Enhancing the structure of a swimming program for three boys with autism through the use of activity schedules

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ABSTRACT

The purpose of the current investigation was to examine the effects of implementing a pictographic schedule within a currently structured swimming class consisting of individuals diagnosed with autism. Three boys (11 to 17 years) enrolled at a school for children with developmental disabilities served as participants. A time-series design was used to assess the effects of the pictographic activity schedules on the variables of time on-task, time off-task, and inappropriate response time in the activity setting, while rates of inappropriate behaviour were examined within the associated changeroom setting prior to and following the activity setting. The results indicated that activity schedules, when implemented in a physical activity setting, increase time on-task and decrease inappropriate response time in children with autism. In addition, when compared to periods of no schedule-use, activity schedules assisted in the reduction of rates of inappropriate behaviour within settings prior to and following activity sessions. Findings for the variable of time off-task yielded inconclusive results. The implications of these findings show the importance of visual activity schedules within all domains of education, including those involving physical activity.

RÉSUMÉ

L'objet de cette étude était d'observer les effets de l'utilisation d'un programme d'activités représentées par des images, dans un cours de natation structuré, auprès d'individus ayant été diagnostiqués comme autistique. Les trois sujet de cette recherche était des garçons âgés de 11 à 17 ans fréquentant une école spécialisée pour enfants ayant des troubles de développement. Suivant un modèle « time-series », les effets de l'utilisation du programme d'activités représentées par des images ont été calculés en mesurant les variables suivantes lors des sessions d'activités : temps engagé à la tâche, temps non-engagé à la tâche et temps de réaction inapproprié. La proportion de comportements inappropriés a quant à elle été mesurée avant et après les sessions d'activités, soit dans le vestiaire. Les résultats ont indiqués que les programmes d'activités, lorsque utilisés dans le cadre d'une activité physique, augmentent le temps engagé à la tâche et diminue le temps de réaction inapproprié chez les enfants atteint d'autisme. De plus, lorsque comparé avec des périodes où l'on ne fait pas l'usage d'un programme, on remarque que les programmes d'activités contribue à diminuer la proportion de comportements inappropriés avant et après les sessions d'activités dans un cadre donné. Les résulats portant sur le temps non-engagé à la tâche n'ont pas été concluants. Les données recueuillies démontrent ansi l'importance d'un programme d'activités représentées par des images pour tous les champs d'éducation, incluant l'éducation physique.

FOREWARD

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TABLE OF CONTENTS

APPENDICES

LIST OF TABLES

LIST OF FIGURES

Chapter 1

INTRODUCTION

Leo Kanner (1943) first described autism as a distinct disorder. Currently, there exists debate as to whether autism falls on a spectrum of pervasive developmental disorders (Baron-Cohen, 2000; Schopler, 1998), or if it is a distinct entity (McLaughlin-Cheng, 1998). Nonetheless, three areas of impairment have been associated with a diagnosis of autism. Specifically, these impairments reside in social interaction, communication, and particular patterns of behaviours and interests (American Psychiatric Association, 1994). For example, the uneven cognitive profiles of those diagnosed with autism may reflect upon abnormalities in receptive and expressive language, a lack of empathy for others, and a limited scope of creativity (Rapin, 1997).

According to the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.) (DSM-IV) (APA, 1994), the course of autism is continuous from diagnosis to adulthood. Yet, its appearance varies significantly depending on age and developmental level of the individual (Rapin, 1997). For example, Bushwick (2001) has described differences in severity with regard to all three major impairments.

The first population study of autism was not published until the mid-1960s (Fombonne, 1999). In this period it was concluded that 4.5 in 10,000 children had the disorder (Lotter, 1966). Since then, several studies have documented prevalence changes (Fombonne, 1999; Gillberg & Wing, 1999; Wing & Potter, 2002). For example, studies conducted in the 1980s revealed prevalence rates between 4.0 and 16.0 in 10,000 individuals (Gillberg & Wing, 1999). Over the last twelve years rates of up to 60 in 10, 000 individuals have been reported (Kadesjo, Gillberg, & Hagberg, 1999). Although the limitations (e.g., number of individuals, geographical regions,

etc.) of this research must be recognized, the prevalence of autism has increased significantly. Associated with this increase in prevalence, several theories regarding the treatment of autism have been developed.

Early theories regarding treatment focused largely upon a psychoanalytic perspective whereby children with autism were viewed as emerging from an environment lacking in parental warmth and comfort (Koegel, Kern-Koegel, & Carter, 1999; Koegel, Kern-Koegel, & McNerney, 2001; Smith, 1995). Therefore, intervention eliminated the parents from the treatment equation and stressed rehabilitation within residential programs. Today it is believed these types of treatments "are based on erroneous theories and harm children with autism and their families" (Smith, 1995:p. 52). More specifically, it has been shown that these treatments limited how much the child is likely to change in everyday settings, and allowed for chances to escape from therapeutic situations through ritualistic behaviours (Smith, 1995).

Today interventions include pharmacotherapy, psychotherapy, vitamin therapy, anti-yeast therapy, the use of hormonal compounds (i.e., secretin), and the control of allergies (American Psychiatric Press, 2001; Society for the Autistically Handicapped, 2003). However, the most effective forms of intervention and treatment procedures have emanated from special education, which addresses the three major impairment domains involved with autism: social, behavioural, and communication (Rapin, 1997). Additionally, it has been proposed that these educational programs be highly structured and geared towards the individual needs of the child undergoing treatment (Campbell, Schopler, Cueva, & Hallin, 1996).

One treatment method that directs its attention according to the individual is the instructional format of structured teaching. Structured teaching was developed to

teach students in classroom settings as well as to manage difficult student behaviors (Mesibov, Schopler, & Hearsey, 1994). According to Kunce and Mesibov (1998) the importance of structured teaching is twofold. First, structured teaching seeks to make the world as meaningful as possible. Generally speaking, if the child understands what is currently taking place and what is expected to come, learning may be enhanced while simultaneously reducing problematic behaviour. Second, structured teaching maximizes student strengths while concurrently minimizing deficits.

There are five distinct elements of structured teaching; physical organization, schedules, individual work systems, visual structure, and routines (Mesibov et al., 1994). With the use of these elements the teacher can provide a controlled learning environment that can be generalized to other settings the child may encounter. Also, the family can introduce the structure and consistency provided by structured teaching into the home and community, thus "enabling families to support their children at home and preventing the likelihood of family breakdown" (Howley, Preece, & Arnold, 2001, p. 43).

Physical organization refers to the physical layout, selection of work areas, and the provision of boundaries (Mesibov et al., 1994). For example, visually clear locations for work and play allow a child to understand what is expected when sent to that area of the classroom. As well, the removal of mirrors, closing of window shades, and the provision of dividers such as bookshelves may minimize visual and auditory distractions (Schopler, Mesibov, & Hearsey, 1995). The purpose of these modifications is to clarify the physical space and reduce any environmental information that may disrupt the student at work (Howley et al., 2001). In addition, it has been stated that areas which are crowded may overstimulate the individual with autism provoking avoidance behaviour (Heflin & Alberto, 2001).

Schedules are another essential component of structured teaching. According to McClannahan and Krantz (1999), schedules are sets "of pictures or words that cues someone to engage in a sequence of activities" (p. 3). Depending on the individual, these schedules can be broken down and simplified into individual task components, or in a general sense guide a child to perform an entire task or activity. Schedules aid students in understanding the difference between discrete events and their relationships amongst themselves (Mesibov et al., 1994). Schedules also help students anticipate and predict activities that are to come. The use of such visual and concrete systems provides "an effective means for supporting and eliciting communication in students with autism" (Heflin & Alberto, 2001, p. 95).

The third item of structure is work systems. A work system "informs students of what they should do while in their independent work areas" (Mesibov et al., 1994:p. 200). These systems aid in providing organizational strategies (Howley et al., 2001) and communicate four pieces of information to students: what work they are supposed to do, how much work there is, how they will know when they are finished, and what happens after the work is completed (Mesibov et al., 1994). Individual work systems are developed in the same manner as schedules. Pictures, symbols, and numbers communicate what work is to be done to lower functioning students, while words convey an identical message to those at a higher functioning level. This element of structure is important as the concept of "finished" (p. 201) is made concrete and meaningful.

Visual structure focuses on clarity, organization, and the provision of instruction. For example, colour coding materials, dividing space into smaller more manageable parts, and identifying where vital materials are to be placed when tasks are completed are characteristic of visual structure. According to Garretson, Fein,

and Waterhouse (1990) individuals with autism possess identical capabilities of attending to visual information as do typically developing persons. In fact, Grandin (1995) suggests that visually processing information might be the preferred modality for many individuals with autism. By directing attention to these visual strengths, students with autism may be offered a definite means of understanding what is being asked of them.

Lastly, routines are systematic and consistent manners in which tasks are carried out (Mesibov et al., 1994). For example, a morning classroom routine may involve a child putting his or her personal belongings in a locker, putting a lunch in the classroom refrigerator, going to the bathroom, and then sitting down at a desk. All of these actions are performed systematically on a daily basis, and imply the notion of familiarity within the individual as consistent information is constantly being presented. Further, the use of these routines may aid in the goal of increasing independence within the individual with autism (Howley et al., 2001).

While structured teaching serves as only a guideline to teach individuals with autism, it can create an environment in which a child can explore and ultimately learn. Just as no treatment has been produced to cure autism, no format has been singled-out as the only or best means of treating the disorder. However, there is substantial evidence that supports educating those with autism within the limits of structure.

Panerai, Ferrante, Caputo, and Impellizzeri (1998) incorporated all five elements of structured teaching in a study of 18 children with autism. Their purpose was to test whether special education based on the notion of structured teaching increases learning capacities and spontaneous communication while simultaneously reducing behavioral problems. According to the data, their hypotheses were

confirmed as improvement of children's competence, reduction of behavioral problems, and increases in spontaneous communication were found.

Alterations of individual elements within the scope of structured teaching have also been successful for individuals with autism. For example, Duker and Rasing (1989) have empirically supported the redesigning of the physical environment. Specifically, these authors indicated that redesigning the physical environment and "lowering their exteroceptive input of stimulation" (p. 458) does in fact reduce the symptomatology of autistic tendencies. An analysis of the data indicated that the new physical environment led to a reduced amount of self-stimulation and inactivity, while simultaneously increasing the degree of on-task behaviors.

Another element of structure that has proven successful is the use of activity schedules. MacDuff, Krantz, and McClannahan (1993) showed that photographic activity schedules produced sustained engagement, and skills generalized to new sequences of activities and photographs without additional training in four autistic boys. Additionally, the schedules enabled the boys to display lengthy and complex response chains, to independently change activities, and to engage in fewer aberrant behaviors. Since then, positive findings from structured teaching, and more specifically the use of schedules, have gained much support (Dettmer, Simpson, Smith-Myles, & Ganz, 2000; Massey & Wheeler, 2000; Schmit, Apler, Raschke, & Ryndak, 2000). Moreover, schedules have also been shown to be effective in self-managing behaviour in the absence of supervision (Pierce and Schreibman, 1994), reducing teacher-delivered verbal and physical prompts (Dettmer, Simpson, Smith-Myles, & Ganz, 2000), and maintaining high levels of on-task and on-schedule behaviour (Bryan & Gast, 2000).

Schultheis, Boswell, and Decker (2000) indicated that a structured environment has positive effects on individuals with autism in a physical activity setting. They stated that redesigning the physical environment through the use of boundaries increased independent behaviour, aided in schedule-following, increased levels of emotional security, and reduced off-task behaviours such as stereotypic ones. Despite these claims, no empirical evidence was provided.

Statement of Problem

Structure in the classroom has been recommended for children with autism for a number of years (Mesibov et al., 1994; Schopler et al., 1995). In addition, structure has also been advocated within physical education environments (Connor, 1990; Kitson, 1993; O'Connor, French, & Henderson, 2000; Reid & Morin, 1981; Schultheis et al., 2000). However, while evidence exists to support structure's efficacy within special education classrooms, there is a lack of supportive data in the physical education domain. Due to the physical education milieu being physically different from a classroom, it cannot be assumed that elements of structure will necessarily be effective in the gymnasium.

The purpose of this study was to examine the effects of enhanced structure within a physical activity environment. More specifically, it examined how pictographic activity schedules, within an already structured aquatics program consisting of individuals diagnosed with autism will affect time on-task, time off-task, and inappropriate response time.

Hypotheses:

1. It was hypothesized that the activity schedules implemented in the physical activity setting will increase time on-task, while simultaneously reducing time off-task and time including stereotypical responses.

2. It was hypothesized that the effects of improved behaviour will be transferred outside the activity setting, for example, to the areas that the children occupy prior to and immediately after the time spent in the pool.

Delimitations:

1. The participants were chosen based on specific behaviours denoted in the previous literature. These behaviours included aggression, hyperactivity, stereotypical behaviours, avoidance behaviours, and language deficiencies (i.e., echolalia, noncontextual speech, etc.).
2. The participants were chosen, as they were considered low-functioning according to their psychological profiles. Thus, it was thought that the intervention would provide additional benefits than for those considered high-functioning.
3. The participants were chosen as a matter of convenience as all were taken from one class within one school.
4. The participants were from an age group ranging from 11 to 17.
5. The teachers were familiar with the concept of schedule use as it was used in the regular classroom environment.

Limitations:

1. The experimental length was relatively short (13 weeks). However, structured teaching has demonstrated positive effects over experimental lengths of shorter duration (i.e., Durham, 2000; Durnick et al., 2000)
2. A relatively small sample of three adolescent boys was used.
3. The experimental settings had naturally occurring distractions which might have caused behaviours to be intensified, or possibly overlooked. For example, the external noise and echoes provided by an additional class may

have drowned out language impairments exhibited by the participants under examination.

4. There was no videotaped evidence in part of the experimental setting. Due to ethical considerations of videotaping while the participants changed, data collection took place via observation by the researcher in the change room. Behaviours in the swimming pool area itself were captured on videotape.

Chapter 2

LITERATURE REVIEW

The purpose of the study was to examine the effects of implementing a pictographic schedule within a structured swimming class consisting of individuals diagnosed with autism. This chapter outlines the review of literature in the following sections: (1) Definition and Diagnosis, (2) Movement Behaviour, (3) Epidemiology, (4) Etiology, (5) Physical Exercise as a Form of Intervention, (6) Special Education as a Form of Intervention, and (7) The Treatement and Education of Autistic and Communication Handicapped Children (TEACCH) Model.

Definition and Diagnosis

Leo Kanner first described autism as a distinct disorder in 1943. After extensive observation of 11 children, Kanner identified several characteristics that differed markedly and uniquely from anything that had been reported. These characteristics included an inability to relate to themselves and to others; an extreme sense of aloneness; poor communication skills marked by delayed echolalia, literalness, and pronoun reversal; and an insistence on sameness. As the first manifestations of these characteristics were preceded by at least two years of essentially average development, Kanner labeled the disorder as "early infantile autism".

Since the first description of early infantile autism, research has supported the idea of a spectrum of autistic disorders (Wing & Gould, 1979). The essential feature of this spectrum included a triad of impairment in the areas of socialization, social communication, and in social play. As research continued to grow, this triad eventually translated into the concept of "pervasive developmental disorders" (PDDs), which was characterized by a similar, but somewhat different triad.

In 1980, the term PDD became a part of the official classification system when it appeared in the third edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-III) (APA, 1980). At this time, PDD was considered to be a generic label encompassing several different conditions including autism, childhood-onset PDD, residual autism, and atypical autism. In addition, the term referred to "the idea that the impairments in socialization, communication, and play 'pervade' all aspects of a child's life and arise from a developmental disability" (Szatmari, 2000:p. 731).

Due to controversy about the non-autistic forms of PDD, the DSM-III was revised in 1987 (DSM-III-R) (APA, 1987). At this time, the diagnostic criteria were broadened to capture a larger variation in expression, while simultaneously collapsing the other forms of PDD into a single category labeled "PDD not otherwise specified" (PDDNOS). These changes led to an increase in the number of children receiving diagnosis.

Currently, autism is classified in the fourth edition, text revision of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV) (APA, 1994) under the category of Autistic Disorder. This disorder is found in a group of PDDs with Rett's Disorder, Childhood Disintegrative Disorder, Asperger's Disorder, and PDDNOS. Like early diagnostic criteria, a triad of impairments exists with regard to PDD, and specifically with the disorder of autism. While there are several elements to each of these impairments, not all have to be observed. However, each of the impairments themselves must be represented in order for a diagnosis to occur (See Appendix D). The 10th revision of the *International Classification of Diseases* (ICD-10) (World Health Organization [WHO], 1993) also contains similar subgroups and research criteria for pervasive developmental disorders (See Appendix D-1).

The first component of the triad is the presence of markedly abnormal or impaired development in social interaction. The use of multiple nonverbal behaviour such as eye-to-eye gaze and body posture may be inhibited. As well, there is a failure to develop peer relationships appropriate to developmental level. For example, a child with autism may seek out relationships with those who are in authoritative positions rather than with children who share a classroom with them. A lack of spontaneous seeking to share enjoyment and a lack of social and emotional reciprocity also exists, as a child may prefer solitary activities to simple social games. In addition, children with autism may involve others only if they can be used as tools to complete an activity or task. Lastly, a concern with the individual's awareness of others arises. Often, an individual with this disorder may be oblivious to other children, have no concept of the needs of others, or may not notice another person's distress.

The presence of markedly abnormal or impaired development in communication is the second element of the Autistic Disorder triad of impairments. Impairment may reside in both verbal and nonverbal skills. There may also be a delay in, or total lack of, the development of spoken language. In individuals who do speak, there may be impairments in the ability to initiate or sustain conversation with others. There may also be a stereotyped and repetitive use of idiosyncratic language, immature grammatical structures, use of metaphorical language, and abnormalities in pitch, intonation, rate, rhythm, or stress.

The third and final component of the triad of impairments is a markedly restricted repertoire of activity and interests. Within this component, the individual may have preoccupations with one or more stereotyped and restricted patterns of interest that are abnormal in intensity or focus. For example, an individual may

collect voluminous material about a certain music group, or amass facts about specific baseball statistics. Moreover, an inflexible adherence to specific non-functional routines or rituals may exist. An example of this is repetitive switching of a light on and off before entering a room, or taking exactly the same route to school everyday. Other characteristics include stereotyped and repetitive motor mannerisms, such as body rocking or movements of the hands, abnormalities of posture, and a fascination with movement.

Although this triad of impairments is essential in diagnosing autism, there are several other features that are associated with the disorder. For example, in 75% of cases there is an associated diagnosis of mental retardation (APA, 1994; Bryson & Smith, 2002). There may also be abnormalities in development of cognitive skills; impairment in levels of receptive compared to expressive language; behavioural symptoms such as hyperactivity, short attention span, aggression, impulsivity, self-injurious behaviour, and tantruming; odd responses to sensory stimuli; abnormalities in eating and sleeping; abnormalities in mood or affect; and a lack of fear in response to real danger, and excessive fear in response to harmless objects. While none of these features are critical for a diagnosis, all are common for describing an individual with autism.

According to the DSM-IV, autism's course is not gender-specific. However, its rate occurs four to five times higher in males than in females. In addition, the onset of autism occurs prior to age three years, and its course is continuous from diagnosis into adulthood. Over this period of time, some individuals deteriorate whereas others improve. Regardless, the highest functioning adults typically continue to exhibit problems in the three impairments that distinguish autism from the other pervasive developmental disorders.

To date, the classification systems of the American Psychiatric Association and the World Health Organization are the most widely used criteria for diagnosing autism (Wing & Potter, 2002). While assessment and evaluation continue to be based on these systems, many speculate flaws due to foundations within the medical model. For example, Szatmari (2000) claims that attempting to pinpoint discrete biological entities "leads to a preoccupation with searching for cross-sectional differences between PDD subtypes" (p. 737). Moreover, this investigator believes that these strategies display no implications for clinical practice and are confusing to parents and clinicians.

Alternatively, it has been suggested that evaluations be based on criteria within a developmental context whereby individuals are evaluated in relation to others (Gillham, Carter, Volkmar, & Sparrow, 2000; Szatmari, 2000). According to Baily and colleagues (1996) this alternative view has several advantages. These include reliance on well-normed developmentally based assessment instruments, allowance of sensitivity to differences in severity other than what has been expressed through categorical approaches, and facilitation in the identification of subtypes of disorders. By using this developmental approach, a better appreciation and understanding of symptom change with age may be developed (Gillham et al., 2000).

Regardless of diagnostic approaches being used, the list of studies involving autism continues to grow. Within this list, literature involved with the motor functioning in PDD is apparent. According to Reid and Collier (2002) impairments in motor functioning are diagnostic criteria in Rett's Disoder and associated criteria in Asperger's Syndrome. Further, these authors suggest that these impairments could have diagnostic capabilities with respect to autism. Due to these suggestions, a brief look at movement behaviour is warranted.

Movement Behaviour

As mentioned above, impairments in motor functioning are used to diagnose individuals with Rett's disorder. However, other pervasive developmental disorders (i.e., autism and Asperger's syndrome) do not require motor impairments for diagnosis. Instead, difficulties in motor functioning are characterized as associated criteria, and are observed through repetitive motor mannerisms and clumsiness. While a relationship is apparent within the diagnostic criteria, two specific areas of movement behaviour and autism have sparked interest amongst researchers in the field.

The first area of interest is in the motor and skill development of individuals with autism. In his initial work, Kanner (1943) commented very little on the motor behaviour of the 11 children he examined. Although several instances of clumsiness in gait and gross motor abilities were noted, he still found the group of children as dextrous. Early work in the area of autism supported this notion of dexterity as individuals with autism were described as having normal patterns of motor development (Rimland, 1964). However, further research in the area disputed these claims stating that the motor functioning in individuals with autism was impaired and atypical.

DeMyers (1976) compared individuals with autism to peers with intellectual disabilities on locomotor and object control skills. While it was shown that both groups performed at similar levels on skills like jumping, hopping, skipping, and running, object control skills involved with ball-play proved difficult for those with autism. Similarly, Damasio and Maurer (1978) documented movement difficulties stating that individuals with autism displayed akinesia (absent or diminished movement); bradykinesia (delay in initiating, stopping or changing movement

patterns); and dyskinesia (involuntary tics or stereotypies), as well as abnormalities of muscle tone, posture, and gait.

Morin and Reid (1985) compared the motor performance of eight adolescents with high-functioning autism to that of eight adolescents with mental retardation. Motor skills modified from the Bruininks-Oseretsky Test of Motor Proficiency (BOTMP; Bruininks, 1978) were evaluated quantitatively and qualitatively. The results from these tests indicated that the motor patterns of the individuals with autism could be characterized as immature and significantly inferior to the functionally retarded males. Specifically, while no meaningful quantitative differences between the groups existed, the authors suggested that the condition of autism "may be a deterrent to qualitative motor behaviour beyond that of mental retardation" (p. 53).

Recently, Berkeley and her colleagues (2001) examined the locomotor and object control skills of 15 children (10 male, 5 female) with autism, aged 6-8 years. Through comparison with the norms reported by the Test of Gross Motor Development (TGMD; Ulrich, 1985), 73% of the children fell into the poor to very poor categories of the TGMD. More specifically, all participant scores ranged from below average to very poor on tests of locomotion, while 80% fell in the range of below average to very poor on tests of object control.

The second area of interest amongst researchers has been the differentiation of pervasive developmental disorders through motor functioning. For several years, research has noted the apparent clumsiness of children with Asperger's syndrome (Asperger, 1944/1991; Ghaziuddin & Butler, 1998; Ghaziuddin, Butler, Tsai, & Ghaziuddin, 1994; Ghaziuddin, Tsai, & Ghaziuddin, 1992; Smith, 2000; Wing, 1981). In addition, it has been suggested that these movement difficulties may

differentiate between a diagnosis of high-functioning autism (Klin, Volkmar, Sparrow, Cicchetti, and Rourke, 1995). While agreement exists as to motor coordination problems in Asperger's syndrome, the majority of research contends that movement skills do not distinguish the disorder from autism.

With the purpose of distinguishing amongst high-functioning autism (HFA) and Asperger's syndrome (AS), Ghaziuddin and colleagues (1994) compared 11 individuals with AS to 9 individuals with HFA. Through the use of the BOTMP (Bruininks, 1978), results revealed no differences as each group showed problems with coordination, and the distribution of standard scores was virtually identical. According to these researchers, these results suggested that "motor clumsiness, as measured by tests of coordination, may not reliably distinguish AS from HFA" (p. 519).

Manjiviona and Prior (1995) demonstrated similar results through their examination of 21 individuals, 7-17 years of age. Through the use of the Test of Motor Impairment – Henderson Revision (TOMI-H; Scott, Moyes, & Henderson, 1985), the authors concluded that no aspect of motor impairment differentiated HFA and AS. Rather, a depiction of the heterogeneous manifestations of motor difficulties and their relationship to cognitive profiles in autism spectrum disorders was given. Ghaziuddin and Butler (1998) supported these findings through their examination of 10 and 11-year olds with HFA, AS, and pervasive developmental disorders not otherwise specified (PDD-NOS). These authors found no distinction among the groups, however all showed motor coordination difficulties.

Through such tools as the BOTMP, TGMD, and TOMI-H, it may be clearly observed that motor dysfunction is characteristic of pervasive developmental disabilities. Additionally, it should be noted that conclusions with regards to the

diagnostic capabilities of motor difficulties require further investigation before subtypes can be extrapolated. While debate continues in areas of diagnosis and motor functioning, studies reporting progressively rising prevalence rates have sparked interest among professionals in the field of developmental disabilities (Bax, 1994 cf. Gillberg & Wing, 1999). The following section will examine the epidemiology of autism and its associated spectrum of disorders.

Epidemiology

According to Fombonne (1999), epidemiology is concerned with patterns of disease occurrence in human populations and by factors that influence them. Within this field, recent studies of incidence and prevalence have reported rising rates considerably higher than in almost all previous studies (Wing & Potter, 2002). Incidence refers to the number of individuals in a specialized population in whom the condition being studied begins within a specified time period, while prevalence refers to the number individuals in a specified population who have the conditions being studied at a specified time, regardless of when it began (Wing & Potter, 2002). While both can be used to determine changes within a population, the problem with calculating incidence rates for autism is its difficulty in defining a precise age of onset. Due to this difficulty, most studies of epidemiology examine rates of prevalence.

