

# Developing an Applied Learning Analysis Program for Children with Autism in Brunei

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## Abstract

The purpose of this study is to present preliminary results of an Applied Learning Analysis (ALA) treatment model for children with Autism and related disorders. This analysis covers the first five years of program development at Learning Ladders Centre. All children who received services from the centre for six months or more were included in this study. Children in this study ranged in ages from 2.5 to 11 years. A retrospective design was used to study the children's development, specific to improving their symptoms of Autism as well as their cognitive, social, emotional, academic and behavioural development. We developed a structured data template for reviewing all files. Included in this template was information on the children's diagnosis as well as treatment effects. Reliability was assessed on 25% of the data. This paper will present preliminary empirical data indicating growth in all domains assessed. In conclusion, this study has demonstrated that the development of an ALA based program founded on empirically supported treatment research is an effective model for treating children with Autism and related disorders.

**Keywords** : Autism, applied learning analysis, program development, early intervention

## Introduction

Starting in the 1980s (Fenske, Zaluski, Krantz & McClannahan, 1985; Anderson, Avery, DiPietro, Edwards & Christian, 1987; Lovaas, 1987) research has been demonstrating the effectiveness of Applied Behaviour Analysis (ABA) as a set of effective intervention techniques for improving the lives of young children with Autism Spectrum Disorders (ASD). Major reviews assessing the potential therapeutic value of many treatment options (Maglione, Gans, Das, Timbie & Kasari, 2012; National Autism Center, 2009; Volkmar, 2014; Wong et al., 2013) have consistently found ABA to be a treatment of choice. However, the true magnitude of the impact of ABA on the development of children with ASD is easily underestimated due to the branding of many essentially behavioural techniques as unique treatments. For instance Wong et al 2013 list 27 individual behavioural treatments. Certain techniques, such as the Picture Exchange Communication System (PECS) program (Frost & Bondy, 2002) a communication training program based on the principles of ABA, may in one instance be listed as a behavioural procedure (e.g. Wong et al, 2013) or as being in the purview of speech language therapy (Volkmar, 2014). Packaged treatments, such as Pivotal Response Training (Koegel & Koegel, 2006), are based on behavioural principles but are often viewed as separate treatments. Regardless of the terms or titles used, all such treatments follow the core principles of

ABA. There is ongoing discussion regarding empirical support for individual types of techniques. It is clear that, to date, the only treatment with significant positive research outcomes for making comprehensive and lasting treatment gains for young children with ASD are comprehensive programs based on ABA (National Autism Center, 2009). This is particularly true relative to more typical eclectic or multi-disciplinary treatments (Cohen, Ameringer-Dickens & Smith, 2006; Howard, Spademan, Cohen, Green & Stanislaw, 2005; Lovaas, 1987) when treating children with ASD who have no other formal diagnostic disability except a possible intellectual disability (e.g. global developmental delay). What is often not clearly delineated is the role that developmental psychology has played in the outcome research. It is clear that most outcome research studies have relied heavily on findings from developmental psychology for defining many of the treatment goals and objectives. This has led to the fairly consistently agreed upon developmental objectives that ABA programs use for early intervention. For example, the Assessment of Basic Language and Learning Skills – Revised (Partington, 2010) is fashioned on the Assessment Log and Developmental Progress for the Carolina Curriculum for Preschoolers with Special Needs (Johnson-Martin, Attermeir, & Hacker, 1990). Most of the items in Lovaas' (2003) classic curriculum for his research on early intervention for children with ASD can be found in a range of developmental psychology research and publications (Brigance, 2004; Furuno, O'Reilly, Inatsuka, Hosaka & Zeisloft-Falbey, 1993; Newborg, 2005). A more formal integration of developmental psychology and ABA has also started to occur (Novak, 1996; Schlinger, 1995). ABA at its core, is based on the behavioural learning theory developed by B. F. Skinner (e.g. 1953, 1957, 1968). Over the years, his theory of learning has been supported by thousands of individual studies. His work on language (verbal behaviour) has been extended by

