The Predictive Validity of the Assessment of Basic Learning Abilities versus Parents' Predictions with Children with Autism

by

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Abstract

The Assessment of Basic Learning Abilities (ABLA) is an empirically validated assessment tool for assessing the learning ability of persons with intellectual disabilities and children with autism. During the administration of an ABLA, an examiner attempts to teach an examinee to perform six individual tasks, called levels, using standardized prompting and reinforcement procedures until either a pass or fail criterion is met on each task. The majority of studies investigating the ABLA have been conducted with adults with intellectual disabilities. Research has demonstrated that the six levels of the ABLA are hierarchical in terms of difficulty, and that pass/fail performance on the levels is highly predictive of the ease or difficulty with which examinees will learn a variety of training tasks (Vause, Yu, & Martin, 2007). The present study examined the predictive validity of the ABLA with 9 children with autism, assessed at ABLA levels 2 and 3. A parent of each child was asked to predict the child's pass-fail learning performance on 20 criterion tasks. In addition, according to the child's ABLA performance, I predicted that each child would pass the criterion tasks that corresponded to his/her previously passed ABLA levels, and would fail the criterion tasks that were corresponded to his/her previously failed ABLA levels. I then attempted to individually teach each criterion task to each child, using standardized prompting and reinforcement procedures, until each child met either the pass criterion or the fail criterion of the ABLA. Ninety-two percent of the predictions based on the children's ABLA performance were confirmed, and the ABLA was significantly more accurate than the parents for predicting the children's performance on the criterion tasks.

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Introduction

During the 1940's, Leo Kanner used the term *early infantile autism* to describe a group of children who displayed deficits related to communication, cognitive abilities, and social behaviour (Green, 1996). Since that time, numerous treatments have been proposed to dramatically help, even cure, individuals with autism. Unfortunately, there has been little empirical evidence to support the efficacy of many of these treatments (Pelios & Lund, 2001). One approach that has been supported, as reviewed below, is early intensive behavioural intervention (EIBI) using the methods of applied behaviour analysis (ABA), which has become the most popular treatment for autism.

EIBI involves targeting several skill domains simultaneously in a coordinated, integrated, and organized manner (Pelios & Lund, 2001). However, children with autism tend to progress in their development at varying rates, especially during the child's first 36 months (Chawarska & Bearss, 2008; Chawarska & Volkmar, 2005). While some skills may develop quickly, the development of other skills may be significantly delayed or abnormal. Consequently, individuals with autism can learn some training tasks with relative ease, while having greater difficulty learning other, seemingly similar, training tasks.

The Assessment of Basic Learning Abilities (ABLA) is an empirically validated clinical tool that assesses the ease or difficulty with which an individual is able to learn six visual and auditory discriminations that appear to be prerequisites for learning various training tasks (Kerr, Meyerson, & Flora, 1977). The effectiveness of the ABLA for matching the learning ability of individuals to the difficulty of training tasks has been well documented with individuals diagnosed with profound, severe, and moderate intellectual disabilities (Vause et al., 2007). Moreover, preliminary research has indicated that the ABLA may be a valuable assessment and

training tool for children with autism as well. The following research compared ABLA performance versus parents' predictions for predicting the learning ability of a sample of children with autism.

Autism

Autistic disorder, referred to as autism herein, is categorized in the *Diagnostic and Statistical Manual of Mental Disorders, 4th ed., Text Revision* (*DSM-IV-TR*) as a pervasive developmental disorder (PDD) (American Psychiatric Association [APA], 2000). Other diagnoses that also fall under the term PDD include childhood disintegrative disorder, Asperger's disorder, Rett's disorder, and pervasive developmental disorder - not otherwise specified (PDD-NOS). These disorders are characterized by severe and pervasive impairment in several developmental areas. Due to the general similarities shared between autism, Asperger's disorder, and PDD-NOS with regard to symptom presentation, these three disorders are typically referred to as autism spectrum disorders (ASDs).

Autism is characterized by qualitative impairment or abnormal development in three main areas: (a) social interaction skills; (b) communication skills; and (c) restricted, repetitive and stereotyped patterns of behaviour, interests, and activities (APA, 2000). However, individuals with autism exhibit a wide range and variety of symptom presentation and characteristics (Chawarska & Bearss, 2008; Pelios & Lund, 2001), and therefore, may display varying strengths and weaknesses in their skill development.

In order to meet the *DSM-IV-TR* diagnostic criteria for autism, symptoms must be present prior to 3 years of age. Thus, most children with autism tend to demonstrate a delay in one or more areas of development during the first few years of life (Chawarska & Bearss, 2008; Volkmar & Lord, 2007). In fact, research has found that approximately 30% to 50% of parents

reportedly recognized developmental abnormalities related to autism when their child was less than 12 months old, and 80% to 90% recognized the symptoms by the time the child was 24 months old (Volkmar, Chawarska, & Klin, 2008).

In the upcoming 5th edition of the *Diagnostic and Statistical Manual of Mental Disorders (DSM-5)*, set to be published in May 2013, APA has proposed to eliminate the PDD subtypes. Instead, all individuals presently diagnosed with autism, Asperger's disorder, childhood disintegrative disorder, and PDD-NOS will fall under the diagnostic term ASD and will be categorized as having a Neurodevelopmental Disorder (APA, 2010). Rett's Disorder will not be included in the *DSM-5*. Moreover, there will be only two symptom domains listed, although the diagnostic criteria states that symptom severity can vary due to the individual's age and language ability. The proposed *DSM-5* criteria for ASD are as follows:

Criterion A. Persistent difficulties in social communication and social interaction across contexts, not accounted for by general developmental delays, and deficits in all three of the following:

(1) Social-emotional reciprocity,

(2) Verbal and nonverbal social communication,

(3) Developing and maintaining developmentally-appropriate relationships.

Criterion B. Restricted and repetitive patterns of behaviour, interests, or activities, as manifested by at least two of the following:

(1) Stereotyped motor or verbal behaviour or use of objects,

(2) Excessive adherence to routines or behavioural rituals, or excessive resistance to change,

(3) Restricted, fixated interests that are abnormal in intensity or focus,

(4) Hyper- or hypo-reactivity to sensory input or unusual sensory interests.

Criterion C states that these symptoms must appear during childhood, although the *DSM-5* also recognizes that symptoms may not become fully manifested until social demands exceed an individual's limited capacities. Lastly, *Criterion D* states that the symptoms must impair the individual's everyday functioning. Overall, the proposed criteria reflect a more dimensional, rather than categorical, model of diagnosis.

According to Fombonne's (2009) review of international studies conducted between 1966 and 2008, the prevalence for the combined PDDs (excluding Rett's disorder) is approximately 1 in 150 children. The Centers for Disease Control and Prevention (2012) reported an even higher prevalence of ASDs in the United States based on 2008 reports, approximately 1 in 88 children. Regardless, data indicates that the prevalence of autism has increased in the past 15 to 20 years. Fombonne hypothesizes that this increase can largely be attributed to three main factors: (a) a general broadening of the concept and expanding definition of ASDs, (b) increased service availability, and (c) heightened awareness regarding ASDs among both professionals and the lay public.

Autism is more likely to occur in males than in females, with an estimated male/female ratio of approximately 4.2 : 1 (Fombonne, 2009). However, females are typically more severely affected (APA, 2000) and are more likely to have cognitive impairment (Centers for Disease Control and Prevention, 2009). Moreover, the degree of impairment is typically associated with the individual's developmental level and chronological age. According to Fombonne (2007), approximately 70% of individuals with autism have some degree of intellectual disability, which can range from mild to profound. The occurrence of autism is indiscriminate with regard to social class, race, immigrant status, and ethnicity (Fombonne, 2007).

The exact cause of autism remains unknown, although it is generally agreed that it is a biologically based, neurodevelopmental disorder (Poustka, 2007; Volkmar, Westphal, Gupta, & Wiesner, 2008). Therefore, the behaviours commonly associated with ASDs are seen as physical manifestations of an underlying dysfunction of the central nervous system. More specifically, research has found support for a genetic influence. For example, researchers have found that there is a 3 - 8% chance that a sibling of a child with autism will also meet the diagnostic criteria for autism (Volkmar, Chawarska, et al., 2008). Research has also found abnormalities related to brain structure and growth in the frontal lobes, amygdala, brain stem, and cerebellum. However, there are currently no biological markers for autism and children are diagnosed based on behavioural presentation; specifically, the absence of typical behaviours (e.g., eye contact) and the presence of atypical behaviours (e.g., echolalia) (Bishop, Luyster, Richler, & Lord, 2008).

Autism and EIBI

EIBI using the methods of ABA has resulted in dramatic, comprehensive, and lasting improvements in many children with autism (Green, 1996). The teaching method involves carefully planned learning opportunities that are provided to a child on a one-to-one basis by expert teachers. In order to receive optimal treatment, EIBI is recommended for at least 30 hours a week for a minimum of two consecutive years. Furthermore, to be most effective, it is advised that the intervention be implemented before the child reaches the age of 5 years. According to this research, developmental areas that have been successfully targeted in EIBI programs have included expressive and receptive language, social awareness, performance on academic, self-care, and vocational tasks, problematic behaviour (Harris, 2007; Pelios & Lund, 2001). Other behavioural strategies based on ABA principles, such as errorless compliance training (Ducharme, 1996; Ducharme & Drain, 2004; Ducharme, Sanjuan, & Drain, 2007) have also been

found to be effective with children with ASDs and can be implemented as an adjunct to EIBI programs.

The efficacy of EIBI therapy has been supported by an abundance of empirical studies (Cohen, Amerine-Dickens, & Smith, 2006; Conner, 1998; Dawson et al., 2010; Eikeseth, Smith, Jahr, & Eldevik, 2007; Howard, Sparkman, Cohen, Green, & Stanislaw, 2005; Lovaas, 1987; Luiselli, Cannon, Ellis, & Sisson, 2000; McEachen, Smith, & Lovaas, 1993; National Autism Center, 2009; National Research Council, 2001; Rogers, 1998; Sallows & Graupner, 2005; Schreibman, 1997; Sheinkopf & Siegel, 1998; Smith, 1999; Smith, Eikeseth, Klevestrand, & Lovaas, 1997; Smith, Groen, & Wynn, 2000). In fact, some children with autism have gone on to become indistinguishable from their peers in educational settings. Recently, Reichow (2011) reviewed five meta-analyses (Eldevik et al., 2009; Makrygianni & Reed, 2010; Reichow & Wolery, 2009; Spreckley & Boyd, 2009; Virués-Ortega, 2010) that examined the efficacy of EIBI for children with autism. He found that four of the five meta-analyses came to the conclusion that EIBI was an effective intervention for children with autism and can result in significant improvements with regard to IQ and adaptive skills. Given the vast amount of empirical support, the Surgeon General of the United States and the New York State Department of Health recognized EIBI as the treatment of choice for autism (NYSDOH, 1999).

One of the primary goals of EIBI is to teach children with autism to discriminate between various stimuli, including spoken words, numbers, letters, shapes, and colours (Green, 1996). However, even with EIBI, some children do not perform as well as others and the majority of children continue to demonstrate difficulties in certain learning areas. Consequently, children with autism may have difficulty learning simple discriminations. The ABLA can be used to assess which discriminations are lacking in the child's repertoire and, through behavioural

intervention, assist in the programming and development of the child's learning skills (Vause et al., 2007).

The ABLA

The ABLA is an empirically validated assessment tool that is used to evaluate the ease or the difficulty with which an individual with an intellectual disability can learn to perform six visual and auditory discriminations that appear to be prerequisites for learning various training tasks (Kerr et al., 1977). The assessment was originally developed by Nancy Kerr and Lee Meyerson, who noticed that some children with intellectual disabilities could learn some tasks with relative ease while they struggled with other, seemingly similar, tasks. Consequently, Kerr and Meyerson developed the ABLA, which can be used to identify an individual's deficits in learning certain visual and auditory discriminations. These discriminations, or learning-to-learn skills, appear to be prerequisites for various self-care, academic, vocational, and prevocational tasks (Martin, Yu, & Vause, 2004).

As stated previously, there are six mini-tasks, referred to as levels, which make up the ABLA. These levels are: (1) a simple imitation; (2) a two-choice position discrimination; (3) a two-choice visual discrimination; (4) a two-choice match-to-sample discrimination; (5) a two-choice auditory discrimination; and (6) a two-choice auditory-visual discrimination (see Table 1).

The ABLA Testing Procedure

The ABLA can typically be administered in approximately 30 minutes or less. During testing, the examinee sits across from the examiner at a table. To assess an individual on a level, the examiner uses a set of standardized prompting and reinforcement procedures that involve several components. Testing begins with a demonstration of the correct response, during which

Table 1

A Description of the ABLA Levels, the Types of Discriminations Required, and Sample Everyday Behaviours Requiring the Discriminations.

ABLA levels	Discriminations	Sample behaviours
Level 1: Imitation. A tester puts an object into a container and asks the testee to do likewise.	A simple imitation.	Children playing Follow-the-Leader.
Level 2: Position Discrimination. When a red box and a yellow can are presented in a fixed position, a testee is required to consistently place a piece of white foam in the container on the left when the tester says "put it in".	A simultaneous visual discrimination with position, color, shape, and size as relevant visual cues.	Turning on the cold (vs. the hot) water tap.
Level 3: Visual Discrimination. When a red box and a yellow can are randomly presented in left-right positions, a testee is required to consistently place a piece of white foam in the yellow can when the tester says "put it in".	A simultaneous visual discrimination with color, shape, and size as relevant visual cues.	Locating one's coat from among other coats hung in a closet, with the coats in no fixed position.
Level 4: Match-to-Sample. When a yellow can and a red box are presented in random left-right positions and a testee is presented with a yellow cylinder or a red cube, he/she consistently places the cylinder in the yellow can and the cube in the red box.	A conditional visual-visual quasi-identity discrimination with colour, shape, and size as relevant visual cues.	Sorting socks into pairs.
Level 5: Auditory Discrimination. When presented with a yellow can and a red box (in fixed positions), a testee is required to consistently place a piece of white foam in the appropriate container when the tester randomly says "red box" (in a high-pitched rapid fashion) or "yellow can" (in a low-pitched drawn-out fashion).	A conditional auditory-visual non-identity discrimination, with pitch, pronunciation, and duration as relevant auditory cues and with position, color, shape, and size as relevant visual cues.	Responding to go left or right, to go to different rooms, or to open different drawers.
Level 6: Auditory-Visual Combined Discrimination. The same as Level 5 except that the left-right position of the containers is randomly alternated.	A conditional auditory-visual non-identity discrimination with the same auditory cues as Level 5 and with only color, shape, and size as relevant visual cues.	Responding appropriately to requests such as "pass the salt" versus "pass the pepper" when the salt and pepper shakers are in different places on the table from meal to meal.