Since Lotter's (1966) initial examination, over 40 studies have estimated the rate of prevalence in autism (Gillberg & Wing, 1999; Fombonne, 1999; Wing & Potter, 2002). Table 1 is a summary of the research on prevalence. From the reviews of Gillberg and Wing (1999), Fombonne (1999), and Wing and Potter (2002) it is clear that more studies have been performed recently compared to earlier periods. For example, from 1982 to the present over 30 studies have been reported, the

remainder occurring prior to this year. Wing and Potter (2002) have identified 10 research studies since 1998.

	Gillberg & Wing (1999)	Fombonne (1999)	Wing & Potter (2002)
1966-1973	2	3	3
1974-1981	1	1	1
1982-1989	7	11	15
1990-1997	8	6	6
1998-Present	-	2	10

Table 1 – Epidemiological studies within three review articles.

While Table 1 outlines the number of studies, Table 2 shows the average rates of autism across time periods. As with the previous table, averages calculated by the three reviews demonstrate an increase of prevalence overtime. However, in the meta-analysis of Fombonne (1999), prevalence rates dropped from 10.0 per 10,000 individuals to 7.8 per 10,000 individuals since 1998. While the significance of this decline is not known, it must be taken into consideration that Fombonne (1999) used only two studies in determining the prevalence rates for the 1998 to present time period.

	Gillberg & Wing, 1999	Fombonne, 1999	Wing & Potter, 2002	Average
1966-73	4.4	3.0	3.1	3.5
1974-81	4.9	4.8	4.6	4.8
1982-89	9.6	7.0	6.3	7.6
1990-97	13.4	10.0	13.0	12.1
1998-Present	-	7.8	23.1	15.5

Table 2 – Autism prevalence rates across time periods (per 10,000).

Prevalence rates of autism have increased dramatically since the first studies took place. While there is no definite reason for this increase, several explanations

have been offered (Wing & Potter, 2002). The first explanation they give deals with diagnostic criteria. As "diagnosis is made from a detailed developmental history and observation of behaviour" (Wing & Potter, 2002:p. 152), changes in the evolution of the terminology has governed what professionals looked for in assessing and diagnosing individuals. In addition, there has been an impact of diagnostic criteria in prevalence studies. For example, the operational definitions, and training in their use, may not have been used as stringently as possible, thus circumventing the likelihood of similar participant evaluation.

The differences in methods used may also serve as an explanation of increasing prevalence rates. For example, studies have different target populations and geographical areas (Arvidsson et al., 1997; Bryson, Clark, & Smith, 1988; Gillberg, 1984; Gillberg, Steffenburg, & Schaumann, 1991; Honda, Shimizu, Misumi, Niimi, & Ohashi, 1996; Magnusson & Saemundsen, 2001). In addition, the methods of case-finding have changed. While contemporary research uses medical and educational agencies to find eligible children, previous studies relied on parents assuming that something was incorrect with their infant (Wing & Potter, 2002).

Two additional reasons that link nicely with each other include the increasing awareness of autism spectrum disorders among professionals and general public, and the development of specialist services. As research has become more widespread, services such as family support programs, special schools, occupational services, individual support in mainstream schools, and specialized leisure opportunities have been made readily available to both individuals with autism and their families (Wing, 2001). Due to these services, parents have been more willing to accept a diagnosis and begin treatment. In accordance, professionals and clinicians are more willing to

offer such a diagnosis as they know that it will lead to appropriate help (Wing & Potter, 2002).

Another explanation is the recognition that it can be associated with other conditions. Bryson and Smith (2002) have remarked that 75% of those with autism have mental retardation. In addition, they claim that 25% of those with mental retardation also have autism. Other profound developmental disabilities that have been linked to autism include Tourette's syndrome (Kadesjo & Gillberg, 2000), Down syndrome (Howlin, Wing, & Gould, 1995), epilepsy (Bryson & Smith, 2002; Rapin, 1997), sensory impairments (Rapin, 1997), and motor coordination problems (Smith, 2000). Even the spreading knowledge of Asperger's syndrome has heightened the awareness that autistic conditions may reside in those individuals with high intellectual ability (Wing & Potter, 2002).

Changing prevalence rates may also have occurred due to misdiagnosis with psychiatric illnesses. According to Wing and Potter (2002), prior to, and after Kanner's first paper on autism, autistic conditions were often diagnosed as childhood schizophrenia. In addition, it has been thought that these errors in diagnosis may have occurred with respect to schizophrenia, bipolar disorder, and obsessive-compulsive disorder. (Ryan, 1992 cf. Wing & Potter, 2002).

Lastly, the difference in possible cause and the relation to age of onset may be an explanation for changing prevalence rates. Asperger (1944; 1991) observed that traits related to his syndrome were often seen in parents of children under examination. Rutter (2000) also has suggested that there is a strong genetic influence due to evidence in twin studies of autism. Environmental factors, such as diet, environmental pollutants, allergies, and vaccines, have also been suggested as having

some influence on prevalence. However, these hypotheses are based on very weak empirical evidence.

From the evidence presented, all factors have likely contributed to the observed rise in rates of ASD. However, there is no certainty as to how much of the variance they explain. What is needed are comparative studies conducted within the same regions, in which identical methods of assessments and diagnostic criteria are used at different points in time (Wing & Potter, 2002). Such studies would provide comparative data not only on prevalence, but also on demographic and other associated psychological and biological characteristics. In addition, knowledge pertaining to the financial burdens of families, governments, and different service industries (i.e., education, health, child welfare), as well as influence the reform of new social policies and treatments (Bristol et al., 1996) may be revealed.

Etiology

Etiology is defined as the study of causes (Morehead & Morehead, 1995). As several researchers have noted autism's heterogeneity (Mackowiak, 2000; Rutter, 2000; Szatmari, Jones, Zwaigenbaum, & MacLean, 1998); it is "not a disease with uniform etiology" (Cook, 2001:p. 333). In fact, the cause of autism is now being viewed as occurring at the genetic, developmental, neurobiologic, pathophysiologic, cognitive, and behavioural levels (Minshew, Johnson, & Luna, 2001).

As each level of analysis is equally important in determining causation (See Table 3), a variety of theories and models have been proposed. Particularly, areas within genetics, neurobiology, and psychology have been examined.

Evidence exists at the genetic level in terms of molecular genetics and functional genomics (Rutter, 2000), as well as through genome-wide linkage and genetic association studies (Cook, 2001). Despite this evidence, its detail is complex

and not within the scope of the current study. While their magnitude is important within autistic research, the strongest evidence of autism's heritability comes from twin and family studies (Cook, 2001).

According to Szatmari and his colleagues (1998), the rationale behind twin studies is to compare the concordance rate for autism among monozygotic (MZ) twins who are genetically identical to dizygotic (DZ) twins, 50% of whose genes are identical by descent. Family studies, on the other hand, are important in determining if any patterns of transmission exist between the siblings and parents of autistic individuals. Moreover, family studies are essential in delineating the breadth and pattern of the possible broader phenotype within autism (Rutter, 2000).

Twin studies support a genetic foundation as it has been suggested that heritability of an underlying liability to autism is in excess of 90% in MZ twins (Rutter, 2000). According to Folstein (1996) this rate is high, as MZ twins are assumed to share identical environmental factors (cf. Szatmari et al., 1998). Family studies also provide some support for the genetic foundation within autism, as subsequent siblings born into families with one child with autism have an increased chance of being autistic themselves (Stodgell, Ingram, & Hyman, 2001). This increase has been reported at approximately 6-14 times the usual prevalence (Reid & Collier, 2002).

While not specific to twin and family studies, the notion that several interacting genes support a genetic basis for autism has also been proposed. Further, Pickles et al. (1995) have suggested that any number between 2 and 10 genes may be a possibility, however three or four are most probable.

At the neurobiological level, two areas are involved, one dealing with anatomical features of the brain, and one concerned with chemical processes. With

regard to neuroanatomy, autism is frequently found to co-exist with other diseases in which the central nervous system is affected, or brain abnormalities exist (Mackowiak, 2000). For example, Schopler and Mesibov (1987) found anatomical abnormalities at the levels of the cerebellum, limbic system, and cortex. In addition, Hashimoto and colleagues (1995) found the brainstem (including the midbrain, pons, and medulla oblongata) and the cerebellum to be significantly smaller in autistic patients. Abnormal lateralization through post-mordem studies has also provided evidence of impaired functioning between the parietal and frontal regions of the brain, and between the thalamus, caudate, and the lenticular nuclei and insula (Mackowiak, 2000). Finally, larger head circumferences found in autistic individuals have given rise to neuroanatomical theories of cause (Woodhouse et al., 1996).

In terms of the neurochemical and neuropharmacological studies that have been performed, theories of cause have indicated dysfunction within the dopaminergenic (Bradshaw & Mattingley, 1995) and serotonergic (Bolton, Pickles, Murphy, & Rutter, 1998 cf. Mackowiak, 2000) pathways within the brain. For example, Anderson (1994) found that dopamine antagonists aggravated autistic behaviour while agonists treated such behaviour. According to Mackowiak (2000) this indicates an underlying problem between the dopaminergenic brain stem and the mesolimbic pathways that project to the mesolimbic cortex. In terms of serotonergic dysfunction, it has been found that increased levels of whole blood and platelet serotonin and increased rates of platelet serotonin transmission have been associated with obsessive symptoms resembling those of autism (Cook & Leventhal, 1996 cf. Mackowiak, 2000). Further, studies have found that serotinin transporter antagonists decrease autistic symptoms (Cook et al., 1997) and that decreasing the dietary intake

of tryptophan, an amino acid from which serotonin is derived, may aggravate autistic tendencies (Anderson & Hoshino, 1997 cf. Fisher et al, 1999).

Aside from these two neurological transport systems, exposure to thalidomide due to brain stem injury during earliest stages of brain development (Rodier, 2002) and impaired transmission of amino acid gamma-aminobutyric acid (GABA) (Cohen, 2000; Hussman, 2001) have also been mentioned.

The largest body of literature regarding the cause of autism occurs within the psychological domain. Particularly, three theories have evolved from this perspective: theory of mind, executive function, and complex information processing.

According to Baron-Cohen (2001), a theory of mind refers to being "able to reflect on the contents of one's own and others' mind" (p. 169). In essence, the cognitive feature enabling one to infer a full range of mental states (i.e., beliefs, desires, intentions, imagination, emotions, etc.) is impaired in those with autism spectrum conditions. Table 3 provides a summary of the manifestations of the theory of mind abnormality.

1. Impairments in making a mental-physical distinction.
2. Lack of understanding the functions of the brain.
3. Impairments in the appearance-reality distinction.
4. Difficulties in shifting perspective to judge what someone else might think.
5. Impairments in recognizing mental state words.
6. Production of fewer mental state words in spontaneous descriptions involving action and deception.
7. A failure to reflect on one's own imagination.
8. Difficulties with mental states as causes of emotion.
9. Difficulties with mentalistic interpretation of the eyes of another person.
10. Lack of ability in monitoring one's own intentions.
11. Difficulties in production and understanding of deception.
12. Lack of ability to understand metaphorical, sarcastic, and ironic speech.
13. Difficulties in all areas of pragmatics.

Table 3 – Manifestations of Theory of Mind abnormality (Adapted from Baron-Cohen, 2001).

The theory that people with autism have deficits in their abilities to infer mental states, has been partially successful in accounting for the three key impairments (Frith, 1989). Above all, it has "allowed predictions to be made concerning the pattern of impaired and preserved competence" (Happe, 1994:p. 217). Nevertheless, there are gaps in this theory that remain. For example, Happe (1994) states that tasks which are designed to tap mental processes also require the use of other psychological abilities such as language and memory. Due to these lack of abilities, other theories have attempted to sort out the causal nature of autism. Executive function is one of these theories.

Executive function has been described as an umbrella term for the mental operations which enable an individual to disengage from the immediate context in order to guide behaviour by reference to mental modes or future goals (Hughes, Russell, & Robbins, 1994). Formally, it has been defined as "the ability to maintain an appropriate problem-solving set for attainment of a future goal" (Ozonoff, Pennington, & Rogers, 1991: p. 1083). It includes acts such as planning, impulse control, inhibition of prepotent but irrelevant responses, set maintenance, organized search, flexibility of thought and action, integration across space and time, and working memory (Ozonoff, Strayer, McMahon, & Filloux, 1994; Ozonoff et al., 1991; Pennington & Ozonoff, 1996).

There are two central ideas within the concept of executive functioning (Pennington & Ozonoff, 1996). The first involves context-specific action selection, especially in the face of strongly competing, but context-inappropriate responses. The other is maximal constraint satisfaction in action selection, which requires the integration of constraints from a variety of other cognitive domains, portraying

executive function as being essential to complex behaviour, especially human social behaviour.

According to Bishop (1993), executive function impairment has been proposed as a potential underlying deficit of autism because the symptoms demonstrated by patients with prefrontal cortical dysfunction are similar to that of autistic behaviour. Originally it was thought that the frontal lobes played an integral role in the deficits demonstrated by those with autism, however little evidence of local abnormality in the frontal lobes was found (Ozonoff et al., 1991; Pennington & Ozonoff, 1996). Nonetheless, several features of autism are reminiscent of deficits in executive function. These include behaviour that is rigid and inflexible, distress accompanying trivial changes in the environment or routine, perseverative behaviour, difficulty in self-reflection and self-monitoring, and impulsivity (Bishop, 1993; Ozonoff et al., 1991).

The last theory within the psychological domain is complex information processing. According to Minshew and colleagues (2001), there are three features of this theory, including: a) a pattern of selective involvement of complex abilities within and across affected domains, b) a remaining integrity of simpler abilities in the same domains demonstrating deficits, and c) the absence of deficits in the attention, sensory perception, simple memory, simple language, and visuospatial domains. Collectively, these three features define autism as "a selective disorder of complex information processing that spares the visuospatial system" (Minshew et al., 2001:p. 128). While this construct accounts for the pattern of deficits within affected domains, deficits within domains of higher-order complex information processing demands are also accounted for.

In this section, only a few of the suggestions regarding causation have been discussed. Other theories such as social learning (Bushwick, 2001), diet (Whitely, Rodgers, & Shattock, 2000), and pregnancy and birth complications (Mackowiak, 2000; Szatmari et al., 1998) have also been proposed. It is important to remember that these suggestions, regardless of their magnitude, are only theories and the exact cause of autism remains unknown. While the search for causation will continue, research which identifies effective educational intervention will continue to be needed.

Physical Exercise as a Form of Intervention

Over the course of the last two decades, a large emphasis has been placed on the importance of physical exercise for individuals with severe and profound developmental disabilities (Allison, Faith, & Franklin, 1995; Lancioni & O'Reilly, 1998). Due to such a concentrated focus, three main objectives have been developed: 1) determining strategies for independent engagement and prolonged physical exercise; 2) improving physical fitness and performance levels; and 3) reducing behavioural problems while enhancing constructive engagement (Gabler-Halle, Halle, & Chung, 1993; Lancioni & O'Reilly, 1998; Reid, Phillips, & Green, 1991). While these objectives have maintained their integrity over the years, the methods by which researchers have pursued them have varied quite significantly. For example, research has examined the behavioural effects delivered from exercise with differing forms, intensities, duration levels, and frequencies.

Several studies have demonstrated how brief bouts of vigorous exercise elicit positive effects in individuals with developmental disabilities (Allison, Basile, & MacDonald, 1991; Basile, Motta, & Allison, 1995; Kern, Koegel, Dyer, Blew, & Fenton, 1982; Powers, Thibadeau, & Rose, 1992; Reid, Factor, Freeman, & Sherman,

1988; Rosenthal-Malek & Mitchell, 1997; Watters & Watters, 1980). For example, Watters and Watters (1980) investigated the effects of an 8-10 minute jogging session on the self-stimulatory behaviour and the academic responses of two children with severe mental disabilities and autism. The results indicated a decrease in self-stimulatory behaviour was apparent after the jogging precondition in one child, while the other child showed no significant change.

Kern and her colleagues (1982) also used jogging as exercise for five children diagnosed with autism. Exercise was provided for 5-20 minutes dependent on recommendations of the children's physician, and was adjusted to be fast enough to be mildly strenuous (e.g., child showed increased breathing rate or slightly flushed face). Observation of the subject's self-stimulation, ball-playing, and academic responses took place during the 15 minutes before and after jogging. The data showed that the jogging condition decreased self-stimulatory behaviour and increased appropriate play and academic responding on all of the participants, therefore demonstrating a positive effect with respect to exercise.

More recently, Rosenthal-Malek and Mitchell (1997) examined the self-stimulatory behaviour of five adolescents (aged 14-15 yrs) with autism. Their purpose was to determine the effects of aerobic exercise on the self-stimulatory behaviours and academic performance, and to assess the generalization in a community-based workshop situation. Both exercise and academic preconditions were administered prior to engagement in other academic sessions or within the community-based workshop. The results indicated that there was a significant decrease in self-stimulatory behaviour following a physical exercise precondition compared with an academic precondition.

Experimental research using longer durations of vigorous exercise has also shown improvements in behaviour (Bachman & Sluyter, 1988; McGimsey & Favell, 1988; Whitaker & Saleem, 1994). For example, Bachman and Sluyter (1988) performed their study with two adults with developmental disabilities. The program required the participants to partake in a 45-minute aerobic exercise session, consisting of warm-up stretches, a fast aerobic routine, and a cool-down period. Two observations were performed daily, one immediately prior to the exercise session and another immediately after. Results from these observations indicate that a marked decreased in each of the subjects' inappropriate vocalizations, repetitive movements, and off-task behaviours.

With respect to exercise intensity, studies comparing the effects of vigorous exercise versus mild forms have shown behavioural management capabilities (Bachman & Fuqua, 1983; Celiberti, Bobo, Kelly, Harris, & Handleman, 1997; Elliot, Dobbin, Rose, & Soper, 1994; Kern, Koegel, & Dunlap, 1984; Levinson & Reid, 1993; Morrissey, Franzini, & Karen, 1992). For example, Kern and her colleagues (1984) compared the effects of jogging versus ball playing on three children with autism. The children were exposed to each condition daily. The sessions lasted for 15-minutes followed by a 90-minute observation period. While minimal influence was observed through the ball-playing sessions, the jogging sessions revealed reductions in stereotyped behaviours.

Elliot and colleagues (1994) compared the effects of no exercise, general motor activities (i.e., riding an exercise bike, lifting weights on a universal gym) and vigorous aerobic exercise (i.e., a motorized treadmill moving at 4.0 miles/hour) on maladaptive and stereotypic behaviours in six adults with both autism and moderate to profound mental retardation. Experimental sessions lasted for 20 minutes, which

were followed by 30 minutes of observation. The observations confirmed the research on vigorous exercise suggesting that the intensity of the exercise is "critical for reducing maladaptive and stereotypic behaviours" (p. 572). In addition, the authors suggest that the use of vigorous exercise can be used as a normalized, proactive method to assist in reducing both behaviours that prompt restrictive placement and those that prolong it.

Lastly, studies examining the effects of increased exercise frequency have revealed interactions between the amount of exercise delivered and unsuitable behaviour (Prupas & Reid, 2001). Using four children with developmental disabilities, treatment sessions involving a single and multiple exercise sessions were delivered. While the single session confirmed previous research in reducing stereotypies, it was concluded that the effects were "short-lived" (Prupas & Reid, 2001:p. 196). However, the multiple frequency sessions demonstrated additional effectiveness in the reduction of stereotypies, especially throughout specific periods of the day.

In addition to differing activities, intensities, and durations, research has suggested a number of techniques that may be useful within the environment where exercise is administered. Most recently, Reid and O'Connor (2003) have suggested that choosing activities based on individual strengths, and activities which serve a functional purpose are essential in delivering an exercise regimen. O'Connor and colleagues (2000) emphasized the need for a structured physical environment. Specifically, this environment should be one whereby any external stimuli are removed and a low student-to-teacher ratio exists (Connor, 1990; Reid & Morin, 1981). Moreover, this environment should be one which can be generalized to later (Connor, 1990; O'Connor et al., 2001; Reid & Morin, 1981).

Another technique suggested by Weber (1989) is the use of task variation, or interspersal of high-maintenance tasks (Munk & Repp, 1994). Here, tasks which are mastered, and those which are not, are presented intermittently during an physical education session. It is assumed that this process facilitates learning by providing a review for material that is already learned, while increasing confidence levels in individuals allowing for increased enthusiasm and motivation towards unlearned material. The method of task variation has been shown to be effective in motor functioning (Weber & Thorpe, 1992), and is associated with decreased maladaptive behaviours in individuals with autism (Dunlap, 1984).

An educational model which incorporates the use of physical activity as a form of intervention is The Higashi Method (Teachers College Columbia University, 2004). Originating in Japan, and currently available in Boston, Massachusetts, the goal of this method is to help children with autism develop as close to normal as possible physically, emotionally, and mentally, and to be able to achieve independence and obtain a good quality of life. It provides children with a systematic education involving group dynamics, the use of modeling, art, music, academics, vocational training, and most important in this review, physical activity. According to this method physical activity is emphasized to reduce anxiety, improve stamina, and establish routines. Practitioners applying this method believe that through exercise, students will learn to control their body, and through this, learn to control their behaviour as well.

Special Education as a Form of Intervention

While exercise has demonstrated a substantial effect in terms of intervention, special education has generated other therapeutic treatment methods. Distinctively, therapies such as applied behaviour analysis, communication therapy, sensory-motor

therapy, group and play therapy, and multi-treatment approaches have been proposed (American Psychiatric Association, 1989; American Psychiatric Press, 2001; Dempsey & Foreman, 2001; Dunlap & Kern, 1993; Dunlap, Kern, & Worcester, 2001; Eliasoph & Donnellan, 1995; Green, 1996; Rogers, 1999).

According to Dempsey and Foreman (2001) applied behaviour analysis (ABA), "focuses on teaching small measurable units of behaviour systematically" (p. 108). In particular, simple and complex responses are analyzed and broken down into smaller, more easily manipulated steps. Through the use of an "antecedent-behaviour-consequence" order of events, each step is taught (Koegel et al., 1999). As a question or command is presented, a response is naturally given. If the response is desirable, it is reinforced with an item of value or interest (i.e., edibles). However, when an inappropriate response occurs (i.e., self-stimulatory behaviour, tantruming, etc.) reinforcement is withheld, the behaviour is ignored, and the child is redirected. In such a case, a functional analysis of the surrounding environment is carried out in order to determine any explanation of the inappropriate behaviours (Green, 1996; Munk & Repp, 1994).

The idea of a relationship between behaviour and the environmental context in which it occurs has been discussed in depth by Dunlap and his colleagues (Dunlap, Kern, and Worcester, 2001). These authors state that those variables in the environment that initiate undesirable behaviour should be "removed or ameliorated, while environmental variables linked to desirable behaviour are amplified" (p. 130). These variables, also described as "setting events", influence the likelihood that an otherwise neutral antecedent will determine a particular behaviour (Munk & Repp, 1994:p. 391). Therefore, as these events initiate a response, modification of them may have a powerful influence on behaviour.

Several suggestions have been made with regard to modifying antecedent variables. They include simplifying tasks by teaching parts rather than the whole task, providing opportunities for choice making, modifying the task size and duration, interspersal of high-maintenance tasks, task variation, including elements of interest or relevance to the child's life, and modifying the instructional media delivering information to the child (Dunlap et al., 2001; Munk & Repp, 1994). Although these modifications are easily implemented within the instructional environment, a concern with this approach is that such manipulations may be very dissimilar to a general education curriculum (Dunlap et al., 2001). Therefore, it has been recommended to, "fade the antecedent intervention" in order to resemble a more typical curricular approach (p. 132).

Sensory-motor therapy (SMT), "relies on the assumption that the individual may be over-aroused or under-aroused by normal levels of sensory input" (Dempsey & Foreman, 2001, p. 104). As a result, intervention seeks to minimize or optimize these arousal levels in order for learning to occur. In addition, SMT encourages sustained attention to tasks and people through the regulation of an individual's sensory world (Rogers, 1999). According to Dempsey and Foreman (2001), the major sensory-motor therapies include sensory integration training, auditory integration training, and music therapy. For decades, these types of therapies have been supported in terms of anecdotal evidence. However, due to the lack of empirical evidence, therapies concerned with the senses themselves have been largely abandoned (Schopler, 1998b).

Communication therapy (CT) aims at stimulating the child's natural interest and ability to learn language (Dempsey & Foreman, 2001). According to the American Psychiatric Association (1989) there are four major goals of

communication therapies. The first broad goal is to maximize communication skills at the child's developmental level. What is meant by communication skills is the ability to send messages that others can interpret, and to interpret messages that have been sent by others. Specifically, these therapies assist the individual in understanding that through communication, they can get other people to act and react in a desirable manner.

The second goal of CT concerns itself with the flexibility and generalization of communication skills. As everyday life presents a wide assortment of contexts, it is imperative that the child learns to use communication skills in a variety of situations. Therefore, it has been proposed that these therapies incorporate programming concerned with increasing the child's knowledge of the symbolic systems of communication, as well as programming concerned with increasing the range of situations in which the child's communication attempts are relevant and effective.

A third major goal of CT is to assist the child in becoming as independent in communication functioning as possible. By ensuring the child has the capability to communicate effectively in various settings, as well as the ability to initiate and respond to the communication of others, this sense of independence may be enhanced.

Lastly, the fourth goal of CT is to assist those who are major figures in the child's life, to understand the nature of the autism and the problems that are associated with it. Concurrently, this goal encourages these figures to discover the adaptations that can be made to lessen the child's handicaps. Through this assistance, those who are close to the child can assume the role of co-therapists, and further develop effective teaching strategies.

Although communication is an effective strategy, it may not be intensive enough on its own to stimulate a child's natural interest and ability to learn language (Dempsey & Foreman, 2001). However, it does have "potential to augment other strategies and assist in encouraging the use of language skills in natural settings" (p. 110).

According to Rogers (1999), children with autism tend to demonstrate more mature play schemas when engaged with partners who are modeling more mature schemas. Thus, the idea behind play and group therapy is for "groups of children to plan and carry out cooperative dramatizations based on a familiar theme" (Dempsey & Foreman:p. 112). It is believed that these experiences, within a group, may foster mutual support, sharing of feelings and concerns, and personal growth (Eliasoph & Donnellan, 1995). In particular, aid in the impairment of social functioning that accompanies the diagnosis of autism.

