made by children with autism between the ages of 4 and 7. Children in the treatment group received Intensive Behavioural Intervention and the comparison group received a combination of treatments following the recommended best practices found in the literature of the day (e.g. sensory-motor therapies, TEACCH model, etc.). Both the treatment group and the comparison group received an average of 28.5 hours of treatment per week. At intake, both groups were comparable on measures of IQ,

visual-spatial skills, language, and adaptive behaviour. At follow-up, the Intensive Behavioural Intervention group obtained significantly higher scores than the comparison group in all of the measurable areas, including IQ, language, and adaptive behaviour (Eikeseth et al., 2002).

Harris and Handleman (2000) investigated age and IQ as predictors of educational placement for young children with autism. This was a 4 to 6 year follow-up study. There were 27 children with autism between the ages of 31 and 65 months (mean = 49 months) who participated in this study. These children had IQ scores between 35 and 109 (mean = 59) on a specific measure of intelligence. All of the children received between 35 and 45 hours of intervention per week and the parents were expected to provide an extra 10 to 15 hours per week. Intellectual testing was done at intake on preschool children with developmental disabilities and the same children were re-assessed 4 to 6 years after they left the preschool. Pre and post-treatment IQ scores were then compared. The results showed that having a higher IQ at intake and being of a younger age were both predictive of being placed into a regular education class. In contrast, having a lower IQ and being older at intake were both predictive of being in a special education classroom after discharge. Specifically, of the children sampled who were younger than 48 months at intake, 27 percent had regular school placements, 64 percent attained supported regular school placement, while 9 percent were in special education classes. One child who was admitted at 58 months of age was eventually placed into a regular class, however, all other children admitted over 48 months of age were in special education classes (Harris & Handleman, 2000).

Another study that examined treatment outcomes and age, with respect to autism, was conducted by Fenski, Zalenski, Krantz, and McClannahan (1985). In this study, a strong relationship between age at program entry and outcome was also found. Specifically, the outcomes of nine children with autism who began receiving intensive early intervention prior to 5 years of age were compared with the outcomes for nine children who entered the same program after 5 years of age. All children received ABA treatment for 5.5 hours a day, 5 days a week, for 11 months of the year. One year after entering the program, 7 of the 18 children were in regular classrooms and the other 11 continued to receive ABA treatment (Fenski et al., 1985). Thus, 44 percent of children in the study attained regular school placement, which again is comparable to the findings of the 1987 Lovaas study. Overwhelmingly, the data suggests that the earlier the intervention, the higher the probability there is for a successful outcome. One of the major weaknesses of the Harris and Handleman study (2000) was that it lacked a control group (Gresham & MacMillan, 1998). The study conducted by Fenski et al. (1985) was also heavily criticized because subjects were not randomly selected, but rather a convenience sample was utilized (Gresham & MacMillan, 1998). This speaks to a wider problem within the general study of autism, because of the relatively small population of young children officially diagnosed with this particular exceptionality, random assignment and overall sample size will always be a major cause for concern. With this being duly noted, Gresham and MacMillan (1998) also criticized Fenski's study because there was very little description regarding the treatment used and very little information regarding the children's pre-intervention level of functioning capacity. Nevertheless, the above studies mentioned are all considered pertinent to this particular research because they examined the various factors contributing to the progress made by children receiving ABA treatment, including both age and IQ. Despite their obvious flaws, they all concluded that early intervention does indeed make a difference.

IQ, Number of Hours, and Duration of Treatment
Sheinkopf and Siegel (1998) conducted a study examining the use of home-based intervention programs, based on Lovaas' general methods. The children with autism who participated in this study were between 2 and 4 years of age. Children in the experimental group were pairwise matched to children in a control group, on the basis of pretreatment chronological and mental age, diagnosis, and length of treatment. The two groups reportedly did not differ on pretreatment IQ (Sheinkopf & Siegel, 1998). Treatment provided was different from that described in previous reports of Intensive Behavioural Intervention in that it was for a shorter period of time, it was not implemented in an academic setting, and parents were exclusively responsible for providing the treatment regimen. The results showed that those children receiving the experimental treatment had significantly higher post treatment IQ scores. Statistically significant effects on symptom severity were also found, however, they were smaller and the experimental group still met the diagnostic criteria for autism or pervasive developmental disorder (Sheinkopf & Siegel, 1998). Nevertheless, there were several methodological flaws noted within this study, including threats to internal and external validity and the fact that parents implementing the treatment were not trained to carry it out in a standardized manner. Also, treatment was not directly observed and the reported results were based in part on anecdotal information provided solely by the parents.