Note. From "Overview of Research on the Assessment of Basic Learning Abilities Test," by G. L. Martin and D.C.T. Yu, 2000, *Journal on Developmental Disabilities, 7,* pp. 14-15. Copyright (2000) by the Ontario Association on Developmental Disabilities. Reprinted with permission. ABLA = Assessment of Basic Learning Abilities.

the examiner provides the correct verbal cue and places the manipulandum (i.e., a piece of foam for ABLA levels 1, 2, 3, 5, and 6, and a yellow cylinder or red cube for ABLA level 4) into the correct container. This is followed by a guided trial, during which the examiner physically guides the examinee to make the correct response. The examinee is then given an opportunity for an independent response. The examiner provides the verbal cue and hands the manipulandum to the examinee. If the examinee responds correctly, the examiner provides praise and a preferred item. However, if the examinee responds incorrectly, a demonstration, guided trial, and an opportunity for an independent response are repeated until the examinee demonstrates one correct independent response. Once the examinee demonstrates one correct independent response, formal testing on that ABLA level begins.

Formal test trials are conducted in an identical manner to the independent response trial described above. During testing, correct responses are followed by praise and a preferred item (e.g., an edible). Incorrect responses are followed by an error correction procedure, consisting of a demonstration, guided trial, and an independent practice trial. During the error correction procedure, an independent correct response is followed by praise only. Independent incorrect responses are followed by a repeat of the error correction procedure. Once the examinee responds correctly on the independent practice trial of the error correction procedure, test trials resume. An examinee's correct responses during any aspect of the error correction procedure do not count toward the pass criterion; however, incorrect responses during the independent practice trial of the error correction procedure do count toward the failure criterion. Testing on an ABLA level continues until the examinee has reached either the pass criterion of eight consecutive correct responses, or the fail criterion of eight cumulative incorrect responses, whichever occurs

first. These particular criteria were chosen because the probability of meeting the pass criterion by chance is very low (approximately 0.03) (Kerr et al., 1977).

ABLA Research Findings

Over the past 30 years, there have been numerous studies conducted on the ABLA. The majority of these findings have examined the ABLA in relation to individuals diagnosed with intellectual disabilities. First, ABLA discriminations underlie many self-care, academic, vocational, and prevocational tasks that are typically assigned to individuals with intellectual disabilities in residential and community training facilities (DeWiele & Martin, 1996; Kerr et al., 1977). Second, test levels are hierarchically ordered in terms of difficulty (Casey & Kerr, 1977; Harapiak, Martin, & Yu, 1999; Kerr & Meyerson, 1977a; Kerr et al., 1977; Martin, Yu, Quinn, & Patterson, 1983; Wacker, 1981). That is, an examinee who fails a particular ABLA level (e.g., level 4) will fail all higher levels (e.g., levels 5 and 6) and will pass all lower levels (e.g., levels 1, 2, and 3). Third, the ABLA has high test-retest and inter-tester reliability (Martin et al., 1983). Fourth, failed ABLA levels are very difficult to teach using the ABLA's standard prompting and reinforcement procedures that were described previously. Hundreds of training trials are necessary to show little, if any, improvement on a previously failed level of discrimination (Meyerson, 1977; Stubbings & Martin, 1995, 1998; Vause, Martin, Yu, Marion, & Sakko, 2005; Witt & Wacker, 1981; Yu & Martin, 1986). However, ABLA levels can be rapidly taught to both children and adults with intellectual disabilities using multiple component training packages (Conyers, Martin, Yu, & Vause, 2000; Hazen, Szendrei, & Martin, 1989; Murphy, Figueroa, Martin, Yu, & Figueroa, 2008; Walker, Martin, & Graham, 1991; Yu & Martin, 1986). Fifth, as will be described in more detail in the next section, the ABLA is highly predictive of an individual's performance on other discrimination tasks (Martin, Thorsteinsson, Yu, Martin, &

Vause, 2008). Sixth, compared to experienced caregivers, ABLA performance is more accurate in predicting an individual's learning ability (Stubbings & Martin, 1998; Thorsteinsson et al., 2007). Moreover, direct-care staff often request that clients complete tasks that are inconsistent with the clients' learning abilities, as predicted by the ABLA (DeWiele & Martin, 1996; Vause, Martin, Cornick, et al., 2000). Seventh, mismatching an individual's ABLA level with the ABLA difficulty of training tasks can result in aberrant behaviour (Vause, Martin, & Yu, 1999). Finally, an individual's performance on the ABLA is correlated with other tests of the individual's intellectual and adaptive functioning, such as the Vineland Adaptive Behaviour Scales, the Wechsler Adult Intelligence Scale-Revised (WAIS-R), the Distar Reading Readiness Test, and the Communication Ability Screening Survey (Barker-Collo, Jamieson, & Boo, 1995; Kerr et al., 1977; Meyerson, 1977; Richards, Williams, & Follette, 2002; Vause, Martin, & Yu, 2000).

The Predictive Validity of the ABLA with Persons with Intellectual Disabilities

The ABLA is highly predictive of an individual's performance on other discrimination tasks. That is, a training task that requires a previously learned ABLA level of discrimination will be learned quickly, while a task that requires a previously failed ABLA level of discrimination will be learned very slowly, or not at all.

Martin et al. (2008) reviewed six studies that examined the predictive validity of the ABLA with various imitative and two-choice discrimination tasks (referred to as criterion tasks) (Stubbings & Martin, 1995, 1998; Tharinger, Schallert, & Kerr, 1977; Thorsteinsson et al., 2007; Wacker, Kerr, & Carroll, 1983; Wacker, Steil, & Greenebaum, 1983). Across the studies, there were 77 participants, ranging in age from 4 to 55 years, who had diagnoses of intellectual disabilities that ranged from profound to mild. Before attempting to teach the criterion tasks to the participants, the researchers made two predictions: (a) if a participant passed up to and

including a particular ABLA level, that participant would also pass criterion tasks that required corresponding or lower levels of discriminations; and (b) if a participant failed a particular ABLA level, that participant would also fail criterion tasks that required corresponding or higher levels of discriminations. There were two types of criterion tasks that researchers attempted to teach to participants using the testing procedures and the pass/fail criteria of the ABLA. First, an attempt was made to teach to 23 participants criterion tasks that used similar materials as the ABLA (e.g., a box and a can of different colour and size than the box and can used in the ABLA; see Table 2 in Martin et al., 2008). Based on the participants' performance on the ABLA, the percentage of confirmed pass/fail predictions on these criterion tasks was 90%. Second, an attempt was made to teach criterion tasks using common everyday materials that are frequently found in prevocational and educational settings to 69 participants. For example, in order to perform an ABLA level 4 (match-to-sample) task, the participant was required to place a blue letter into a blue envelope and place a brown letter into a brown envelope. Based on the participants' performance on the ABLA, the percentage of confirmed pass/fail predictions on these types of criterion tasks was 92%.

As stated previously, research has shown that, compared to experienced caregivers, ABLA performance is more accurate in predicting an individual's learning ability. Stubbings and Martin (1998) asked experienced direct-care workers to make predictions about the training tasks that a client with an intellectual disability could learn, if the client was exposed to the testing procedures and pass/fail criteria of the ABLA. Predictions were made by (a) caregivers that had worked with the client for a minimum of 8 months; and (b) caregivers that did not personally know the client, but were allowed to interact with the client for a period of 30 minutes. Predictions were also made based on the clients' ABLA performance. A total of 18 individuals

with severe or moderate intellectual disabilities, ranging in age from 9 to 39 years, were assessed on the ABLA. The researchers predicted that a client would pass the criterion tasks that corresponded to the ABLA levels that the client had previously passed, and would fail the criterion tasks that corresponded to the ABLA levels that the client had previously failed. Based on the clients' ABLA performance, 90% of the researchers' predictions were confirmed. However, only 81% of the predictions from the experienced caregivers familiar with the clients were confirmed, and 73% of the predictions from the experienced caregivers who had interacted with the clients for 30 minutes were confirmed. Moreover, the differences between the number of confirmed predictions for each group and predictions based on the ABLA were statistically significant.

Thorsteinsson et al. (2007) replicated this study with 20 adults diagnosed with profound, severe, and moderate intellectual disabilities, for making predictions of learning everyday tasks. The study compared predictions based on the clients' ABLA performance to the predictions of caregivers who had worked with the clients for a minimum of 24 months. Based on the participants' ABLA performance, 94% of the predictions were confirmed, while only 72% of the caregivers' predictions were confirmed. Again, predictions based on the clients' ABLA performance were significantly more accurate in predicting the participants' learning abilities.

Autism and the ABLA

Compared to individuals with intellectual disabilities, there is less research on the ABLA and children with autism. However, a few studies have provided preliminary evidence for the ABLA's relevance as an assessment and training tool for individuals with autism.

Ward and Yu (2000) and Morris (2002) confirmed the ABLA hierarchy, as described previously, with children with autism. Moreover, upon retesting three months later, all the

children had similar ABLA performances (Morris, 2002). This latter finding confirms that the ABLA has high test-retest reliability with children with autism. Viel et al. (2011) and Ward and Yu also demonstrated that a child's ABLA test performance is correlated with the child's language abilities.

Cummings and Williams (2000) attempted to teach three types of visual matching tasks to five children diagnosed with a PDD. Three of the children were initially assessed at ABLA level 2 (position discrimination), and two of the children were assessed at ABLA level 4 (match-to-sample discrimination). If an examinee passes an ABLA level, such as level 2, and fails all higher levels (i.e., levels 3, 4, 5, and 6), then the examinee is said to be at the highest passed level. In the Cummings and Williams study, all five children, regardless of their initial ABLA level, were able to pass the matching tasks. Although this finding conflicts with past ABLA research with individuals with intellectual disabilities, it should be noted that the children were not later reassessed on the ABLA in order to demonstrate that they were still functioning at their initial discrimination level (i.e., at ABLA levels 2 and 4, respectively). Given that all of the children were also receiving weekly, in-home, one-on-one skills training while they were participating in the study, it is conceivable that they may have learned new discrimination skills during this time, and therefore progressed though some of the ABLA discrimination levels by the end of the study's data collection phase. Nonetheless, Cummings and Williams did find that auditory tasks (i.e., vocal imitation) were more difficult than visual tasks (three-choice visual matching and picture exchange training), in that the children had to learn the visual tasks before they were able to learn the auditory tasks.

Condillac (2002) examined the predictive validity of the ABLA with 46 individuals with a dual diagnosis of intellectual disabilities and an ASD (i.e., either autism or PDD-NOS). The

participants were first assessed on the ABLA. Two of the participants failed all six ABLA levels, while one participant was assessed at ABLA level 1, five participants at ABLA level 2, seven participants at ABLA level 3, 16 participants at ABLA level 4, and 15 participants at ABLA level 6. Similar to the predictive validity studies with individuals with intellectual disabilities, Condillac then attempted to teach each participant two types of criterion tasks at each of the ABLA levels (for a total of 12 tasks). The first type of criterion tasks used materials that were similar to the ABLA (e.g., white box and black can); the second type of criterion tasks used everyday training materials (e.g., cutlery, socks). Condillac predicted that participants would pass the criterion tasks that corresponded to the ABLA levels they had previously passed, and would fail the criterion tasks that corresponded to the ABLA levels they had previously failed. Across the two types of criterion tasks, predictions were confirmed for 86% of the criterion tasks. Specifically, 95% of the predictions for the criterion tasks that used similar materials were confirmed, and 78% of the predictions for the criterion tasks that used everyday training materials were confirmed. However, for the six tasks that used everyday training materials, there was a large range with regard to the prediction accuracy across the discrimination levels. Therefore, it may be more meaningful to examine the percent correct at each discrimination level. As such, predictions were confirmed for 72% of the tasks corresponding to ABLA level 1, 57% of the tasks corresponding to ABLA level 2, 80% of the tasks corresponding to ABLA level 3, 85% of the tasks corresponding to ABLA level 4, and 87% of the tasks corresponding to ABLA levels 5 and 6, respectively.

There were a number of limitations of the Condillac (2002) study. First, at each ABLA level, only one criterion task using everyday training materials was assessed. Second, although the everyday training tasks were assumed to be consistent with the corresponding ABLA levels,

no inter-observer reliability agreements were conducted to confirm this assumption. For example, in order to assess the predictive validity of ABLA level 1 (imitation), the examiner modeled a stirring motion with a spoon inside of an empty cup. However, this task appears to involve a chain of behaviours, making it more complex than a simple imitation task. Moreover, according to Kerr and Meyerson's (1977b) original definition of ABLA level 1, the task may have involved behaviours that the children were unable to perform themselves, and therefore not an appropriate ABLA level 1 task. The activity may have also been inconsistent with the everyday experiences of these children. That is, the children may have learned to perform a stirring motion only in situations when there had actually been something in a container to stir. Finally, as emphasized in the *DSM-IV-TR* diagnostic criteria for autism, the ability to engage in pretend play is a marked deficit in individuals with autism (APA, 2000; Chawarska & Volkmar, 2005; Rutherford & Rogers, 2003). A second example involved the criterion task that corresponded to ABLA level 2 (position discrimination) using everyday training materials. For this task, a plate resting on a placemat was presented in front of the participant. The participant was then required to place a cup in the upper right quadrant of the placemat either above or beside a plate. However, this appears to be a four-choice discrimination rather than a two-choice discrimination (i.e., with possible responses occurring in the upper right and left quadrants, as well as the lower right and left quadrants of the placemat), and therefore may have been a more difficult task for the participants. Moreover, placing the manipulandum above/beside the plate may have been inconsistent with the participant's learning history, if the participant had been previously reinforced on the ABLA for placing the manipulandum inside of the containers.

In order to overcome these limitations, Schwartzman et al. (2009) replicated the above study with participants assessed at ABLA levels 4 and 6 using a wider variety of criterion tasks.

There were four criterion tasks at each of ABLA levels 1, 2, 3, 4, and 6 (for a total of 20 tasks). Schwartzman et al. did not include tasks for ABLA level 5. In six studies (as cited in Martin & Yu, 2000) that involved 197 clients who passed ABLA level 5, all but 8 of those clients also passed ABLA level 6. Therefore, ABLA level 5 provides very little information about a client's learning abilities, and Martin and Yu recommended that ABLA level 5 be deleted from the ABLA. Moreover, Schwartzman et al. included a criterion task only if two experts on the ABLA reached 100% inter-observer agreement that it was an appropriate task. Martin and Yu defined an expert as a person who meets the following criteria: (a) a minimum of 3 years working with individuals with developmental disabilities, (b) a minimum of 20 hours studying descriptions of each ABLA task and scoring criteria, (c) a minimum of 10 hours observing clients being assessed on the ABLA, and (d) a minimum of 30 hours of personal experience administering the ABLA.