Finally, within multi-treatment programs (Dempsey & Foreman, 2001), elements of many methods of treatment are used. One particular program that is of interest is Project TEACCH (Treatment and Education of Autistic and Related Communication Handicapped Children). The defining features of this model relate to individualization, structured learning, and environmental adaptation (Dempsey & Foreman, 2001). Since its inception in the 1960s, the TEACCH model has emerged throughout the field of special education (Ferraro, 2001; Safran, 2001; Schreibman, 2000), both in North America as well as worldwide. For example, Sweden, Italy, France, and the United Kingdom are just a few of the countries that have collaborated with the TEACCH program in creating their own organizations specializing in the treatment of autistic individuals (Durham, 2000; Durnick, et al., 2000; Micheli, 2000;

Preece, Lovett, Lovett, & Burke, 2000). This model will be discussed in greater detail later in this chapter.

Several instructional formats are embedded in applied behaviour analysis, communication therapy, sensory-motor therapy, group and play therapy, and multi-treatment approaches. In particular, formats including discrete trial training, incidental learning, pivotal teaching, and structured teaching have been used within the field of special education (Whiteford-Erba, 2000; Koegel et al., 1999; Fenske, Krantz, & McClannahan, 2001; Harrower & Dunlap, 2001; Kunce & Mesibov, 1998; Mesibov et al., 1994; Schopler, 1998; Schopler et al., 1995).

As an instructional example of applied behaviour analysis, discrete trial format involves the presentation of a stimulus, a response, and feedback in terms of a reward or punishment (Koegel et al., 1999). This type of instruction usually takes place in a one-to-one ratio of teacher and child, where the former controls the content under examination. The content may be non-functional in terms of appropriate academic tasks, and therefore is associated with problems of generalization across settings (Whiteford-Erba, 2000).

According to Fenske and his colleagues (2001), "the steps in incidental teaching include: arranging a setting that contains materials of interest to the child; waiting for the child to initiate an interaction about an object of interest; asking for more elaborate language, or approximations to speech; and providing the object for which the child initiated" (p. 75). This instruction differs from the discrete trial format as the child initiates the interaction, the instruction takes place within the natural environment, and materials are of interest to the child. In addition to these procedural differences, either the teacher or the natural environment itself can reinforce appropriate responding or approximations of a correct response.

In pivotal teaching, the focus is on "increasing motivation to learn amongst children with autism" (Harrower & Dunlap, 2001:p. 776). This instructional format incorporates incidental teaching, such as child-initiation and the natural environment, as well as the methods of child choice, interspersal of maintenance trials, use of multiple cues, self-management, and self-initiation (Koegel et al., 1999).

Structured teaching was developed to teach students in classroom settings as well as to manage difficult student behaviors. As with any regular-functioning student, structure is important to individuals with autism because of "their deficits in organization and their inability to understand or successfully control their behaviour without assistance, direction, and support" (Mesibov et al., 1994:p. 195).

According to Schopler and his colleagues (1995) visual structure, provided by structured teaching as a whole, fosters a sense of independence and effective teaching and learning. The five key elements of structured teaching are visual in nature. These elements include physical structure, schedules, work systems, routines, and visual information. As a whole or individually, these elements can provide a framework that is appropriate to the needs of the individual. In addition, these elements can facilitate access to different areas of the curriculum and can be generalized to other settings (Howley et al., 2001).

The use of structured teaching as an intervention strategy has been central to multi-treatment programs like TEACCH since its inception. Therefore, because the TEACCH program itself revolves around such a central idea, a discussion regarding its detail follows.

The TEACCH Model

Division TEACCH (Treatment and Education of Autistic and Communication Handicapped Children) is a statewide program serving individuals with autism in

North Carolina, and an internationally recognized service delivery system (Mesibov, 1996; Schopler & Mesibov, 2000). Founded by Eric Schopler (Schopler & Olley, 1982) and currently directed by Gary Mesibov (Smith, 1996), the TEACCH program "has been the most influential special education agency serving children with autism" (p. 46). One major reason for this conclusion is that a variety of people are incorporated into a treatment plan. According to Whiteford-Erba (2000), this program provides a lifelong continuum of services not only for those diagnosed with autism, but also to their families and service providers. These services include diagnostic evaluation, special education, individualized treatment programs, consultation, skills training, community collaboration, supported employment, and living and parent counseling.

The conceptual framework of the TEACCH model is based on behavioural, developmental, and ecological theoretical perspectives and oriented towards a biological theory of autism (Whiteford-Erba, 2000). Behaviourally, techniques such as task analysis, positive reinforcement, and extinction are used to foster independence and success. Developmentally, TEACCH therapists allow themselves to recognize differences between children and differences in a child's ability to attain skills (Lord, Bristol, & Schopler, 1993). And ecologically, the long term goal of the program is for the individual with autism to fit as well as possible into society as an adult (Mesibov & Shea, 2003) thus reinforcing its community-based viewpoint and consistency of approach across environmental settings (Ferraro, 2001; Howley et al., 2001).

According to Mesibov and Shea (1998), five key principles govern the basis for the TEACCH model. These principles include: (1) the use of strengths and interests to build a bridge between educators and their students, (2) careful, ongoing

assessment that optimizes opportunities for independence and success, (3) provision of environmental structure that will assist individuals with autism understand meaning, (4) reframing noncompliance as the inability of individuals to understand what is expected of them, and (5) involvement of parents as key collaborators on an interdisciplinary team. In keeping with the conceptual framework outlined above, these principles clarify the ideology of the TEACCH program using behavioural techniques within its infrastructure, while concurrently focusing on each individual, their families, and their surrounding community.

The major theory of the TEACCH program, according to Lovaas and Smith (1989), is a central-deficit theory (cf. Whiteford-Erba, 2000). This theory states that "individuals with the disorder share certain learning problems and strengths" (p. 89). On the basis of this theory, the TEACCH program suggests that individuals with autism require alterations to their environment and task goals in order to learn. Specifically, these alterations should be made in the form of increased structure.

Increased structure within TEACCH occurs through the use of the instructional format of structured teaching, whereby the child's environment is designed and reorganized in terms of visual information. Through the use of the five key elements (i.e., physical organization, schedules, work systems, routines, and visual structure) the environment is manipulated to foster independence and understanding, and to decrease problem behaviour.

While several studies have empirically demonstrated the effectiveness of the TEACCH program as an effective intervention program (Ozonoff & Cathcart, 1998; Panerai, Ferrante, & Caputo, 1997; Panerai, Ferrante, & Zingale, 2002; Panerai et al., 1998), others have claimed several informal and formal measures of effectiveness. Panerai and colleagues (2002) examined the effectiveness of TEACCH using two

groups of children with a mean age of 9 years. Through the use of the PsychoEducational Profile – Revised (PEP-R; Schopler, Reichler, Bashford, Lansing, & Marcus, 1990), these researchers found improved performance on imitation, perception, gross motor skills, hand-eye coordination, and cognitive performance with respect to the group using TEACCH. Ozonoff and Cathcart (1998) found similar results in their application of a TEACCH-based home program intervention for young children with autism. Using the PEP-R, these researchers found improved performance on four of the seven subtests, as well as on the total PEP-R score.

Mesibov (1997) has also suggested a number of informal and formal measures of effectiveness. For example, outcome measures such as parent enthusiasm and satisfaction, and the number of individuals working within TEACCH supported employment programs support the usage of the program. In addition, informal measures including state and private funding; state, national, and international interest and recognition; and the overwhelming parent enthusiasm and support have been proposed as effective.

Regardless of these measures, structured teaching and the organization of TEACCH itself has expanded through day-to-day activities of the program (Mesibov, 1997). While this approach cannot claim positive impacts for all, nor superiority over other approaches (Bristol et al., 1996; Reid & O'Connor, 2003; Schreibman, 2000), "Division TEACCH is a vibrant example of how science can contribute to society and society can inspire the evolution of science when the two cooperate with shared goals" (p. 33). Thus, the possible benefits are left indeterminable to the individuals, their families, and society as a whole.

Chapter 3

METHODOLOGY

The purpose of the study was to examine the effects of implementing a pictographic schedule within a structured swimming class consisting of individuals diagnosed with autism. This chapter outlines the methods in the following sections: (1) Participants, (2) Materials, (3) Dependent Variables, (4) Procedures, and (5) Experimental Design.

Participants

Participants included three boys diagnosed with autism and associated disabilities such as mental retardation and attention deficit hyperactivity disorder (ADHD). The boys ranged in age from 11 to 16 years old and were enrolled at a school for children with developmental disabilities in Montreal, Canada. Teachers within the Physical Education Department, who thought schedules might improve motor performance, initially referred the participants to the researcher. Further, due to their involvement within the swimming program at the beginning of the study, the participants were referred on the basis of convenience.

A collaborative team of professionals from the school was responsible for confirming the diagnosis of autism. This team included educational psychologists, physiotherapists, occupational therapists, and speech pathologists, who verified the diagnosis through observation and the criteria specified by the DSM-IV (APA, 1994). In addition, formal assessment tests such as The Childhood Autism Rating Scale (CARS) (Schopler, Reichler, & Rochen-Renner, 1988) and The Psychoeducational Profile Revised (PEP-R) (Schopler et al., 1990) were used to determine developmental age, strengths and weaknesses, and initial programming considerations

for the participants. While all participants had received formal diagnoses of autism from the educational team, resources did not allow for an independent confirmation.

The CARS (Schopler et al., 1988) is a 15-item behavioural rating scale developed to identify children with autism, and to distinguish them from developmentally handicapped children without autism. Further, it distinguishes children with autism in the mild-to-moderate range from children in the moderate-to-severe range. The items in this assessment include relating to people; imitation; emotional response; body use; object use; adaptation to change; visual responses; listening responses; response to use of taste, smell, and touch; fear or nervousness; verbal communication; nonverbal communication; activity level; level and consistency of intellectual responses; and general impressions of the child over the course of the observation period.

CARS has been demonstrated to be a reliable and valid measure to assess those individuals with autism. In terms of reliability, CARS reported agreement between .71 and .94 indicating a high degree of internal consistency, stability over time and agreement amongst assessors (Schopler et al., 1988). Correlations of between .71 and .84 with respect to validity also indicate that the CARS scores are comparable to those made under alternate clinical conditions (Schopler et al., 1988).

The PEP-R (Schopler et al., 1990) is an inventory of behaviours and skills designed to identify uneven and idiosyncratic learning patterns. It is primarily used for preschool and grade school-aged children with autism, and provides information on functioning within several developmental areas including imitation, perception, fine and gross motor coordination, eye-hand coordination, cognitive performance, and cognitive verbal. The PEP-R also identifies degrees of behavioural abnormality in cooperation and human interest, play and interest in materials, sensory responses, and

language. In addition to its unique scoring system that acknowledges the child may have some knowledge of what is required to complete a task but not full understanding, the inventory is designed as an educational tool for planning individualized special education programs.

The PEP-R has also been shown to be a reliable and valid measure to assess those individuals with autism. According to the PEP-R manual, one subject was scored by five raters on the scale's seven developmental areas in order to determine reliability. This procedure yielded intraclass correlations of up to .92, indicating a high degree of similarity across raters (Schopler et al., 1990). In addition, differences between raters have been found to be nonsignificant, providing further evidence for its reliability. With regard to validity, the total score can be used with similar degree of confidence as scores derived from such tests as the Vineland Social Maturity Scale (Doll, 1965), the Bayley Scales of Infant Development (Bayley, 1969), and the Peabody Picture Vocabulary Test (Dunn, 1965). These tests correlate with the PEP-R at the $p<.00001$ level (Schopler et al., 1990).

All participants had histories of disruptive behaviours including aggressiveness, hyperactivity, high levels of anxiety, and avoidance behaviours, and all displayed high levels of stereotypical behaviours including finger flapping, rocking, and eye rolling (See Table 4). In addition, each exhibited deficiencies in language such as echolalia, noncontextual speech, lack of spontaneous language, and inappropriate laughter. The boys were reliant on ongoing supervision and prompting to complete activities, however all were familiar with the concept of schedules as they were used in their regular classrooms.

Participant	Behavioural Characteristics
Jason	Limited span of attention; avoidance; socially withdrawn; inappropriate vocalizations; stereotypical behaviours (i.e., licking and rubbing fingers, pressing outside corner of eyes, facial ticks, grabbing and clutching himself.
Adam	High levels of anxiety; socially isolated; noncompliance when not observed by authoritative figure; inappropriate laughter despite being non-verbal; aggressive; self-stimulation (i.e., tapping fingers on back of neck, pacing, tapping inanimate objects)
Robert	Displays echolalia and uses noncontextual speech; aggressive; hyperactive; impulsive; high levels of anxiety; inattentive; noncompliant; stereotypical behaviours (i.e., repetitive touching of those around, hand/arm flapping, bouncing)

Table 4 – Participant behaviour profiles.

Materials

Five pictographic schedules were used for the swimming program. The schedules were comprised of colour pictures, placed in a specific sequential order, on a plain sheet of coloured paper using Velcro. All pictures were taken from a computer program (BoardmakerPlus) used by the school to create pictographs for regular classroom activities, such as lunch time or art class. Of the five schedules, three were used individually by each of the three participants, one was used simultaneously by all three participants, and one was set up in the form of individual work systems. A further description of each schedule is given below.

The first schedule (See Figures 1a & 1b) was posted in the locker room describing a changing sequence for the boys to get ready for the aquatics program. For example, the schedule included pictures describing the action of changing; articles of clothing, pictures of a locker, a picture of a towel, and a picture of a swimming pool. Each participant had his own schedule that was placed on the inside of each boy's locker door. These schedules were comprised of pictures

approximately 3.5 cm by 3.5 cm, while a larger schedule with pictures approximately 7 cm by 7cm depicting identical events, was placed on a lockeroom wall for all participants to observe.

Figure 1a – Set-up of changeroom schedules.

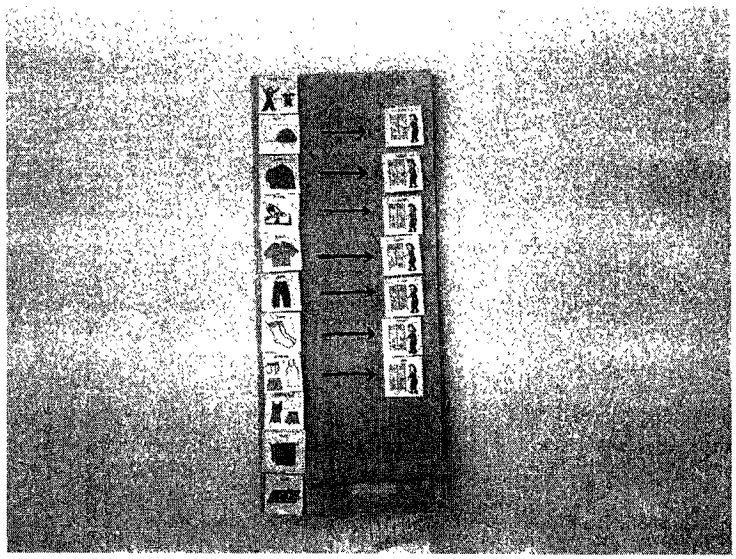


Figure 1b- Schedule of changing sequence.

The second schedule (See Figures 2a & 2b) was used simultaneously by all three participants. Included on this schedule were activities corresponding to the Physical Education teacher's daily lesson occurring within the swimming pool. For

example, pictures representing warm-up activities, relays, games, and free time were incorporated. This schedule consisted of picture symbols approximately 21.5 cm by 28 cm which were placed on a wall beside the pool where the participants initiated their activities. In addition, to reduce the obstacle of the teacher getting in and out of the pool, an identical hand-held schedule with pictures approximately 3.5 cm by 3.5 cm, was integrated. The teachers and assistants aided the participants in following this schedule through the use of a prompt hierarchy (Watkinson & Wall, 1982).

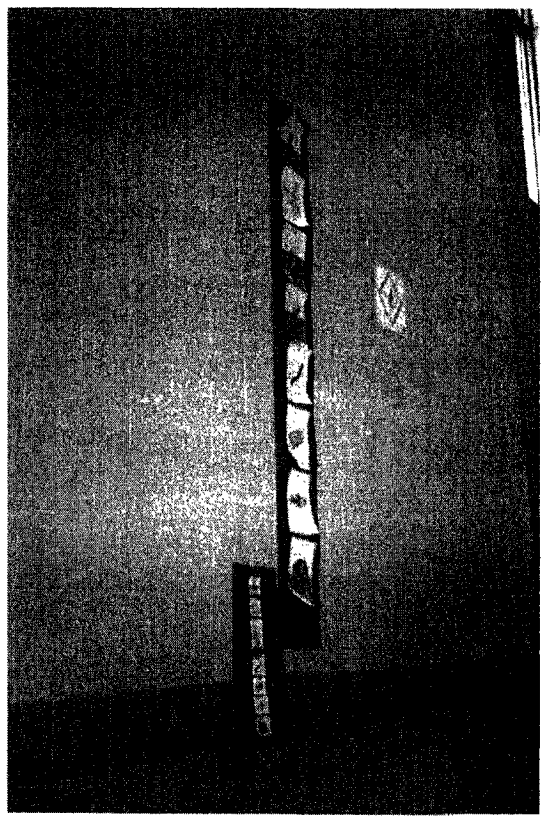


Figure 2a – Set-up of lesson schedule in pool area.

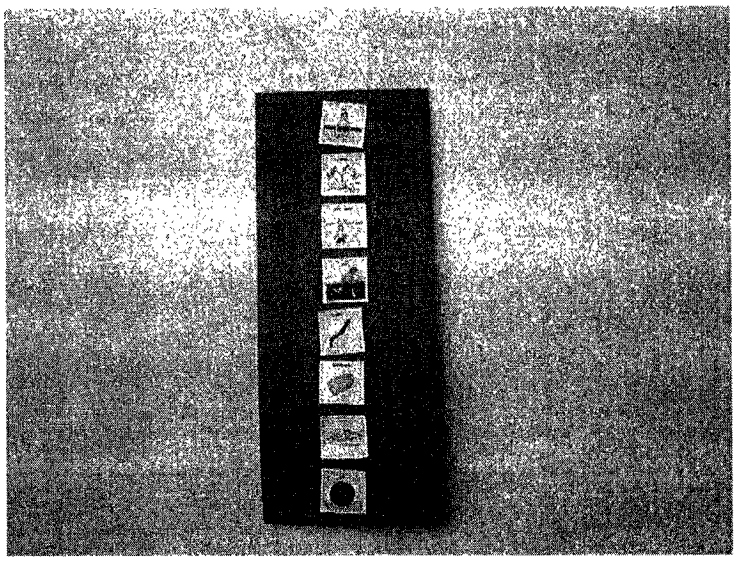


Figure 2b – Schedule of swimming lesson activities.

The third schedule (See Figures 3a & 3b) was an extension of the warm-up activities noted on the larger schedule of all pool activities. This schedule was individual to each participant. Appearing on this schedule was a Polaroid photograph of the participant and pictures depicting the number of activities to be completed. For example, the schedule consisted of three pictures depicting running across the pool, three pictures depicting swimming with the use of a pool noodle, and three pictures depicting swimming with the use of a flutterboard. All pictures were 3.5 cm by 3.5 cm, and the complete schedule was attached to an inverted V-shaped "Wet Floor" sign which was approximately two feet tall, at the edge of the swimming pool. This schedule was identical across all three participants.

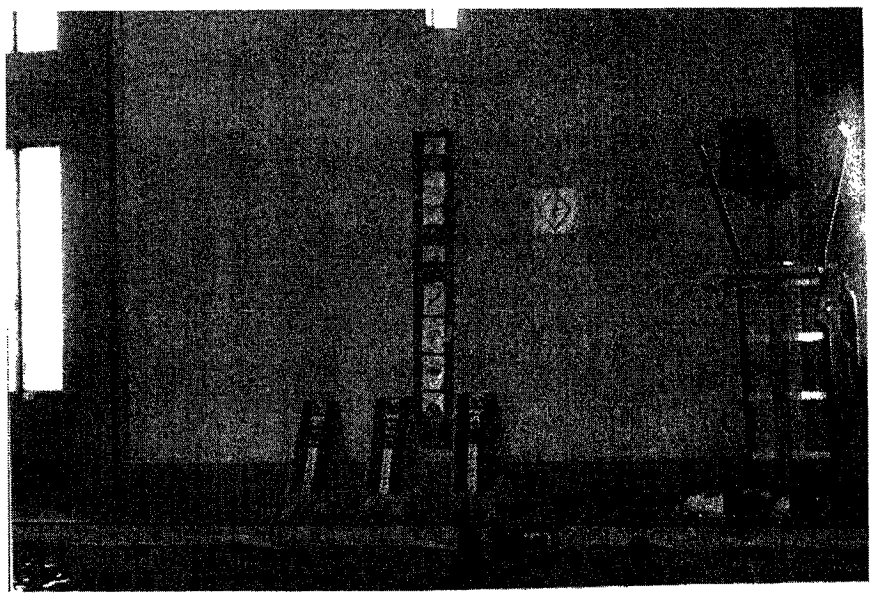


Figure 3a – Set-up of warm-up activities in the swimming pool.

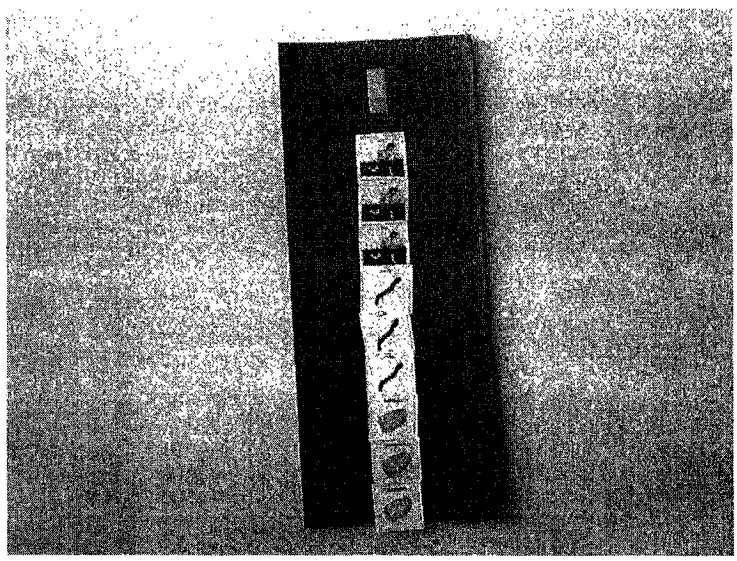


Figure 3b – Schedule of warm-up activities.

The fourth schedule (See Figures 4a & 4b) was set up in the form of a work system for each of the three participants. Each participant had a different work system, as each reflected individual interests. For example, one participant enjoyed jumping into the water; another enjoyed diving underneath the surface; while yet

another enjoyed swimming in the deep end of the pool. Therefore, the picture symbols were representations of these activities. Specifically, pictures of hockey pucks that the participants had to dive for, the action of swimming, and the action of jumping of the side of the pool were used. Each picture was 3.5 cm by 3.5 cm, while five identical pictures made up the complete work system schedule. The schedules were placed at differing areas of the pool, and used after the warm-up activities were completed.

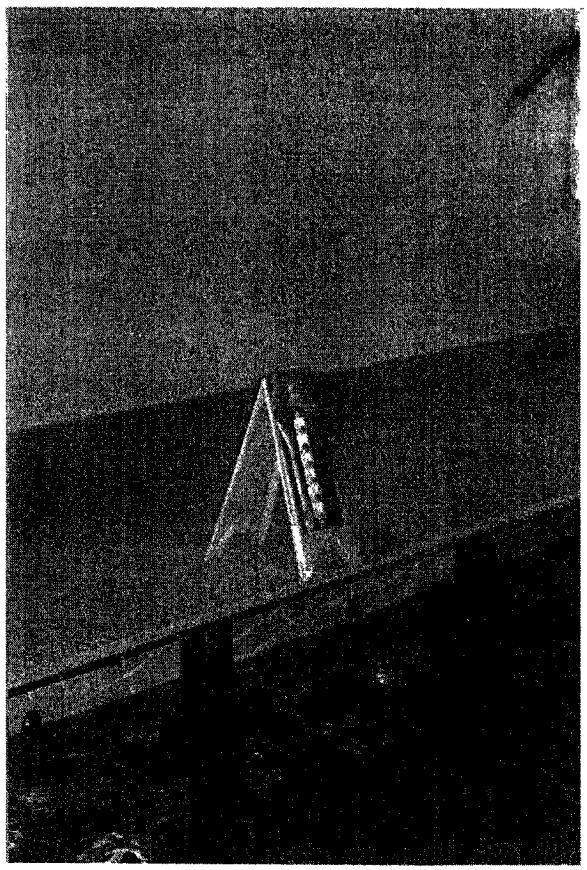


Figure 4a – Example of a work system set-up.

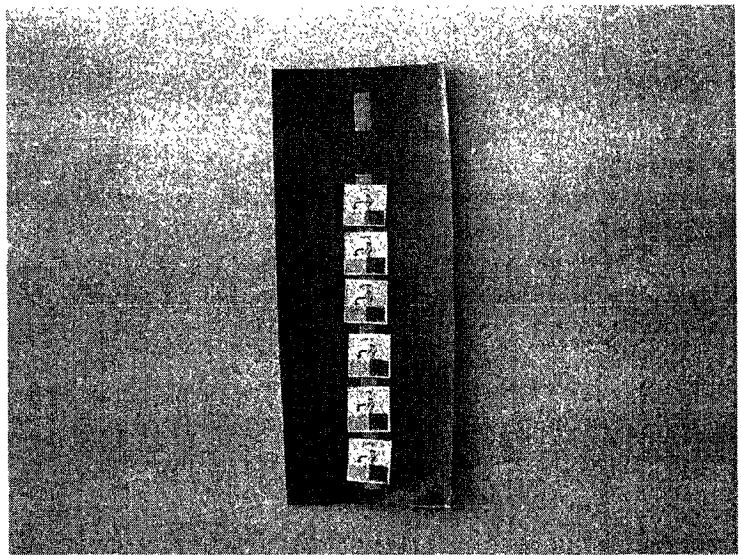


Figure 4a – Example of an individual work system schedule.

The last schedule was a rearrangement of the first schedule, depicting changing immediately following the aquatics session. Here, pictures included a towel, the action of drying off, the action of changing clothes, articles of clothing, a picture of a plastic bag, pictures of a locker, blow-drying hair, and a picture of a bus. Again, the schedule was placed in a sequential order with individual schedules on locker doors, and an enlarged schedule placed on a lockeroom wall. These schedules were identical in size to those prior to the swimming lesson.

Dependent Variables

Structured teaching is designed to educate individuals with autism and circumvent problems with difficult student behaviours. Therefore, research that has empirically evaluated the impact of structured teaching has typically selected dependent variables such as on-task and on-schedule behaviours, and off-task behaviours including stereotypies (e.g., Bryan & Gast, 2000; Duker & Rasing, 1989; MacDuff et al., 1993; Panerai et al., 1998; Schultheis et al., 2000).