psychologists studying complex language (Hayes, Barnes-Holmes, & Roche, 2001), leading to an elaboration on the original Skinnerian-based verbal behaviour techniques (Murphy, Barnes-Holmes & Barnes-Holmes, 2005; Rehfeldt, Dillen, Ziomek & Kowalchuk, 2007). While Skinner was well aware of the need to study brain function, he was writing at a time when there was very limited technology for doing so. The current explosion of neuroscience and scanning technology has produced the beginnings of a possibility for integrating behavioural learning theory, with a far more nuanced understanding of the neurological functioning of children with ASD (Buxbaum & Hof, 2013). The literature on early ABA intervention programs for young children with ASD is focused almost exclusively on improving the children's learning and providing them with meaningful gains in skill development. Only as needed, is there a focus on the reduction of undesired behaviour. This focus on learning, the reliance on developmental psychology research to set appropriate objectives, and the growing focus on the neurological underpinnings of learning has led Learning Ladders Society to develop an Applied Learning Analysis model for guiding its treatment program.

Despite extensive research regarding ABA, Autism, developmental, cognitive and clinical psychology from a program development perspective, there is little detailed information available regarding how to integrate such fields into a coherent treatment service for children with ASD. In particular, there is little in the professional literature regarding the process of developing effective intervention services from initial start-up, through to developing a fully functioning treatment program. Existing literature is largely based on research that is heavily dependent on direct or indirect support from major universities, particularly UCLA. How does one go about developing a high quality ABA treatment pro-

gram in a community with little, if any, existing infrastructure to support an ABA program, and only recent awareness of Autism and related disorders? This is the question we will address in this article. In other words, this study is formative in nature rather than summative in that the results will focus more on data related to the process of developing a program, rather than evaluating its outcomes. In Brunei, prior to creation of the Learning Ladders Society, a few parents had contracted for out-of-country consultants to assist in developing home-based programs. There was no local site for developing and training staff to work with children who have ASD, thus much of the training came from periodic visits by the consultant or from the parents directly. While difficult to evaluate the limited services prior to the start of LLS, it would appear to be similar to that reported by Bibby, Eikeseth, Martin, Mudford & Reeves (2002) which reported no therapeutic gain for children after a year of relatively intensive services. Bibby et al (2002) in summarizing the lack of treatment impact, identified several factors which indicated that such programs were unlikely to develop sufficient treatment fidelity comparable to the existing literature, which likely was the cause of the ineffective outcomes.

### *Program Outline*

Learning Ladders Society is a non-governmental agency in Brunei run by parents of children with ASD and related disorders. LLS is funded by parent fees and donations. None of its operating expenses are supported by ongoing government grants, except for the donation of a small residence that has become the physical site of the treatment program. It opened its doors in November 2009 and has been in continuous operation ever since.

To address the issue of ensuring constant clinical oversight to the program, the first author as the senior clinical member, has made 4 trips to LLS

totaling approximately 39 days of on-site time. In addition, video conferencing has been utilized for approximately 4 hours a week (approximately 720 hours overall) as well as video clips of sessions being sent via Dropbox. All intervention plans are sent to the first author for authorization, prior to both the baseline assessment as well as the start of intervention. Weekly summaries of all the children's profiles are sent to the first author for review.

Training of the first three staff (the second and third authors, as well as one other staff who has since left) was conducted by the first author and consisted of an initial two week training period with incidental training being provided on an ongoing basis. Currently the second author has obtained her BCaBA® (Board Certified assistant Behavior Analyst) from the Behavior Analyst Certification Board® and the third author is working to obtain her BCaBA. The second and third authors are currently the senior behavioural consultants at LLS. Together with the first author, a staff training program was designed which the second and third authors provide for all new staff. New staff receive approximately 30 hours of formal training that includes an induction program (e.g. what is Autism, introduction to policies and procedures at Learning Ladders, goals of treatment etc.), lectures on Applied Behaviour Analysis, practical training or role-play, plus an additional 30 hours of shadowing where they will observe each client for at least 1 session, for a total of 60 hours of training. For a degree holder, they will complete the 60 hours in an intensive two weeks training, while a non-degree holder will receive at least four weeks of training (15 hours per week for four weeks) with continuous supervision. To date, 23 staff have worked at LLS with an average employment period of 22.5 months per staff. Currently there are 13 staff working directly with children. During all onsite visits, the first author observes therapy sessions, provides staff training,

consults with parents and consults with LLS board members. Consultation with LLS board members also occurs on an occasional basis via video conferencing.