Participants were 16 children, 2 females and 14 males, who ranged in age from 3 to 11 years. All of the children were involved in government programs for children with autism and resided in either Ontario or Manitoba. During the initial ABLA assessment, eight children were assessed at ABLA level 4 and eight children were assessed at ABLA level 6. In addition, 15 of the children had a parent participate in the study (11 mothers and 4 fathers). A parent was provided a written description of each criterion task, as well as the training procedures that would be used to teach that task. Each parent was asked to predict if his/her child would learn a task (defined as 8 consecutive correct responses) before failing that task (defined as 8 cumulative incorrect responses), when exposed to standardized prompting and reinforcement procedures. Schwartzman et al. (2009) predicted that the children would pass the criterion tasks that corresponded to their passed ABLA levels, and would fail the criterion tasks that corresponded

to their failed ABLA levels. Based on the children's ABLA performance, 94% of the predictions were confirmed. However, only 85% of the parents' predictions were confirmed. Compared to the parents, ABLA performance was significantly more accurate in predicting the children's performance on the criterion tasks.

Statement of the Problem

Although these initial results are promising in terms of establishing predictive validity of the ABLA with children with autism, Schwartzman et al. (2009) established the predictive validity of ABLA levels 4 and 6, leaving a gap in the literature with regard to the predictive validity of ABLA levels 1, 2, and 3 with children with autism. Therefore, I attempted to replicate the Schwartzman et al. study to establish the predictive validity of ABLA levels 1, 2, and 3. I hypothesized that the children would pass the criterion tasks that corresponded to their previously passed ABLA levels, and would fail the criterion tasks that corresponded to their previously failed ABLA levels. In addition, one parent from each child was asked to predict, for each criterion task, which criterion the child would reach first, the pass or fail criterion. I hypothesized that, compared to the parents' predictions, predictions based on the children's ABLA performance would be significantly more accurate in predicting the children's learning performance on the criterion tasks.

Method

Participants

Participants were nine children diagnosed with an ASD. Over a period of 30 months, I attempted to recruit children through Manitoba Family Services and Consumer Affairs Children's Disability Services and the St. Amant ABA Preschool Program for Children with Autism. St. Amant is a community and residential treatment centre for persons with

developmental disabilities, including children with autism. During this time period, I received parental consent for 103 children to participate in the research project. After conducting a short phone screen with a parent of each child, 39 of the parents reported that their child had little to no expressive language skills. Given the recruitment criteria (i.e., children assessed at ABLA levels 1, 2 or 3), I assessed each of these children on the ABLA. Nine of these children were assessed at ABLA levels 2 or 3 and were therefore eligible to continue participating in the project. One additional child, referred to as Participant 10 herein, was assessed at ABLA level 1. However, his ABLA testing results were inconsistent and therefore the data was not included in the data analysis (see Appendix A for Participant 10's results).

A total of six males and three females participated (see Table 2 for a summary of participant characteristics). The children ranged in age from 2 to 12 years. According to agency records and/or parental report, five of the children had co-morbid diagnoses, such as global developmental delay, Down syndrome, and auditory impairment. Seven of the participants were recruited from the St. Amant ABA Preschool Program for Children with Autism. Of these children, one child was enrolled in the St. Amant ABA Preschool Program at the time of her participation, while the other six were recruited from the program's waitlist. In order to be accepted into the St. Amant ABA Preschool Program, children are required to have received a diagnosis of an ASD by a licensed psychiatrist or psychologist. The other two participants were recruited from Manitoba Family Services and Consumer Affairs Children's Disability Services. At the time of participation, both children were enrolled in a middle-years school. Of note, one of these two children had previously been enrolled in a private ABA Preschool Program. In order to be registered with Manitoba Family Services and Consumer Affairs Children's Disability Services, a referral must be made from the professional who diagnosed the child with an ASD.

Table 2

Participant Characteristics

Participant	Age	Gender	Diagnosis	ABLA level	Parent's highest education level achieved	Parent familiar with ABLA	Referral source
1	7 years	Female	ASD; GDD; disorder of motor planning	2	Post secondary degree	Yes	ABA
2	12 years	Male	ASD; Down syndrome; hearing impaired; sleep disorder; disorder of motor planning; anxiety	2	Post secondary degree	No	CDS
3	10 years	Male	ASD	2	Post secondary degree	No	CDS
4	2 years	Female	ASD	3	Post secondary degree	No	ABA (Waitlist)
5[a]	2 years	Male	ASD; GDD	3	Post secondary degree	No	ABA (Waitlist)
6[a]	2 years	Male	ASD; GDD	3	Post secondary degree	No	ABA (Waitlist)
7	3 years	Male	ASD	3	Some post secondary education	No	ABA (Waitlist)
8	3 years	Male	ASD	3	Some post secondary education	No	ABA (Waitlist)
9	3 years	Female	ASD; GDD	3	Some post secondary education	No	ABA (Waitlist)

Note. ABLA = Assessment of Basic Learning Abilities; ASD = Autism Spectrum Disorder; GDD = Global Developmental Delay; ABA = St. Amant ABA Preschool Program for Children with Autism; CDS = Manitoba Family Services and Consumer Affairs Children's Disability Services.

[a]Participant 5 and Participant 6 are brothers.

During the initial ABLA testing, three children were assessed at ABLA level 2 and six children were assessed at ABLA level 3. Consent was obtained from each child's parent (see Appendices B and C).

In addition, one parent of each of the nine children participated. In each case, the mother of the child participated.

Setting

For eight of the children, all of the testing and training sessions took place within their respective homes. In these cases, sessions took place in a quiet room and access to potential reinforcers (e.g., toys, food) was restricted. For one child, the parents requested that the sessions be held at St. Amant. In this case, the sessions took place in a quiet testing room.

During testing and training sessions, the child sat at a table or on the floor directly across from the examiner. In the event that an additional observer was present for reliability checks, the observer sat next to the examiner. In addition, some of the mothers were present during the sessions. In these cases, the mothers were asked to remain neutral during the testing and training process and, when necessary, to position themselves out of the child's line of sight in order to avoid providing accidental prompts to the child.

Materials

ABLA. Materials included a yellow can (15.5 cm in diameter and 17.5 cm in height), a shorter red box with black, diagonal stripes (14 cm by 14 cm by 10 cm), a yellow cylinder (9 cm long and 4 cm in diameter), a red cube with black, diagonal stripes (5 cm by 5 cm by 5 cm), and an irregularly-shaped piece of white foam (5 cm in diameter).

Criterion tasks. There were four criterion tasks corresponding to each of ABLA levels 1, 2, 3, 4, and 6, for a total of 20 tasks. These were the criterion tasks used by Schwartzman et al.

(2009), and according to two experts on the ABLA (see Martin and Yu, 2000), the tasks were consistent with the corresponding ABLA levels, respectively. Of the four tasks at each ABLA level, two of the tasks used materials that were similar to the ABLA materials and two of the tasks used materials that were different from the ABLA materials. See Table 3 for a description of the 20 criterion tasks.

Procedure

Semi-structured interview. At the start of the initial meeting with the participants, I conducted an informal semi-structured interview with each mother in order to gain more information about the child (see Appendix D). For example, each mother was asked to identify potential reinforcers that could be used (i.e., food, activities, toys), as well as to note any problem behaviour that may arise during the session and how those behaviours should be consequated. The mothers were then asked about their familiarity with the ABLA and their highest education level attained (for reliability purposes, which will be described later) (see Appendix E). During the interview, only one mother reported that she was familiar with the ABLA; however, this mother was also the only parent with a child currently enrolled in the St. Amant ABA Preschool Program for Children with Autism.

Predictions of child performance based on parent predictions. In order to prevent the child's initial ABLA performance from potentially influencing the parents' predictions of their child's learning abilities, each mother was asked to predict her child's pass-fail learning performance on the criterion tasks prior to the start of ABLA testing. The parent was first provided with a written description of the training procedures that would be used when

Table 3

Description of Criterion Tasks

Corresponding ABLA level	Similar	Similar	Different	Different
Level 1: Imitation.	1. Standard ABLA with a green can, white box, and beige foam (4 trials with each item).	2. A felt board is placed in front of child. After examiner demonstrates placing either a red block or a yellow triangle onto the felt board, the child is required to do the same when verbally prompted to, "put it on" (4 trials with each item).	3. A pegboard with one peg and a container are placed in front of the child. After the examiner demonstrates taking the peg off and placing it in the container, the child is required to place the peg in the container when the examiner says, "take it off".	4. A wooden ring stand is placed in front of the child. The examiner demonstrates how to put on a respective shape. The child is required to do the same when teacher says, "put it on".
Level 2: Position Discrimination	5. Standard ABLA with a green can, white box, and beige foam.	6. When a round gold container and a rectangular blue container are presented in a fixed position, the child is required to consistently place a cardboard star into the container on the left (i.e., blue container) when examiner says, "where does it go?"	7.When a blue block and a gold block are presented in fixed positions to the left and right of a tin can, respectively, the child is required to consistently place the blue block (positioned to the left of the tin can) into the tin can when examiner says, "which one?"	8. When a placemat that is half black and half white is presented in a fixed position, the child is required to consistently place a red cup onto the right side of the placemat (i.e., the white side) when examiner asks, "where does it go?"
Level 3: Visual Discrimination	9. Standard ABLA with a green can, white box, and beige foam.	10. When a round gold container and a rectangular blue container are randomly presented in left-right positions, the child is required to consistently place a cardboard star into the blue container when examiner says, "where does it go?"	11. When a measuring cup and a tin can are randomly presented in left-right positions, the child is required to consistently place a yellow spoon into measuring cup when examiner says, "where does it go?"	12. When a blank card and a black and white card with a picture of a cat are randomly presented in left-right positions, child is required to consistently place a block onto the black and white card with a picture of a cat when examiner says, "put it on the picture".

Table 3 continued

Description of Criterion Tasks

Corresponding ABLA level	Similar	Similar	Different	Different
Level 4: Match-to-Sample	13. Standard ABLA with a green can, white box, green cylinder, and white cube.	14. When a large brown and a small white envelope are presented in random left-right positions and the child is presented with a small white or a large brown folded piece of paper, the child consistently places the folded piece of paper on top of the corresponding envelope when the examiner says, "where does it go?"	15. When a white plastic plate containing a role of tape and a white plastic plate containing a stapler are presented in random left-right positions and the child is given either a role of tape or a stapler, the child consistently places the role of tape or the stapler on the correct plate when examiner says, "where does it go?"	16. When a black-and- white picture of a building and a black-and-white picture of people are presented in random left-right positions and the child is given a black-and-white picture of either buildings or people, the child consistently places the sample picture onto corresponding comparison picture when examiner says, "where does it go?"
Level 6: Auditory-Visual Discrimination	17. Standard ABLA with a green can, white box, and beige foam.	18. When presented with a yellow triangle and a red square (in random positions) the child is required to consistently place the yellow triangle onto a felt board when the examiner randomly says, "yellow triangle" (in a low-pitched, drawn-out fashion) or the red square when examiner says, "red square" (in a high-pitched, rapid fashion).	19. When presented with a role of tape and a stapler (in random positions), the child is required to consistently pick up the correct item when the examiner randomly says "tape", or "stapler" (spoken in a normal tone) and place it into a white rectangular container.	20. When presented with a black-and-white picture of a building and a black-and-white picture of people (in random positions), the child is required to touch the correct picture when the examiner randomly says, "building", or "people" (spoken in a normal tone).

Note. ABLA= Assessment of Basic Learning Abilities.

attempting to teach each criterion task to the child (see Appendix F). The mother and the examiner reviewed this description together, and the examiner provided a demonstration of a criterion task. Once the mother verbally indicated she understood the training procedures, she was asked to complete the prediction questionnaire (see Appendix G). The prediction questionnaire provided a written description of the 20 criterion tasks, which were listed in randomized order. Each description included: (a) the materials used during the task, (b) the position of each stimulus in relation to both the child and the other stimuli present during the task, (c) the instructions provided to the child, and (d) the response(s) required from the child in order to perform the task correctly. The mother was also provided with a prompt sheet that she could refer to while completing the prediction questionnaire (see Appendix H).

For each criterion task, the parent was asked to make predictions about which criterion would be met first, the pass criterion (i.e., 8 consecutive correct responses) or the fail criterion (8 cumulative incorrect responses). The parent was also asked to rate how confident she felt about her predictions on a scale of 1 to 7, where 1 = “it’s a guess”, 4 = “somewhat confident”, and 7 = “very confident”.

In order to ensure that I, as the experimenter, remained blind as to the parent predictions throughout the testing and training process, I did not look at the parents’ predictions until the child was assessed on all 20 of the criterion tasks. Furthermore, if possible, observers who were present to conduct reliability checks on the criterion tasks were blind as to the child’s initial ABLA performance.

Preference assessment. Using the information gathered from each mother during the informal semi-structured interview, I presented the child with a choice of six edibles at the start of each testing and training session. The child was asked to choose three of the six edibles, which were then randomly alternated during that session to reinforce correct responses. If the child was uninterested in or unable to consume edibles, preferred activities or toys were used in lieu of the edible items.

Rapport building. As the majority of the children had little to no ABA training (and were therefore unfamiliar with the ABA procedure of discrete trials teaching), a 5-minute rapport-building period was implemented prior to the start of ABLA testing and, if necessary, the criterion task training sessions. During this period, I verbally reinforced appropriate behaviour (e.g., "good attending", "nice sitting"). After approximately 5-minutes, the session would begin.

ABLA procedure. Testing on each ABLA level was conducted as described on Page 7 and Page 9. For the participant with an auditory impairment, all verbal cues were also provided using American Sign Language.

For three of the participants, the child appeared fatigued or uninterested while completing some of the ABLA levels towards the end of a testing session. Therefore, in order to ensure accuracy when determining a child's discrimination ability, the session was terminated, and the child was retested on that particular ABLA level at the beginning of the next session. In these cases, the "best two out of three" rule was applied when assigning the child's ABLA level. That is, if the child obtained an identical result as he/she had during the initial testing (i.e., passed or failed that level again), then the highest level passed during the initial session was assigned as the child's current ABLA level. For example, if the child passed ABLA level 3 and failed ABLA level 4 twice (on two separate occasions), then the child was assigned a pass on ABLA level 3

and a fail on ABLA level 4. However, if the child obtained a different result than he/she had during the initial testing, the child was then retested on that level a third time, and the child's ABLA level was assigned based on his/her performance during that particular testing session. For example, if the child failed ABLA level 3 once, but went on to pass ABLA level 3 during the next two testing sessions, then the child was assigned a pass on ABLA level 3.

Predictions of child performance based on the ABLA. I made predictions for each child's learning performance on each of the 20 criterion tasks. There were a total of 180 predictions (20 tasks x 9 children). However, one parent failed to indicate her prediction for one of the criterion tasks. Therefore, I removed the corresponding prediction based on the child's ABLA performance for this task, for a final total of 179 predictions. Using a standardized training procedure (described later) and the ABLA pass/fail criteria (i.e., eight consecutive correct responses or eight cumulative incorrect responses, respectively), I attempted to teach each criterion task to the child. I hypothesized that each child would pass the criterion tasks that were corresponding to or lower than their highest ABLA level passed, and would fail the criterion tasks that were corresponding to or higher than their highest ABLA level passed. In other words, I hypothesized that the children assessed at ABLA level 2 (position discrimination) would pass the criterion tasks that corresponded to ABLA levels 1 and 2, and fail the tasks that corresponded to ABLA levels 3, 4, and 6; and the children assessed at ABLA level 3 (visual discrimination) would pass the criterion tasks that corresponded to ABLA levels 1, 2, and 3, and fail the tasks that corresponded to ABLA levels 4 and 6.