Luiselli et al. (2000) conducted a study to investigate whether young children with autism or pervasive developmental disorder, receiving home-based Intensive Behavioural Intervention, differed in learning depending on the following factors: treatment commencement, length, and total hours of service. This was a retrospective study involving 16 children with autism or pervasive developmental disorder. The children were divided into two groups, those starting treatment before 3 years of age and those starting after 3 years of age. All children in the sampled group received treatment from a private human services and behavioural health organization. Communication, cognition, fine motor, gross-motor, social-emotional, and self-care abilities were assessed. Results showed that all subjects demonstrated significant changes within the measurable developmental domains, however, there appeared to be no significant difference between the age groups. These findings somewhat contradict the findings previously mentioned, which noted definite correlations between age and outcome. At a minimum, these research anomalies would appear to warrant further investigation.

IQ and Adaptive Functioning
In a study by Harris, Handleman, Gordon, Dristoff, and Fuentes (1991), cognitive and language functioning of preschool children with autism were examined. Nine children with autism participated in this study and they were compared to nine developmentally normal children. The children with autism were characterized as having mild to moderate autism. The main finding of this study was that the children with autism increased their IQ scores by a mean of 19 points (mean was 67.5 at pretest and 86.3 at posttest), whereas, the developmentally normal children's IQ scores did not change with treatment. Despite the quite profound gains, the children with autism still scored somewhat behind their age/grade peers, but, quite significantly, were now charted as functioning in the borderline to low average range on standardized tests, as opposed to the previously charted mild mental retardation range. With reference to further study, it would be interesting to find out whether these children maintained the achieved gains in IQ. Unfortunately, there has yet to be any follow up information regarding the children's entry into school and whether any of these children were able to achieve regular placement without support. One general criticism of this study was that the children who participated were diagnosed with mild to

moderate autism, therefore, the sample did not and cannot provide results that can be extended/applied to all children diagnosed with autistic disorders.

Conclusions

Several studies, many of which have been discussed in this paper, (and our own which follows directly), evaluated the evidence for the efficacy and effectiveness of autism treatment programs. In a comprehensive report, Gresham, Beebe-Frankenberger & MacMillan (1999) reviewed and critiqued several of the most frequently cited treatment programs for children with autism, including Applied Behavioural Analysis (ABA). In essence, they concluded that there was no one perfectly reliable treatment protocol for autism, however, they found that virtually all programs reviewed, showed some degree of developmental gain in each of its' participants, particularly when it came to measurable IQ gain. With direct reference to the Applied Behavioural Analysis approach, at least where this particular research effort is concerned, it would appear that there is not sufficient evidence to promote it as being a superior or universal treatment program for all children with autism, however, on the other hand, very few would discount it as being at least a reasonable place to start (Smith, 1999; Jacobson, Mulick, & Green, 1998).

With respect to the above view, Jacobson et al. (1998) have developed a cost-benefit analysis model that examined the use of Intensive Behavioural Intervention for young children with autism. Their research indicated that with early intensive intervention, based on the principles of Applied Behaviour Analysis, young children with autism or pervasive developmental disorder could attain intellectual, academic, social, and daily living skills within the average range. In their analysis, representative costs from the State of Pennsylvania were applied in a cost-benefit model, which assumed average participation in an Intensive Behavioural Intervention program for 3 years - between the age of 2 years and school entry. The model assumed a range of Intensive Behavioural Intervention effects. The model estimated that cost savings ranged from $187,000 to $203,000 per child for ages 3 to 22 years, and from $656,000 to $1,082,000 per child for ages 3 to 55 years at varying rates of effectiveness and in constant dollars. The analysis indicated that by providing Intensive Behavioural Intervention, significant cost-aversion or cost-avoidance may be possible. Reciprocally, without intervention, most people with autism and other pervasive developmental disorders require lifelong specialized care, which has been estimated to cost millions of dollars. This analysis suggests that investment in services now is likely to pay off in the long run, both in dollar and in human costs. Many assumptions were made in creating this model and in analyzing the costs of treatment for children with autism using Applied Behavioural Analysis, however, if these results are even close to being accurate, it would only make sense to invest in such programs now rather than later.

In brief, the evidence to date, at best, seems to offer very contradictory conclusions, and can be confusing to those searching for definitive answers within the field. Until recently, families with members who are diagnosed with autism have had little hope, and even less support. With Intensive Behavioural Intervention, however, evidence has clearly shown that, at least for some, there may be a chance for them to gain the requisite skills necessary to lead more productive and fulfilling lives.