Time On-task

Time on-task was defined as time that participants were engaged in activities that were consistent with the objectives of the lesson. Consistent with Academic Learning Time (ALT) (Parker, 1989), time on-task ensures the student is using materials that are appropriate to his developmental level allowing for high success and low error rates. Engagement of activities consisted of (a) visually attending to the activity or teacher, (b) looking at the activity schedules, (c) manipulating activity materials appropriately (i.e., using pool equipment as it was designed to be used), or (d) in transition from one scheduled activity to the next (i.e, the time between one activity and the next set of instructions).

Time Off-task

Time off-task referred to the time when participants (a) used materials in a manner other than that for which they were designed, (b) manipulated but did not visually attend to the materials or tasks, or (c) did not engage in activity.

Inappropriate Response Time

Inappropriate response time was defined as the time when participants (a) behaved inappropriately to the time and place, (b) were disruptive in nature causing the teacher to stop instruction or a peer to stop engagement in activity, or (c) were harmful to themselves or anyone in the surrounding pool area. Examples of inappropriate responses included aggression, hyperactivity, self-injurious behaviour, and stereotypies such as self-stimulation and inappropriate vocalization (See Appendix F-1).

Data Collection and Analysis

Due to the study's multiple settings, data collection was twofold. Within the swimming pool, participants were videotaped using two video cameras that were

strategically place at opposite ends of the pool. Two cameras were used to ensure that all data were captured. Data within this setting were subsequently scored via 6-second intervals for time on-task, time off-task, and inappropriate response time. Interval recording of the 6-second duration was used to minimize the possibility of several behaviours being observed in the same interval (van der Mars, 1989). Any action considered appropriate to the situation was scored with respect to time on-task. When behaviours caused the teacher to stop instruction, running away, hitting, and repetitive vocalizations occurred, they were deemed inappropriate and scored accordingly. When misuse of materials, inattention to task, and non-engagement occurred, time off-task was scored. If variables arose simultaneously within the interval, they were recorded based on the hierarchy of behaviours that was determined prior to coding (See Table 5). For example, if time on-task and time off-task shared an equal length of time within an interval, that interval would be scored as time on-task as referred to by the hierarchy of participant behaviours. Percentage occurrence for each variable was obtained by dividing the total number of occurrences by the total number of intervals and multiplying by one hundred.

The second setting was the men's changing room of the recreational facility, and it served as the setting immediately before and after the time spent in the pool. These settings were not videotaped due ethical concerns of privacy. Instead, the researcher and a graduate student trained on the dependent measures, used event recording and field notes to gain a better understanding of behaviours occurring prior to and following the swimming session. According to van der Mars (1989), event recording refers to the frequency of occurrences within a discrete event. Therefore, only inappropriate behaviours (i.e., aggression, hyperactivity, stereotypical behaviour,

avoidance behaviour, and language deficits) were numerically scored, while variables such as time on-task and off-task were represented through field notes.

Appropriately Engaged/On-task	(i.e., visually attending to teacher, looking at schedules, appropriate manipulation of materials, transition)
↓	
Off-task	(i.e., misuse of materials, inattention to task, not engaged)
↓	
Inappropriate Responses	(i.e., aggression, hyperactivity, stereotypical behaviour, avoidance, language impairments)

Table 5 – Hierarchy of participant behaviours.

According to Bogdan and Biklen (1982) field notes contain two important types of materials: descriptive and reflective. Descriptive information involves portraits of the subjects, reconstruction of the dialogue that took place, a description of the physical setting, accounts of particular events, and a depiction of all activities. Reflective material contains reflections on analysis, methods, observer's frame of mind, as well as points of clarification. Examples of field notes taken included specific numbers an articles of clothing that were repeated, consequences that were employed after disturbing behaviour, and the time at which each participant finished his schedule.

Procedure

Setting

The study occurred in a recreational facility where the participants had taken part in a weekly aquatics program in the three months prior to the study. For the

purposes of the current study, observation took place in a therapeutic swimming pool and the men's changing room of the facility, over a 13-week period. Each week consisted of one session lasting approximately 80 minutes.

Schedule Use

As mentioned, participants entered this study with some experience of schedule-use as they had previously used picture symbol schedules in their regular special education classrooms. According to the homeroom teacher, they were able to discriminate amongst tasks and comprehend when an activity was completed. However, due to the unfamiliarity of the pictures in the current study, students had to be re-taught discrimination tactics for the differing picture symbols prior to administering them in the swimming program. This task was completed via the regular special education teacher in the classroom.

Discrimination of the picture symbols was taught prior to the study. After each picture symbol was correctly identified from a larger group of pictures with the help of the classroom teacher or assistant, prompting was faded in order to promote a greater sense of independence. Once the individual had correctly identified each of the pictures without the intrusiveness of prompting, it was believed that an understanding had been developed, and each individual picture could be incorporated into a schedule.

Each of the schedules was implemented in the same way, however the setting in which they were applied differed. Once the child had completed the task denoted by the schedule, he was guided to tear the picture from the schedule and place it in a plastic pouch located at the bottom of the schedule. The child was then instructed to return to the schedule in order to determine if any additional items were left. Once all the items had been removed, it was indicated to the child that the schedule was

finished. It is important to note that the second schedule was used by all three participants simultaneously, and was regulated by the teacher rather than any of the students.

Experimental Design and Reliability

A time-series design was used to assess the effects of the pictographic activity schedules on time on-task, time off-task, and inappropriate response time including stereotypies. After achieving baseline measures for each participant the activity schedules were introduced, then removed from the experimental condition to test the maintenance of the behaviour. Baseline measures took place over three experimental sessions, while the treatment and withdrawal portions of the study occurred over eight and two sessions respectively.

Interobserver reliability on participant responding and the researcher's adherence to planned procedures was collected on 25 % of all experimental sessions, including changeroom activity before and after the swimming session. Trained observers conducted at least one reliability check in each of the experimental conditions. For event recording purposes, training consisted of the researcher explaining all categorical definitions, methods of data collection, and procedures in detail to the trainee. In addition to these tactics, interval recording training consisted of the researcher conducting a practice session with the trainee whereby both watched, scored, and compared data simultaneously. Reliability estimates were calculated using the point-by-point method in which the number of agreements is divided by the number of agreements plus disagreements, and multiplied by 100. At least 80% agreement was required for the study to be considered reliable.

Chapter 4

RESULTS

The purpose of the study was to examine the effects of implementing a pictographic schedule within a structured swimming class consisting of individuals diagnosed with autism. This chapter outlines the results of the current investigation in the following sections: (1) Reliability, (2) Activity Prior to the Swimming Session, (3) Activity during the Swimming Session, and (4) Activity Following the Swimming Session.

Reliability

Percentage of agreement between the researcher and the trained observer ranged from 68% to 100% of the total number of behavioural occurrences on all inappropriate behaviours observed in the changeroom before and after the swimming session. Specifically, mean interrater agreements were calculated as 84% prior to the pool session, and 81% following the pool session. On the 25% of the swimming sessions themselves, interrater reliability ranged from 80% to 97% on all timed intervals and variables, with a mean agreement of 90%.

Activity Prior to the Swimming Session

Figures 5-7 indicate the rate per minute of inappropriate behaviours observed in the changeroom prior to the swimming session for all three participants across all experimental conditions. During baseline sessions, mean rates of inappropriate behaviour were 1.85 per minute for Robert, 2.40 per minute for Adam, and 3.25 per minute for Jason. With the application of the pictographic schedules however, rates remained relatively stable or increased for all participants. Mean rates of inappropriate behaviours per minute were calculated as 2.12 for Robert, 2.36 for Adam, and 4.39 for Jason. During maintenance, the removal of the pictographic

schedules resulted in increased variability in scores. Mean results included 0.85 inappropriate behaviours per minute for Robert, 1.50 inappropriate behaviours per minute for Adam, and 9.00 inappropriate behaviours per minute for Jason. While aggression, hyperactivity and avoidance behaviours were included in behavioural means for all participants, stereotypical behaviours and language deficits made up the majority of total behaviours observed.

In addition to data collected via event recording, field notes revealed other interesting trends. It was observed that the majority of inappropriate behaviours occurred while the participants were waiting for others to complete their schedules. It was the classroom teacher's decision that each participant changed, and then waited for the final person, before the group entered the pool area simultaneously. Thus, the changeroom actually had two time periods, changing with the assistance of schedules and waiting for others. To determine if any different effects existed within these two time periods, an alternative means to collecting data was implemented after the first four treatment sessions to distinguish between the use of schedules and waiting. This means included recording a "check mark" when a participant used the schedules, and an "X" was recorded while waiting. Results of this alternative form of data collection are represented in Figure 8.

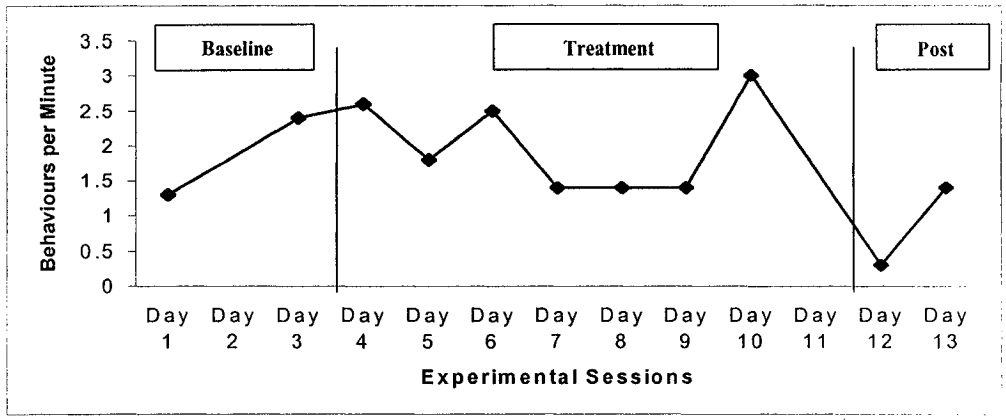


Figure 5 – Rates of inappropriate behaviours for Robert across all experimental sessions prior to the swimming session.

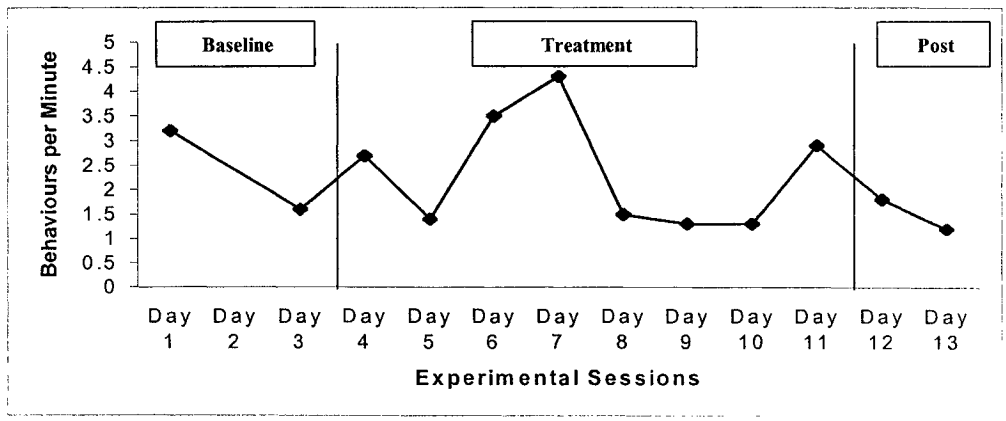


Figure 6 – Rates of inappropriate behaviours for Adam across all experimental sessions prior to the swimming session.

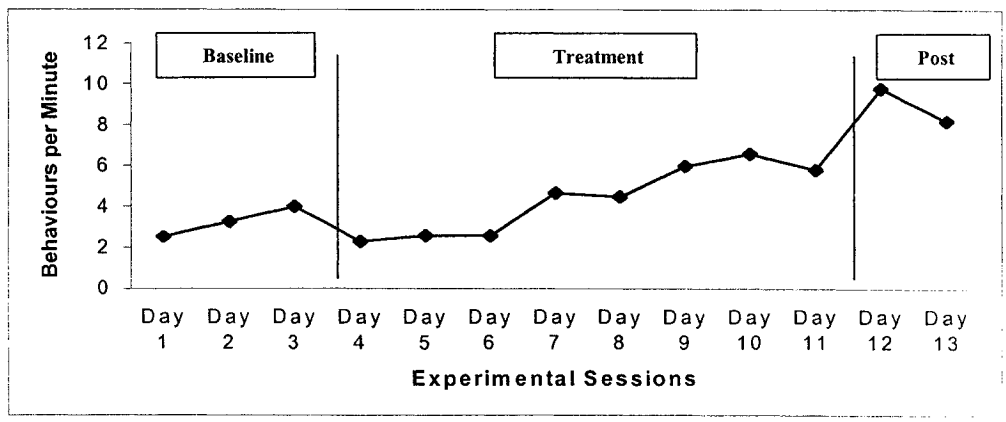


Figure 7 – Rates of inappropriate behaviours for Jason across all experimental sessions prior to the swimming session.

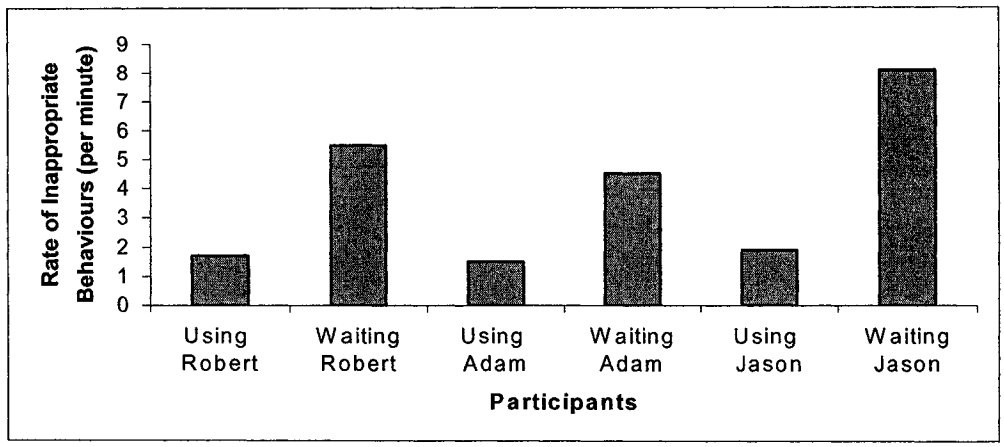


Figure 8 – Differences in the rates of inappropriate behaviours while using schedules and waiting over final 4 treatment sessions before the swimming lesson (per minute).

According to Figure 8, the average rate of inappropriate behaviours increased for all participants when periods of using schedules and waiting were separated. Specifically, the rates increased by 3.8 per minute in Robert, 3.0 per minute in Adam, and 6.2 per minute in Jason – increases of 324%, 300%, and 426% respectively. Therefore, all participants' inappropriate behaviours improved while they were engaged in schedule-use.

Another trend that was observed from the field notes was a reduction of teacher assistance. At baseline and during the early stages of treatment, participants relied on physical prompts to complete the tasks denoted by the schedules. However, by the end of the treatment condition, most of the physical prompts had been faded and were replaced by prompting of the verbal and gestural nature (i.e., pointing). In addition, it was noted that in the case of Adam and Jason, prompting was completely removed and independence was apparent over the last four sessions of schedule-use. Both Adam and Jason maintained this trend of independence when the schedules were removed over the two post-treatment sessions, however Robert showed regression and reliance on physical prompting to complete his changing sequence.

Activity During the Swimming Session

Figure 9 shows percentages of time on-task for the participants over all sessions. During baseline, the mean time on-task for Robert was 62.1%, while Adam displayed a mean of 72.9% and Jason a mean of 62.7%. Over the course of the treatment sessions, the use of picture symbol schedules produced means of 72.2%, 76.9%, and 69.0% in Robert, Adam, and Jason, respectively. In the post-treatment, time on-task was maintained by Adam (80.0%), and Jason (75.5%), while Robert's mean time on-task was lower than baseline measures. While all participants improved their time on-task over the treatment sessions, it is important to note that these increases were only modest as all participants displayed relatively high baseline measures prior to the implementation of the schedules.

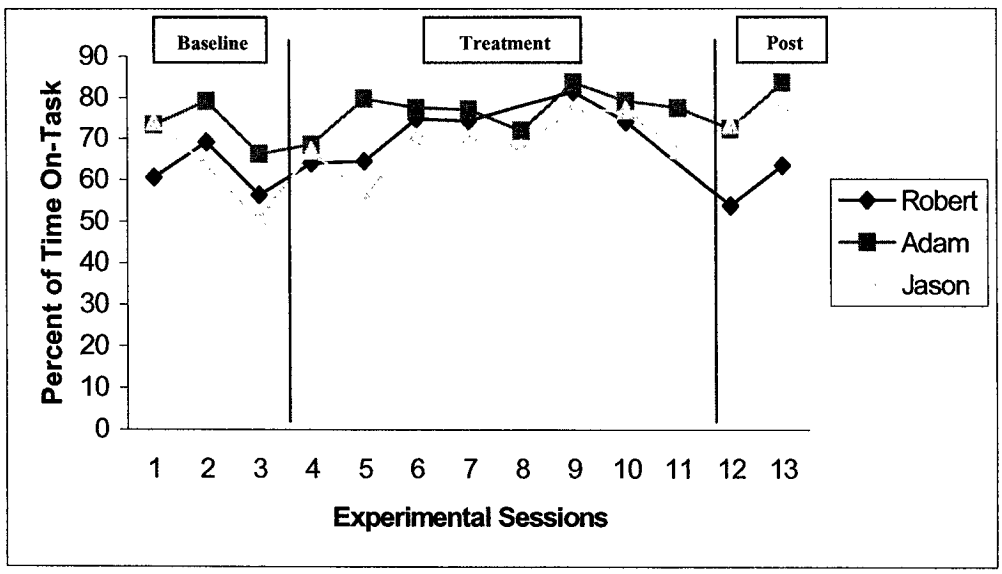


Figure 9 – Percentages of time on-task over all sessions.

Figure 10 reports the percentage of time participants were observed to be off-task over all sessions. During baseline, time off-task means were 27.8% for Robert, 11.9% for Adam, and 26.4% for Jason. Through the implementation of schedules,

Robert reduced to 23.8%, while Adam and Jason increased to 17.4% and 27.6%. In maintenance, mean off-task behaviour for Robert, Adam, and Jason were 33.3%, 18.9%, and 24.0 % respectively. Therefore, only one of the three participants showed improvements in time off-task when schedules were implemented, while the remaining two increased in the amount of time they spent performing undesirable acts. Maintenance of time-off task was not observed for any of the participants.

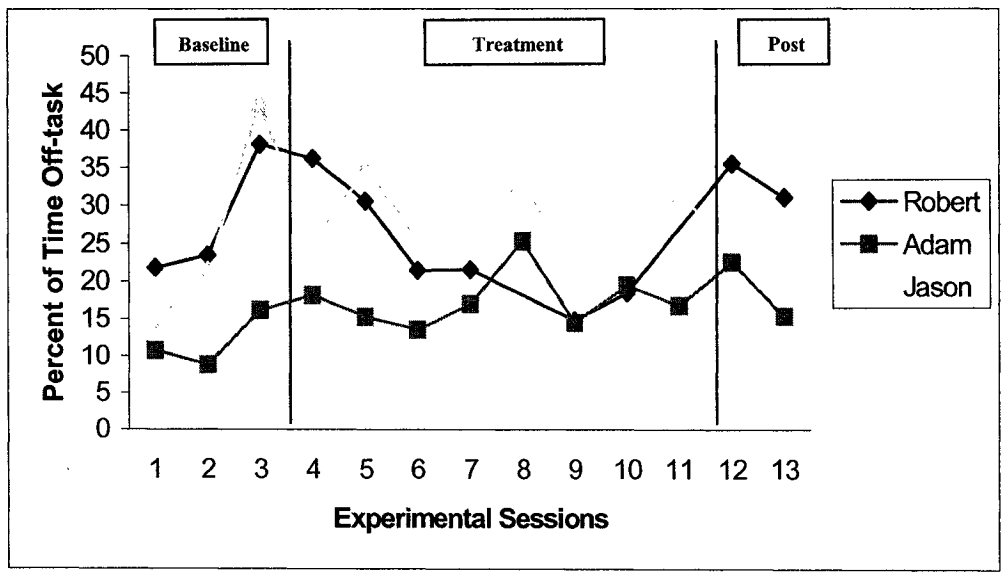


Figure 10 – Percentages of time off-task over all sessions.

Figure 11 reports percentages of time participants were engaged in inappropriate responses for all sessions. During baseline, the mean inappropriate response time for Robert was 11.1%, for Adam 15.3%, and for Jason 10.8%. While the picture symbol schedules were in use, mean percentages dropped to 5.6%, 5.7%, and 3.7% in Robert, Adam, and Jason, respectively. In maintenance, all three participants displayed mean percentages lower than their respective baseline measures. Robert exhibited a mean percentage of 8.1%, Adam showed a mean percentage of 3.1%, and Jason displayed a mean percentage of 0.5%. Therefore, it appears that inappropriate response time was positively effected as it was reduced

over the treatment condition, and maintained below that of baseline levels for all three participants.

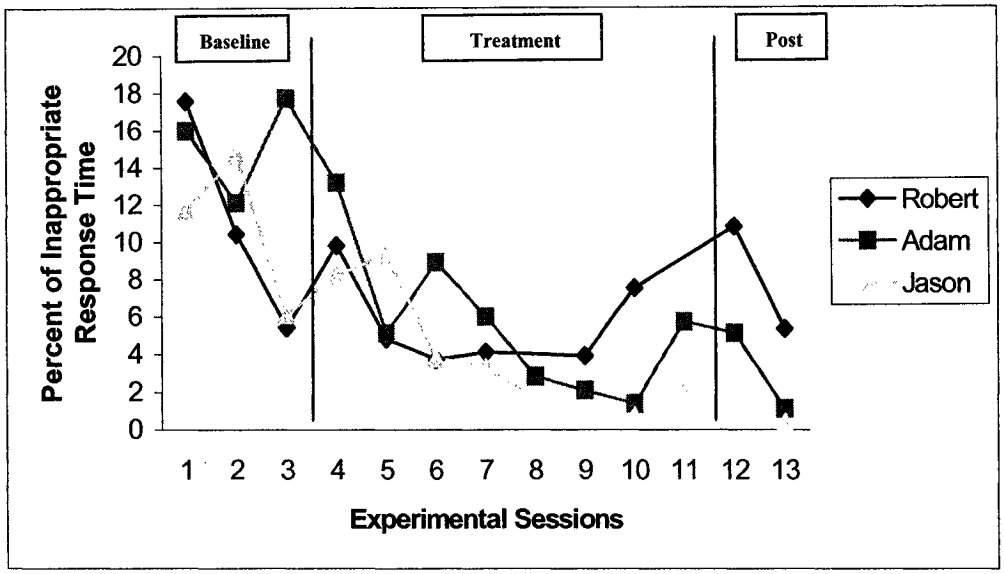


Figure 11 – Percentages of inappropriate response time over all sessions.

Figures 9, 10, and 11 have conveyed the percentage of time on-task, time off-task, and inappropriate response time enduring the experimental sessions. However, due to the modest changes observed with time on-task, and the inconclusive results of time off-task, each variable's data was analyzed over two distinct time periods. These two periods, comprising the total 30 to 40 minute session, included time when instruction was given and schedules were used, and time when the children were given time to play amongst their peers while remaining in the pool (i.e., free time).

Figure 12 conveys time on-task for the intervals when instruction was given and schedules were used. During baseline, Robert exhibited a mean of 57.6%, Adam a mean of 77.0%, and Jason a mean of 65.9%. While schedules were used in the treatment condition, time on-task means increased to 74.5%, 84.8%, and 76.1% for Robert, Adam, and Jason, respectively. During maintenance, both Adam and Jason managed to maintain high-levels of time on-task (87.1% and 87.6%), yet Robert

returned to a baseline level of 56.7%. Therefore, while the treatment was effective during instruction, only two of the three participants managed to maintain high levels of time on-task without the schedules in the post-treatment sessions.

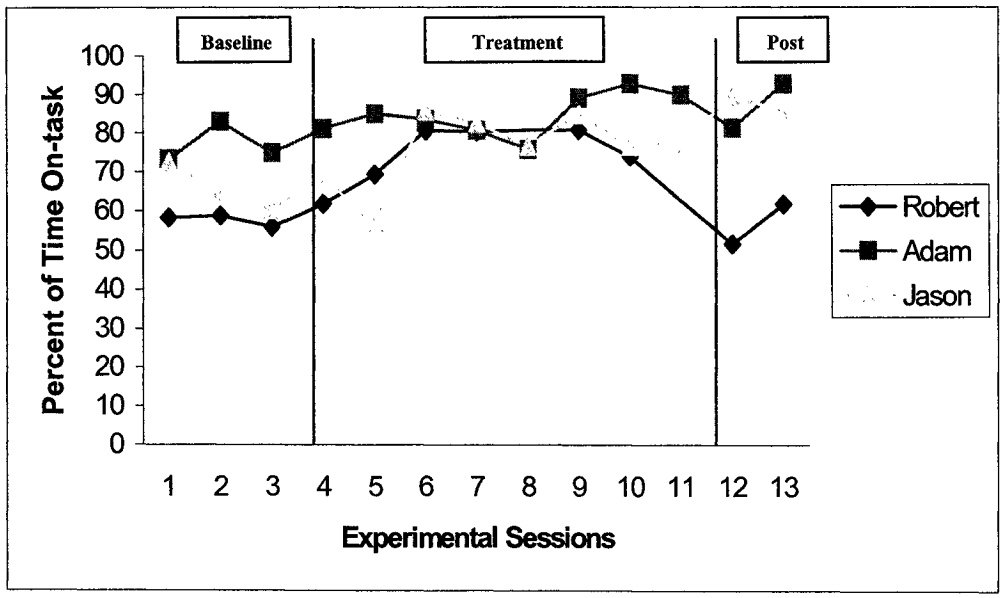


Figure 12 – Percentages of time on-task within instructed intervals.

Figure 13 describes the data pertaining to the percent of time off-task for all participants when instruction was given. Baseline measures were 26.4% for Robert, 10.8% for Adam, and 24.1% for Jason. During treatment sessions, mean percentages included 20.5% for Robert, 12.1% for Adam, and 20.8% for Jason. Maintenance sessions revealed much variability among all three participants. While Robert's mean percentage of 34.9% was higher than baseline, Adam's score returned back to baseline and was 10.7%. Jason, on the other hand, maintained a low percentage of time off-task from the treatment sessions, recording a mean of 12.4%.