Training procedures for the criterion tasks. I attempted to teach the 20 criterion tasks to each child using the ABLA procedure described previously. Prior to teaching a task, the child was provided a demonstration of the correct response, followed by a guided trial and an

opportunity for an independent response. For the majority of the children, praise and a preferred item were given after every correct independent response. However, if the child appeared to have difficulty attending during a task, or if consuming the preferred item required more than approximately 10 seconds (e.g., access to television program), praise was given after every correct independent response and access to the preferred item was given after approximately every third correct independent response. In addition, some participants were provided additional praise and access to preferred items for compliant behaviour (e.g., “nice sitting”, “nice hands”, “nice attending”) during the sessions. For all of the children, an error correction procedure (consisting of a demonstration, guided trial, and an independent practice trial) was given after an incorrect independent response. Training continued until either the pass criterion (i.e., eight consecutive correct responses) or the fail criterion (eight cumulative incorrect responses) was met, whichever occurred first.

For each child, the tasks were presented in a quasi-random order. That is, tasks were randomly presented, although no two tasks that involved the same discrimination ability (e.g., two ABLA level 1 imitation tasks) were presented sequentially within a session. Moreover, in the case of one participant who demonstrated a high frequency of escape-maintained problem behaviour during the initial training sessions, that participant was first assessed on criterion tasks that were either at or below his ABLA level in order to increase the likelihood of reinforcement for correct independent responses and compliant behaviour.

After I had administered all of the criterion tasks to a child, I retested each child on the ABLA to determine if the ABLA level of that child had changed from his/her initial level (i.e., to determine if the child was still functioning at the same discrimination ability).

Each training session was approximately 45 minutes in duration, and ranged from 15 minutes to 135 minutes. Including ABLA testing, the mean number of tasks completed per session was approximately four, and ranged from one to 14. The mean number of sessions required to complete all of the testing and training sessions was approximately eight, and ranged from three to 12.

Reliability Assessments

Inter-observer reliability (IOR). For 47% of the testing and training sessions, IOR checks were conducted. An observer and I independently recorded a child's correct and incorrect responses on each trial. A trial was defined as an agreement if both observers recorded the same response; otherwise, it was defined as a disagreement. An IOR score for a session was calculated by dividing the number of agreements by the number of agreements plus the number of disagreements, and then multiplying by 100% (Martin & Pear, 2011). Overall, a mean IOR score of approximately 99% was obtained, with scores ranging from 81% to 100%.

Procedural reliability (PR). For 33% of the semi-structured interviews with the mothers and 38% of the testing and training sessions with the children, PR checks were conducted. An observer used a procedural datasheet that outlined the specific procedural steps that should be followed during each component. Both the observer and I independently monitored whether each item on the datasheet was carried out correctly. A step was defined as an agreement if both the observer and I recorded that that step was carried out correctly; otherwise, it was defined as a disagreement. Percent agreement for each session was calculated as described above for IOR. With regard to the semi-structured interviews, 100% agreement was obtained on each interview. With regard to the testing and training sessions, a mean PR score of approximately 97% was obtained, with scores ranging from 80% to 100%.

Procedural integrity (PI). For 33% of the semi-structured interviews with the mother and 38% of the testing and training sessions, PI checks were conducted. The PI score was calculated from the PR data collected by the observer. For each session, the number of steps the observer recorded as correctly followed was divided by the total number of steps and multiplied by 100%. With regard to the semi-structured interviews, a mean PI score of 100% was obtained. With regard to the testing and training sessions, a mean PI score of 99% was obtained, with scores ranging from 91% to 100%.

Reliability of parent predictions. Three steps were taken in order to measure the reliability of the parents' predictions. First, in order to ensure that the parents could understand the written questionnaire, I inquired about each mother's highest education level achieved in an attempt to assess each parents' reading ability. Six of the mothers reported that they had graduated from a post-secondary education program, while three of the mothers reported that they had at least some post-secondary education. All of the parents had completed Grade 12. Given their achieved level of education, it would seem reasonable to assume that the mothers had, at least, average reading abilities. Second, as mentioned previously, each parent was given a prediction questionnaire (see Appendix G) that described each of the criterion tasks, including (a) the materials used during the task, (b) the position of each stimulus in relation to both the child and other stimuli present during the task, (c) the instructions provided to the child, and (d) the response(s) required from the child in order to perform the task. Based on these descriptions, parents were asked to predict, for each criterion task, which criterion would be met first, the pass criterion (i.e., 8 consecutive correct responses) or the fail criterion (8 cumulative incorrect responses). I conducted a Flesch-Kincaid readability test on the questionnaire. The readability test assesses the reading level of textual materials. The questionnaire achieved a rating equivalent

to a Grade 7.2 reading level, which falls within the generally recommended score range of 7.0 - 8.0 (Microsoft Corporation, 2011). Third, although psychometric measures (such as spilt-half reliability) can be used to assess the reliability and validity of written questionnaires, I did not use these measures due to the small number of respondents (n = 9) and test items (n = 20). However, a descriptive analysis was used to examine the mothers' responses to the test items. The mothers' predictions were split into two data sets; the first set consisted of each mother's first 10 predictions (i.e., Predictions 1 through 10), while the second set consisted of each mother's final 10 predictions (i.e., Predictions 11 through 20). As mentioned previously, the criterion tasks were listed in random order, so both data sets were counterbalanced to reflect the parents' prediction accuracy for criterion tasks that corresponded to each of the ABLA levels 1, 2, 3, 4, and 6. As Participant 8 only had 19 parental predictions recorded, the total number of accurate predictions for each participant was then converted into a percentage in order to allow a comparison between the two data sets (see Table 4). Eight of the nine mothers obtained fairly similar percent correct between Predictions 1-10 and Predictions 11-20. However, Participant 9's parental predictions deviated from this pattern; she obtained 100% correct on the first set of predictions, but only 30% correct on the second set of predictions. I, as the experimenter, did not observe any notable events or behaviour that occurred while Participant 9's mother was completing the questionnaire that could be used to help explain this result. However, I was interacting with her daughter in the same room while the mother was completing the questionnaire. It is possible that the mother became increasingly distracted by our presence in the room, thereby losing concentration and focus on the task and providing less accurate predictions as she progressed through the questionnaire.

Table 4

Accuracy of the Parents' Predictions for Predictions 1-10 and Predictions 11-20

Participant number	Percent Correct for Predictions 1-10 (%)	Percent Correct for Predictions 11-20 (%)	Accuracy difference: Predictions 1-10 vs. Predictions 11-20
1	70	80	10
2	40	40	0
3	60	60	0
4	80	90	10
5	50	50	0
6	40	40	0
7	80	70	10
8	30	55[a]	25
9	100	30	70

Note. [a]Based on 9 predictions.

Results

Predictions of Learning Performance: ABLA Results versus Parent Predictions

The children's pass-fail performance on the criterion tasks is presented in Table 5. The children's performance on the criterion tasks were compared to both the parents' predictions and the predictions based on their ABLA performance, for a total of 179 predictions (9 participants x 20 criterion tasks - 1 task for Participant 8). The percentage of predictions that were confirmed for each child is presented in Table 6. The ABLA was more accurate than the parents in predicting the children's performance for eight of the nine participants, and was equally accurate for the other participant. For predictions based on the children's ABLA performance, 92% of the predictions were confirmed with a phi-coefficient of .843. For parents, 59% of their predictions were confirmed with a phi coefficient of .198. The proportion of accurate predictions made based on the children's ABLA performance was significantly larger than the proportion of accurate predictions made by the parents: McNemar's χ^2 (1, 179) = 45.21, $p < .001$. That is, the predictions based on the child's ABLA performance were significantly more accurate than the parents' predictions of their children's pass-fail performance on the criterion tasks.

Prediction Accuracy by the ABLA Level of Each Criterion Task

The prediction accuracy according to the ABLA level of each criterion task is shown in Table 7. For 19 of the 20 criterion tasks, predictions based on the children's ABLA performance were more accurate than the parent predictions. For one criterion task corresponding to ABLA level 4 (match-to-sample; i.e., Task #14), the predictions based on the child's ABLA performance were equally as accurate as the parent predictions. Closer examination showed that criterion tasks corresponding to ABLA level 6 (visual-auditory discrimination) resulted in the highest percentage of confirmed predictions based on parent predictions, with a mean of 72%.

Table 5

Participants' Pass-Fail Performance on the Criterion Tasks

		ABLA level of criterion tasks																			
		Level 1				Level 2				Level 3				Level 4				Level 6			
Participant	Participants' ABLA level	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	2	P	P	P	P	P	P	P	P	P	F	F	F	F	P	F	F	F	F	F	F
2	2	P	P	P	P	P	P	P	P	F	F	F	F	F	F	F	F	F	F	F	F
3	2	P	P	P	P	P	P	P	P	F	F	F	F	F	F	F	F	F	F	F	F
4	3	P	P	P	P	P	P	P	P	P	P	P	P	F	F	F	F	F	F	F	F
5	3	P	P	P	P	P	P	P	P	P	F	F	P	F	F	F	F	F	F	F	F
6	3	P	P	P	P	P	P	P	P	P	P	P	P	F	F	F	F	F	F	F	F
7	3	P	P	P	P	P	P	P	P	P	P	F	F	F	F	P	F	F	F	F	F
8	3	P	P	P	P	P	P	P	P	P	P	P	P	F	F[a]	F	F	F	F	F	F
9	3	P	P	P	P	P	P	P	P	F	F	P	P	P	P	P	P	P	F	F	F

Note. ABLA = Assessment of Basic Learning Abilities; P = Pass; F = Fail.
[a]Excluded from data analysis.

Table 6

Prediction Accuracy Per Participant Based on ABLA Performance and Parent Predictions

Participant	Participants' ABLA level	Predictions confirmed from ABLA (%)	Predictions confirmed from parents (%)	Accuracy difference: ABLA vs. parent predictions (%)
1	2	90	75	15
2	2	100	40	60
3	2	100	60	40
4	3	100	85	15
5	3	90	50	40
6	3	100	40	60
7	3	85	75	10
8[a]	3	100	42	58
9	3	65	65	0
Overall Mean		**92**	**59**	**33**

Note. ABLA = Assessment of Basic Learning Abilities.
[a]Based on 19 predictions.

Table 7

Prediction Accuracy Per Predictive Task Based on ABLA Performance and Parent Predictions

	Prediction accuracy based on ABLA performance			Prediction accuracy based on parent predictions		
Criterion task	Correct	Incorrect	% Correct	Correct	Incorrect	% Correct
Level 1						
1	9	0	100	6	3	67
2	9	0	100	5	4	56
3	9	0	100	5	4	56
4	9	0	100	5	4	56
Mean			100			58
Level 2						
5	9	0	100	6	3	67
6	9	0	100	6	3	67
7	9	0	100	4	5	44
8	9	0	100	3	6	33
Mean			100			53
Level 3						
9	7	2	78	4	5	44
10	7	2	78	4	5	44
11	7	2	78	5	4	56
12	8	1	89	3	6	33
Mean			81			44
Level 4						
13	8	1	89	6	3	67
14[a]	6	2	75	6	2	75
15	7	2	78	6	3	67
16	8	1	89	6	3	67
Mean			83			69
Level 6						
17	8	1	89	6	3	67
18	9	0	100	6	3	67
19	9	0	100	6	3	67
20	9	0	100	8	1	89
Mean			97			72
Total	**165**	**14**		**106**	**73**	
Mean accuracy			**92**			**59**

Note. Total number of predictions is 179. ABLA = Assessment of Basic Learning Abilities.
[a]Based on 8 predictions.

Criterion tasks corresponding to ABLA level 1 (imitation) and ABLA level 2 (position discrimination) resulted in the highest percentage of confirmed predictions based on the children's ABLA performance, obtaining means of 100%. However, criterion tasks corresponding to ABLA level 6 (visual-auditory discrimination) were close behind, with a mean of 97%. On the other hand, criterion tasks that corresponding to ABLA level 3 (visual discrimination) resulted in the lowest percentage of confirmed predictions, with parental predictions obtaining a mean of 44% confirmed, and predictions based on ABLA performance earning a mean 81% confirmed.

Prediction Accuracy by the Children's ABLA Level

The accuracy of the predictions for each criterion task for participants assessed at ABLA levels 2 and 3 are shown in Table 8. Overall, for the three children assessed at ABLA level 2, predictions based on ABLA performance were more accurate than the parent predictions (i.e., 96% vs. 58%, respectively). Likewise, for the six participants assessed at ABLA level 3, predictions based on ABLA performance were more accurate than the parent predictions (89% vs. 60%, respectively).

Prediction Accuracy of Criterion Tasks by Materials

Across both the parents' predictions and predictions based on the children's ABLA performance, criterion tasks that used materials similar to the ABLA materials resulted in 136 confirmed predictions out of a possible 179, or 76% correct predictions. Criterion tasks that used everyday training materials resulted in 135 confirmed predictions out of a possible 179, or 75% correct predictions. More specifically, predictions based on ABLA performance obtained 90% accuracy for criterion tasks that used materials similar to the ABLA materials, and 93% accuracy for criterion tasks that used everyday training materials. The parents' predictions obtained 61%

Table 8

Prediction Accuracy for each Criterion Task Based on ABLA Performance and Parent Predictions for Participants at each of ABLA Levels 2 and 3

	Number of correct predictions based on ABLA performance		Number of correct predictions based on parent predictions	
Predictive task	Level 2 (*n* = 3)	Level 3 (*n* = 6)	Level 2 (*n* = 3)	Level 3 (*n* = 6)
Level 1				
1	3	6	2	4
2	3	6	1	4
3	3	6	2	3
4	3	6	2	3
Level 2				
5	3	6	2	4
6	3	6	2	4
7	3	6	2	2
8	3	6	2	1
Level 3				
9	2	5	2	2
10	3	4	1	3
11	3	4	1	4
12	3	5	1	2
Level 4				
13	3	5	2	4
14	2	4[a]	2	4[a]
15	3	4	1	5
16	3	5	2	4
Level 6				
17	3	5	2	4
18	3	6	2	4
19	3	6	2	4
20	3	6	2	6
Total Correct	58	107	35	71
Total Number of Predictions	60	119	60	119
Percent Correct	**96**	**89**	**58**	**60**

Note. ABLA = Assessment of Basic Learning Abilities.
[a]Based on 5 predictions.

accuracy accurate predictions for criterions tasks that used materials similar to the ABLA materials, and 56% accuracy for criterion tasks that used everyday training materials. Thus, predictions based on the children's ABLA performance and the parents' predictions obtained similar results when individually compared across both sets of materials.