CASE STUDIES

Methodological Note
The data used in this study were collected to formally evaluate the effectiveness of an existing program, designed solely for the therapeutic treatment of children with autism who live in Ontario. The information to be shared was compiled over the past 2 years as a matter of general routine, under the general direction of a registered psychologist. As is always the case when intervention therapies are formally evaluated and information is collectively shared with a wider audience, no specific identifying information is used. Although we will be referring, in a general way, to the three children diagnosed with autistic spectrum disorder, issues concerning anonymity and confidentiality will be absolutely respected. Hence, real names and places will not be used.

An Analytical Overview:
All three children who are profiled in this paper received Intensive Behavioural Intervention from the *Intensive Early Intervention Program* through the Ministry of Children's Services. All of the children were under the age of 6 years at the end of treatment. The following are case studies examining individual outcomes. Reported data consists of pre-treatment and post-treatment measures of IQ and adaptive functioning scores. The children had a variety of language capabilities, however, spontaneous speech from these children was either minimal or nonexistent.

The Participants:
As alluded to previously, the 3 participants profiled in this study were those for whom the greatest amount of data was available. All 3 participants were male.
Participant one was 4 years and 6 months old when he started receiving ABA treatment. He was diagnosed with autism at the age of 2 years and 8 months. At the start of treatment, his language skills were at the pre-verbal level, with only vocalizations and gestures used for communication. This child had a vocabulary of approximately 50 words at the age of 3 but regressed at some point between the ages of 3 and 4 and by the time treatment was started, the use of words was almost non-existent with a limited vocabulary of small words including *bye, ma, and da*. This child received 30 hours of IBI therapy by trained therapists for a duration of 18 months. Therapy ended in May 2000 when he turned 6 years of age.

Participant two was 4 years and 10 months old when he started receiving ABA treatment. He was diagnosed with autistic disorder at the age of 4 years and 2 months. At the start of treatment, his language skills were approximately 1 year behind his chronological age. He had difficulty answering questions and he also had difficulty using the pragmatics of social language. This child received 20 hours of IBI per week for a duration of 14 months.

Participant three was 2 years and 11 months old when he started receiving ABA treatment. He was diagnosed with autism at the age of 2 years and 4 months. At the start of treatment, his language skills were at the 2 year old level. He had a limited vocabulary and was just beginning to use two-word phrases. He received 25 hours of IBI per week for 21 months and continues to receive treatment.

The Mechanics of Measurement
Pretreatment testing was conducted and included measures of intelligence, language ability, and adaptive behaviour. Post-treatment testing utilized the same tests whenever and wherever possible.

Measures of IQ
The Wechsler Preschool and Primary Scale of Intelligence-Revised (WPPSI-R) is a test used to assess the general thinking and reasoning skills of children ages 4 through 6 years. This test has three main scores: a Verbal score (VIQ), a Performance score (PIQ) and a Full Scale score (FSIQ). The Verbal score indicates how well the child performs on tasks that require listening skills and verbal responses. They evaluate skills in understanding verbal information, thinking with words, and expressing thoughts in words. The Performance score indicates how well a child performs on tasks that require a cognitive response to specific designs, pictures, puzzles, sometimes requiring eye-hand coordination, working with speed, and working efficiently with designated visual cues. Ultimately then, the Verbal and Performance scores are combined to provide a Full Scale measurement. The recorded scores show how well a participant fared when compared to a group of his or her same age. The highest possible score is 160, and the lowest possible score is 40. Half of all participants will score less than 100, while, quite logically, the other half will score more than 100. Scores from 90 to 109 are considered average.

Adaptive Behaviour Scale
The Vineland Adaptive Behaviour Scale measures the personal and social skills of individuals from birth to adulthood. Adaptive behaviour refers to an individual's typical performance related to day-to-day activities. These scales, therefore, assess what a person actually does as opposed to what he or she is capable of doing. The Vineland covers adaptive behaviours in four different domains: Communication, Daily Living Skills, Socialization, and Motor Skills. It also provides a composite score that summarizes the individual's performance across all of these domains.

Measures of Language Ability
The Peabody Picture Vocabulary Test (PPVT-R) is a measure of receptive language. The PPVT-R does not require any expressive speech as the person's task is simply to choose which of four pictures best represents a specific word. This is a common screening device utilized within the profession to identify individuals with low levels of general ability, or those with profound language impairment that require special attention.

Therapeutic and Experimental Design
Therapy consisted of 15 to 35 hours of ABA treatment per week, provided by a therapist trained in Applied Behavioural Analysis methods. Pre-test scores for each case were compared to post-test scores in order to determine the amount of progress as assessed by the measures indicated above. More specifically, the data was analyzed qualitatively to more closely explore possible gains made, particularly in the areas of IQ and adaptive functioning.