All intervention plans follow a four stage process: 1) Baseline assessment, 2) Intervention, 3) Maintenance evaluation and 4) Generalization evaluation. Only when children pass the criteria for generalization is the intervention deemed complete. Given the relatively young age of most children in the program, LLS has used the Assessment of Basic Language and Learning Skills – Revised (ABLLS-R) curriculum predominately, but also includes as necessary, items from other published curricula or individually designed programs developed by the first author. While there is a generally agreed upon range of typically expected objectives to be met by each of the children, each child's program profile varies, sometimes significantly, depending on each child's learning strengths and challenges.

Parents are involved on a continuous basis. During the initial intake process, parents are asked to identify priority areas of concern. Home-based initial observations are made by senior staff, in an attempt to make it more comfortable for parents to be able to show LLS staff issues, regarding their child's learning and behaviour. Monthly review meetings are held to give parents an update regarding their children's progress, as well as to gain input from the parents, regarding specific issues they wish to have assistance with.

LLS started in 2009 and continues to operate a centre-based program. In May 2011 LLS also started to deliver home-based programs, particularly aimed at young (e.g. 2.5 – 3 years) children. Beginning in January 2014 the program also started to provide limited school-based programs. To a large extent LLS services are constrained by the availability of staff. All home and school programs, while having obvious benefits, require significantly more staff and

supervisory time to operate properly, compared to the centre-based program.

## Objectives

The purpose of this study is to present preliminary results of an Applied Learning Analysis (ALA) treatment model for children with Autism and related disorders. This analysis covers the first five years of program development at Learning Ladders Centre. All children who received services from the Centre for six months or more, were included in this study. Children in this study ranged in ages from 2.5 to 11 years.

## Methods

Given the five years that LLS has been operating a treatment centre, a retrospective study was designed to investigate the development of the program, from its initial opening until the present. This study is limited to focusing on the clinical development of the program rather than on the social, political and/or policy issues that have affected its growth and development. We are attempting to provide a glimpse into the development of the program from its initial opening until now.

LLS produces six monthly update reports for children in the program. We chose this as the minimum time in the program, for a child to be included in this study. A total of 32 children have been in the program for a minimum of six months.

Files for all eligible children were reviewed using two standardized review forms. The first form was designed to capture essential demographic information and the second form was to capture summary information regarding the treatment plans for each child. The first and fourth authors reviewed all files verifying demographic, diagnostic and standardized assessment information. The demographic form collected such information as age, diagnosis, hours of treatment, priorities of the parents and standardized

assessment results. The children's files were independently reviewed by the last five authors regarding each child's treatment plan. A potential of slightly more than 740 different treatment plans were included in this analysis. This form collected information regarding the relative time when interventions were started, baseline duration and intervention duration for each program presented to each child. Summary statistics were also compiled covering areas such as total time in direct instruction, reinforcement time, time spent on self-help skills, etc. Eight files were selected for conducting a reliability check on the data collected, regarding the children's treatment plans. This was done, as staff were required to convert treatment data information into time spent in treatment. This was thought to be a more meaningful unit for analysis, compared to the raw data units which vary across programs. Reliability was calculated as the ratio of agreements, divided by the sum of all agreements and disagreements for programs implemented. The overall reliability was 90.74% with a range of 69.44% - 98.88%.