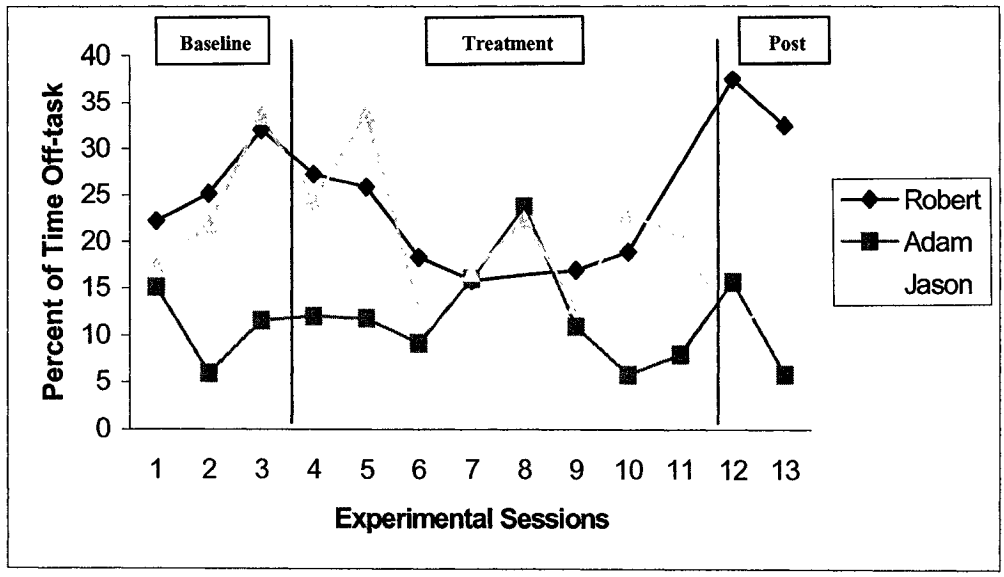


Figure 13 – Percentage of time off-task within instructed intervals.

Figure 14 reports percentages of inappropriate response time within intervals of instruction. During baseline, the mean for Robert was 11.2%, for Adam 12.2%, and Jason 10.0%. Over the course of the treatment sessions means dropped to 5.1%, 2.7%, and 3.0% in Robert, Adam, and Jason, respectively. In maintenance, Robert displayed a mean of 8.5%, Adam showed a mean of 3.1%, and Jason exhibited an inappropriate response time mean of0.0%. These results indicated similar findings to the results of all intervals scored (Figure 11). Specifically, all participants displayed reduced inappropriate response times throughout the treatment condition, while maintaining them over the two post-treatment sessions.

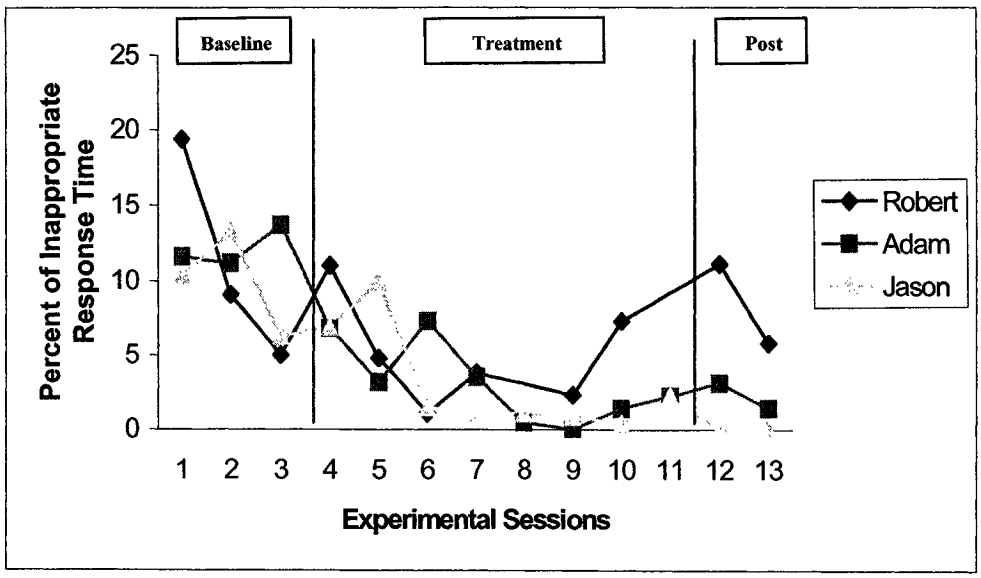


Figure 14 – Percentage of inappropriate response time within instructed intervals

Figure 15 represents the percentages of on-task time through periods of free time. These were times when instruction was removed and the participants were given time to do as they pleased while remaining in the pool (i.e., free time). During baseline, Robert showed a mean percentage of 54.4%, while Adam a mean of 57.8% and Jason a mean of 49.6%. Over the treatment condition, time on-task for Robert and Jason increased, while Adam remained relatively stable. Robert displayed a mean percentage of 66.7%, Adam showed 56.2%, and Jason 59.9%. In maintenance, mean percentages again varied amongst the participants. Robert increased above baseline and treatment measures (80.1%), Adam decreased to a mean below baseline (50.3%), and Jason remained stable with baseline (49.3%). These results show that effects of the treatment schedules were not as pronounced as when instruction was given, and that maintenance varied amongst all participants.

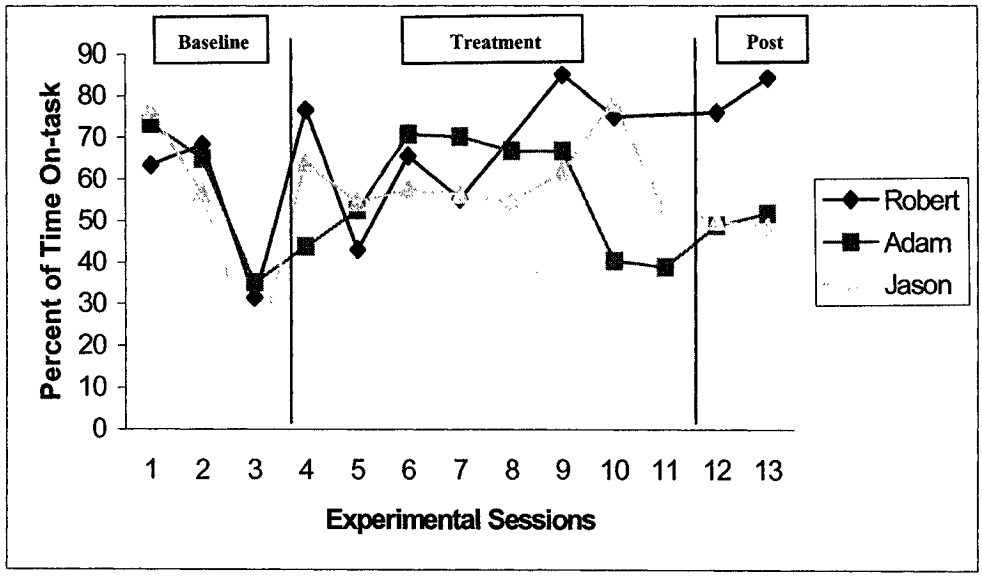


Figure 15 – Percentage of time on-task within intervals free time.

Figure 16 reveals percentage of time off-task over the intervals without instruction. During baseline Robert's mean percentage was 32.6%, Adam's was 18.6%, and Jason's was 36.4%. Mean time off-task percentages over the treatment conditions showed a decrease for Robert to 26.2%, an increase for Adam to 32.0%, and relatively no change in Jason as his score remained stable at 35.5%. In maintenance, Robert was the only participant to maintain a low percentage of time off-task as he reported a mean of 15.9%, while Adam and Jason reported means of 44.5% and 49.3% respectively. Both the means of Adam and Jason were above that of their respective baseline scores suggesting that time off-task was not maintained.

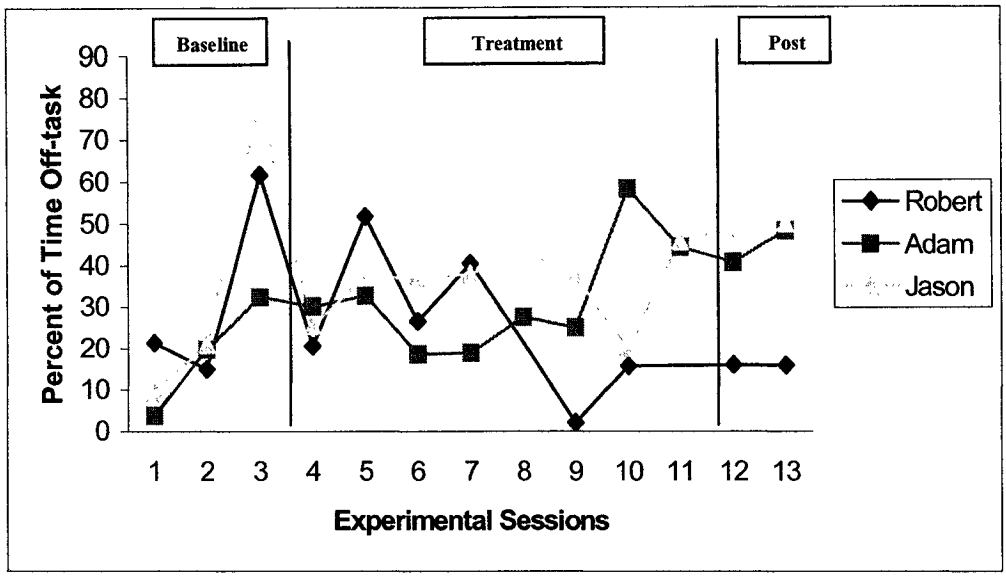


Figure 16 – Percentage of time off-task within free play.

Figure 17 shows percentages of inappropriate response time for all participants over intervals without instruction. During baseline, the inappropriate response time mean for Robert was 12.9%, while Adam displayed a mean of 23.6% and Jason a mean of 13.9%. Over the course of the treatment sessions, the use of picture symbol schedules produced reduced means of 7.3%, 10.6%, and 4.6% in Robert, Adam, and Jason, respectively. In the post-treatment, inappropriate response time was maintained and further reduced by all three participants as Robert displayed a mean of 4.0%, Adam of 5.3%, and Jason of 1.4%. Similar to the results of all intervals and those pertaining to instruction, these findings suggest convey a message that the schedules positively affected inappropriate response time during free time.

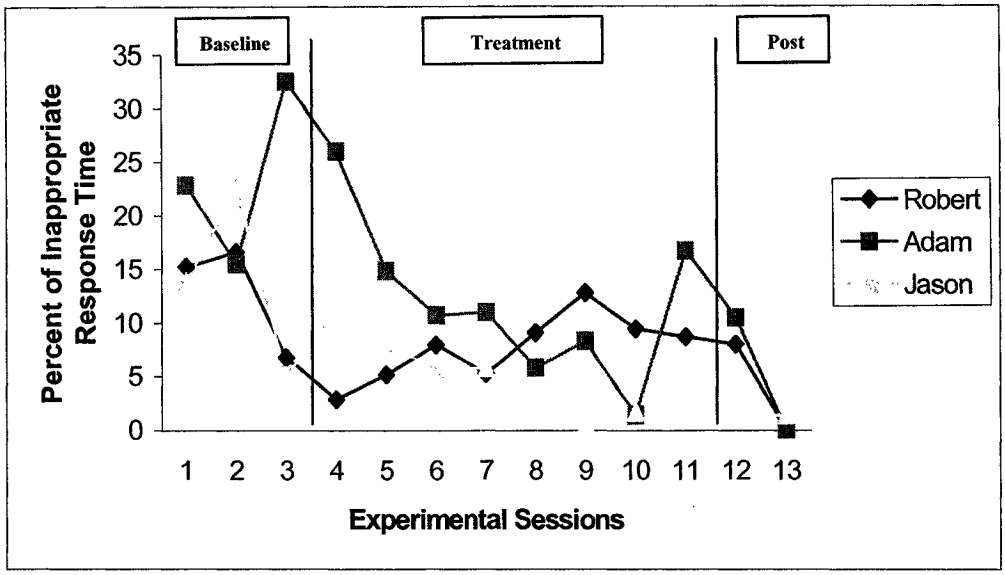


Figure 17 – Percentage of inappropriate response time within free time.

Activity Following the Swimming Session

Schedules were also implemented in the time immediately following the participants' time in the pool. Figures 18-20 indicate the rate of inappropriate behaviours observed in the changeroom following the swimming session for the participants across experimental conditions. During baseline sessions, mean rates of inappropriate behaviours for Robert were 2.87 per minute, 2.53 per for Adam, and 1.97 per minute for Jason. With the application of the picture symbol schedules, both Robert and Adam decreased, while Jason escalated. Robert decreased to 2.35 inappropriate behaviours per minute, Adam to 2.26, while Jason increased to 3.30 behaviours per minute. During maintenance, the removal of the schedules resulted in all three participants returning to near baseline levels, Robert to 3.30 inappropriate behaviours per minute for Robert, Adam to 3.90, and Jason to 2.15. Again, as in the session prior to the swimming lesson, stereotypical behaviour and language deficits accounted for the majority of inappropriate behaviours recorded.

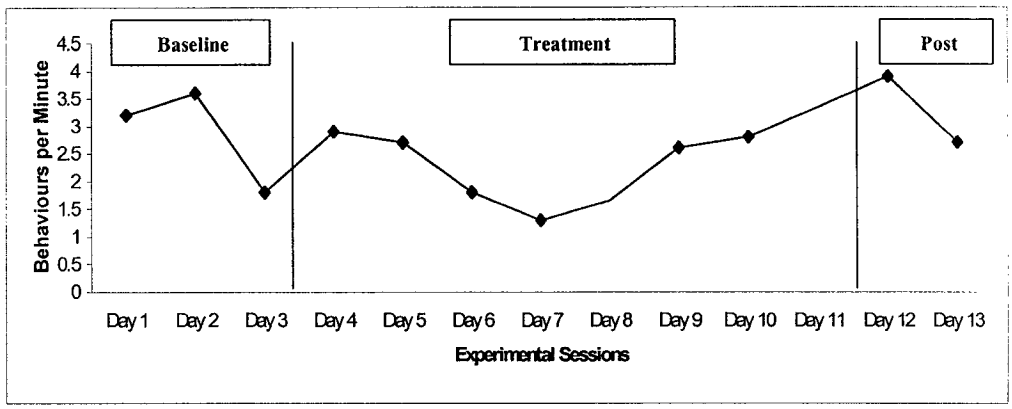


Figure 18 – Rates of inappropriate behaviours for Robert across all experimental sessions following the swimming session.

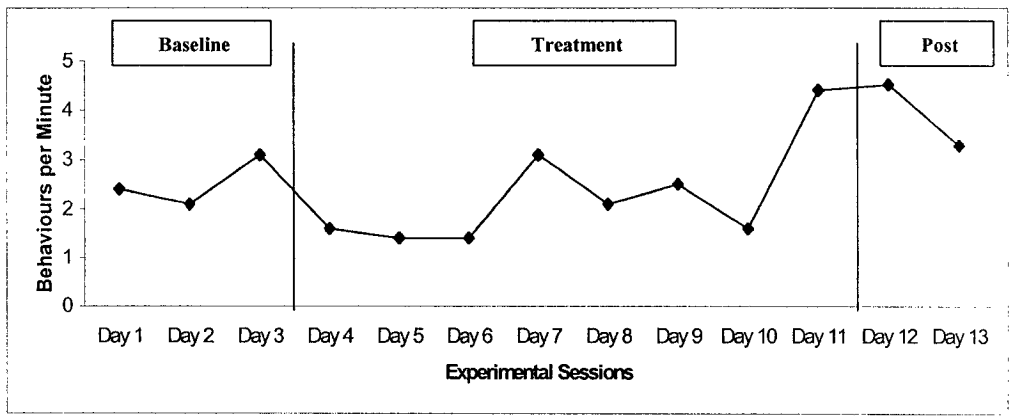


Figure 19 – Rates of inappropriate behaviours for Adam across all experimental sessions following the swimming session.

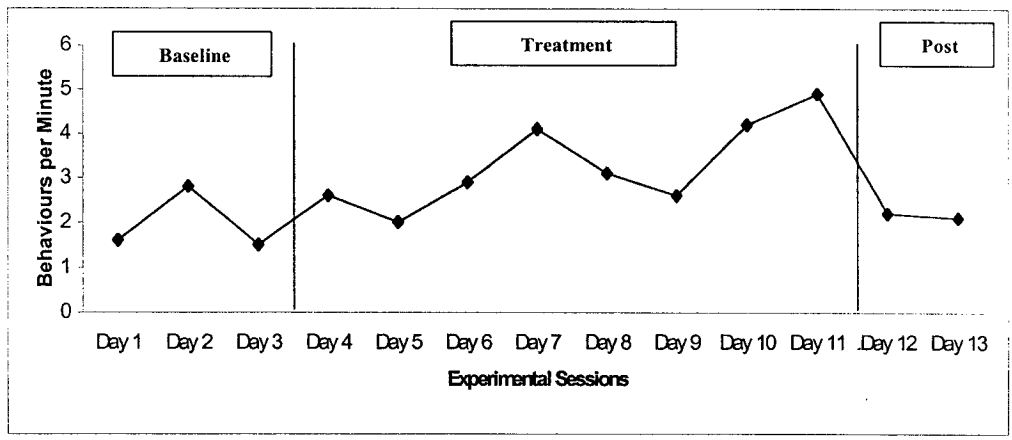


Figure 20 – Rates of inappropriate behaviours for Jason across all experimental sessions following the swimming session.

As with the changing session prior to the swimming lesson, field notes accompanied the data collected via event recording. These notes conveyed similar trends to those prior to the lesson. For example, the assistance of teachers and assistants was reduced over the course of the study. In baseline and early treatment sessions, physical prompts were used to assist the participants in completing their schedules. However, by the end of the treatment sessions, Adam and Jason were completely independent while changing, and Robert only required the use of gestural and verbal prompting. These behaviours were maintained by the former two participants, who continued their independence throughout the course of the maintenance sessions. Robert however, regressed again requiring physical help to complete his changing sequence.

In addition to the assistance provided by the teachers and assistants, and resembling patterns previously reported in the session before the pool, a large number of the behaviours occurred while the participants were in transition and waiting for others to finish their schedules. Therefore, the alternative means of data collection, as mentioned in the section prior to the swimming lesson, was employed. That is, inappropriate behaviours were counted while using the schedules and while waiting for others. These results are found in Figure 21.

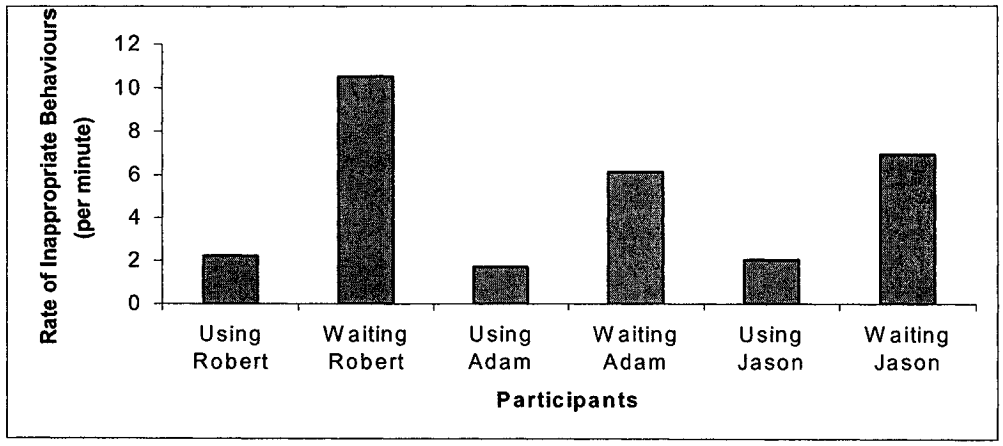


Figure 21 - Differences in the rates of inappropriate behaviours while using schedules and waiting over final 4 treatment sessions after the swimming lesson (per minute).

In the changing session following the swimming lesson, all three participants showed trends of increased inappropriate behaviours while not using the activity schedules. Specifically, the average rates increased by 7.3 per minute in Robert, 4.4 per minute in Adam, and 4.9 in Jason – increases of 477%, 359%, and 345% respectively. Similar to time prior to the pool session, inappropriate behaviours were less frequent for all participants while they were engaged in schedule-use.

Chapter 5

DISCUSSION AND CONCLUSION

The present study was designed to investigate the efficacy and maintenance of pictographic activity schedules on three adolescent boys with autism over a 13-week swimming program. This chapter will be organized in the following sections: (1) During the Swimming Sessions, (2) Prior to and Following the Swimming Sessions, (3) Conclusion, and (4) Recommendations for Future Studies.

During the Swimming Session

Within the swimming pool, schedules were used to determine if behaviour changes were apparent with respect to time on-task, time off-task, and inappropriate response time. According to the data, schedules noticeably influenced participant behaviour, however the extent of their influence varied amongst the variables. Due to this variance, all experimental sessions were analyzed as a whole, as well as through time periods with and without instruction. Each of these time periods will be discussed with regard to each dependent variable.

Time On-task

According to the data collected over all intervals, schedules positively influenced time on-task as increases occurred in all three participants from baseline sessions into the treatment condition. For example, increases ranged from 4.0% to 10.1% for each participant. While these increases can only be viewed as modest improvements, it should be noted that relatively high baseline measures were originally observed (i.e., 62.1% to 72.9%). Therefore, it would be expected that the increase would not be very large, as room for improvement was limited.

While only modest changes were apparent within the data analyzed over the complete lesson, more pronounced changes were produced within the specified time

periods of the lesson. It is apparent that the schedules had a positive impact on time on-task during instruction as increases were observed for Robert (57.6% to 74.5%), Adam (77.0% to 84.8%), and Jason (65.9% to 76.1%) between baseline and treatment. In addition, increases reached levels of up to 12.3% in free time, although only two of the three participants improved.

These results lend support to previous research on activity schedules using this variable. For example, in the study of MacDuff and colleagues (1993) students maintained high levels of on-task behaviour while using activity schedules. As well, Pierce and Schreibman (1994) stated that daily living behaviours increased with the use of pictorial self-management packages. With respect to physical activity, Schultheis and colleagues (2000) noted that the use of schedules might influence the success rates of individuals with autism if more time is spent on task. While the two former studies are empirically sound, the work of Schultheis et al. (2000) gave no empirical evidence as to these suggestions. Still, the notion of the latter researchers, coupled with the data from the current study, provide encouragement for the use of schedules within physical education programming.

While all three participants did not show signs of maintenance in the post-treatment, Adam and Jason did manage to maintain treatment levels of time on-task. Reasons for a lack of maintenance by Robert may have been the result of too few treatment or post-treatment sessions gathered. It was indicated that Adam maintained levels of time on-task into the post-treatment sessions over all intervals (76.9% to 80.0%) and when instruction was given (84.8% to 87.1%). In addition, Jason increased his time on-task over all intervals collected (69.0% to 75.5%) and when instruction was given (76.1% to 87.6%). While further post-treatment sessions would have provided additional clarity, the current investigation provides some support for

the findings of Bryan and Gast (2000), who claimed the implementation of schedules allowed students to maintain high levels of on-task behaviour after schedules were removed.

Time Off-task

Unlike the variable of time on-task, the results for the variable of time off-task were for the most part inconclusive. The results of time off-task showed relatively little or no change across conditions and time periods for all participants. For example, only Robert displayed reductions in time off-task from baseline levels over all intervals. Still, this reduction was only modest at 4.0%. Within the intervals pertaining to instruction, again modest results were shown as time off-task reduced for both Robert (26.4% to 20.5%) and Jason (24.1% to 20.8%). Finally, during free time in the pool, Robert again was the only participant to reduce the amount of time spent off-task (32.6% to 26.2%). In maintenance the results remained inconclusive, as only two instances were observed over the entire study for the variable of time off-task (Jason within instructed intervals and Robert in free time). Adam showed no signs of improved performance or maintenance over any experimental condition, or distinguished time period.

While it can be suggested that schedules modestly influenced time off-task for Robert, there a few explanations that could be given with respect to the inconclusive results observed for Adam and Jason. First, corresponding to explanations given in the section above, the baseline scores for time off-task were initially quite low due to the rather high levels of time on-task. Therefore, room for improvement was minimal moving into the treatment and post-treatment sessions.

Another explanation that has previously been mentioned is that of the length of the experimental investigation. In total, the length of the study included 13

sessions: 3 baseline sessions, 8 treatment sessions, and 2 maintenance sessions. While research has shown that elements of structured teaching demonstrate positive effects over short periods of time (Durham, 2000; Durnick et al., 2000), and the current study reveals positive effects with respect to time on-task, 13 sessions may have not been long enough to show more dramatic effects for the variable of time off-task. However, these results do show support for Bouffard (1993), who suggests there are individual differences in responses to treatment. This "person-by-treatment" interaction (p.373) has also been argued by Watkinson and Wasson (1984) who suggest that similar treatments may produce changes for some persons while others may not reap the same benefits. For example, Robert decreased his time off-task over all time periods when schedules were implemented, while Adam showed no signs of such a response.

Inappropriate Response Time

The variable of inappropriate response time displayed the most pronounced effects of all variables in the current investigation. As a whole, this variable was reduced for all participants over all experimental conditions and time periods. Specifically, Robert reduced inappropriate response time by 5.5%, while Adam and Jason improved performance levels by 9.6% and 7.1%, respectively. In addition, post-treatment scores revealed maintenance tendencies for all participants, as scores did not return to baseline levels. In fact, inappropriate response time decreased for Adam and Jason, who almost showed no signs of inappropriate activity. Because these results demonstrated positive findings over all intervals, it was not necessary to further examine the variable within the two distinct time periods. However, due to the researcher's interest, investigation of the time periods with and without instruction did occur.