RESULTS
Participant One - Case Summary
As alluded to previously, participant one received ABA treatment through the Ontario funded intensive early intervention program starting in November 2000 when he was 4 years and 6 months of age. He received 30 hours of Intensive Behavioural Intervention per week by trained therapists for a duration of 18 months.

Participant one was diagnosed with severe autism when he was 2 years and 8 months old. Speech and language assessments indicated significant communication deficits. Reports from September, 2000, and October, 2001, confirmed significant delays in both expressive and receptive language skills for which therapy was recommended. Intensive Behavioural Intervention and alternate communication were recommended in 1999 following an assessment at the Children's Hospital of a major American city.

Overview
Participant one was assessed by a registered psychologist in April 2002, after 17 months of Intensive Behavioural Intervention provided by the Ontario funded program. During the assessment, the psychologist reported that the subject was easily distracted and difficult to keep on task during actual testing, and that it was seldom clear whether or not the tasks were truly understood as presented. However, it was noted that he responded best when his common Intensive Behavioural Intervention prompts were utilized within the testing procedure (e.g.. *come sit*, *look at me*).

IQ
Participant one was administered the WPPSI-R as part of his overall psychological assessment in 2002. As reported by the psychologist, the subject was unable to complete many of the subtests of the WPPSI-R. Prorated scores were calculated using four Performance subtests (Object Assembly, Block Design, Picture Completion, and Animal Pegs) and four Verbal subtests (Information, Arithmetic, Vocabulary, and Similarities). The prorated full scale score was 43. These scores are all significantly below the first percentile when compared to other children within his age/grade cohort. The psychologist reported that with respect to these test results, it was impossible to say whether or not these provide a true assessment of the subject's underlying cognitive abilities. An intellectual assessment was attempted in November 2000, at the commencement of Intensive Behavioural Intervention, however, at that time the subject was deemed untestable because of his inability to participate in the assessment procedure. It was not even possible to obtain prorated IQ scores at that time because of his apparent lack of comprehension.

Adaptive Functioning
Participant one's score on the *Adaptive Behaviour Composite*, as assessed by a registered psychologist in 2002, was 46. His percentile score of 0.1 on the Adaptive Behaviour Composite, indicated that his score was higher than or equal to only 0.1 percent of similarly aged individuals in the norm group. His adaptive level was rated as *Low* for his age group, this score was lower than that obtained in September 1999 (Adaptive Behaviour Composite = 56).   Participant one's level of adaptive functioning within the *Communication* domain was *Low* for his age group. His standard score of 41 resulted in a percentile rank of 0.1. Thus, his score in this area was higher than or equal to only 0.1 percent of his peers in the normative sample. He had an adaptive level of *Low* for all three subdomains (*Receptive, Expressive*, and *Written*). Again, these scores were lower than those obtained in 1999 (*Communication* domain = 59).

Participant one's standard score for the *Daily Living Skills* domain was 46. This score represented a *Low* level of adaptive functioning for an individual of his age. His percentile rank for the *Daily Living Skills* domain was 0.1. His adaptive level was *Low* for all three subdomains (*Personal, Domestic,* and *Community*). His total score for *Daily Living Skills* in 1999 was 65.

Participant one's level of adaptive functioning within the *Socialization* domain was described as being *Low* for his age group. His standard score was 49 which resulted in a percentile rank of 0.1. An examination of the subdomain scores within the *Socialization* domain indicated that his adaptive level was *Low* for all three subdomains (*Interpersonal Relationships, Play and Leisure Time,* and *Coping Skills*). Again, this score was considerably lower than the score reported in 1999, pre-treatment (*Socialization* = 60).

Participant one's standard score for *Motor Skills* was 61. This score represented a *Low* level of adaptive functioning for his age group. His percentile rank for this domain was 0.5. The level was

Moderately Low for both the *Gross* and *Fine Motor Skills* subdomains. His standard score in the *Motor Skills* domain in 1999 was 60, thus no improvement in this area was observed.

In summary, all of the domain standard scores for participant one were lower after 17 months of Intensive Behavioural Intervention as compared to before treatment.

Language Ability
It was not possible to assess participant one's receptive language abilities using the PPVT-R at either of the testing intervals because he did not appear to comprehend the assigned task after repeated attempts to show him what was expected.

Hence, after 17 months of Intensive Behavioural Intervention, participant one's general cognitive abilities, as evaluated by the WPPSI-R and the PPVT-III, were significantly below average in all areas. As a caveat, however, these scores must be viewed with some caution/suspicion, given quite obvious language delays and his tendency to be easily distracted.