## Results

The average age for children starting at LLS from 2009 to 2011 was 80.8 months with a range of 53-165 months. In staying consistent with the research literature, LLS has developed a strong emphasis on early intervention. This is seen in the average age of children, starting LLS since 2012, being 57.7 months with a range of 33-114 months. All children received diagnoses from outside agencies. Of the diagnoses on file, sixteen were for ASD, five for developmental delay/learning problems, one for Cerebral Palsy, one for epilepsy, and one for agenesis of the corpus callosum. Twenty children have had the Adaptive Behavior Assessment System – II (ABAS-II) completed by parents and seven children have had the ABAS-II completed by a teacher or shadow teacher as part of the intake process to LLS. The mean parent

rating of children's adaptive skills at intake was 52.4 with a range of 40-89 and the mean teacher rating was 51.9 with a range of 41-65. Due to the young age of many of the children receiving services from LLS, and the significantly below average results of the ABAS-II, only six children have received intellectual assessments. These children are clearly some of the higher functioning children seen, as they were all able to complete full intellectual assessments using either the Wechsler Preschool and Primary Scale of Intelligence (WPPSI) or the Wechsler Intelligence Scale for Children (WISC). However, only two of the children's profiles were consistent enough to produce a full scale IQ. Of the six children completing the assessments, the mean verbal IQ was 70.0 and the performance IQ was 89.7. Of these children, three also had ABAS-II data and their mean adaptive score was 58.7, only marginally higher than the group overall.

Parent priority as established during intake, while hard to summarize, tended to fall into priorities for increase in communication, social interaction, pre-academics, attention, self-direction and self-help skills, and reductions in odd behaviour and tantrums. This is consistent with many of the issues facing young children with ASD. As a way of assessing the general consistency of parent priority setting, the parents are asked after completing the ABAS-II, to circle 10 of the items they are most concerned with. Overall there has been very good consistency between parent's spontaneous statements of priority and their identification of specific items consistent with their priorities. For instance, when communication is listed as a priority, parents may identify such specific items as "follows simple commands", "says the name of other people" or "uses sentences with a noun and a verb."

Developing and supporting staff expertise and stability is essential for increasing the program's capacity. Of the 22 staff who have worked

at LLS, the average duration of employment is 23.5 months. For the three senior staff, the average duration is 49.3 months and for the 19 line staff, the average duration is 19.5 months with six line staff to date staying for two years or more. The range of academic qualifications for staff is: eleven bachelor degrees; six national diplomas; three A level and one O level staff (one staff is missing and only worked at LLS for one month). One of the senior staff received her BCaBA in 2014 and the second senior staff is working towards a BCaBA certification.

LLS has focused from the start on attempting to build local expertise and capacity. Looking at the relationship between staff and treatment hours provided, can give an overview of how well this focus is being met. It has been estimated that,

to date, LLS has provided approximately 19,620 hours of treatment services. The centre has had three senior staff over this time period, thus averaging approximately 6,500 hour of experience per senior staff. For the 19 line staff who have, or are working at LLS, this comes to approximately 1,032 hours of experience per staff.

Since inception, LLS has always focused on attempting to develop early intensive learning based intervention programs, matching the research level of a minimum of 25 hours a week. As shown in Table 1 currently, due to staffing limitations, the typical duration of intervention is approximately 7-9 hours per week for the first 30 months that children are in the program.

**Table 1:** Average hours in program per child

Average hours in program per child								
Months	6	12	18	24	30	36	42	48
Total hrs	6444	4618	3630	2147	1704	770	165	142
# children	32	23	17	10	7	4	1	1
hrs/child	201.4	200.8	213.5	214.7	243.5	192.6	165.4	142.0
hrs/week	7.7	7.7	8.2	8.3	9.4	7.4	6.4	5.5

To date, children have received 1,996 intervention programs. Children have received an average of 62.4 programs each, however, the range is very large (21 to 181 programs) due to the individual needs and learning capacities of each child, and the complexity of the intervention programs being used. A large number of these interventions focus on increasing early learning skills, cognitive development language/social skills, and early academic skills. The number of programs per child has also remained fairly constant over time. Of the 17 children who started receiving services from 2009-2011, the

average number of programs per child was 63.3. For children who started services since 2012 until the present, the average per child is 61.3.