Prediction Accuracy and Confidence Ratings of Parents' Predictions

Table 9 displays the percentage of correct parent predictions based on the services that their child was receiving at the time of data collection. Both of the mothers whose children were receiving services from Manitoba Family Services and Consumer Affairs Children's Disability Services predicted that their child would either pass or fail all of the criterion tasks. The mother with two children on the waitlist to receive services from the St. Amant ABA Preschool Program for Children with Autism predicted that both of her children would fail all of the criterion tasks. The two mothers with children currently enrolled in the St. Amant ABA Program (and who were familiar with the ABLA) had some of the highest percentages of predictions confirmed.

Across all of the parents, the average confidence rating of their predictions was 3.7 on a scale of 1 to 7, where 1 = "it's a guess", 4 = "somewhat confident", and 7 = "very confident". Furthermore, each parent's average confidence rating did not correlate with the accuracy of their predictions. For example, the parent with the highest percentage of accurate predictions (i.e., 85%) gave a confidence rating of 1 ("it's a guess") on all of her predictions, indicating that, although her predictions were very accurate, she felt very unsure of her predictions regarding her child's discrimination abilities. In contrast, one of the parents with the lowest percentage of accurate predictions (i.e., 40%) had one of the highest average confidence ratings (i.e., 4.55),

Table 9

Accuracy of Parents' Predictions Based on the Service their Child was Receiving at the Time of Data Collection

Participant number	Participant ABLA level	Service that the child was receiving at the time of data collection	Parents' prediction accuracy
1	2	ABA	75
10	1	ABA	65
4	3	ABA (Waitlist)	85
5[c]	3	ABA (Waitlist)	50[a]
6[c]	3	ABA (Waitlist)	40[a]
7	3	ABA (Waitlist)	75
8	3	ABA (Waitlist)	42
9	3	ABA (Waitlist)	65
2	2	CDS	40[b]
3	2	CDS	60[a]

Note. ABLA = Assessment of Basic Learning Abilities; ABA = St. Amant ABA Preschool Program for Children with Autism; CDS = Manitoba Family Services and Consumer Affairs Children's Disability Services.

[a]Mother predicted that child would fail all of the criterion tasks. [b]Mother predicted that child would pass all of the criterion tasks. [c]Participant 5 and Participant 6 are brothers.

indicating that, although she felt somewhat confident in her predictions, she was very inaccurate when predicting her child's discrimination abilities.

Discussion

The ABLA demonstrated high predictive validity with children with autism assessed at ABLA levels 2 and 3. Moreover, compared to parent predictions, the ABLA was significantly more accurate in correctly predicting the children's performance on 20 criterion tasks. Across all participants, 92% of the predictions based on ABLA performance were confirmed, while 59% of the parents' predictions were confirmed.

Across the 20 criterion tasks, predictions based on ABLA performance were more accurate than the parents' predictions of the children's pass-fail performance for eight of the participants, and equally as accurate for one participant. Closer examination of the data indicated that the parents obtained the highest percent accuracy for criterion tasks that corresponded to ABLA level 6 (visual-auditory discrimination), with a mean of 72%. Given that level 6 criterion tasks include a language component, and all of the participants displayed minimal language abilities, the mothers may have made a commonsense decision and predicted that their children would fail the level 6 criterion tasks. Predictions based on the children's ABLA performance obtained the highest percent accuracy for criterion tasks that corresponded to ABLA level 1 (imitation) and ABLA level 2 (position discrimination), with means of 100%, followed closely by tasks that corresponded to ABLA level 6 (visual-auditory discrimination), with a mean of 97%. These results may reflect floor and ceiling effects. Given that the participants were tested at either ABLA level 2 or level 3, as well as the hierarchical nature of the ABLA levels in terms of difficulty, it is not surprising that the participants passed the criterion tasks that corresponded to lower levels in the ABLA hierarchy (i.e., levels 1 and 2), and failed the criterion tasks that

corresponded to the highest level in the ABLA hierarchy (i.e., level 6). The result could also be due to the probability of correct responses decreasing as the level of the task increases (i.e., task difficulty increases). That is, children assessed at ABLA levels 2 and 3 are more likely to respond correctly on level 1 criterion tasks and incorrectly on level 6 criterion tasks. Therefore, it is more probable that they would pass level 1 tasks and fail level 2 tasks.

Interestingly, ABLA level 3 (visual discrimination) obtained the lowest percentage of predictions that were confirmed for both the parents' predictions and the predictions based on the children's ABLA performance, with means of 44% and 81%, respectfully. As the participants were assessed at either ABLA level 2 or level 3, the results indicate that both types of predictions were the most inaccurate for a discrimination level that was either directly above or equal to the child's discrimination ability, as measured by the ABLA. Interestingly, Schwartzman et al. (2008) also found that predictions for level 4 criterion tasks obtained the lowest accuracy means (=86%) for her participants assessed at ABLA levels 4 and 6 participants. This finding may indicate that there are other bridging tasks within the ABLA hierarchy, such as a visual-visual non-identity matching task that has been found to fall between ABLA level 4 and 6 (Sakko, Martin, Vause, Martin, & Yu, 2004; Ward & Yu, 2000). The finding may also reflect the children's developing discrimination skills, whether through an intensive training program or natural development (e.g., modeling, reinforcement history, genetic development). If certain discriminations skills are in development, it would not be surprising to see mixed performances (i.e., pass and fail) on tasks that required corresponding discrimination skills.

The hypothesis of developing discrimination skills may also apply to the participants who demonstrated mixed performances on criterion tasks that corresponded to other ABLA levels. For example, Participant 1 was enrolled in the St. Amant ABA Preschool Program at the time of

her participation. According to the mother's report, the child was being trained in matching programs while the study was ongoing. Therefore, given that the child was being instructed on matching skills at the same time as we were assessing those skills, it is possible that she may have started to acquire the ability to match-to-sample during the course of the research project (thus resulting in her obtaining a pass on a criterion task that corresponded to ABLA level 4 match-to-sample discrimination). Similarly, Participant 9 was recruited from the St. Amant ABA Preschool Program's waitlist. During her initial ABLA testing, she failed ABLA level 4 (match-to-sample) on two separate occasions. Therefore, according to the "best two out of three" rule, she was assigned a fail on ABLA level 4, and it was predicted that she would also meet the failure criterion on each of the four criterion tasks that corresponded to ABLA level 4. However, she went on to pass those four criterion tasks, as well as one criterion tasks that corresponded to ABLA level 6 (visual-auditory discrimination). Moreover, when I reassessed the child on the ABLA at the end of her participation in the research project, she passed ABLA level 4. Therefore, the child may have naturally acquired matching skills during the course of the research project.

Taking a closer look at specific criterion tasks, at least two of the six children assessed at ABLA level 3 (visual discrimination) failed either Task #10 and Task #11, criterion tasks that corresponded to ABLA level 3. Again, this may indicate that the children's visual discrimination skills were still developing. First, Participant 5 passed his initial testing on ABLA level 3 in 36 trials, and thus did not demonstrate that he could pass the task convincingly. Second, each of participants who failed either Task #10 or Task #11 also failed at least two of the four criterion tasks that corresponded to ABLA level 3. Finally, compared to the other Level 3 participants for whom 100% of the predictions based on their ABLA test performance were confirmed, these

participants earned the lowest accuracy percentages (90%, 85%, and 65%, respectively), indicating mixed performance across all of the criterion tasks.

The children's performance may also be related to the task materials. The first of these tasks involved a tall, round gold container and a short, blue square container. The correct response was to place a star into the blue container. However, given the height difference between the containers, the taller gold container may have acted as an incidental prompt for the children who were still developing visual discrimination skills, as the response required less effort. The second task involved a measuring can and a tin can. The correct response was to place a large yellow spoon into the measuring can. However, placing the spoon into the tin can resulted in a loud noise, which may have acted as external sensory positive reinforcement (Martin & Pear, 2011) for the children. This task can also be conceptualized as a visual-visual non-identity matching task, which has been found to fall between ABLA levels 4 and 6 in the hierarchy with individuals with intellectual disabilities (Sakko et al., 2004). Therefore, it may have been a more difficult discrimination than an ABLA level 3 visual discrimination task.

In addition, two of the six children assessed at ABLA level 3 also passed a criterion task (Task #15) that corresponded to ABLA level 4 (match-to-sample). This task involved matching either a role of tape or a stapler to the identical item. According to parental report, these materials were familiar to the children, which may have contributed to their performance.

With regard to the criterion tasks, predictions based on ABLA performance and the parents' predictions yielded similar results for tasks that used materials similar to the ABLA (= 76%) and for tasks that used common everyday materials (= 75%). Moreover, for predictions based on ABLA test performance, 90% of predictions for criterion tasks that used materials similar to the ABLA were confirmed, and 93% of predictions for criterion tasks that used

everyday materials were confirmed. This finding is consistent with Martin et al.'s (2008) review of six studies that examined the predictive validity of the ABLA with persons with intellectual disabilities, and extends the finding to children with autism.

The performance of Participant 10 (whose data was not included in the analysis, but can be found in Appendix A) warrants closer examination. During the initial ABLA testing, Participant 10 demonstrated a side preference during ABLA level 2 (position discrimination). Specifically, he failed the task twice when the correct container (the yellow can) was placed on the right side, and passed the task once when the correct container was placed on the left side. Based on the "best two out of three" rule, the child was assigned a fail on ABLA level 2. Interestingly, he went on to pass all of the criterion tasks that corresponded to ABLA level 2, regardless of the left-right position required for the correct response. Moreover, when I reassessed the child on the ABLA, he passed ABLA level 2 once when the correct container was placed on the right side, but failed ABLA level 2 once when the correct container was placed on the left side (the opposite result from his initial ABLA testing). For practical reasons (i.e., his home was outside of the city), the child was not retested on ABLA level 2 a third time to apply the "best two out of three" rule. Although the child's ABLA level 2 results are somewhat unclear, it could be argued that he was demonstrating a *type* of position discrimination. That is, the child was responding to the position of the containers, regardless of the containers' physical attributes. Given his performance, it appears that the child's discrimination skills were in development, and most likely fell somewhere between ABLA levels 1 (imitation) and 3 (visual discrimination). In fact, he passed two of the four criterion tasks that corresponded to ABLA level 3. If his performance on the criterion tasks that corresponded to ABLA level 2 were removed from analysis, the percentage of correct predictions based on his ABLA performance

would increase from 65% to 81%, while the percentage of correct parental predictions would increase from 65% to 69%.

Based on Participant 9 and Participant 10's ABLA performances, it appears that discrimination skills can develop according to the ABLA hierarchy over a relatively short period of time. Given that the ABLA is both quick and simple to implement, and requires easily accessible materials, the finding seems to lend even greater support for the ABLA's utility as a tool to help clinicians in the programming and development of training tasks for children with autism. That is, clinicians can easily reassess a child's discrimination ability at short time intervals (e.g., every six months) to help develop appropriate training programs.

According to the results, the parents' predictions of the children's performance on the criterion tasks were slightly above chance levels (i.e., 59%). Moreover, during my own personal interaction with the mothers, many of them seemed somewhat hesitant when asked to predict their child's discrimination ability. For example, during the short phone screen I conducted with each mother after receiving the consent to participate, many of the mothers were unsure if their child had acquired matching skills (therefore leading me to also inquire about the children's verbal abilities). Interestingly, four of the nine mothers predicted that their child would either pass *all* of the criterion tasks or fail *all* of the criterion tasks. These findings provide some evidence that parents may be unaware of their child's discrimination abilities, thus resulting in either over- or under-estimations of the child's true abilities. Given that research conducted with adults with intellectual disabilities found that direct-care staff often request that clients complete tasks that are inconsistent with the clients' learning abilities (DeWiele & Martin, 1996; Vause, Martin, Cornick, et al., 2000), future research could examine whether children with autism are

also asked to perform tasks that are either above or below their discrimination abilities, as measured by the ABLA.

One of the most significant challenges of this research project was the difficulty with recruitment. Over a period of approximately 30 months and contact with over 100 families with a child with autism, I was able to successfully recruit only 10 participants assessed at ABLA levels 1, 2, and 3. There are a number of possible explanations for this difficulty. First, my primary recruitment source was the St. Amant ABA Preschool Program for Children with Autism. Children enrolled in this program receive at least 36 hours per week of one-on-one interaction, 31 of which is tutor-led and 5 of which is parent-led. Therefore, it is possible that parents were hesitant to consent to their child's participation in a research project due to practical factors (e.g., the time and energy that would be required above and beyond that already devoted to the child's ABA program). Second, once children are enrolled in the ABA program, there is a tendency for the children to pass ABLA levels 4 (match-to-sample) and/or ABLA level 6 (auditory-visual discrimination) by the child's six-month review (Fazzio, personal communication). As mentioned above, the children receive at least 36 hours per week of intensive training on various programs (including discrimination skills). Moreover, consultants in the St. Amant ABA Preschool Program typically tend to immediately target matching skills when implementing academic programs. These events may explain why the children tend to move through the lower levels of the ABLA so quickly (and would therefore be ineligible to participate in this study). Third, according to Kerr and Meyerson's (1977b) research, typically-developing children generally achieve ABLA level 4 (match-to-sample) by age 17-18 months and level 6 (auditory-visual discrimination) by age 27-32 months. However, Ouellette-Kuntz et al. (2009) found that, between 1997 and 2005, the mean age of diagnosis for children with an ASD in Manitoba was

48.0 months. Given that approximately 30% of children with an ASD fall in the average range with regard to intellectual functioning (Fombonne, 2007), it is conceivable that, by the time the children had been formally diagnosed with an ASD and received recruitment information regarding the research project, many of the children may have naturally acquired matching skills with age and therefore would not qualify for participation. In fact, Schwartzman (2007) reported that, at the time of her recruitment process, 69% of the children with autism enrolled in the St. Amant ABA Preschool Program were assessed at ABLA levels 4 and 6. Similarly, 67% of the children who participated in the Condillac (2002) study were assessed at ABLA levels 4 and 6. Therefore, it seems that it is generally more difficult to recruit children with autism assessed at ABLA levels 1, 2, or 3 compared to ABLA levels 4 and 6.

Due to difficulty with recruitment, a limitation of this study is the small sample size (n = 9), as well as a limited number of ABLA level 2 participants. In addition, I was not able to establish the predictive validity of ABLA level 1. Perhaps researchers with access to a larger participation pool could address this gap in the literature.

A second limitation of this study relates to the fact that only imitation and two-choice discrimination criterion tasks were presented in a structured manner (i.e., the child was sitting down, directly across from the examiner). Research with adults with intellectual disabilities has shown that the ABLA is predictive of an individual's performance on everyday activities, such as flipping on a light switch (Level 1), placing laundry into a laundry basket (Level 2), or pairing socks together (Level 4). However, it still remains unknown whether the ABLA can accurately predict performance on practical, everyday activities with children with autism. For example, if a child is assessed at ABLA level 3 (visual discrimination), is that child able to locate his/her jacket in a closet among other jackets, when they are placed in a different order within the closet

each time they are hung up? Future research could examine whether this finding is true for children with autism as well.