In terms of developmental issues, participant one presented with significant delays in all areas even after intervention. His adaptive functioning levels, as measured by the Vineland, were significantly depressed (well below the first percentile) across all measurable domains.

Participant Two - Case Summary
Participant two was diagnosed with autistic disorder when he was 4 years and 2 months. He received Intensive Behavioural Intervention through the Ontario funded program starting in June 2002 when he was 4 years and 10 months of age. He received 20 hours of Intensive Behavioural Intervention per week by trained therapists for a duration of 14 months.

Overview
Participant two was assessed by a registered psychologist in August 2003, after 14 months of Intensive Behavioural Intervention. During the assessment, the psychologist reported that the subject was hyperactive (running around the office), and having great difficulty completing the tasks. In general, at best, it was reported that he was not very cooperative during the assessment.

IQ
Participant two was administered the WPPSI-R, as part of his overall psychological assessment. The WPPSI-R was completed over two sessions as he was very inattentive and uncooperative throughout testing. As reported by the psychologist, participant two's full scale score was 76. This score fell within the *Borderline* range of intellectual functioning. The Verbal score was 74 while the performance score was 76. When compared to his scores at the commencement of treatment, there is little question that participant two displayed a significant increase in overall intellectual functioning as a direct result of intervention. To illustrate, in June 2000 when participant two was first assessed, his full scale IQ score was 65, which placed him in the *Mild* range of mental retardation.

Adaptive Functioning
Participant two's score on the *Adaptive Behaviour Composite*, as assessed by a registered psychologist in 2003, was 69. His percentile score of two on the Adaptive Behaviour Composite, indicated that his score is higher than or equal to only 2 percent of similarly aged individuals in the norm group. His adaptive level was rated *Low* for his age group. This score was higher than that obtained in the assessment conducted in 2002 (Adaptive Behaviour Composite = 56).

Participant two's level of adaptive functioning within the *Communication* domain was *Moderately Low* for his age group. His standard score of 73 resulted in a percentile rank of four. Thus, his score in this area was higher than or equal to only 4 percent of his peers in the normative sample. He had an adaptive level of *Low* for two of the subdomains *(Receptive Communication* and *Expressive Communication)*, and *Moderately Low* for *Written Communication*. However, again, these scores were higher than those obtained in June 2002 (Communication = 67).

Participant two's standard score for the *Daily Living Skills* domain was 66. This score represented a *Low* level of adaptive functioning for an individual of his age. His percentile rank for the *Daily Living Skills* domain was one. His adaptive level was *Low* for the *Personal subdomain*, *Moderately Low* for the *Domestic* subdomain, and *Moderately Low* for the *Community* subdomain. His total score for *Daily Living Skills* from the assessment conducted in 2002 was 58, which demonstrated another significant improvement.

Participant two's level of adaptive functioning within the *Socialization* domain was described as being Adequate for his age group. His standard score was 88, while his percentile rank was 21. A look at the subdomain scores within the *Socialization* domain indicated that his adaptive level was *Adequate* for all three subdomains (*Interpersonal Relationships, Play and Leisure Time*, and *Coping Skills*). Again, the overall score was considerably higher than the score reported in 2002, pre-treatment (*Socialization* = 66). Participant two's standard score for the *Motor Skills* domain was 72. This score represented a *Moderately Low* level of adaptive functioning for his age group. His percentile rank for this domain was three. The adaptive level was *Low* for the *Gross Motor Skills* subdomain and *Adequate* for the *Fine Motor Skills* subdomain. The lower adaptive level for the *Gross Motor* subdomain indicated that the subject had particular difficulty with tasks such as walking up and down stairs. He had more success with *Fine Motor* subdomain activities, such as tasks that involved picking up objects, building blocks, and completing puzzles. His *Motor Skills* standard score in 2002 was 64, thus some improvement in this area was duly noted after treatment.

In summary, participant two appeared to be significantly delayed in terms of adaptive functioning, (at or below the 4th percentile) in the communications, motor skills, and daily living skills domains and somewhat below age-level in terms of socialization, scoring at the 21st percentile rank. After 14 months of Intensive Behavioural Intervention, some gains were observed and noted, however, the overall gains as demonstrated by the *Adaptive Behaviour Composite* were not considered statistically significant because the scores remained in the *Low* range for his age group.

Language Ability
The PPVT-R was administered to participant two. With respect to this, his standard score was 91, placing him within the 27th percentile, or in the average range for a child his age. As can be easily ascertained, this was also a significant increase noted after treatment, given that his score on the PPRVT-R in June 2000, (at his first assessment), was 85 placing him within the 16th percentile.