A component of empirical evidence-based practice is also the length of time children remain in treatment. Of the 17 children who have completed services with LLS, the mean length of time in treatment is 18.6 months. Looking at all 32 children who have or are receiving services from LLS, the mean length of time in treatment is 20.2 months. This places the duration of services per child by LLS, as being within the expected range of treatment duration.

**Table 2:** Number of Programs per general learning intervention category

Number of Programs per general learning intervention category	
Early Learning	387
Cognitive	408
Language/social	827
Academic	356
Motor/Self-help	18
<b>Total programs</b>	<b>1996</b>

Summarizes the programs into five categories of program focus: early learning, cognitive, language/social, academic, and motor/self-help skills.

As can be seen from Table 2, the large majority of intervention efforts by LLS staff has been in these four areas, with the heaviest emphasis on language/social development. This would be expected given the number of children attending LLS who have a diagnosis of ASD.

## Discussion

There is ample evidence of the positive outcomes of early intensive behavioural interventions for young children with Autism. There is however, little in the way of research on what it takes, outside of funded research projects to: a) provide the quality of services needed and b) scale up the services to match the level of intensity (i.e. 25 or more hours per week) to meet best practice standards as defined in the empirical literature. This study is meant to present preliminary research on the developmental issues related to starting an early intervention program for children with Autism that integrates Applied Behaviour Analysis, child development and clinical psychology into an Applied Learning Analysis model. This formative study has outlined several key features for the development of such a program. First, it is essential

that a focus be on developing and maintaining the quality of treatment. This entails both the training and supervision of staff, as well as maintaining a constant linkage between line staff, supervisors and a clinical director. LLS has focused on quality of service provision throughout its development over the last five years. While staffing and funding have been, and continue to be, limiting factors in providing a high intensity program, the quality of the program is far more under the internal control of the program. To continue its development of meeting quality standards, LLS is currently revamping its internal staff training system to meet the standards outlined by the Behavior Analyst Certification Board for qualifying all line staff as Registered Behavioral Technicians™. As well, the third author will be taking leave within a year to pursue a Master's degree in Psychology, before returning to the LLS program. The fourth and fifth authors are currently being trained to assume senior staff roles, thus indicating that LLS is evolving a generational shift that is necessary for any program to be able to maintain itself over time.

It is clear from the information regarding the children seen by LLS, that the centre is providing services to children similar to those identified in the research literature, as well as children who likely would not have been part of such research, due to

the exclusionary criteria in the research regarding having no other diagnoses. On a practical basis for a community-based program, it seems very likely that as part of developing services, that requests will be made for serving a somewhat wider range of children than those seen in the outcome studies specific to Autism. Maintaining a reasonable range of clients is important however, to allow for the development of expertise in a defined area. As LLS has done since its inception, it has focused more on seeing children at younger ages. While this is obviously consistent with the best outcomes in the literature, it was also recognized that early on, LLS did not have the level of experience and expertise to work with older children who may present with more complex and longer lasting challenges. However, as LLS continues to grow, it is acquiring the capacity to serve children of older ages, but this is evolving more developmentally rather than attempting to initiate immediate services for older children, who may have issues not yet faced by LLS staff.

Home-based programs were initiated in 2011 and continue today. It is recognized that there is a significant overhead cost to operating

such programs, mostly involved in travel time for line staff and supervisors. LLS has thus focused its home-based program on the youngest children being referred to the program, transferring the children to its centre-based program as they get older.

School-based programs also come with the same overhead issues as home-based programs. However, there is also the issue of working with individual schools to set up positive working relationships between both organizations. Clearly this is necessary as the children get older, as they will be spending greater amounts of time in school than at LLS.

Going forward, LLS will continue to develop its base of local expertise while attempting to increase the intensity of its early intervention program. Once a more stable service operation has been established, LLS will also turn to developing more formal outcome measures to document the impact its services are having on the development of the children and families it serves.

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