A third limitation of this study was that the children's ASD diagnoses were based on agencies' records, and were not confirmed during the research. Moreover, co-morbid diagnoses were also based on either the agency's records or parental report. However, in order to receive services from Manitoba Family Services and Consumer Affairs Children's Disability Services (including enrolment in the St. Amant ABA Preschool Program), a referral must be made from the professional who diagnosed the child with an ASD.

Finally, the examiner was not blind as to the children's initial ABLA performance while administering the criterion tasks. However, as mentioned previously, IOR scores were obtained and, when possible, observers were blind as to the children's ABLA level.

The ABLA is a valuable assessment and training tool for individuals with intellectual disabilities. Although the majority of ABLA research has been conducted with individuals with intellectual disabilities, some research has replicated and extended previous ABLA findings to children with autism. Previous research with children with autism has demonstrated that the ABLA (a) levels are hierarchically ordered in terms of difficulty, (b) has high test-retest reliability, (c) appears to be correlated with language skills, (d) has high predictive validity for ABLA levels 4 (match-to-sample) and 6 (visual auditory discrimination), and (e) is more accurate than parents in predicting a child's learning ability on two-choice match-to-sample and auditory-visual discrimination tasks. The current study has extended the above findings, demonstrating that the ABLA has high predictive validity for children with autism assessed at ABLA levels 2 (position discrimination) and 3 (visual discrimination), and that predictions based on ABLA performance are more accurate than parents in predicting the learning ability of such

children. Therefore, the ABLA may be an effective tool that can be used to identify the discrimination skills that are lacking in the repertoire of children with autism and, through EIBI, assist in the programming and development of the learning skills of those children.

References

American Psychiatric Association (2010). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: Author. Retrieved December 30, 2011, from http://www.dsm5.org/-proposedrevisions.

American Psychiatric Association (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., Text Revised). Washington, DC: Author.

Barker-Collo, S., Jamieson, J., & Boo, F. (1995). Assessment of Basic Learning Abilities test: Prediction of communication ability in persons with developmental disabilities. *International Journal of Practical Approaches to Disability, 19,* 23-28.

Bishop, S., Luyster, R., Richler, J., & Lord, C. (2008). Diagnostic assessment. In K. Chawarska, A. Klin, & F. Volkmar (Eds.), *Autism spectrum disorders in infants and toddlers: Diagnosis, assessment, and treatment* (pp. 23-49). New York: Guilford Press.

Casey, L., & Kerr, N. (1977). Auditory-visual discrimination and language prediction. *Rehabilitation Psychology, 24,* 137-155.

Centers for Disease Control and Prevention (2012). Prevalence of autism spectrum disorders – Autism and developmental disabilities monitoring network, 14 sites, United States, 2008. *Surveillance Summaries, 61,* 1-19. Retrieved July 5, 2012, from http://www.cdc.gov/mmwr/preview/mmwrhtml/ss6103a1.htm.

Chawarska, K., & Bearss, K. (2008). Assessment of cognitive and adaptive skills. In K. Chawarska, A. Klin, & F. Volkmar (Eds.), *Autism spectrum disorders in infants and toddlers: Diagnosis, assessment, and treatment* (pp. 50-75). New York: Guilford Press.

Chawarska, K., & Volkmar, F. (2005). Autism in infancy and early childhood. In F.R. Volkmar, R. Paul, A. Klin, & D.J. Cohen (Eds.), *Handbook of autism and pervasive developmental disorders* (3rd ed., pp. 223-246). New York: Wiley.

Cohen, H., Amerine-Dickens, M., & Smith, T. (2006). Early intensive behavioral treatment: Replication of the UCLA model in a community setting. *Journal on Developmental Behavioral Pediatrics, 27,* 145-155.

Condillac, R.A. (2002). *Assessment of discrimination skills in individuals with autism: Validity of the Assessment of Basic Learning Abilities test.* Unpublished doctoral thesis, University of Toronto, Toronto, Ontario, Canada.

Conner, M. (1998). A review of behavioral early intervention programs for children with autism. *Educational Psychology and Practice, 14,* 109-117.

Conyers, C.J., Martin, G.L., Yu, D.C.T., & Vause, T. (2000). Rapid teaching of a two-choice auditory-visual discrimination to persons with developmental disabilities. *Journal on Developmental Disabilities, 7,* 84-92.

Cummings, A., & Williams, L. (2000). Visual identity matching and vocal imitation training with children with autism: A surprising finding. *Journal on Developmental Disabilities, 7,* 109-122.

Dawson, G., Rogers, S., Munson, J., Smith, M., Winter, J., Greenson, J., Donaldson, A., & Varley, J. (2010). Randomized, controlled trial of an intervention for toddlers with autism: The Early Start Denver Model. *Pediatrics, 125,* 17-23.

DeWiele, L.A., & Martin, G.L. (1996). Can the ABLA test help staff match training tasks to the abilities of developmentally disabled trainees? *International Journal of Practical Approaches to Disability, 20,* 7-11.

Ducharme, J. (1996). Errorless compliance training: Optimizing clinical efficacy. *Behavior Modification, 20,* 259-280.

Ducharme, J., & Drain, T. (2004). Errorless academic compliance training: Improving generalized cooperation with parental requests in children with autism. *Journal of the American Academy of Child and Adolescent Psychiatry, 43,* 163-171.

Ducharme, J., Sanjuan, E., & Drain, T. (2007). Errorless compliance training: Success-focused behavioural treatment of children with Asperger Syndrome. *Behavior Modification, 31,* 329-344.

Eikeseth, S., Smith, T., Jahr, E., & Eldevik, S. (2007). Outcome for children with autism who began intensive behavioral treatment between ages 4 and 7: A comparison controlled study. *Behavior Modification, 31,* 264-278.

Eldevik, S., Hastings, R.P., Hughes, J.C., Jahr, E., Eikeseth, S., & Cross, S. (2009). Using participant data to extend the evidence base for intensive behavioral intervention for children with autism. *American Journal on Intellectual and Developmental Disabilities, 115,* 381-405.

Fombonne, E. (2009). Epidemiology of pervasive developmental disorders. *Pediatric Research, 65,* 591-598.

Fombonne, E. (2007). Epidemiological surveys of pervasive developmental disorders. In F. Volkmar (Ed.), *Autism and pervasive developmental disorders* (2nd ed., pp. 33-68). Cambridge, UK: Cambridge University Press.

Green, G. (1996). Early behavioral intervention for autism: What does research tell us? In C. Maurice, G. Green, & S. C. Luce (Eds.), *Behavioral intervention for young autistic children: A manual for parents and professionals* (pp. 29-44). Austin, TX: Pro-Ed.

Harapiak, S., Martin, G.L., & Yu, D. (1999). Hierarchical ordering of auditory discriminations and the Assessment of Basic Learning Abilities test. *Journal on Developmental Disabilities, 6,* 32-50.

Harris, S.L. (2007). Behavioral and educational approaches to the pervasive developmental disorders. In F. Volkmar (Ed.), *Autism and pervasive developmental disorders* (2nd ed., pp. 255-268). Cambridge, UK: Cambridge University Press.

Hazen, A., Szendrei, V., & Martin, G. L. (1989). The AVC discrimination test: A valuable tool for teachers of developmentally disabled persons. *Journal of Practical Approaches to Developmental Handicap, 13,* 7-13.

Howard, J.S., Sparkman, C.R., Cohen, H.G., Green, G., & Stanislaw, H. (2005). A comparison of intensive behavior analytic and eclectic treatments for young children with autism. *Research in Developmental Disabilities, 26,* 359-383.

Kerr, N., & Meyerson, L. (1977a). Further evidence on ordering, generalization, and prediction from the AVC scales: AVC skills in deaf retarded adults. *Rehabilitation Psychology, 24,* 127-131.

Kerr, N., & Meyerson, L. (1977b). Implications of results with normal children: Piaget's sensory motor intelligence and the AVC levels. *Rehabilitation Psychology, 24,* 169-176.

Kerr, N., Meyerson, L., & Flora, J.A. (1977). The measurement of motor, visual, and auditory discrimination skills [Monograph]. *Rehabilitation Psychology, 24*, 95-112.

Lovaas, O.I. (1987). Behavioral treatment and normal educational and intellectual functioning in young autistic children. *Journal on Consulting and Clinical Psychology, 55,* 3-9.

Luiselli, J.K., Cannon, O., Ellis, J.T., & Sisson, R.W. (2000). Home-based behavioral interventions for young children with autism/pervasive developmental disorder: A

preliminary evaluation of outcome in relation to child age and intensity of service. *Autism, 4,* 426-438.

Makrygianni, M.K., & Reed, P. (2010). A meta-analytic review of the effectiveness of behavioural early intervention program for children with autism spectrum disorders. *Research in Autism Spectrum Disorders, 4,* 577-593.

Martin, G.L., & Pear, J. (2011). *Behavior modification: What it is and how to do it* (9th ed.). Upper Saddle River, NJ: Prentice-Hall.

Martin, G.L., Thorsteinsson, J.R., Yu, C.T., Martin, T.L., & Vause, T. (2008). The Assessment of Basic Learning Abilities test for predicting learning of persons with intellectual disabilities. A review. *Behavior Modification, 32,* 228-247.

Martin, G.L., & Yu, D.C.T. (2000). Overview of research on the Assessment of Basic Learning Abilities test. *Journal on Developmental Disabilities, 7,* 10-36.

Martin, G.L., Yu. D.C.T., Quinn, G., & Patterson, S. (1983). Measurement and assessment of AVC discrimination skills: Independent confirmation and extension. *Rehabilitation Psychology, 28,* 231-237.

Martin, G.L., Yu, C.T., & Vause, T. (2004). Assessment of Basic Learning Abilities test: Recent research and future directions. In W.L. Williams (Ed.), *Advances in developmental disabilities: Etiology, assessment, intervention, and integration* (pp.161-176). Reno, NV: Context Press.

McEachen, J.J., Smith, T., & Lovaas, O.I. (1993). Long-term outcome for children with autism who received early intensive behavioral treatment. *American Journal on Mental Retardation, 97,* 359-372.

Meyerson, L. (1977). AVC behavior and attempt to modify it [Monograph]. *Rehabilitation Psychology, 28,* 231-237.

Microsoft Cooperation (2011). Readability scores. Retrieved December 30, 2011, from: http://office.microsoft.com/en-us/word-help/readability-scores-HP005186318.aspx?CTT=3.

Morris, D. (2002). *The Assessment of Basic Learning Abilities test: Implications for individuals with autism.* Unpublished master's thesis, University of Toronto, Toronto, Ontario, Canada.

Murphy, C., Figueroa, M., Martin, G.L., Yu, C.T., Figueroa, J. (2008). The use of computer-generated fading materials to teach visual-visual non-identity matching tasks. *Developmental Disabilities Bulletin, 36,* 49-66.

National Autism Center (2009). *National standards report*. Randolph: National Autism Center.

National Research Council (2001). *Educating children with autism.* Committee on education and interventions for children with autism: Division of behavioral and social sciences and education. Washington, D.C.: National Academy Press.

NYSDOH (1999). *Clinical practical guideline: The guideline technical report autism/pervasive developmental disorders, assessment, and intervention.* Albany: Early Intervention Program, New York State Department of Health.

Ouellette-Kuntz, H., Coo, H., Lam, M., Yu, C.T., Breitenbach, M., Hennessey, P.,... & Crews, L. (2009). Age at diagnosis of autism spectrum disorders in four regions of Canada. *Quantitative Review, 100,* 268-273.

Pelios, L., & Lund, S. (2001). A selective overview of issues on classification, causation, and early intensive behavioral intervention for autism. *Behavior Modification, 25,* 678-697.

Poustka, F. (2007). The neurobiology of autism. In F. Volkmar (Ed.), *Autism and pervasive developmental disorders* (2nd ed., pp. 179-220). Cambridge, UK: Cambridge University Press.

Reichow, B. (2011). Overview of meta-analyses on early intensive behavioral intervention for young children with autism spectrum disorders. *Journal of Autism and Developmental Disorders*. Advanced online publication. doi: 10.1007/s10803-011-1218-9.

Reichow, B. & Wolery, M. (2009). Comprehensive synthesis of early intensive behavioral interventions for young children with autism based on the UCLA Young Autism Project model. *Journal of Autism and Developmental Disorders, 39,* 23-41.

Richards, D.F., Williams, L., & Follette, W.C. (2002). Two new empirically derived reasons to use the Assessment of Basic Learning Abilities. *American Journal on Mental Retardation, 107,* 329-339.

Rogers, S.J. (1998). Empirically supported comprehensive treatments for young children with autism. *Journal of Clinical Child Psychology, 27,* 168-179.

Rutherford, M.D., & Rogers, S.J. (2003). Cognitive underpinnings of pretend play in autism. *Journal of Autism and Developmental Disorders, 33,* 289-302.

Sakko, G., Martin, T. L., Vause, T., Martin, G. L., & Yu, C. T. (2004). A visual-visual non-identity matching assessment is a worthwhile addition to the Assessment of Basic Learning Abilities test. *American Journal of Mental Retardation, 109,* 44-52.

Sallows, G.O., & Graupner, T.D. (2005). Intensive behavioral treatment for children with autism. Four-year outcome and predictors. *American Journal on Mental Retardation, 110,* 417-438.

Schreibman, L. (1997). Theoretical perspectives on behavioral intervention for individuals with autism. In D.J. Cohen & F.R. Volkmar (Eds.), *Handbook of autism and pervasive developmental disorders* (2nd ed., pp. 920-933). New York: Wiley.

Schwartzman, L. (2007). *Predicting the learning ability of children with autism: The Assessment of Basic Learning Abilities test versus parents' predictions*. Unpublished doctoral thesis, University of Manitoba, Winnipeg, Manitoba, Canada.

Schwartzman, L., Vause, T., Martin, G.L., Yu, C.T., Campbell, L., Danbrook, M., & Feldman, M. (2009). Predicting the learning ability of children with autism: The ABLA test versus parents' predictions. *Education and Training in Developmental Disabilities, 44,* 271-279.

Sheinkopf, S.J., & Siegel, B. (1998). Home-based behavioral treatment of young children with autism. *Journal of Autism and Developmental Disorders, 28,* 15-23.

Smith, T. (1999). Outcome of early intervention for children with autism. *Clinical Psychology: Research and Practice, 6,* 33-49.

Smith, T., Eikeseth, S., Klevestrand. M., Lovaas, O.I. (1997). Intensive behavioral treatment for preschoolers with severe mental retardation and pervasive developmental disorders. *American Journal on Mental Retardation, 102,* 238-249.

Smith, T., Groen, A., & Wynn, J. (2000). Randomized trial of intensive early intervention for children with pervasive developmental disorder. *American Journal on Mental Retardation, 105,* 269-285.

Spreckley, M., & Boyd, R. (2009). Efficacy of applied behavioral intervention in preschool children with autism for improving cognitive, language, and adaptive behavior: A systematic review and meta-analysis. *The Journal of Pediatrics, 154,* 338-344.