Participant Three
Participant three was diagnosed with mild to moderate autism when he was 2 years and 4 months. Like the other 2 participants, he received Intensive Behavioural Intervention through the Ontario funded program starting in December 2001, when he was 2 years and 11 months old. Participant three received 25 hours of Intensive Behavioural Intervention per week by trained therapists for a duration of 21 months.

Participant three was assessed by a registered psychologist in July 2003, after 19 months of Intensive Behavioural Intervention. During the assessment, the psychologist reported that the subject was cooperative and able to perform well on most of the assigned tasks.

IQ
Participant three was administered the WPPSI-R as part of the overall psychological assessment. As reported by the psychologist, his full scale score was 88. These scores signify that he was able to perform in the *Low average* range on tests which measure general intellectual functioning. His Verbal score was 80, while his performance score was 96. There was no comparison for these IQ scores as participant three had never undergone IQ testing prior to the formal start of therapy primarily because he was too young to do so.

Adaptive Functioning
Participant three's score on the *Adaptive Behaviour Composite* as assessed by a registered psychologist in July of 2003 was 74. His percentile rank measurement of 16 on the Adaptive Behaviour Composite indicated that his score was higher than or equal to 16 percent of similarly aged individuals in the norm group. His adaptive level was rated as *Moderately Low* for his designated age group. With reference to his overall score, it was recognized as being moderately higher than the score he obtained in November 2001 (Adaptive Behaviour Composite = 70). Participant three's level of adaptive functioning within the *Communication* domain was described as *Adequate* for his age group. His standard score was 89. Thus, his score in this area was higher than or equal to 23 percent of his peers in the normative sample. On measures of adaptive level, again he scored in the *Adequate* range for all three *Communication* subdomains (*Receptive, Expressive*, and *Written*). Overall, his score in this specific category of tests was significantly higher than the one he obtained in his assessment of 2001 (*Communication* domain = 64).

Participant three's standard score for the *Daily Living Skills* domain was 84. This score represented an *Adequate* level of adaptive functioning for an individual of his age. His percentile rank for the *Daily Living Skills* domain was 14. This meant that his overall adaptive level was considered *Moderately Low* for all the three subdomains measured (*Personal, Domestic,* and *Community*). However, in totality, when one considers that his score for *Daily Living Skills* in 2001 was 76, some gains related to intervention can again be seriously considered.

Participant three's level of adaptive functioning within the *Socialization* domain was *Low* for his age group. His standard score was 54, which resulted in a percentile rank of 0.1 being officially registered. An examination of the subdomain score within the general *Socialization* domain indicated that his adaptive level was *Low* for all three subdomains (*Interpersonal Relationships, Play and Leisure Time,* and *Coping Skills*). Interestingly, his score within this category was substantially lower than the score obtained in 2001, prior to therapeutic intervention (*Socialization* = 67). Participant three's standard score for *Motor Skills* was 92. This score represented a general level of *Adequate* adaptive functioning for his designated age group. His percentile rank for this domain was charted at 30. This level was considered to be in the *Adequate* range for both the *Gross* and *Fine Motor Skills* subdomains. His standard score in the *Motor Skills* domain in 2001 was 73, hence another dramatic gain was noted after intervention.

Language Ability
Participant three's score on the PPVT-R was 85, placing him within the 16th percentile, or the low average range. This is a reasonable increase when compared to his score in November 2001, where he scored 77 and was charted within the 6th percentile.

With the exception of the *Socialization* domain, all of the standard scores for adaptive functioning and language ability were higher after 19 months of Intensive Behavioural Intervention. As well, after 19 months of Intensive Behavioural Intervention, participant three's cognitive abilities, as evaluated by the WPPSI-R were considered to be almost in the average range in all measurable areas.

Discussion
The central purpose of this research was to review current literature and to briefly make some observations with reference to the effectiveness of Intensive Behavioural Intervention in treating children with autism. More specifically, to determine whether IQ, adaptive functioning, and language abilities are improved when this general treatment approach is utilized. In this analysis, the effects of age, length of treatment, and duration of treatment were examined from a qualitatively perspective using three case studies.

IQ
The first hypothesis was that children who received Intensive Behavioural Intervention would have significantly higher IQ scores after treatment.