From the analysis of these periods, results revealed similar findings to those mentioned above. Specifically, all participants showed improvements in levels of inappropriate response time, as well as in maintaining levels below that of baseline. Despite these results, there were differences between the two time periods. For example, a larger reduction of inappropriate response time was noticed within the intervals when instruction was removed (5.6% to 13.0%) compared to when instruction was present (6.1% to 9.5%). In addition, maintenance data of these two time periods indicated that average percentages of inappropriate response times were lower within intervals without instruction (3.4%) compared to that of instructed intervals (3.9%). While there were essentially no differences, consistently low percentages of inappropriate response time across time periods indicates a sense of generalization. Specifically, because no activity was expressed to the participants in the time period without instruction, yet inappropriate response time remained similar levels as when instruction was given, the current study supports the notion of generalization found by Bryan and Gast (2000). Although these researchers used on-task behaviour as a variable, they discovered that students were able to generalize this behaviour to novel activities not denoted by the schedules.

Overall, the results of this variable support the previous research using inappropriate responses as a dependent measure. For example, Krantz et al. (1993) stated that decreases in disruptive behaviour were apparent once photographic schedules were introduced to three boys with autism. In addition, Pierce and Scheibman (1994) stated that substantial decreases in stereotypic behaviours were observed when children used pictures to manage their behaviour. Lastly, MacDuff et al. (1993) anecdotally described that participants engaged in fewer aberrant behaviours when following their schedules.

Hypothesis 1 stated that activity schedules, when implemented in the physical activity setting, should increase time on-task, while simultaneously reducing time off-task and time including stereotypical responses. While the variables of time on-task and inappropriate response time did reveal improvements in performance for all three participants over the examined time periods, results from time off-task data remain inconclusive due to increased variability among the data. Therefore, this hypothesis was partially supported for has not been confirmed as a whole, however does show support for on-task behaviour and inappropriate responding. In addition, the current investigation extends the present literature as it has been empirically shown schedules can be used within physical education programming for individuals with autism.

Prior to and Following the Swimming Sessions

Within the changeroom, the rates of inappropriate behaviours were examined to determine if schedule-use influenced the performance of participants engaged in activity before and after the swimming session. According to the overall data, schedules showed minimal or no influence in the rate of inappropriate behaviours observed prior to and following the pool.

Field notes were taken regarding on-task behaviour. While on-task behaviour improved, another interesting trend became apparent after the first four treatment sessions. Here, it was noted that the majority of the behaviours observed in the changeroom occurred while individuals waited for the entire class to finish the changing sequence, rather than when using the schedules. This questions the data for the entire session. Upon adjustment of the coding procedure, suspicions were confirmed as all participants decreased in the rates of inappropriate behaviours while using the schedules as opposed to waiting. Specifically, before the swimming lesson rates of inappropriate behaviour were 3.0 per minute with schedules, and 6.2 per

minute during free time, while after the lesson these rates were 4.4 and 7.3, respectively. As with the inappropriate response time variable of the activity session, these results support the findings of Krantz et al. (1993), MacDuff et al. (1993), and Pierce and Schreibman (1994) who showed that inappropriate behaviours were reduced as schedules were implemented.

Another aspect of behaviour that was anecdotally reported through field notes, was the amount of assistance given to participants in order for them to complete their changing sequences. These accounts indicated that all participants improved as prompting levels decreased when schedules were employed. Over the initial stages of the study, Adam and Jason required the use of gestural prompts accompanied by verbal suggestions. By the end of the treatment session however, both were able to complete the schedule independent of all assistance. Robert on the other hand, did not reach this level of independence. While he still improved from levels of physical assistance, only levels of verbal prompting were reached.

The indication of decreased assistance shown through the field notes supports the previous research of Dettmer et al. (2000). In a study using two participants with autism, these researchers found significant decreases in teacher-delivered verbal and physical transition prompts required to move individuals from one activity to the next. Additionally, the current investigation supports the work of Massey and Wheeler (2000) who found that prompts decreased, while the ablility to transition amongst task without episodes of challenging behaviours improved.

Hypothesis 2 stated that the effects of improved behaviour should be transferred to areas outside the activity setting. While this hypothesis can be refuted when considering the total behaviours within the changeroom, it cannot if times representing schedule-use and waiting are distinguished. Therefore, due to the

dramatic increases in the rates of inappropriate behaviours while waiting, and for the decreases in the amount of prompts delivered by teachers and assistants over the changing sequence, it can be concluded that improved behaviour was transferred outside the physical activity setting. Hence, the second hypothesis is fully supported by the data.

In addition to partially supporting the first hypothesis and fully supporting the second hypothesis, the results of the present investigation extends previous work in special education settings as it provides empirical evidence of the use of schedules within physical activity. Another extension involves the ability to incorporate schedules throughout the course of the entire school day. As mentioned, the participants used schedules in the regular special education classroom before and after the physical activity session. Therefore by implementing the schedules during the swimming program, a break in routine between classroom activity did not exist, and consistent information was being presented. According to Mesibov et al. (1994) routines are of particular importance for individuals with autism as they imply the notion of familiarity of what is occurring and what is about to happen. Thus, it should be expected that added familiarity would stabilize behaviour and prevent an individual with autism from acting in a manner that is not appropriate to the setting. Only one other study has examined the effects of presenting constant information over the course of a school day through the use of schedules (Schmit et al., 2000), however they did not use participants of adolescent age. In addition, only one other study has used participants over the age of 10 (MacDuff et al., 1993). Therefore, the previous literature is extended by the current data to include the use of five schedules for adolescents with autism.

Finally, the current study extends previous investigations through its implementation of daily life skills (i.e., changing) into a physical activity setting. While Pierce and Schreibman (1994) denoted changing sequences through pictorial representations, their study represented home settings for participants where changing usually takes place. The current research however, successfully transferred these daily living skills into a setting that was less familiar to the participant, and one that may be encountered in the future.

Conclusion

Based upon the results of this study, and within its limitations, structure in the form of schedules does improve participant behaviours in the form of increased time on-task, and reductions in inappropriate response time. However, the variable of time off-task revealed inconclusive results and should further be explored in the physical activity context. While the current invesitigation provides support of research within regular special education classrooms, it also extends it to the domain of physical education. Future examinations within physical activity settings, as well as the settings prior to and immediately following them are warranted to verify schedules as an appropriate means of intervention for students with autism in physical education.

Recommendations for Future Studies

1) Future studies should manipulate (i.e., increase or decrease) the amount of structure given to students with autism to determine an optimal level of intervention suitable to each individual's needs.
2) Future studies should examine the effects of structure on different types of activities to determine acceptable physical education programming.

3) Examination of school-based activities immediately prior to and following physical education classes using structure may reveal optimal placement for physical education classes.
4) Future studies should examine the interaction between structured physical education and other developmental disabilities (i.e., Down syndrome) to determine if benefits exist amongst populations other than those with autism.

REFERENCES

Allison, D. B., Basile, V. C., & MacDonald, R. B. (1991). Comparative effects of antecedent exercise and lorazepam on the aggressive behavior of an autistic man. *Journal of Autism and Developmental Disorders*, **21**, 89-94.

Allison, D. B., Faith, M. S., Franklin, R. D. (1995). Antecedent exercise in the treatment of disruptive behavior: A meta-analytic review. *Clinical Psychology: Science and Practice*, **2**, 279-303.

American Psychiatric Association. (1980). Diagnostic and Statistical Manual of Mental Disorders. 3rd ed. Washington, DC: Author.

American Psychiatric Association. (1987). Diagnostic and Statistical Manual of Mental Disorders. 3rd ed. Revised. Washington, DC: Author.

American Psychiatric Association. (1989). Treatments of Psychiatric Disorders. Washington, DC: Author.

American Psychiatric Association. (1994). DSM-IV: Diagnostic and Statistical Manual of Mental Disorders. 4th ed. Washington, DC: Author.

American Psychiatric Press. (2001). Treatments of Psychiatric Disorders (3rd ed.). Washington, DC: American Psychiatric Press, Inc.

Anderson, G. M. (1994). Studies on the neurochemistry of autism. In Bauman, M. L. and Kemper T. L. (Eds.) *The neurobiology of autism*. Baltimore//////////; Johns Hopkins University Press. pp. 227-242.

Arvidsson, T., Danielsson, B., Forsberg, P., Gillberg, C., Johansson, M., Kallgren, G. (1997). Autism in 3 to 6-year-old children in a suburb of Goteborg, Sweden. *Autism,* **1**, 163-173.

Association for Comprehensive Neurotherapy. (2003). Latitudes [On-line]. Available: http://www.latitudes.org/index.html.

Bachman, J. E., & Fuqua, R. W. (1983). Management of inappropriate behaviors of trainable mentally impaired students using antecedent exercise. *Journal of Applied Behavior* Anaysis, **16**, 477-484.

Bachman, J. E., & Sluyter, D. (1988). Reducing inappropriate behaviors of developmentally disabled adults using antecedent aerobic dance exercises. *Research in Developmental Disabilities,* **9**, 73-83.

Baily, A., Phillips, W., & Rutter, M. (1996). Autism: Towards an integration of clinical, genetic, neuropsychological, and neurological perspectives. *Journal of Child Psychology and Psychiatry*, **37**, 89-126.

Baron-Cohen, S. (2000). Is asperger syndrome/high-functioning autism necessarily a disability? *Development and Psychopathology*, **12,** 489-500.

Baron-Cohen, S. (2001). Theory of mind and autism: A review. In L. M. Glidden (Ed.), *International Review of Research in Mental Retardation*, **23**, (pp.169-184). New York, NY: Academic Press.

Basile, V. C., Motta, R. W., & Allison, D. B. (1995). Antecedent exercise as a treatment for disruptive behavior: Testing hypothesized mechanisms of action. *Behavioral Interventions*, **10**, 119-140.

Bayley, N. (1969). *Manual for the Bayley Scales of Infant Development.* New York, NY: Psychological Corporation.

Berkeley, S. L., Zittel, L. L., Pitney, L. V., & Nichols, S. E. (2001). Locomotor and object control skills with children diagnosed with autism. *Adapted Physical Activity Quarterly*, **18**, 405-416.

Bishop, D. V. M. (1993). Annotation: Autism, Executive Functions and Theory of Mind: A Neuropsychological Perspective. *Journal of Child Psychology and Psychiatry*, **34**, 279-293.

Bogdan, R. C., & Biklen, S. K. (1982). *Qualitative research of education: An introduction to theory and methods*. Boston, MA: Allyn & Bacon.

Bouffard, M. (1993). The perils of averaging data in adapted physical activity research. *Adapted Physical Activity Quarterly*, **10**, 371-391.

Bradshaw, J. L., & Mattingly, J. B., (1995). *Clinical Neuropsychology: Behavioral and Brain Science.* San Diego, CA: Academic Press.

Bristol, M. M., Cohen, D. J., Costello, E. J., Denckla, M., Eckberg, T. J., Kallen, R., Kraemer, H. C., Lord, C., Maurer, R., McIlvane, W. J., Minshew, N., Sigman, M., Spence, M. A. (1996). State of the science in autism: Report to the national institutes of health. *Journal of Autism and Developmental Disabilities*, **26**, 121-154.

Bruininks, R. H. (1978). *The Bruininks-Oseretsky Test of Motor Proficiency*. Circle Pines, MN: American Guidance Service.

Bryan , L. C., & Gast, D. L. (2000). Teaching on-task and on-schedule behaviors to high-functioning children with autism via picture activity schedules. *Journal of Autism and Developmental Disorders,* **30,** 553-567.

Bryson, S. E., & Smith, I. M. (1998). Epidemiology of autism: prevalence, associated characteristics, and implications for research and service delivery. *Mental Retardation and Developmental Disabilities*, **4**, 97-103.

Bryson, S. E., Clark, B. S., & Smith, I. M. (1988). First report of a Canadian epidemiological study of autistic syndromes. *Journal of Child Psychology and Psychiatry*, **29**, 433-446.

Bushwick, N. L. (2001). Social learning and the etiology of autism. *New Ideas in Psychology*, **19**, 49-75.

Campbell, M., Schopler, E., Cueva, J. E., & Hallin, A. (1996). Treatment of autistic disorder. *Journal of the American Academy of Child and Adolescent Psychiatry*, **35**, 134-143.

Celiberti, D. A., Bobo, H. E., Kelly, K. S., Harris, S. L., & Handleman, J. S. (1997). The differential and temporal effects of antecedent exercise on the self-stimulatory behavior of a child with autism. *Research in Developmental Disabilities*, **18**, 139-150.

Cohen, B. I. (2000). Infantile autism and the liver: A possible connection. *Autism*, **4**, 441-442.

Connor, F. (1990). Physical education for children with autism. *Teaching Exceptional Children*, **23**, 30-33.

Cook, E. H. (2001). Genetics of autism. *Child and Adolescent Psychiatric Clinics of North America*, **10**, 333-350.

Cook, E. H., Jr. Lindgren, V., Leventhal, B. L., Courchesne, R. Lincoln, A., Shulman, C., Lord, C., & Courchesne, E., (1997). Autism or atypical autism in maternally but not paternally derived proximal 15q duplication. *American Journal of Human Genetics*, **60**, 928-934.

Damasio, A. R., & Maurer, R. G. (1978). A neurological model for childhood autism. *Archives of Neurology*, **35**, 779-786.

Dempsey, I., & Foreman, P. (2001). A review of educational approaches for individuals with autism. *International Journal of Disability, Development and Education*, **48**, 103-116.

DeMyers, M. K. (1976). Motor, perceptual-motor, intellectual disabilities of autistic children. In L. Wing (Ed.). *Early Childhood Autism*. New York, NY: Pergamon Press.

Dettmer, S., Simpson, R. L., Smith-Myles, B., & Ganz, J. B. (2000). The use of visual supports to facilitate transitions of students with autism. *Focus on Autism and Other Developmental Disabilities*, **15**, 163-169.

Doll, E. A. (1965). *Vineland Social Maturity Scale: Condensed Manual of Directions*. Circle Pines, MN: American Guidance Services, Inc.

Dunn, L. M. (1965). *Peabody Picture Vocabulary Test.* Circle Pines, MN: American Guidance Services, Inc.

Duker, P. C., Rasing, E. (1989). Effects of redesigning the physical environment on self-stimulation and on-task behavior in three autistic-type developmentally disabled individuals. *Journal of Autism and Developmental Disorders*, **19**, 449-460.

Dunlap, G. (1984). The influence of task variation and maintenance task variation and maintenance tasks on the learning and affect of autistic children. *Journal of Experimental Child Psychology*, **37**, 41-64.

Dunlap, G., & Kern, L. (1993). Assessment and intervention for children within the instructional curriculum. In J. Reichle & D. Wacker (Eds.), *Communicative Approaches to the Management of Challenging Behavior* (pp. 177-203). Baltimore: Brookes.

Dunlap, G., Kern, L., & Worcester, J. (2001). ABA and academic instruction. *Focus on Autism and Other Developmental Disabilities*, **16**, 129-136.

Durham, C. (2000). Evolution of services for people with autism and their families in France. *International Journal of Mental Health*, **29**, 22-34.

Durnik, M., Dougherty, J. M., Andersson, T., Persson, B., Bjorevall, G.-B., & Emilsson, B. (2000). Influence of the TEACCH program in Sweden. *International Journal of Mental Health*, **29**, 72-87.

Eliasoph, E. & Donnellan, A. M. (1995). A group therapy program for individuals identified as autistic who are without speech and use of facilitated communication. *International Journal of Group Psychotherapy*, **45,** 549-560.

Elliot, R. O., Dobbin, A. R., Rose, G. D., & Soper, H. V. (1994). Vigorous aerobic exercise versus general motor activities: Effects on maladaptive and stereotypic behaviors of adults with both autism and mental retardation. *Journal of Autism and Developmental Disorders*, **24**, 565-576.

Fenske, E. C., Krantz, P. J., & McClannahan, L. E. (2001). Incidental teaching: a not-discrete-trial teaching procedure. In C. Maurice (Ed.), *Making a Difference: Behavioral Intervention for Autism* (pp. 75-82). Austin, TX: Pro-Ed.

Ferraro, F. R. (2001). Survey of treatments for childhood autism. *Psychology and Education: An Interdisciplinary Journal*, **38**, 29-41.

Fisher, E., Van Dyke, D. C., Sears, L., Matzen, J., Lin-Dyken, D., & McBrien, D. (1999). Recent research on the etiologies of autism. *Infants and Young Children*, **11**, 1-8.

Fombonne, E. (1999). The epidemiology of autism: a review. *Psychological Medicine*, **29**, 769-786.

Frith, U. (1989). *Autism: Explaining the enigma.* Cambridge, MA: Blackwell.

Gabler-Halle, D., Halle, J. W., & Chung, Y.B. (1993). The effects of aerobic exercise on psychological and behavioral variables of individuals with developmental disabilities: A critical review. *Research in Developmental Disabilities*, **14**, 359-386.

Garretson, H., Fein, D., & Waterhouse, L. (1990). Sustained attention in autistic children. *Journal of Autism and Developmental Disorders*, **20**, 101-114.

Ghaziuddin, M., & Butler, E. (1998). Clumsiness in autism and Asperger's syndrome: A further report. *Journal of Intellectual Disability Research*, **42**, 43-48.

Ghazziudin, M., Butler, E., Tsai, L., & Ghaziuddin, N. (1994). Is clumsiness a marker for Asperger syndrome. *Journal of Intellectual Disability Research*, **38**, 519-527.

Ghaziuddin, M., Tsai, L., & Ghaziuddin, N. (1992). Brief report: A comparison of the diagnostic criteria for Asperger syndrome. *Journal of Autism and Developmental Disorders*, **22**, 643-649.

Gillberg, C. (1984). Infantile autism and other childhood psychoses in a Swedish urban region: Epidemiological aspects. *Journal of Childhood Psychology and Psychiatry*, **25**, 35-43.

Gillberg, C., Steffenburg, S., Schaumann, H. (1991). Is autism more common now than ten years ago? *Behavioural Journal of Psychiatry*, **158**, 403-409.

Gillberg, C., & Wing, L. (1999). Autism: not an extremely rare disorder. *Acta Psychiatrica Scaninavica*, **99,** 399-406.

Gillham, J. E., Carter, A. S., Volkmar, F. R., & Sparrow, S. S. (2000). Toward a developmental operational definition of autism. *Journal of Autism and Developmental Disabilities*, **30**, 269-278.

Grandin, T. (1995). *Thinking in Pictures.* New York, NY: Doubleday.

Green, G. (1996). Early behavioral intervention for autism. In C. Maurice (Ed.), *Behavioral Intervention for Young Children with Autism* (pp. 29-44). Austin, TX: Pro-Ed.

Happe, F. G. E. (1994). Annotation: Current Psychological Theories of Autism: The "Theory of Mind" Account and Rival Theories. *Journal of Child Psychology and Psychiatry*, **35**, 215-229.

Harrower, J. K., & Dunlap, G. (2001). Including children with autism in general education classrooms: a review of effective strategies. *Behavior Modification*, **25**, 762-784.

Hashimoto, T., Tayama, M., Murakawa, K., Yoshimoto, T. Miyazaki, M., Harada, M., & Kuroda, Y. (1995). Development of the brainstem and cerebellum in autistic patients. *Journal of autism and Developmental Disorders*, **25**, 1-18.

Heflin, L. J., & Alberto, P. A. (2001). Establishing a behavioral context for learning for students with autism. *Focus on Autism and Other Developmental Disabilities*, **16,** 93-101.

Honda, H., Shimizu, Y., Misumi, K., Niimi, M., Ohashi, Y. (1996). Cumulative incidence of childhood autism in children in Japan. *Behavioral Journal of Psychiatry*, **169**, 228-235.

Howley, M., Preece, D., & Arnold, T. (2001). Multidisciplinary use of 'structured teaching' to promote consistency of approach for children with autistic spectrum disorder. *Educational and Child Psychology*, **18,** 41-52.

Howlin, P., Wing, L., Gould, J. (1995). The recognition of autism in children with Down syndrome – implications for intervention and some speculations about pathology. *Developmental Medicine and Child Neurology*, **37**, 398-414.

Hughes, C., Russell, J., Robbins, T. W. (1994). Evidence for Executive Dysfunction in Autism. *Neuropsychologia*, **32**, 477-492.

Hussman, J. P. (2001). Suppressed Gabaergic inhibition as a common factor in suspected etiologies of autism. *Journal of Autism and Developmental Disabilities*, **31**, 247-248.

Kadesjo, B., & Gillberg, C. (2000). Tourette's disorder: Epidemiology and comorbidity in primary school children. *Journal of the American Academy of Child and Adolescent Psychiatry*, **39**, 548-555.

Kadesjo, B., Gillberg, C., Hagberg, B. (1999). Autism and asperger syndrome in seven-year-old children: A total population study. *Journal of Autism and Developmental Disorders*, **29**, 327-331.

Kanner, L. (1943). Autistic disturbances of affective contact. *Nervous Child*, **2**, 217-250.

Kern, L., Koegel, R. L., & Dunlap, G. (1984). The influence of vigorous versus mild exercise on autistic stereotyped behaviors. *Journal of Autism and Developmental Disorders*, **14**, 57-67.

Kern, L., Koegel, R. L., Dyer, K., Blew, P. A., & Fenton, L. R. (1982). The effects of physical exercise on self-stimulation and appropriate responding in autistic children. *Journal of Autism and Developmental Disorders*, **12**, 399-419.

Kitson, V. (1993). Providing opportunities for physical education for children with autism. *British Journal of Physical Education*, **24**, 15.

Klin, A., Volkmar, F. R., Sparrow, S. S., Cicchetti, D. V., & Rourke, B. P. (1995). Validity and neuropsychological characterization of Asperger syndrome: Convergence with non-verbal behavior learning disabilities syndrome. *Journal of Child Psychology and Psychiatry*, **36**, 1127-1140.

Koegel, R. L., Kern-Koegel, L., & Carter, C. M. (1999). Pivotal teaching interactions for children with autism. *School Psychology Review*, **28**, 576-594.

Koegel, R. L., Kern-Koegel, L., & McNerney, E. K. (2001). Pivotal areas in intervention for autism. *Journal of Clinical Child Psychology*, **30**, 19-32.

Krantz, P. J., MacDuff, M. T., & McClannahan, L. E. (1993). Programming participation in family activities for children with autism: Parents' use of photographic activity schedules. *Journal of Applied Behavior Analysis*, **26**, 137-138.

Kunce, L., & Mesibov, G. (1998). Educational approaches to high-functioning autism and asperger syndrome. In E. Schopler, G. B. Mesibov, & Kunce, L. (Eds.), *Asperger Syndrome of High-Functioning Autism?* (pp. 227-261). New York, NY: Plenum Press.

Lancioni, G. E., O'Reilly, M. F. (1998). A review of research on physical exercise with people with severe and profound developmental disabilities. *Research in Developmental Disabilities*, **6**, 477-492.

Levinson, L. J., & Reid, G. (1993). The effects of exercise intensity in the stereotypic behaviors of individuals with autism. *Adapted Physical Activity Quarterly*, **10**, 255-268.

Lord, C., Bristol, M. M., & Schopler, E. (1993). Early intervention for children with autism and related developmental disorders. In E. Schopler, M. E. Van Bourgondien, & M. M. Bristol (Eds.), *Preschool issues in autism* (pp. 199-221). New York, NY: Plenum Press.

Lotter, V. (1966). Epidemiology of autistic conditions in young children: I. Prevalence. *Social Psychiatry*, **1**, 124-137.

MacDuff, G. S., Krantz, P. J., & McClannahan, L. E. (1993). Teaching children with autism to use photographic activity schedules: maintenance and generalization of complex response chains. *Journal of Applied Behavior Analysis*, **26**, 89-97.

Mackowiak, M. (2000). Aetiology of autism – focus on the biological perspective. *Early Child Development and Care*, **160**, 77-84.

Magnusson, P., Saemundsen, E. (2001). Prevalence of autism in Iceland. *Journal of Autism and Developmental Disorders*, **31**, 153-163.

Manjiviona, J., & Prior, M. (1995). Comparison of Asperger syndrome and high-functioning autistic children on a test of motor impairment. *Journal of Autism and Developmental Disorders*, **25**, 23-39.

Massey, N. G., & Wheeler, J. J. (2000). Acquisition and generalization of activity-schedules and their effects on task engagement in a young child with autism in an inclusive pre-school classroom. *Education and Training in Mental Retardation and Developmental Disabilities*, **35**, 326-335.

McClannahan, L. E., & Krantz, P. J. (1999). *Activity Schedules for Children with Autism: Teaching Independent Behavior.* Bethesda, MD: Woodbine House.

McGimsey, J. F., & Favell, J. E. (1988). The effects of increased physical exercise on disruptive behavior in retarded persons. *Journal of Autism and Developmental Disorders*, **18**, 167-179.

McLaughlin-Cheng, E. (1998). Asperger syndrome and autism: A literature review and meta-analysis. *Focus on Autism and Other Developmental Disabilities*, **13**, 234-245.

Mesibov, G. B. (1996). Division TEACCH: A program model fro working with autistic people and their families. In M.C. Roberts (Ed.), *Model practices in service delivery in child and family mental health.* Hillsdale, NJ: Lawrence Erlbaum Associates.

Mesibov, G. B. (1997). Formal and informal measures on the effectivenss of the TEACCH programme. *Autism*, **1**, 25-35.

Mesibov, G. B., Schopler, E., Hearsey, K.A. (1994). Structured teaching. In E. Schopler & G. B. Mesibov (Eds.), *Behavioral Issues in Autsim* (pp. 195-207). New York, NY: Plenum Publishing.

Mesibov, G. B., & Shea, V. (2003). *The culture of autism: From theoretical understanding to education practice.* [On-line]. Available: http://www.rmplc.co.uk/eduweb/sites/autism/culture.html.

Micheli, E. (2000). Dealing with the reality of autism: A psychoeducational program in Milan, Italy. *International Journal of Mental Health*, **29**, 50-71.

Minshew, N. J., Johnson, C., Luna, B. (2001). The cognitive and neural basis of autism: A disorder of complex information processing and dysfuction of neocortical systems. In L. M. Glidden (Ed.) *International Review of Research in Mental Retardation* (Volume 23, pp. 111-138). New York, NY: Academic Press.

Morehead, A., & Morehead, L. (1995). *The New American Webster Handy College Dictionary (3rd Edition).* New York, NY: Penguin Books, Inc.

Morin, B., & Reid, G. (1985). A quantitative and qualitative assessment of autistic individuals on selected motor tasks. *Adapted Physical Activity Quarterly*, 2, 43-55.

Morrissey, P. A., Franzini, L. R., & Karen, R. L. (1992). The salutary effects of light callisthenics and relaxation training on self-stimulation in the developmentally disabled. *Behavior Residential Treatment*, **7**, 373-389.

Munk, D. D., & Repp, A. C. (1994). The relationship between instructional variables and problem behavior: a review. *Exceptional Children*, **60**, 390-401.