Stubbings, V., & Martin, G.L. (1995). The ABLA test for predicting performance of developmentally-disabled persons on prevocational training tasks. *International Journal of Practical Approaches to Disability, 19,* 12-17.

Stubbings, V., & Martin, G.L. (1998). Matching training tasks to abilities of people with mental retardation: A learning test versus experienced staff. *American Journal of Mental Retardation, 102,* 473-484.

Tharinger, D., Schallert, D., & Kerr, N. (1977). Use of AVC test tasks to predict classroom learning in mentally retarded children [Monograph]. *Rehabilitation Psychology, 24,* 113-118.

Thorsteinsson, J.R., Martin, G.L., Yu, C.T., Spevack, S., Martin, T.L., & Lee, M.S. (2007). Predicting learning ability of people with intellectual disabilities: Assessment of Basic Learning Abilities test versus caregivers' predictions. *American Journal on Mental Retardation, 112,* 130-139.

Vause, T., Martin, G.L., Cornick, A., Harapiak, S., Chong, I., Yu, D., & Garringer, J. (2000). Training task assignments and aberrant behavior of persons with developmental disabilities. *Journal on Developmental Disabilities, 7,* 37-53.

Vause, T., Martin, G.L., & Yu, D.C.T. (1999). Aberrant behavior of persons with developmental disabilities as a function of the characteristics of training tasks. *International Journal of Rehabilitation Research, 22,* 321-325.

Vause, T., Martin, G.L., & Yu, D. (2000). ABLA test performance, auditory matching, and communication ability. *Journal on Developmental Disabilities, 7,* 123-141.

Vause, T., Martin, G.L., Yu, C.T., Marion, C., & Sakko, G. (2005). Teaching equivalence relations to individuals with minimal verbal repertoires: Are visual and auditory-visual discriminations predictive of stimulus equivalence? *Psychological Record, 55,* 197-218.

Vause, T., Yu, C.T., & Martin, G.L. (2007). The Assessment of Basic Learning Abilities test for persons with intellectual disability: A valuable clinical tool. *Journal of Applied Research in Intellectual Disabilities, 20,* 483-489.

Viel, J., Wrightman, J., Marion, C., Jeanson, B., Martin, G., Yu, C.T., & Verbeke, A. (2011). Does mastery of ABLA level 6 make it easier for children with autism to learn to name objects? *Research in Autism Spectrum Disorders, 5,* 1370-1377.

Virués-Ortega, J. (2010). Applied behavior analytical intervention for autism in early childhood: Meta-analysis, meta-regression and dose-response meta-analysis of multiple outcomes. *Clinical Psychology Review, 30,* 387-399.

Volkmar, F., Chawarska, K., & Klin, A. (2008). Autism spectrum disorders in infants and toddlers: An introduction. In K. Chawarska, A. Klin, & F. Volkmar (Eds.), *Autism spectrum disorders in infants and toddlers: Diagnosis, assessment, and treatment* (pp. 1-22). New York: Guilford Press.

Volkmar, F.R., & Lord, C. (2007). Diagnosis and definition of autism and other pervasive developmental disorders. In F. Volkmar (Ed.), *Autism and pervasive developmental disorders* (2nd ed., pp. 1-31). Cambridge, UK: Cambridge University Press.

Volkmar, F.R., Westphal, A., Gupta, A.R., & Wiesner, L. (2008). Medical issues. In K. Chawarska, A. Klin, & F. Volkmar (Eds.), *Autism spectrum disorders in infants and toddlers: Diagnosis, assessment, and treatment* (pp. 274-299). New York: Guilford Press.

Wacker, D.P. (1981). Applicability of a discrimination assessment procedure with hearing impaired/mentally handicapped clients. *Journal of the Association for the Severely Handicapped, 6,* 51-58.

Wacker, D.P., Kerr, N.J., & Carroll, J.L. (1983). Discrimination skills as a predictor of prevocational performance of institutionalized mentally retarded clients. *Rehabilitation Psychology, 28,* 45-59.

Wacker, D.P., Steil, D.A., & Greenebaum, F.T. (1983). Assessment of discrimination skills of mentally handicapped preschoolers and prediction of classroom task performance. *Journal of the Association for the Severely Handicapped, 8,* 65-78.

Walker, J., Martin, G.L., & Graham, M. (1991). Rapid teaching of an auditory two-choice discrimination to severely mentally handicapped persons. *Journal of Practical Approaches to Developmentally Handicap, 15,* 8-11.

Ward, R., & Yu, D. (2000). Bridging the gap between visual and auditory discrimination learning in children with autism and severe intellectual disabilities. *Journal on Intellectual Disabilities, 7,* 142-155.

Witt, J.C., & Wacker, D.P. (1981). Teaching children to respond to auditory directives: An evaluation of two procedures. *Behavioral Research of Severe Developmental Disabilities, 2,* 175-189.

Yu, D., & Martin, G.L. (1986). Comparison of two procedures to teach visual discriminations to severely handicapped persons. *Journal of Practical Approaches to Mental Handicap, 10,* 7-12.

Appendix A: Participant 10's Characteristics and Results

1. *Participant Characteristics*

Age	Gender	Diagnosis	ABLA level	Parent who participated	Parent's highest education level achieved	Parent familiar with ABLA	Referral source
4 years	Male	ASD	1	Mother	Post secondary degree	Yes	ABA

Note. ABLA = Assessment of Basic Learning Abilities; ASD = Autism Spectrum Disorder; ABA = St. Amant ABA Preschool Program for Children with Autism.

2. *Participant 10's Pass-Fail Performance on the Criterion Tasks*

Participant 10's ABLA level	ABLA level of criterion tasks																			
	Level 1				Level 2				Level 3				Level 4				Level 6			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	P	P	P	P	P	P	P	P	P	F	P	F	P	F	F	F	F	F	F	F

Note. ABLA = Assessment of Basic Learning Abilities; P = Pass; F = Fail.

3. *Predictions of Performance Confirmed for Participants*

Participant	Participants' ABLA level	Predictions confirmed from ABLA (%)	Predictions confirmed from parents (%)	Accuracy improvement of ABLA vs. parent prediction (%)
10	1	65	65	0

Note. ABLA = Assessment of Basic Learning Abilities.

Appendix B

Project Description and Consent to Participation for Children Recruited from the St. Amant ABA Preschool Program for Children with Autism

Research Project Title:
Does Performance on the Assessment of Basic Learning Abilities Test Predict Training Task Performance with Children with Autism?

Researcher(s):
Colleen Murphy, Principal Investigator and Ph.D. Student, 256-4301 ext. 5434
Research Supervisors:
Dr. Garry L. Martin, Professor, University of Manitoba, 474-8589
Dr. C. T. Yu, Research Director, St. Amant Research Centre, 256-4301 ext. 5399
Toby Martin, Research Manager, St. Amant Research Centre, 256-4301 ext. 5481

This consent form, a copy of which will be left with you for your records and reference, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about anything mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

What is the purpose of the study?

You may be aware that, as a part of the St. Amant ABA Program for Children with Autism, the children are regularly assessed on the Assessment of Basic Learning Abilities (ABLA) test. During this test, an examiner, using standard prompting and reinforcement procedures, attempts to teach a child to perform each of 6 tasks. For example, when testing ABLA Level 3, a tutor places a red box and a yellow can in front of a child in randomly alternated left/right positions across trials. On each trial, the tutor gives the child a piece of foam and says "put it in." The correct response is for the child to learn to place the piece of foam into the yellow can. Correct responses are positively reinforced and errors are followed by a demonstration and guided trial of the correct response, as well as an opportunity for an independent response. Training trials on a task continue until the child achieves either a pass performance of 8 consecutive correct responses or incurs a total of 8 errors.

The **purpose** of this research is to assess whether or not performance of children with autism on the ABLA test is a good predictor of the ease or difficulty with which they will learn 20 other training tasks. Standardized prompting and reinforcement procedures will be used during the teaching of each training task.

What are the study procedures and how long with the study take?

If you support your child's participation, we will:

1. Assess your child on the ABLA test
2. Attempt to teach your child 20 training tasks.

We hope to be able to conduct two or three 30 minute sessions per week with your child for approximately 6 weeks. It is estimated that the entire project will be completed by approximately September 2011.

What are the risks and benefits in taking part in the study?

The procedures of this study present no risks beyond those encountered in everyday life. Benefits include acquiring knowledge about the learning needs of your child, and the possibility that your child will learn some new tasks. Also, based on our past experience, because we use positive reinforcement procedures, children with autism typically enjoy participating in these types of assessment and training sessions.

Will any recording devices be used?

Yes. All sessions will be videotaped for data collection purposes. Tapes will only be accessible to the researchers and will be kept in a locked filing cabinet. All tapes will be destroyed at the end of the research project.

Will I be asked to provide personal information about my child or myself?

Yes. You will be asked to provide your name, your child's name, and consent to the researchers to access the results of assessments (e.g. assessments of language abilities) conducted with your child by the ABA Program.

Will personal information about me be kept confidential?

Yes. All information will be handled in compliance with Section 24 of the Personal Health Information Act (PHIA). All information will be kept confidential and stored in a locked office. Only the research staff will have access to the information. Any presentations, reports, or publications about the project will not contain any identifying information. The information will be kept for approximately five years (estimated to be September 31, 2015) after the completion of the study and will then be destroyed in a confidential manner.

Will I receive the results of the study?

We will inform you of the results of your child's participation within approximately one month of your child's completion.

If you wish to be informed of the results from the entire project, please check the appropriate box at the end of this form. We will send you a summary of the project's findings within 3 months of completion of the project. This is estimated to be approximately September 2011.

Is there payment or cost for participating?

There is no payment or cost for participating.

Is participation voluntary?

Participation is voluntary. Whether you give consent for your child to take part in this study will in no way affect your employment, status, or services that you or your child may be receiving now or in the future from the University of Manitoba or St. Amant.

Moreover, even after giving consent, you may stop the sessions at any time and for any reason by simply calling or emailing the principle investigator listed at the beginning of the consent from. Your decision to stop will not affect any services that you or your child may be receiving now or in the future from the University of Manitoba or St. Amant.

Also, if your child is unwilling to come to a session or wishes to leave during a session, that decision will be respected and the session will be cancelled/rescheduled. If this happens on a continual basis (e.g., several times in a row) we will accept this as a possible indication that your child does not wish to continue and we will discuss with you whether or not we should discontinue your child's participation in the project.

Will I be contacted in the future for other studies?

If you wish to be contacted for future studies please check the appropriate box at the end of this form.

Signing the Consent Form

Your signature on the last page indicates that you have understood to your satisfaction the information regarding participation in the research project and agree to your child's participation. In no way does this waive your legal rights, nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw your child from the study at any time, and you are free to refrain from answering any questions you prefer to omit, without prejudice or consequences.

This research has been approved by the Psychology/Sociology Research Ethics Board at the University of Manitoba. If you have any concerns or complaints about this project you may contact any of the above-named persons of the Human Ethics Secretariat at 474-7122, or e-mail margaret_bowman@umanitoba.ca. A copy of this consent form has been given to you to keep for your records and reference.

Signatures

I, _____ here by consent to my child's _____
(*please print your name*) **(*please print your child's name*)**

participation in the project, "*Does performance on the ABLA test predict training task performance with children with autism?*"

By giving consent I allow the research project staff to:

- Obtain personal health information of my child, including: age, diagnosis, level of functioning, previous intellectual and adaptive behavior assessments, and physical and sensory difficulties from the health records at St. Amant. This information will be used to ensure that my child meets the project's inclusion/exclusion criteria, and to help the researchers work with my child in a manner appropriate to his/her abilities.
- Include my child's results in publications, reports, and talks, so that others may learn from this project. The identity of my child, however, *will not* be disclosed.

I understand that I can revoke or amend this consent at any time and for any reason. The consent will otherwise remain in effect for a period of 12 months from the date it is received.

Please check YES or NO for the following items:	**YES**	**NO**
• I would like to receive the results of this project.		
If you responded Yes to the previous question, please write your mailing address here:		
• I allow the researchers to make confidential video records of sessions to improve the reliability of their observations.		
• I allow the researchers to share my child's results with authorized St. Amant staff.		
• The researchers may contact me directly for possible future related studies.		

_____ _____
Signature of Consenting Individual Date

_____ _____
Phone Number Address

_____ _____ _____
Name of Researcher/Delegate **Signature of Researcher/Delegate** **Date**

Appendix C

Project Description and Consent to Participation for Children Recruited from Manitoba Family Services and Consumer Affairs Children's Disability Services

Research Project Title:
Does Performance on the Assessment of Basic Learning Abilities Test Predict Training Task Performance with Children with Autism?

Researcher(s):
Colleen Murphy, Principal Investigator and Ph.D. Student, 256-4301 ext. 5434

Research Supervisors:
Dr. Garry L. Martin, Professor, University of Manitoba, 474-8589
Dr. C. T. Yu, Research Director, St. Amant Research Centre, 256-4301 ext. 5399
Toby Martin, Research Manager, St. Amant Research Centre, 256-4301 ext. 5481

This consent form, a copy of which will be left with you for your records and reference, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about anything mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

What is the purpose of the study?

The Assessment of Basic Learning Abilities (ABLA) test is an empirically-validated assessment tool that is used to determine the ease or the difficulty with which an individual can perform basic discrimination tasks, such as imitation and matching tasks. During this test, an examiner, using standard prompting and reinforcement procedures, attempts to teach a child to perform 6 tasks. For example, when testing ABLA Level 3, a tutor places a red box and a yellow can in front of a child in randomly alternated left/right positions across trials. On each trial, the tutor gives the child a piece of foam and says "put it in." The correct response is for the child to learn to place the piece of foam into the yellow can. Correct responses are positively reinforced and errors are followed by a demonstration and guided trial of the correct response, as well as an opportunity for an independent response. Training trials on a task continue until the child achieves either a pass performance of 8 consecutive correct responses or incurs a total of 8 errors.

The **purpose** of this research is to assess whether or not performance of children with autism on the ABLA test is a good predictor of the ease or difficulty with which they will learn 20 other training tasks. Standardized prompting and reinforcement procedures will be used during the teaching of each training task.

What are the study procedures and how long with the study take?

If you support your child's participation, we will:

1. Assess your child on the ABLA test
2. Attempt to teach your child 20 training tasks.

I will conduct one-to-one sessions with your child, and these sessions will be scheduled at mutually convenient times. I anticipate we will require approximately six 30-minute sessions.

What are the risks and benefits in taking part in the study?

The procedures of this study present no risks beyond those encountered in everyday life. Benefits include acquiring knowledge about the learning needs of your child, and the possibility that your child will learn some new tasks. Also, based on our past experience, because we use positive reinforcement procedures, children with autism typically enjoy participating in these types of assessment and training sessions.

Will any recording devices be used?