As indicated in the results section, the effects of Intensive Behavioural Intervention on IQ were different for all 3 subjects who were profiled in this paper. Participant one had no increase in IQ; his IQ scores remained below the first percentile and in the range of profound mental retardation. It is important to note, however, that he was previously deemed untestable and the fact that he could be tested at all, even though his scores had to be prorated, perhaps in itself indicated a slight increase in overall IQ. With this point being conceded, however, even after treatment, his scores still place him in the lowest ranks with respect to measurable intelligence level. Conversely though, participant two showed significant increases in IQ scores, placing him in the borderline range of intellectual functioning as compared to the mild range of mental retardation, as was noted before the onset of treatment. As far as participant three is concerned, it is difficult to document significant gains in IQ quantitatively, (because there was no pre-treatment comparison data), however, observable qualitative gains would suggest considerable improvement. A most plausible explanation for the lack of increase in IQ scores for Participant one may be that this subject was severely affected by his autistic disorder, whereas the other 2 participants were less affected.
As mentioned previously, participant two had a significant increase in IQ after treatment. This finding lends a minimal amount of support to the above mentioned hypothesis, however, further research is needed to determine whether IBI has a lasting, long term impact on IQ.

Adaptive Functioning
The second hypothesis was that children who received Intensive Behavioural Intervention would have significantly higher adaptive functioning scores after treatment, when compared to scores compiled before the onset of treatment.

As reflected in the results, the effects of Intensive Behavioural Intervention on adaptive functioning were different for 1 of the 3 participants who was profiled in this paper. Participant one was the only subject to show a decrease in adaptive functioning from start to finish. His overall adaptive functioning scores went from *Moderately Low* to *Low*, while the other 2 participants showed increases in measurable adaptive functioning. More specifically, although participant two showed an increase in adaptive functioning, his overall adaptive functioning scores still remained in the *Low* range for his age group, thereby not officially registering as a significant net gain. Likewise, although participant three also showed an overall increase in

adaptive functioning, his gains still placed him within the *Moderately Low* range, again not representing a significant net increase in adaptive functioning scores.

These general findings do not appear to lend support to the hypothesis that Intensive Behavioural Intervention promotes significant increases in overall adaptive functioning, as only 2 of the 3 participants showed some slight gain in this specifically targeted area. One possible explanation, for the decrease in participant one's adaptive functioning scores, may be that he was generally more negatively affected by the disorder, and that his deficits may not have been as apparent or as exaggerated when measured in his earlier years. Suffice to say, that more research is required to truly determine the lasting effects of Intensive Behavioural Intervention on adaptive functioning.

Language Ability
The third hypothesis was that children who received Intensive Behavioural Intervention would have significantly higher scores on the Peabody Picture Vocabulary Test- Revised, perhaps indicating a measurable increase in overall language abilities. For the most part, we believe that the results which were previously reported support this.

In brief, results showed that Intensive Behavioural Intervention had a positive effect on language ability. However, of note, for participant one, it was impossible to assess language abilities using the PPVT-R, at either of the testing intervals, because the subject did not fully comprehend the assigned tasks. On the other hand, participants two and three both showed substantial increases in language ability as a result of treatment. Participant two's score on the PPRV-R went from 85, placing him within the 16th percentile and in the *Low Average* range, to 91, placing him at the 27th percentile, and in the *Average* range for his age group. In a similar vein, participant three's scores on the PPVT-R went from 77, placing him within the 6th percentile, and in the *Moderately Low* range, to 85, placing him within the 16th percentile, and in the *Low Average* range. Without question, these findings, as they specifically relate to participants two and three, seems to lend strong support to the hypothesis that Intensive Behavioural Intervention promotes measurable improvements in overall language ability.

Age
The fourth hypothesis was that children who were younger at intake would have significantly higher IQ and adaptive functioning scores after treatment when compared to scores before treatment. Participant one, who was over the age of 4 at the time of intake, was the only participant who did not make significant gains in IQ, adaptive functioning, or language ability. Participant three, who was the youngest at the time of intake, showed many gains in adaptive functioning and language ability. Although this would tend to somewhat support the notion that the younger the child at treatment commencement, the better the outcome, it is important to note that participant two was also over 4 years of age at treatment commencement and it was he showed the greatest gains across all measurable domains.

There are some documented contradictions in the literature with respect to the effects of age on treatment outcome. Some studies have found no differences between age groups (Luiselli et al., 2000), while others have found significant differences (Harris & Handleman, 2000). The studies that have found the greatest differences in outcome for the different age groups have suggested the obvious, in that, the younger the child, the more progress the child is likely to make in treatment. At minimum, it is important to put some substantial effort into clarifying these age related issues as it pertains to autism because, as it currently stands, individual cases are often prioritized on the basis of chronological age.

With respect to this general overview, the results of our research does not reach clarification as to whether age actually influences treatment outcome. Further research is required to determine the importance of age at treatment commencement for children with autism.