O'Connor, J., French, R., Henderson, H. (2000). Use of physical activity to improve behavior of children with autism – Two for one benefits. *PALAESTRA*, **16**, 22-29.

Ozonoff, S., & Cathcart, K. (1998). Effectiveness of a home program intervention for young children with autism. *Journal of Autism and Developmental Disorders*, **28**, 25-32.

Ozonoff, S., Pennington, B. F., Rogers, S. J. (1991). Executive Function Deficits in High-Functioning Autistic Individuals: Relationship to Theory of Mind. *Journal of Child Psychology and Psychiatry*, **32**, 1081-1105.

Ozonoff, S., Strayer D. L., McMahon, W. M., Filloux, F. (1994). Executive Function Abilities in Autism and Tourette Syndrome: An Information Processing Approach. *Journal of Child Psychology and Psychiatry*, **35**, 1015-1032.

Panerai, S., Ferrante, L., & Caputo, V. (1997). The TEACCH strategy in mentally retarded children with autism: A multidimensional assessment. Pilot study. *Journal of Autism and Developmental Disorders*, **27**, 345-347.

Panerai, S., Ferrante, L., Caputo, V., & Impellizzeri, C. (1998). Use of structured teaching for treatment of children with autism and severe and profound mental retardation. *Education and Training in Mental Retardation and Developmental Disabilities*, **33**, 367-374.

Panerai, S., Ferrante, L., & Zingale, M. (2002). Benefits of the Treatment and Education of Autistic and Communication Handicapped Children (TEACCH) programme as compared with a non-specific approach. *Journal of Intellectual Disability Research*, **46**, 318-327.

Parker, M. (1989). Academic Learning Time – Physical Education (ALT-PE), 1982 Revision. In P.W. Darst, D. B. Zakrajsek, & V. H. Mancini (Eds.), *Analyzing*

Physical Education and Sport Instruction (pp. 195-205). Champaign, IL: Human Kinetics.

Pennington, B. F., Ozonoff, S. (1996). Executive Functions and Developmental Psychopathology. *Journal of Child Psychology and Psychiatry*, **37**, 51-87.

Pickles, A., Bolton, R. Macdonald, H., Bailey, A., Le Couteur, A., Sim, L., & Ruttern, M. (1995). Latent class analysis of recurrence risk for complex phenotypes with selection and measurement error. A twin and family history study of autism. *American Journal of Human Genetics*, **57**, 717-726.

Pierce, K. L., & Schreibman, L. (1994). Teaching daily living skills to children with autism using pictorial self-management. *Journal of Applied Behavior Analysis*, **27**, 471-481.

Powers, S., Thibadeau, S., & Rose, K. (1992). Antecedent exercise and its effects on self-stimulation. *Behavioral Residential Treatment*, **7**, 15-22.

Preece, D., Lovett, K., Lovett, P., Burke, C. (2000). The adoption of TEACCH in Northhamptonshire, UK: A unique collaboration between a voluntary organization and a local authority. *International Journal of Mental Health*, **29**, 19-31.

Prupas, A., & Reid, G. (2001). Effects of exercise frequency on stereotypic behaviors of children with developmental disabilities. *Education and Training in Mental Retardation and Developmental Disabilities*, **36**, 196-206.

Rapin, I. (1997). Autism. *New England Journal of Medicine*, **337**, 97-104.

Reid, D. H., Phillips, J. F., & Green, C. W. (1991). Teaching persons with profound multiple handicaps: A review of the effects of behavioral research. *Journal of Applied Behavior Analysis*, **24**, 319-336.

Reid, G., & Collier, D. (2002). Motor behaviour and the autism spectrum disorders: Introduction. *PALAESTRA*, **18**, 20-27, 44.

Reid, G., & Morin, B. (1981). Physical education for autistic children. *Canadian Association of Health, Physical Education and Recreation Journal*, **48**, 25-29.

Reid, G., & O'Connor, J. (2003). The autism spectrum disorders: Activity selection, assessment, and program organization – Part II. *PALAESTRA*, **19**, 20-27, 58.

Reid, P. D., Factor, D. C., Freeman, N. L., Sherman, J. (1988). The effects of physical exercise on three autistic and developmentally disordered adolescents. *Therapeutic Recreation Journal*, **22**, 47-56.

Rimland, B. (1964). *Infantile autism: The syndrome and its implications for neural theory of behavior*. New York, NY: Appleton-Century-Croft.

Rodier, P. M. (2002). Converging evidence for brain stem injury in autism. *Development and Psychopathology*, **14**, 537-557.

Rogers, S. J. (1999). Intervention for young children with autism: from research to practice. *Infants and Young Children*, **12,** 1-16.

Rosenthal-Malek, A., & Mitchell, S. (1997). The effects of exercise on the self-stimulatory behaviors and positive responding of adolescents with autism. *Journal of Autism and Developmental Disorders*, **27**, 193-202.

Rutter, M. (2000). Genetic studies of autism: From the 1970s into the millennium. *Journal of Abnormal Child Psychology*, **28**, 3-14.

Safran, S. P. (2001). Asperger syndrome: The emerging challenge to special education. *Exceptional Children*, **67,** 151-160.

Schmit, J., Apler, S., Raschke, D., & Ryndak, D. (2000). Effects of using a photographic cueing package during routine school transitions with a child who has autism. *Mental Retardation*, **38**, 131-137.

Schopler, E. (1998a). Premature popularization of asperger syndrome. In E. Schopler, G. B. Mesibov, & L. Kunce (Eds.), *Asperger syndrome or high-functioning autism?* (pp385-399). New York, NY: Plenum Press.

Schopler, E. (1998b). Prevention and management of behavior problems: The TEACCH approach. In E. Sanavio (Ed.), *Behavior and cognitive therapy today: Essays in honor of Hans J. Eysenck* (pp. 249-259). Amsterdam: Elsevier Science.

Schopler, E., & Mesibov, G. (1987). *Diagnosis and assessment in autism.* New York, NY: Plenum Press.

Schopler, E., & Mesibov, G. B. (2000). Cross-cultural priorities in developing autism services. *International Journal of Mental Health*, **29**, 3-21.

Schopler, E., Mesibov, G. B., & Hearsey, K. (1995). Structured teaching in the TEACCH system. In E. Schopler & G. B. Mesibov (Eds.), *Learning and Cognition in Autism* (pp. 243-268). New York, NY: Plenum Publishing.

Schopler, E., & Olley, J. G. (1982). Comprehensive educational services for autistic children: The TEACCH model. In C. R. Reynolds & T. R. Gutkin (Eds.), *The handbook of school psychology* (pp. 629-643). NewYork, NY: Wiley.

Schopler, E., Reichler, R. J., & Rochen-Renner, B. R. (1988). *The Childhood Autism Rating Scale (CARS).* Los Angeles, CA: Western Psychological Services, Inc.

Schopler, E., Reichler, R. J., Bashford, A., Lansing, M., & Marcus, L. (1990). *Individualized assessment and treatment for autistic and developmentally disabled children: 1. Psychoeducational Profile Revised (PEP-R).* Austin, TX: Pro-Ed.

Schreibman, L. (2000). Intensive behavioral/psychoeducational treatments for autism: research needs and future directions. *Journal of Autism and Developmental Disorders*, **30**, 373-378.

Schultheis, S. F., Boswell, B. B., & Decker, J. (2000). Successful programming for students with autism. *Focus on Autism and Other Developmental Disabilities*, **15**, 159-162.

Scott, D., Moyes, F. A., & Henderson, S. E. (1984). *Manual of Test of Motor Impairment – Henderson Revision.* Ontario, Canada: Brook Educational.

Sherrill, C. (1998). *Adapted Physical Activity, Recreation, and Sport – Crossdisciplinary and Lifespan* (5th Ed.). Boston, MA: McGraw-Hill.

Smith, I. M. (1995). Motor functioning in asperger syndrome. In A. Klin, F. R. Volkmar, & S. S. Sparrow (Eds.), *Asperger Syndrome* (pp. 97-124). New York, NY: The Guilford Press.

Smith, T. (1996). Are other treatments effective? In C. Maurice, G. Green, & S.C. Luce (Eds.), *Behavioral Intervention for Young Children with Autism* (pp. 45-59). Austin, TX: Pro-Ed.

Society for the Autistically Handicapped. (2003). [On-line]. Available: http://www.rmplc.cp.uk/eduweb/sites/autism/autism5.html.

Stodgell, C. J., Ingram, J. L., & Hyman, S. L. (2001). The role of candidate genes in unravelling the genetics of autism. *International Review of Research in Mental Retardation*, **23**, 57-81.

Szatmari, P. (2000). The classification of autism, asperger's syndrome, and pervasive developmental disorder. *Canadian Journal of Psychiatry*, **45**, 731-738.

Szatmari, P., Jones, M. B., Zwaigenbaum, L., MacLean, J. E. (1998). Genetics of autism: Overview and new directions. *Journal of Autism and Developmental Disorders*, **28**, 351-368.

Teachers College Columbia University. (2004). Institute for Complementary Practices [On-line]. Available: http://www.tc.columbia.edu.html.

Ulrich, D. (1985). *Test of Gross Motor Development*. Austin, TX: Pro-Ed.

Van der Mars, H. (1989). Basic recording tactics. In P.W. Darst, D. B. Zakrajsek, & V. H. Mancini (Eds.), *Analyzing Physical Education and Sport Instruction* (pp. 19-). Champaign, IL:Human Kinetics.

Waterhouse, L., Morris, R., Allen, D., Dunn, M., Fein, D., Feinstein, C., Rapin, I., & Wing, L. (1996). Diagnosis and classification in autism. *Journal of Autism and Developmental Disorders*, **26**, 59-86.

Watkinson, E. J., & Wall, A. E. (1982). *PREP: The Prep play program.* Ottawa, ON: Canadian Association for Health, Physical Education, and Recreation.

Watkinson, E. J., & Wasson, D.L. (1984). The use of single-subject time-series designs in adapted physical activity. *Adapted Physical Activity Quarterly*, **1**, 19-29.

Watters, R. G., & Watters, W. E. (1980). Decreasing self-stimulatory behavior with physical exercise in a group of autistic boys. *Journal of Autism and Developmental Disorders*, **10**, 379-387.

Weber, R. C. (1989). Motivating and teaching disabled students using task variation in adapted PE. *Journal of Physical Education, Recreation, and Dance*, **60**, 85-87.

Weber, R. C., & Thorpe, J. (1992). Teaching children with autism through task variation in physical education. *Exceptional Children*, **59**, 77-86.

Whitaker, S., & Saleem, A. (1994). The effect of non-contingent exercise on purposeless wandering and self-injury in a man with profound learning difficulty. *Behavioral and Cognitive Psychotherapy*, **22**, 99-102.

Whiteford-Erba, H. (2000). Early intervention programs for children with autism: conceptual frameworks for implementation. *American Journal of Orthopsychiatry*, **70,** 82-94.

Whitely, P., Rodgers, I., Shattock, P. MMR and autism. *Autism*, **4**, 207-211.

Wing, L. (1981). Asperger's syndrome: A clinical account. *Psychological Medicine*, 11, 115-129.

Wing, L. (2001). *The autistic spectrum: A parent's guide to understanding and helping your child.* Berkeley, California: Ulysses Press.

Wing, L. & Gould, J. (1979). Severe impairments of social interaction and associated abnormalities in children: epidemiology and classification. *Journal of Autism and Developmental Disorders*, **9**, 11-29.

Wing, L., & Potter, D. (2002). The epidemiology of autism spectrum disorders: is prevalence rising? *Mental Retardation and Developmental Disabilities Research Reviews*, 8,151-161.

Woodhouse, W., Bailey, A. Bolton, P., Baird, G., Le Couteur, A., & Rutter, M. (1996). Head circumference and PDD. *Journal of Child Psychology and Psychiatry*, **37**, 665-671.

World Health Organization. (1993). International Classification of Mental and Behavioral Diseases. (10^{th} rev). Geneva: Author.

Appendix A

(Ethics Approval)

MCGILL UNIVERSITY
FACULTY OF EDUCATION

CERTIFICATE OF ETHICAL ACCEPTABILITY FOR FUNDED AND NON FUNDED RESEARCH INVOLVING HUMANS

The Faculty of Education Ethics Review Committee consists of 6 members appointed by the Faculty of Education Nominating Committee, an appointed member from the community and the Associate Dean (Academic Programs, Graduate Studies and Research) who is the Chair of this Ethics Review Board.

The undersigned considered the application for certification of the ethical acceptability of the project entitled:

Enhanced Structure for Individuals with Autism in a Physical Activity Setting

as proposed by:

Applicant's Name Kyle Pushkarenko

Supervisor's Name Greg Reid

Applicant's Signature

Supervisor's Signature Greg Reid

Degree / Program / Course M.A.

Granting Agency

The application is considered to be:

A Full Review

An Expedited Review ✓

A Renewal for an Approved Project

A Departmental Level Review

Signature of Chair / Designate

The review committee considers the research procedures and practices as explained by the applicant in this application, to be acceptable on ethical grounds.

1. Prof. René Turcotte
   Department of Kinesiology and Physical Education
   René Turcotte Jan. 27/2003
   Signature / date

2. Prof. Ron Morris
   Department of Integrated Studies in Education
   Ron Morris Feb 5/03
   Signature / date

3. Prof. Ron Stringer
   Department of Educational and Counselling Psychology
   Feb. 27/03
   Signature / date

4. Prof. Kevin McDonough
   Department of Integrated Studies in Education
   Signature / date

5. Prof. Brian Alters
   Department of Integrated Studies in Education
   Signature / date

6. Prof. Ada Sinacore
   Department of Educational and Counselling Psychology
   Signature / date

7. Member of the Community
   Signature / date

Mary H. Maguire Ph. D.
Chair of the Faculty of Education Ethics Review Committee
Associate Dean (Academic Programs, Graduate Studies and Research)
Faculty of Education, Room 230
Tels: (514) 398-7039/398-2183 Fax: (514) 398-1527

Mary Maguire March 3, 2003
Signature / date

(Updated August 2002)

REB # 248-0103

Appendix B

(Informed Consent for Videotaping the Participants)

January, 2003

Dear Parent or Guardian,

I am a graduate student at McGill University and have been a physical education teaching assistant at Summit School for two years. This letter requests your permission for your child to participate in a research study for three months, during the regular aquatics program with Summit. The study is a Master's research project, which I must conduct to fulfill my degree requirements at McGill University.

The research has been designed to explore if pictorial activity schedules, as used within the classrooms, transfer to physical activity settings. Specifically, we are interested in examining if activity schedules influence time on-task, time off-task and disruptive behaviours within a physical activity setting. We hope to include children who have been diagnosed with autistic tendencies. Currently, your child has been identified as one who could be involved.

Prior to the implementation of the activity schedules, we will observe the behaviours of the children within the activity setting. These observations will serve as a point of reference to determine if the schedules influence behaviour in any way. After this reference point has been established, activity schedules will be implemented into the program. All the sessions will be videotaped, but the swimming program will not be altered in any major way for the project.

This project will take place over a two-hour time frame associated with the swimming program. While we are interested in the effects of the activity schedules during the bus ride, the changing room, and during the swimming lesson, videotaping will be restricted to the swimming lesson only. The research will take place one day a week for a 14-week period, or until the completion of the aquatics program.

No child's name will be associated with any presentation or publication that might emerge from this research. Also, we will not show the videos to anyone after they have been analyzed. Your child's identity will be secure.

Please sign the form below to indicate your willingness to have your son/daughter participate. However, even if it is signed, your child is free to withdraw from the study at any time, without question. Should you require any additional information, or wish to obtain the results of the research, do not hesitate to contact me at (514) 844-6149, or my advisor at (514) 398-4184, ext. 0578. Thank you for your time and assistance.

Sincerely,

Kyle Pushkarenko
Graduate Student - Adapted Physical Activity
McGill University

January, 2003

I agree for my son/daughter _____ to participate in the research of Kyle Pushkarenko. I understand the purpose of the research and what will be expected of my child. I am aware that he/she can stop participating at any time for any reason. I am aware that the research is part of the ongoing physical education swim program and that confidentiality of my child's identity will be ensured.

Signature: _____ Date:_____

Please return the form to the Physical Education Department of Summit School.

Appendix B-1

(Informed Consent for Videotaping the Associated Class)

January, 2003

Dear Parent or Guardian,

I am a graduate student at McGill University and have been a physical education teaching assistant at Summit School for two years. This letter requests your permission for your child to be videotaped for three months, during the regular aquatics program with Summit. The videotaping is part of a Master's research project, which I must conduct to fulfill my degree requirements at McGill University.

The research has been designed to explore if pictorial activity schedules, as used within the classrooms, transfer to physical activity settings. Specifically, we are interested in examining if activity schedules influence time on-task, time off-task, and disruptive behaviours within a physical activity setting. Although your child is a participant within the aquatics class, he/she is not considered a participant within the study. However, as your child is participating in front of a camera, it is imperative that we request this permission.

No child's name will be associated with any presentation or publication that might emerge from this research. Also, we will not show the videos to anyone after they have been analyzed. Your child's identity will be secure.

Please sign the form below to indicate your willingness to have your son/daughter videotaped. However, even if it is signed, your child is free to withdraw from the videotaped sessions at any time, without question. Should you require any additional information, or have any questions, do not hesitate to contact me at (514) 844-6149, or my advisor at (514) 398-4184, ext. 0578. Thank you for your time and assistance.

Sincerely,

Kyle Pushkarenko
Graduate Student - Adapted Physical Activity
McGill University

January, 2003

I agree for my son/daughter _____ to be videotaped in the research of Kyle Pushkarenko. I understand the purpose of the research and what will be expected of my child. I am aware that he/she can stop participating at any time for any reason. I am aware that the research is part of the ongoing physical education swim program and that confidentiality of my child's identity will be ensured.

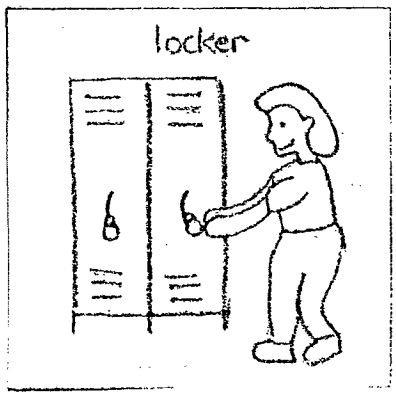
Signature: _____ Date: _____

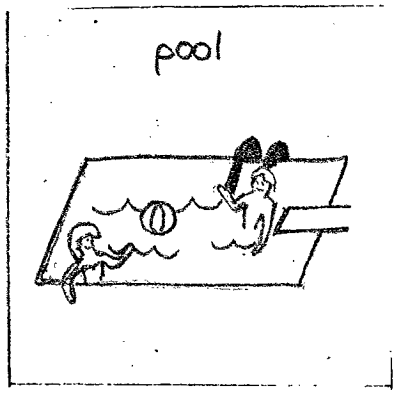
Please return the form to the Physical Education Department of Summit School.

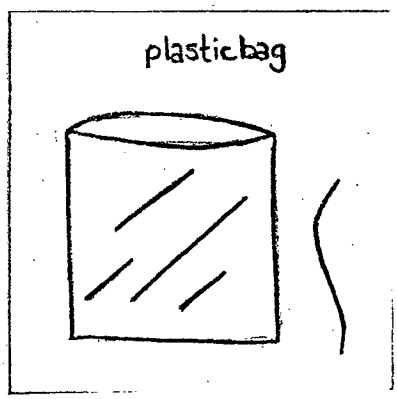
Appendix C

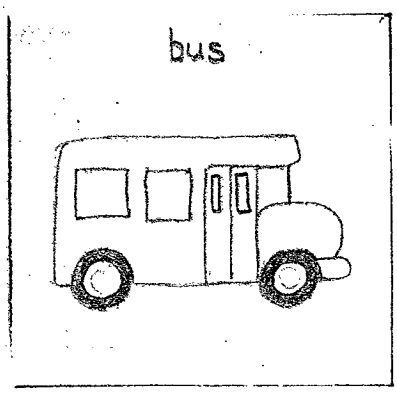
(Picture Symbols for the Changeroom)

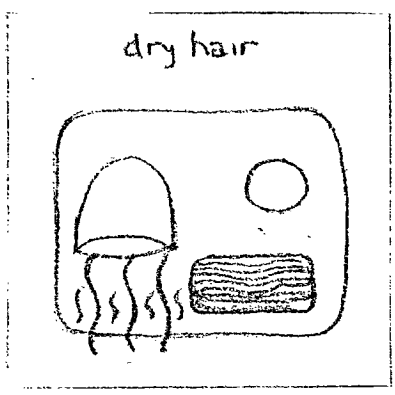
APPENDIX C – Picture Symbols for the Changeroom

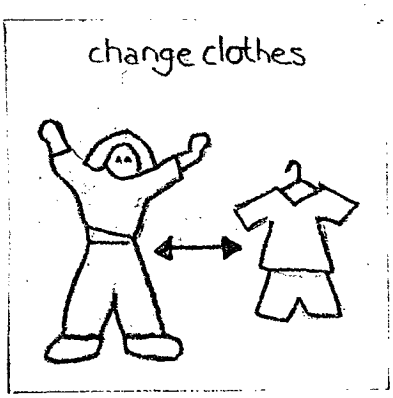


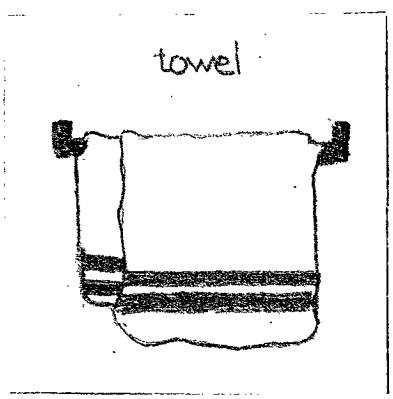












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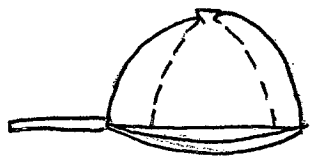
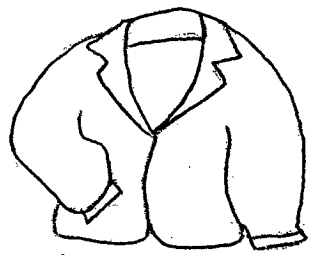
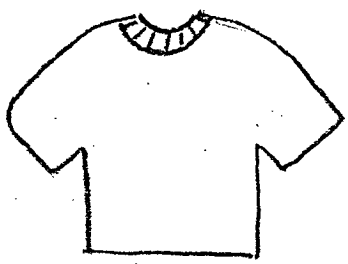


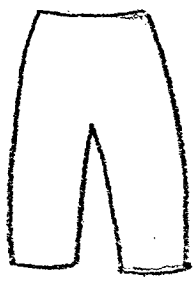
jacket



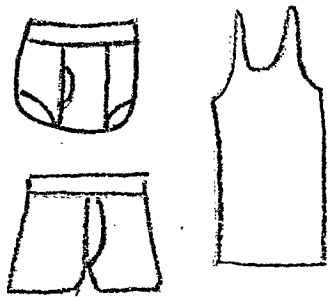
T-shirt



pants

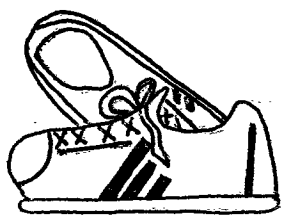


underwear

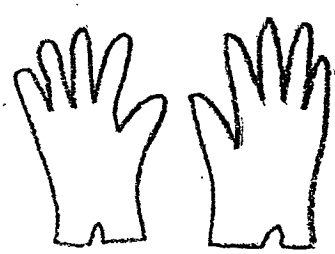


socks

Shoes



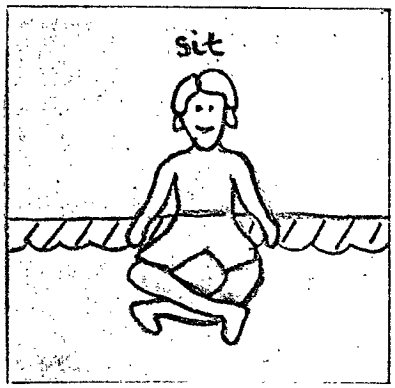
gloves

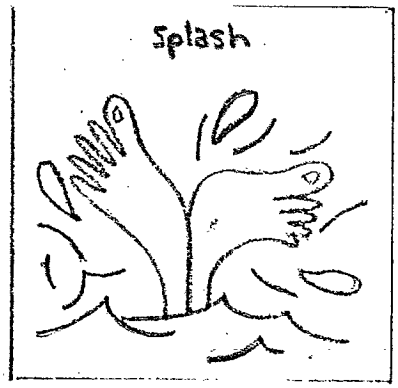


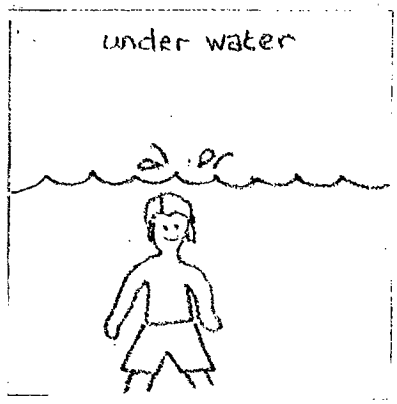
Appendix C-1

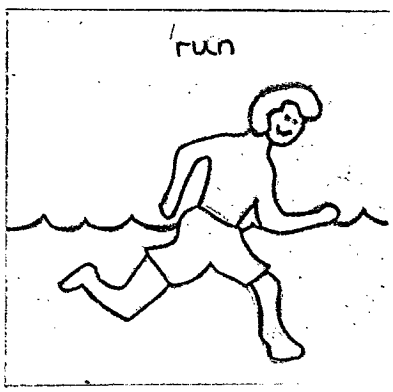
(Picture Symbols for the Pool Area)

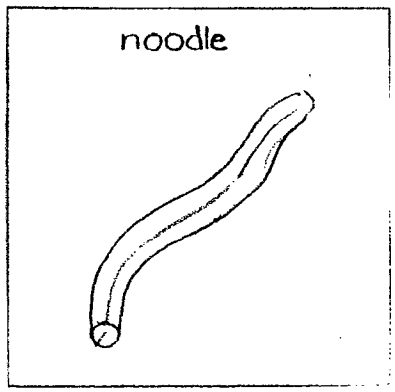
APPENDIX C-1 – Picture Symbols for the Pool Area