Yes. All sessions will be videotaped for data collection purposes. Tapes will only be accessible to the researchers and will be kept in a locked filing cabinet. All tapes will be destroyed at the end of the research project. However, you can decline to have your child videotaped and still participate in the study. Please check the appropriate box at the end of the consent form.

Will I be asked to provide personal information about my child or myself?

Yes. You will be asked to provide your name, your child's name, and your child's age. If your child has received previous assessments (e.g., language, diagnostic assessments) that may be relevant to this study, I will ask for your permission to access the results.

Will personal information about me be kept confidential?

Yes. All information will be handled in compliance with Section 24 of the Personal Health Information Act (PHIA). All information will be kept confidential and stored in a locked office. Only the research staff will have access to the information. Any presentations, reports, or publications about the project will not contain any identifying information. The information will be kept for approximately five years (estimated to be September 31, 2015) after the completion of the study and will then be destroyed in a confidential manner.

Will I receive the results of the study?

We will inform you of the results of your child's participation within approximately one month of your child's completion.

If you wish to be informed of the results from the entire project, please check the appropriate box at the end of this form. We will send you a summary of the project's findings within 3 months of completion of the project. This is estimated to be approximately September 2011.

Is there payment or cost for participating?

There is no payment or cost for participating.

Is participation voluntary?

Participation is voluntary. Whether you give consent for your child to take part in this study will in no way affect any services you may be receiving from the University of Manitoba, the St. Amant Research Centre, or St. Amant, now or in the future.

Moreover, even after giving consent, you may stop the sessions at any time and for any reason by simply calling or emailing the principle investigator listed at the beginning of the consent from. Your decision to stop will not affect any services any services you may be receiving from the University of Manitoba, the St. Amant Research Centre, or St. Amant, now or in the future.

Also, if your child is unwilling to come to a session or wishes to leave during a session, that decision will be respected and the session will be cancelled/rescheduled. If this happens on a continual basis (e.g., several times in a row) we will accept this as a possible indication that your child does not wish to continue and we will discuss with you whether or not we should discontinue your child's participation in the project.

Will I be contacted in the future for other studies?

If you wish to be contacted for future studies please check the appropriate box at the end of this form.

Signing the Consent Form

Your signature on the last page indicates that you have understood to your satisfaction the information regarding participation in the research project and agree to your child's participation. In no way does this waive your legal rights, nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw your child from the study at any time, and you are free to refrain from answering any questions you prefer to omit, without prejudice or consequences.

This research has been approved by the Psychology/Sociology Research Ethics Board at the University of Manitoba. If you have any concerns or complaints about this project you may contact any of the above-named persons of the Human Ethics Secretariat at 474-7122, or e-mail margaret_bowman@umanitoba.ca. A copy of this consent form has been given to you to keep for your records and reference.

Signatures

I, _____ here by consent to my child's _____
(*please print your name*) **(*please print your child's name*)**

participation in the project, "*Does performance on the ABLA test predict training task performance with children with autism?*"

By giving consent I allow the research project staff to:

- Work with my child in one-to-one sessions to assess learning skills.
- Include my child's results in publications, reports, and talks, so that others may learn from this project. The identity of my child, however, *will not* be disclosed.

I understand that I can revoke or amend this consent at any time and for any reason. The consent will otherwise remain in effect for a period of 12 months from the date it is received.

Please check YES or NO for the following items:	**YES**	**NO**
• I would like to receive the results of this project.		
If you responded Yes to the previous question, please write your mailing address here:		
• I allow the researchers to make confidential video records of sessions to improve the reliability of their observations.		
• The researchers may contact me directly for possible future related studies.		

_____ _____
Signature of Consenting Individual Date

_____ _____
Phone Number Address

_____ _____ _____
Name of Researcher/Delegate **Signature of Researcher/Delegate** **Date**

Appendix D

Client Questionnaire Form

Background Information		
Child's Name:	Gender:	Consultant:
Parent's Name:	DOB:	
Please indicate below the food, activities, or toys that your child typically enjoys:		
Food: Activities: Toys:		
Does your child have any known allergies? If yes, please indicate:		
Does your child engage in any challenging behaviour? If so, how would you like us deal with these behaviours?		
What is the best time for us to come and work with your child?		
In order to increase the reliability of our procedures, we typically have an observer (generally a university student who has completed PHIA training) attend the sessions. Are you comfortable with this?		
Do you have any additional questions or concerns?		

Appendix E

Parent Questionnaire

DATE: _____

PARENT'S NAME: _____

CHILD'S NAME: _____

Part 1

1. Have you heard of the Assessment of Basic Learning Abilities (ABLA) test?

Yes No

- If so, what was your experience with it?

_____

2. Please indicate your highest education level attained:

_____ Some high school

_____ Completed high school

_____ Some College/University

_____ College/University diploma/degree

Appendix F

Description of Training Procedures

I am going to try to teach your child to correctly perform 20 tasks. I am asking you to predict whether or not your child will learn each task. Let me first describe the teaching procedure that I will use. When I start to teach a task, I will first demonstrate the correct response. Next, I will physically guide your child to perform the correct response. Finally, I will request your child to perform the task unassisted. Then I will proceed with training trials on the task until a pass or stop criterion is met.

During training trials, **following a correct response**, verbal praise and an additional reward (e.g., preferred food item) will be given. **Following an incorrect response,** I will demonstrate the correct response, physically guide your child to perform the correct response, and request your child to respond unassisted. This 3-step error correction procedure will continue until your child responds correctly on a trial without assistance.

Trials will be presented on each training task until either **eight consecutive correct responses** occur (PASS criterion) or until a total of **eight incorrect responses** (not necessarily consecutive) occur (STOP criterion). We are asking you to predict, for each task, which your child will do first: make 8 consecutive correct responses, or make 8 total incorrect responses (not necessarily consecutive).

If your child meets the PASS criterion, it means that your child has learned that task fairly easily. If your child meets the STOP criterion, it means that we may need to revise our training procedure.

Let's do a practice trial. Here are two white plastic plates. One plate contains a role of tape while the other plate contains a stapler. The left-right positions of the role of tape and the stapler will be randomly alternated. Across trials, I will present your child with either a role of tape or a stapler and will be required to make a match by placing the role of tape or the stapler on the corresponding plate when I say, "where does it go?" I will be asking you to guess which do you think your child will do first: make 8 correct responses in a row, or make 8 total incorrect responses.

Now that you have practiced with a task, I will ask you to read the description of each of 20 tasks. After reading about a task, I will ask you to indicate whether you think that your child will learn that task (i.e., will make 8 consecutive correct responses before making 8 total incorrect responses) by circling "**PASS**" below the corresponding task, or will not learn that task (i.e., will make 8 total errors before making 8 consecutive correct responses) by circling "**STOP**". Continue in this way until you have made a "PASS" or a "STOP" prediction for each task.

After you have made a prediction on a task, we would also ask that you **rate your confidence in the prediction** on a scale of 1 to 7, where:

1 = "It's a guess",
4 = "Somewhat confident", and
7= "Very Confident".

Appendix G

Description of Training Tasks

Task #1.

One container (e.g., either a green can or a white box) is placed in front of the child and remains in a stable position. On each trial, after the teacher models placing a piece of beige foam into the container, the child is given a piece of beige foam and is required to do the same when the teacher says, “where does it go?”

I think my child will:		**Confidence Scale:**						
PASS	STOP	1	2	3	4	5	6	7

Task #2.

One round gold container (on the left) and one rectangular blue container (on the right) are placed in front of the child and remain in a stable position. On each trial, a beige cardboard star is given to the child and the child is required to put the star into the blue container (on the left) when the teacher says, "where does it go?"

I think my child will:		**Confidence Scale:**						
PASS	STOP	1	2	3	4	5	6	7

Task #3.

One blank card and one black and white card with a picture of a cat on it are placed in front of the child along with a red block. The left-right positions of the two cards are randomly alternated. Across trials, the child is required to place the red block onto the black and white card with a picture of a cat on it, regardless of its position, when the teacher says, "put it on".

I think my child will:		**Confidence Scale:**						
PASS	STOP	1	2	3	4	5	6	7

Task #4.

Two white plastic plates are presented in front of the child. One plate contains a role of tape while the other plate contains a stapler. The left-right positions of the role of tape and the stapler are randomly alternated. Across trials, the child is given either a role of tape or a stapler and is required to make a match by placing the role of tape or the stapler on the corresponding plate when the teacher says, “where does it go?”

I think my child will:		**Confidence Scale:**						
PASS	STOP	1	2	3	4	5	6	7

Task #5.

Two sample black and white pictures (e.g., one picture of a building and one picture of people) are presented in horizontal row in front of the child. The left-right positions of the pictures are randomly alternated. Across trials, the child is required to touch the correct picture when teacher says, "building," or "people”.

I think my child will:		**Confidence Scale:**						
PASS	STOP	1	2	3	4	5	6	7

Task #6.

A tin can is placed in front of the child, along with a gold block positioned to the right of the can, and a blue block positioned to the left of the can. The blocks remain in a stable position. Across trials, the child is required to place the block positioned to the left of the can (i.e., the blue block) into the can when the teacher says, “which one?"

I think my child will:		**Confidence Scale:**						
PASS	STOP	1	2	3	4	5	6	7

Task #7.

A wooden ring stand is placed in front of the child and remains in a stable position. On each trial, the teacher models how to take off a respective round shape. The child is required to do the same when the teacher says, "take it off."

I think my child will:		**Confidence Scale:**						
PASS	STOP	1	2	3	4	5	6	7

Task #8.

One green can and one white box are placed in front of the child. The left-right positions of the can and box are randomly alternated. Across trials, the child is presented with either a green cylinder or a white cube and is required to make a match by placing the object in the corresponding container when the teacher says, "where does it go?"

I think my child will:		**Confidence Scale:**						
PASS	STOP	1	2	3	4	5	6	7

Task #9.

A measuring cup and a silver can are placed in front of the child, along with a yellow spoon. The left-right positions of the measuring cup and the silver can are randomly alternated. Across trials, the child is required to place the yellow spoon into the measuring cup, regardless of its position, when the teacher says, "where does it go?"

I think my child will:		**Confidence Scale:**						
PASS	STOP	1	2	3	4	5	6	7

Task #10.

The child is presented with a felt board, along with a yellow triangle and a red square. The left-right positions of the red square and yellow triangle are randomly alternated on both sides of the felt board. Across trials, the child is required to place the triangle onto the felt board when the teacher says, "yellow triangle" (spoken in low tone, slow speed), or to place the square onto the felt board when the teacher says, "red square" (spoken in high tone, fast speed).

I think my child will:		**Confidence Scale:**						
PASS	STOP	1	2	3	4	5	6	7

Task #11.

A white box and a green can are placed in front of the child. The left-right positions of the two containers are randomly alternated. Across trials, the child is required to place a piece of beige foam into the green can, regardless of its position, when the teacher says, “where does it go?”

I think my child will:		**Confidence Scale:**						
PASS	STOP	1	2	3	4	5	6	7

Task #12.

A role of tape and a stapler are placed horizontally in front of the child, along with a rectangular white container. The left-right positions of the role of tape and the stapler are randomly alternated. Across trials, the child is required to pick up role of tape and place it into the container when the teacher says, “tape”, or to pick up the stapler and place it into the container when the teacher says, “stapler”.

I think my child will:		**Confidence Scale:**						
PASS	STOP	1	2	3	4	5	6	7

Task #13.

A white felt board is placed in front of the child and remains in stable position. On each trial, after the teacher models placing either a red block or a yellow triangle onto the felt board, the child is required to do the same when the teacher says, "put it on".

I think my child will:		**Confidence Scale:**						
PASS	STOP	1	2	3	4	5	6	7

Task #14.

A green can and a white box are placed in front of the child, along with a piece of beige foam. The left-right positions of the containers are randomly alternated. Across trials, the child is required to place the beige foam into the green can when the teacher says, “green can” (spoken in a low tone, slow speed), or to place the beige foam into the white box when the teacher says, “white box” (spoken in a high tone, fast speed).

I think my child will:		**Confidence Scale:**						
PASS	STOP	1	2	3	4	5	6	7

Task #15.

Two sample black and white pictures (one of a building and one of people) are presented in a horizontal row in front of the child. The left-right positions of the two pictures are randomly alternated. Across trials, the child is given either a picture of a building or a picture of people and is required to make a match by placing the picture in his/her hand onto the corresponding sample picture in front of him/her when the teacher says, “where does it go?”

I think my child will:		**Confidence Scale:**						
PASS	STOP	1	2	3	4	5	6	7

Task #16

A placemat that is half black and half white is placed in front of the child, along with a red cup. The placemat and the red cup remain in stable positions. Across trials, the child is required to place the red cup on the right side (i.e., the white side) of the placemat when the teacher says, "where does it go?"

I think my child will:		**Confidence Scale:**						
PASS	STOP	1	2	3	4	5	6	7

Task #17.

A large brown envelope and a small white envelope are placed in front of the child. The left-right positions of the envelopes are randomly alternated. Across trials, the child is given either a small white folded piece of paper or a large brown folded piece of paper. The child is required to make a match by placing the folded piece of paper on top of the corresponding envelope when the teacher says, "where does it go?"

I think my child will:		**Confidence Scale:**						
PASS	STOP	1	2	3	4	5	6	7

Task #18.

One green can (on the left) and one white box (on the right) are placed in front of the child and remain in a stable position. On each trial, a piece of beige foam is given to the child and the child is required to put the foam into the green can (on the left) when the teacher says, “where does it go?”

I think my child will:		**Confidence Scale:**						
PASS	STOP	1	2	3	4	5	6	7

Task #19.

One round gold container and one rectangular blue container are placed in front of the child. The left-right positions of the two containers are randomly alternated. Across trials, the child is given a beige cardboard star and is required to place the star in the blue container, regardless of its position, when the teacher says, "where does it go?"

I think my child will:		**Confidence Scale:**						
PASS	STOP	1	2	3	4	5	6	7

Task #20.

A pegboard with one “pegged” puzzle piece and an empty white container are placed in front of the child. The pegboard and the white container remain in a stable position. After the teacher models taking off the peg and placing it into an empty container, the child is required to do the same when the teacher says, "take it off ".

I think my child will:		**Confidence Scale:**						
PASS	STOP	1	2	3	4	5	6	7

THANK YOU FOR COMPLETING THIS QUESTIONNAIRE!

Appendix H

Prompt Sheet

KEEP THIS PROMPT SHEET IN FRONT OF YOU WHILE YOU RATE THE TASKS

Remember:

(a) Your child will demonstrate at least **one** correct response with each task, unassisted, before training begins.

(b) **PASS** = Child will **learn** the task by making 8 correct responses in a row before making 8 total errors.

(c) **STOP** = Child will **not learn** task, that is, 8 total incorrect responses (not necessarily in a row) will occur before 8 consecutive correct responses.

(d) **Confidence Scale**: Rate your confidence in your prediction on a scale from 1 to 7, where:

1 = "**It's a guess**",

4 = "**Somewhat confident**",

7 = "**Very confident**".