Number of Hours of Treatment
The fifth hypothesis, that children who received a higher number of hours of Intensive Behavioural Intervention would show more significant increases in IQ, adaptive functioning, and overall language ability, would not appear to be supported by the data. For example, without exception, participant one received the highest number of hours of Intensive Behavioural Intervention per week, when compared to the other 2 subjects, yet, made the least amount of measurable progress. Conversely, participant two received the lowest number of hours of Intensive Behavioural Intervention per week, when compared to the other 2 subjects, yet, made the most progress.

In fully exploring the above observations, there would appear to be very few studies specifically examining the effects of the number of hours of Intensive Behavioural Intervention on treatment outcome. Although, one study conducted by Sheinkopf and Siegel in 1998, found no significant differences between groups of children who received 25 hours of treatment per week and those who received 35 hours. However, at a minimum, there is no question that this issue should be explored in greater detail in an effort to realistically determine the amount of hours of therapy necessary to achieve optimal gains. Intensive Behavioural Intervention is extremely costly and waiting lists for these services are long, therefore, in our opinion, closer scrutiny within this particular sector might lead to the more efficient deployment of very limited resources.

Duration of Treatment
The final hypothesis was that children who received Intensive Behavioural Intervention for a longer period of time would display the greatest gains in IQ, adaptive functioning, and overall language ability. However, again, this hypothesis would not appear to be supported by the data. Participant one received treatment for 18 months and showed no gains on any of the measures used. Participant two appeared to make the greatest measurable gains while receiving the least amount of treatment (14 months). Participant three received treatment for the longest duration (21 months) and showed some increases in adaptive functioning and language ability.
Although there are studies supporting the notion that duration of treatment positively influences treatment outcome, meaning the longer the treatment, the better the outcome (Luiselli et al., 2000; Smith, Groen, & Wynn, 1985); we did not find this to be necessarily the case.

Conclusion
To summarize, although most of the research consulted for this paper reported substantial improvements after Intensive Behavioural Intervention, the specific nature of these improvements varied quite profoundly from one study to another. For example, some investigators found gains in all of the core areas that they assessed (Anderson et al., 1987; Lovaas, 1987), while others documented major gains in some areas but much smaller improvements in others (Harris et al., 1991). Nevertheless, there is strong evidence suggesting that any gains made within Intensive Behavioural Intervention programs, are maintained long after the discontinuation of treatment (McEachin et al., 1993).

One major factor that complicates the general study of autism is that this particular exceptionality wears many different masks. Some children with autism have a sharp mind while others have marked deficits in intellectual functioning. Restated, it is a spectrum disorder, which means that

every child formally diagnosed with autism has abnormalities which can be charted within a broad spectrum of measures.

Fifteen years ago, Dustin Hoffman played an autistic savant in the film *Rain Man* (1988), romanticizing the disorder and giving people the impression that all those with autism have special talents. In reality, many, perhaps most, are not so lucky and at the very least need help unleashing the sometimes hidden abilities that they do possess. Many times it can be argued that labels are designed and assigned to help us understand and gain knowledge with respect to the person or group of people to whom the label has been applied. Within this context, labels can sometimes be viewed as a positive, if not helpful device. However, when it comes to autism, this does not appear to be the case. There is a wide range of presenting characteristics, some people with autism are severely affected, while others are less affected.

Within this general purview, we have found that those who are diagnosed with severe autism, and who are also described as being moderately to severely mentally retarded on measurable scales, (hence, present as being severely affected), make the least amount of improvement in IQ, adaptive functioning, and overall language ability, despite the age at treatment commencement, the number of hours of treatment, and the duration of treatment. This was clearly demonstrated through the three case studies presented in that participant one who was most affected by the disorder and yielded the lowest IQ scores made the least amount of progress across all areas that were measured. Therefore, it is our contention that the main predictors of outcome when it comes to Intensive Behavioural Intervention for people with autism, are the severity of the disorder and overall IQ prior to the commencement of treatment.

Although this study did not yield more conclusive results and provided little support for the research that already exists, it did attest to the fact that autism is a very unique disorder and as such, treatment should be individualized. Even though Intensive Behavioural Intervention was not shown to be effective for all participants in this research project and may not prove effective in some other specific cases, at a minimum, it still offers some degree of hope, where, perhaps previously, there was absolutely none. It is important that parents and professionals understand the factors that could potentially affect outcome. Research efforts must continue in this area because there are so many people affected by this disorder, (directly and indirectly), and there may be several factors involved in treatment outcome that have not yet been discovered or fully explored.

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