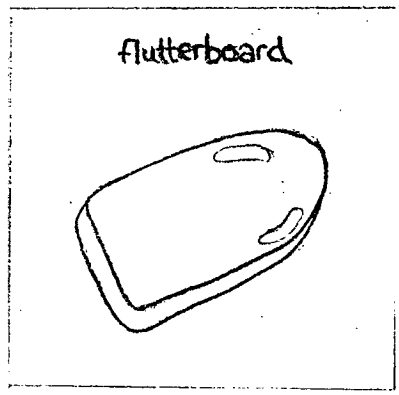


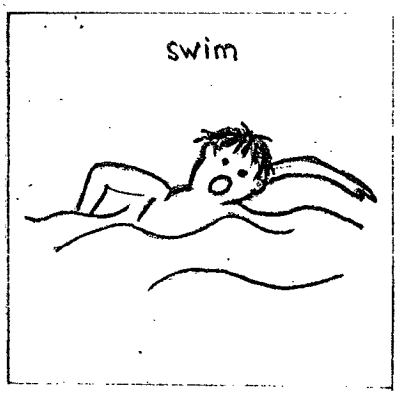


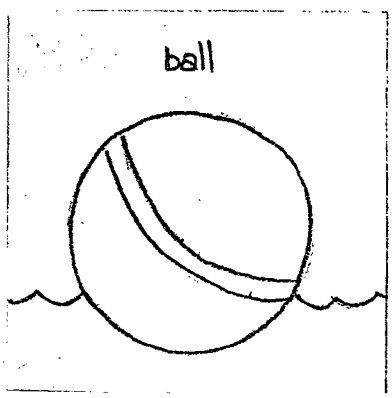








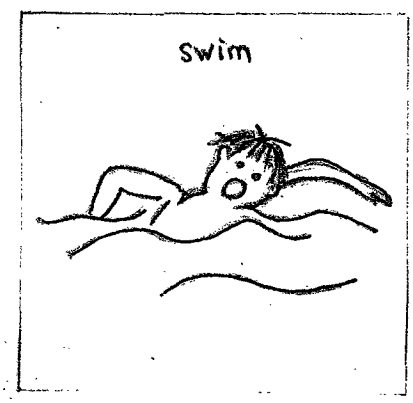


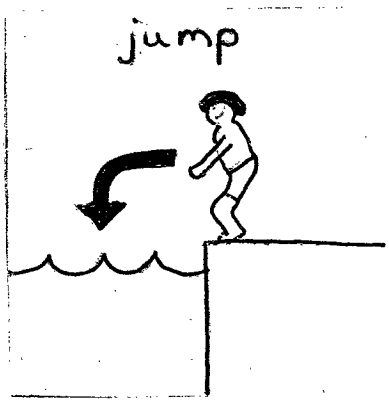


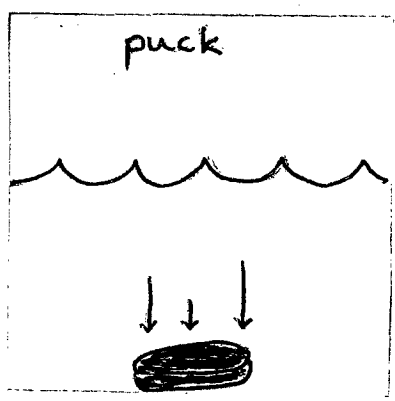
Appendix C-2

(Picture Symbols for the Work Systems)

APPENDIX C-2 – Picture Symbols for the Work Systems







Appendix D

(Diagnostic Criteria – DSM-IV; APA, 1994)

Diagnostic criteria for 299.00 Autistic Disorder

(Taken from the Diagnostic and Statistical Manual of Mental Disorders, 1994, p. 70)

A. A total of six (or more) items from (1), (2), and (3), with at least two from (1), and one each from (2) and (3):

   (1) qualitative impairment in social interaction, as manifested by at least two of the following:

      (a) marked impairment in the use of multiple nonverbal behaviours such as eye-to-eye gaze, facial expression, body postures, and gestures to regulate social interaction
      (b) failure to develop peer relationships appropriate to developmental level
      (c) a lack of spontaneous seeking to share enjoyment, interests, or achievements with other people (e.g., by a lack of showing, bringing, or pointing out objects of interest)
      (d) lack of social or emotional reciprocity

   (2) qualitative impairments in communication as manifested by at least one of the following:

      (a) delay in, or total lack of, the development of spoken language (not accompanied by an attempt to compensate through alternative modes of communication such as gesture or mime
      (b) in individuals with adequate speech, marked impairment in the ability to initiate or sustain a conversation with others
      (c) stereotyped and repetitive use of language or idiosyncratic language
      (d) lack of varied, spontaneous make-believe play or social imitative play appropriate to developmental level

   (3) restricted repetitive and stereotyped patterns of behaviour, interests and activities, as manifested by at least one of the following:

      (a) encompassing preoccupation with one or more stereotyped and restricted patterns of interest that is abnormal wither in intensity or focus
      (b) apparently inflexible adherence to specific, non-functional routines or rituals
      (c) stereotyped and repetitive motor mannerisms (e.g., hand or finger flapping or twisting, or complex whole-body movements)
      (d) persistent preoccupation with parts of objects

B. Delays or abnormal functioning in at least one of the following areas, with onset prior to age 3 years: (1) social interaction, (2) language as used in social communication, or (3) symbolic or imaginative play.

C. The disturbance is not better accounted for by Rett's Disorder or Childhood Disintegrative Disorder.

Appendix D-1

(Diagnostic Criteria – ICD-10; WHO, 1993)

Diagnostic criteria for F84.0 Childhood Autism

(Taken from The ICD-10 Classification of Mental and Behavioral Disorders, 1993)

A. Abnormal or impaired development is evident before the age of 3 years in at least one of the following areas:

   (1) receptive or expressive language as used in social communication;
   (2) the development of selective social attachments or of reciprocal social interaction;
   (3) functional or symbolic play.

B. A total of at least six symptoms from (1), (2), and (3) must be present, with at least two from (1) and at least one from each of (2) and (3):

   (1) Qualitative abnormalities in reciprocal interaction are manifest in at least two of the following areas:
      (a) failure adequately to use eye-to-eye gaze, facial expression, body posture, and gesture to regulate social interaction;
      (b) failure to develop (in a manner appropriate to mental age, and despite ample opportunities) peer relationships that involve a mutual sharing of interests, activities, and emotions;
      (c) lack of socio-emotional reciprocity as shown by an impaired or deviant response to other people's emotions; or lack of modulation of behavior according to social context; or a weak integration of social, emotional, and communicative behaviors;
      (d) lack of spontaneous seeking to share enjoyment interests, or achievements with other people (e.g., a lack of showing, bringing, or pointing out to other people objects of interest to the individual).

   (2) Qualitative abnormalities in communication are manifest in at least one of the following areas:
      (a) a delay in, or total lack of, development in spoken language that is not accompanied by an attempt to compensate through the use of gesture or mime as an alternative mode of communication (often preceded by a lack of communicative babbling);
      (b) relative failure to initiate or sustain conversational interchange (at whatever level of language skills is present), in which there is reciprocal responsiveness to the communications of the other person;
      (c) stereotyped and repetitive use of language or idiosyncratic use of words or phrases;
      (d) lack of varied spontaneous make-believe or (when young) social initiative play.

   (3) Restricted, repetitive, and stereotyped patterns of behavior, interests, and activities are manifest in at least one of the following areas:

      (a) an encompassing preoccupation with one or more stereotyped and restricted patterns of interest that are abnormal in content or focus; or one or more interests that are abnormal in their intensity and circumscribed nature though not in their content or focus;

(b) apparently compulsive adherence to specific, non-functional routines or rituals;
(c) stereotyped and repetitive motor mannerisms that involve either hand or finger flapping or twisting, or complex whole body movements
(d) preoccupations with part-objects or non-functional elements of play materials (such as their odor, the feel of their surface, or the noise or vibration that they generate.

C. The clinical picture is nor attributable to the other varieties of pervasive developmental disorder: specific developmental disorder of receptive language with secondary socio-emotional problems; reactive attachment disorder or disinhibited attachment disorder; mental retardation with some associated emotional or behavioral disorder; schizophrenia of unusually early onset; and Rett's syndrome.

Appendix E

(Field Notes)

Field Notes – Period of February 4, 2003 to May 13, 2003

February 4, 2003 – Week 1 – Baseline

Before Lesson:

- No notes taken

After Lesson:

- No notes taken

February 11, 2003 – Week 2 – Baseline

Before Lesson:

- No notes taken

After Lesson:

- No notes taken

February 18, 2003 – Week 3 – Baseline

Before Lesson:

- Staff not too organized this morning
- Some behaviours paired together (i.e., language deficits and stereotypical behaviours)
- 10:29 – both Andrews ready and waiting for Robert – result in behaviours
- Incidents of aggression not too severe – mouth to arm (biting???)
- Avoidance behaviours displayed resemble not doing what teacher asks of them – blank stares – may be testing teacher

After Lesson:

- Adam a bit of a handful for the staff – avoidance behaviour of not wanting to shower
- Adam displayed behaviours in pairs (as mentioned above) whereby stereotypical behaviours occur with language deficits simultaneously
- Jason was very slow-moving in the first 10 minutes while in changeroom – working 1 on 1 with a staff
- It was noted that Robert was just given a new form of medication (Zoloff) the Monday before the swimming outing

March 11, 2003 – Week 4 – Treatment

Before Lesson:

- Jason and Adam waiting at 10:31 for Richard to finish changing
- Robert very slow
- Robert not finished changing until 10:33
- Robert displaying signs of echolalia – repetitive language (i.e., "very good …", "we go to the piscine"
- While in the pool, it will be hard to determine vocalizations with all the noise already existing
- Teachers instructing/prompting continuously throughout the course of the pool session

After Lesson:

- Looked like it was hard to follow schedules after the lesson finshed

- Both Adam and JAson ready and waiting for Richard at 11:30
- Robert again with the repetitive language (i.e., different nursery rhymes)
- Make some alterations to activity schedules (i.e., picture of boots in lockerroom schedule, place schedule in middle of lockers – each locker containing it's own schedule)

March 18, 2003 – Week 5 – Treatment

Before Lesson:

- 10:27 Jason changed
- 10:28 Adam changed
- 10:30 Robert changed
- Maximum waiting time decreased by 6 minutes
- Robert requiring some manipulation accompanied by gestural and verbal prompts – working with assistant
- Both Adam and Jason only given verbal accompanied with gestural prompts – working with teacher
- All kids, especially Jason, know the routines for changing as they get changed even before looking at the schedules

After Lesson:

- Robert perseverating on specific phrases (i.e., "let go of the arm"), numbers, and items of clothing
- Physical prompting used with Jason at the start, however only verbal prompting was used after picture symbols were pointed to
- Jason and Adam both changed at 11:31 – waiting for Robert

March 25, 2003 – Week 6 – Treatment

Before Lesson:

- Robert displaying echolalia – "go get the bathing suit"
- Minimal behaviours, however, while changing to go the pool
- Majority of the behaviours occurred after each had changed
- Jason waiting at 10:25
- Adam waiting at 10:27
- Robert waiting at 10:29
- All waiting for teachers to get changed to go to the pool

After Lesson:

- Robert showing little independence while getting changed – lots of physical prompting
- Robert vocalizing without any meaning – noncontextual speech
- Robert reprimanded at 11:26 (for 15 seconds) due to behavioural outbursts
- Adam showed avoidance in the shower – not wanting to take one
- Adam very hyper while changing – consequenced, but behaviours continued for 1 minute
- Prompts used for all included verbal, gestural, and physical
- Adam did not finish his schedule, and at points the schedule was not followed in order while dressing

April 1, 2003 – Week 7 - Treatment

Before Lesson:

- Recorder sick today
- Hyperactivity was classified as kids acting out in a crazy manner (not staying seating along with language and stereotypical behaviour)
- Schedule following improving with the decrease of prompts
- Increase in time spent changing while looking at the schedules
- All did extremely well with regards to schedule use, however again behaviours occurred once the children were waiting for all to finish changing
- Prompting restricted to verbal and gestural prompts
- Approximately 70% of behaviours occurred while waiting
- Laughter for some was associated with stereotypical behaviours
- Adam beginning to use schedules independently with looking at teacher for approval at each step of the schedule
- Both Adam and JAson changed and waiting at 10:27
- Robert changed and waiting at 10:30
- Adam and Jason showed some sort of social interaction when both were sitting and waiting, however behaviours still persisted (i.e., laughing, hyperactivity, and stereotypical behaviours)
- Both Adam and Jason extremely hyper in transition from changeroom to pool – language, stereotypies, jumping up and down, laughing, running

After Lesson:

- Teacher adjusting tasks with PFDs (personal floatation devices) – running, forward swim, backward swim
- When work systems were set up for each individual after warm-up activities 0 good job at staying on-task however behaviours were still coupled with on-task behaviour (worked well with Adam, but not so much with Robert)
- Good job of teacher prompting however at times children did not cooperate – avoided putting pictures in basket
- Behaviours displayed by Jason consisted mostly of inappropriate laughter (being silly) – squealing almost all session
- Jason had trouble putting on some articles of clothing (i.e., underwear)
- Jason finished changing at 11:26
- Adam finished changing at 11:27
- Robert at 11:29

April 8, 2003 – Week 8 – Treatment

Before Lesson:

- Only one staff today due to the number of kids
- Slowest kid not here – may reflect reduced transition times
- Both Adam and Jason showed lots of independence with the schedules – just looked to staff for approval of picture symbols
- Jason verbalizing articles of clothing

- Removal of picture symbols and clothing was independent for the most part
- Gestural and verbal prompts of some clothing were only used when absolutely necessary
- New coding procedure due to most behaviours occurring while waiting
- Robert not present due to sickness
- Adam very hyperactive during transition to pool – jumping up and down, laughing, behaviours (tapping back of neck)
- Jason moved quietly to the pool area, but once there very inactive – sat and stimmed; behaviours (i.e., fingers in corners of eyes)
- Jason changed at 10:25
- Adam changed at 10:27

After Lesson:

- Adam trouble with schedules in pool – individual schedules – he can do it but needs teacher's attention to perform task quickly and with ease
- Jason once left alone – not necessarily inactive, but bouncing up and down in water with loud vocals – can hear over the other groups in the pool
- Both were fairly structured in terms of tasks, but with one staff and 2 kids with different tasks – structure is influenced
- Structured tasks with schedules usually are within the first 25 minutes while the remainder of class is free time
- Prompting was same as before changing with lots of verbal, however gestural prompts were reduced a bit – no physical prompts were necessary
- Both entered into the changeroom form the shower very hyper
- Adam very slow changing and off-task due to his hyperactivity
- Jason good job at following schedule – looked to staff for permission, verbalizing picture symbols when pointed to – Jason also pointed
- Adam missed a few steps of the schedule, but caught up once teacher redirected him back to task – independently manipulated schedule pictures
- Jason changed at 11:21
- Adam changed at 11:25

<u>April 15, 2003 – Week 9 – Treatment</u>

Before Lesson:

- Hyperactivity for Adam was coded as he did not remain seated and was bouncing up and down when he left his spot on the bench
- Jason's stereotypical behaviour and language were pretty much coupled together – when one occurred, the other usually went together
- Robert's behaviour was very good aside from his looking a little bit tired
- Robert and Jason verbalized each of the picture symbols on the schedule
- Adam and Jason were quite independent with regards to their schedules however Robert still needed the gestural as well as partial manipulations
- Adam and Jason independent however still looking for approval with regards to each element of the schedules
- Robert changed at 10:33
- Adam changed at 10:31
- Jason changed at 10:29

After Lesson:

- Jason was a bit anxious as pool was locked when the group got to the pool area
- Adam and Robert remained calm, as if nothing was bothering them
- There were an increased number of picture symbols on their poolside schedules – 3 run, 3 noodle, and 3 flutterboard
- Adam very hyper coming into the changeroom
- Robert changed at 11:27
- Adam changed at 11:26
- Jason changed at 11:24

April 22, 2003 – Week 10 – Treatment

Before Lesson:

- Jason and Adam independent once they got started
- Robert still required the use of prompting (gestural and manipulative prompts)
- Regular assistant running the lesson - not as much control as regular teacher
- New staff replace the teacher as he could not make it
- New class accompanying the group of participants
- Jason changed at 10:33
- Adam changed at 10:35
- Robert changed at 10:39

After Lesson:

- Stereotypical behaviour and language deficits were coupled together
- To begin, participants were not very independent however once they got started they looked to teacher for approval
- Lesson started after a 5-day weekend
- Participants did not do work systems due to time restraints – traffic to the pool; no teacher assistant slower at administering the first set of warm-up schedules
- Coder had to intervene with picture symbol schedules as new staff was not doing the proper job

April 29, 2003 – Week 11 – Treatment

Before Lesson:

- Robert not participating today
- Additional people with group – remained on side in changeroom and in pool
- Jason completely independent with schedules – minimal prompting by teacher
- Adam independent with verbal prompting to remain on-task
- Adam changed at 10:34
- Jason changed at 10:32

After Lesson:

- No notes taken

May 6, 2003 – Week 12 – Post-Treatment

Before Lesson:

- Time spent changing reduced from previous sessions
- 2 staff with 3 kids today
- Robert was very good at following directions
- Adam was a bit hyper on way to pool – behaviours persisted while in pool area
- Jason squealing throughout changing session – noncontextual speech
- Routine using schedules over the last 8 weeks has been broken by their removal
- Behaviours are expected to be quite large as when in transition over the course of the next two sessions
- Robert and Adam very good with behaviour reduction
- Adam and Jason changed without instruction by teacher
- All appeared to be very focused aside from their behaviours
- Majority of all behaviours occurred once changed – especially in the case of Jason
- As Robert was so focused – he changed at almost an identical pace as the other two kids

After Lesson:

- Door was locked once at pool area
- Adam got a bit anxious to get into pool area (running around, jumping up and down)
- Jason in other pool
- Robert remained quite calm
- While in transition – sat along the edge of the pool
- Jason lots of splashing accompanied by loud vocals
- Adam began splashing a bit – showed a bit of irritation
- Robert – no response
- Jason looks a bit tired
- Robert required verbal and gestural prompts
- Adam needed no help with changing
- Jason required some physical prompts
- Order of clothing not followed for some – Adam – shoes before pants
- Jason and Adam coupled stereotypies and language behaviours
- Robert reprimanded for behaviour 3x – head between his legs on the bench
- Adam's stereotypical behaviours included sniffing his plastic bag, and his language deficits included giggling
- Robert's language deficits included laughing uncontrollably and singing continuous nursery rhymes (i.e., row, row, row you boat …)

May 13, 2003 – Week 13 – Post-Treatment

Before Lesson:

- Group extremely late – reason unknown
- Robert's aggression consisted of mouth to another's shoulder – not to sure if aggression or expression of affection
- Robert's stereotypies included hand flapping while on bench
- Adam's language deficits included giggling
- Jason's stereotypies included finger in eye, strange gazing, tapping forefinger to back of other hand
- Jason's language deficits included inappropriate vocals – squealing, noncontextual speech, etc.
- Teachers looked a bit disorganized in changeroom
- Robert required a lot of verbal prompting/verbal redirection as well as gestural and partial physical prompts
- Adam and Jason independent in changing
- All seemed quite calm in transition to pool areas, but excited due to the wait – Adam ran to the pool
- Jason still vocalizing
- Robert began vocalizing

After Lesson:

- Once in pool area and waiting/sitting, Jason and Robert began a few behaviours
- Adam remained relatively quiet as he waited for the lesson to begin
- Robert's stereotypies included bouncing up and down, while his language deficits included songs, perseverations on the shower and sauna, and inappropriate vocalizations
- Adam's language deficits included giggling
- All participants required physical assistance in drying off from pool area, however prompts differed in changing procedure
- Robert required verbal, gestural, and physical prompts to get changed
- Adam was independent
- Jason was independent however needed assistance with articles of clothing such as his socks
- Robert changed at 11:32
- Adam changed at 11:29
- Jason changed at 11:28

Appendix F

(Event Recording Tools)

Behaviour Checklist

Date: _____ Time Started: _____

Setting: _____ Time Ended: _____

Participant 1: _____

Participant 2: _____

Participant 3: _____

Participant 4: _____

Participant 5: _____

Participant	Aggression	Hyperactivty	Stereotypical Behaviour	Avoidance Behaviour	Language Deficits
1					
2					
3					
4					
5					

Definitions:

Aggression:

_____

Hyperactivity:

_____

Stereotypical Behaviour: _____

Avoidance Behaviour: _____

Language Deficits: _____

Comments:

Appendix F-1

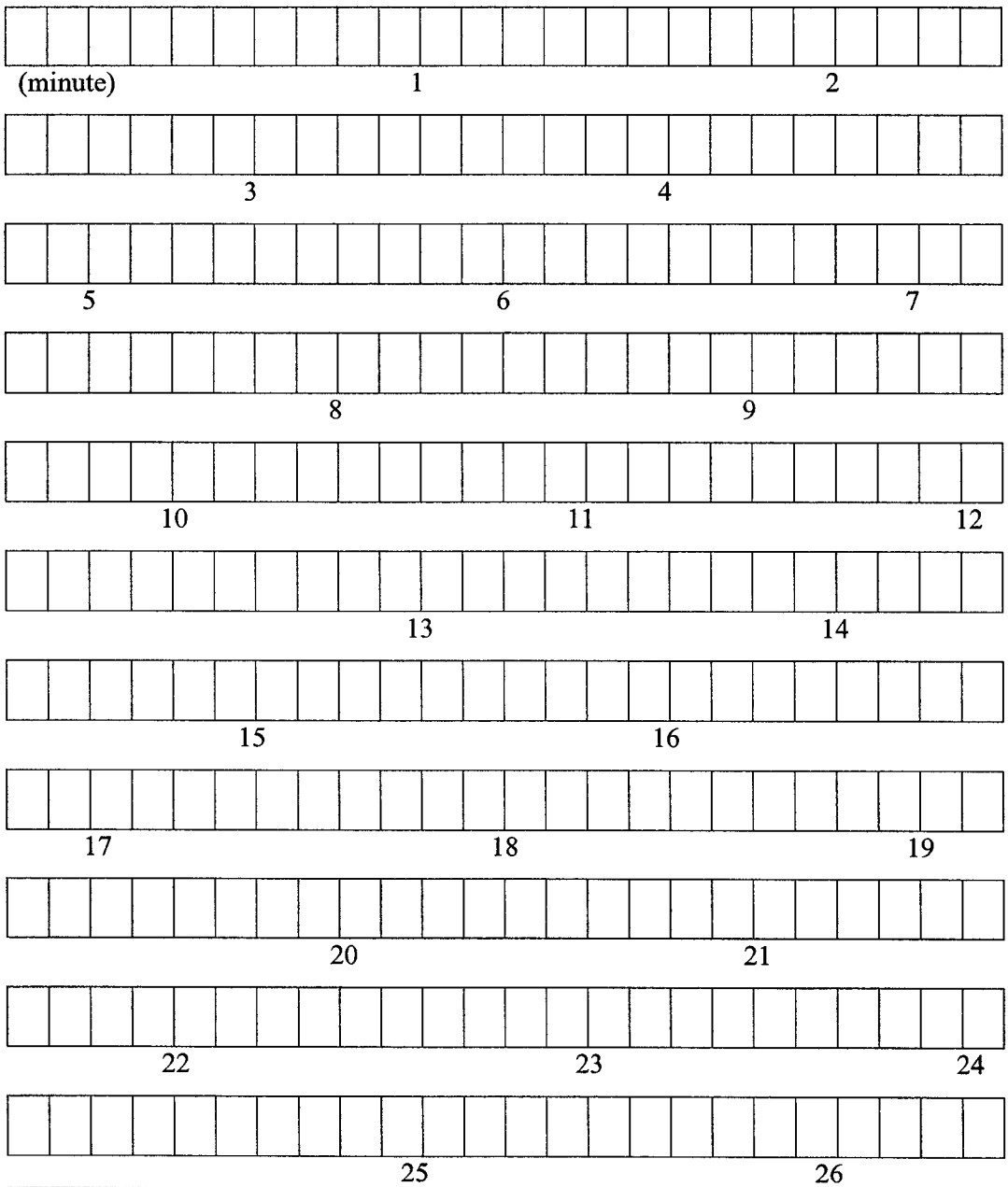
(Interval Recording Tool)

Interval Recording Scoresheet

Week: _____

Participant: _____

Total Number of Intervals: _____



Inappropriate Behaviour (IB)	Off-task Behaviour (OFF)	On-task Behaviour (ON)	Not in View (NV)
Aggression	Misuse of materials	Visually attending to task	
Hyperactivity	Inattention to task	Looking at schedules	
Stereotypical Behaviour	Not engaged	Appropriate material-use	
Avoidance Behaviour		Transition	
Language Difficulties			

Appendix F-2

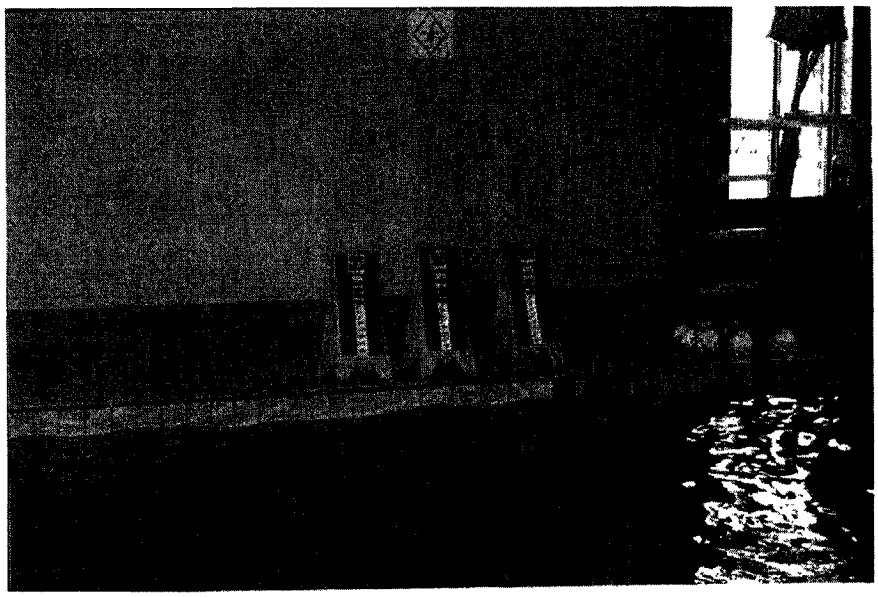
(Experimental Session Breakdown)

Session Duration and Breakdown

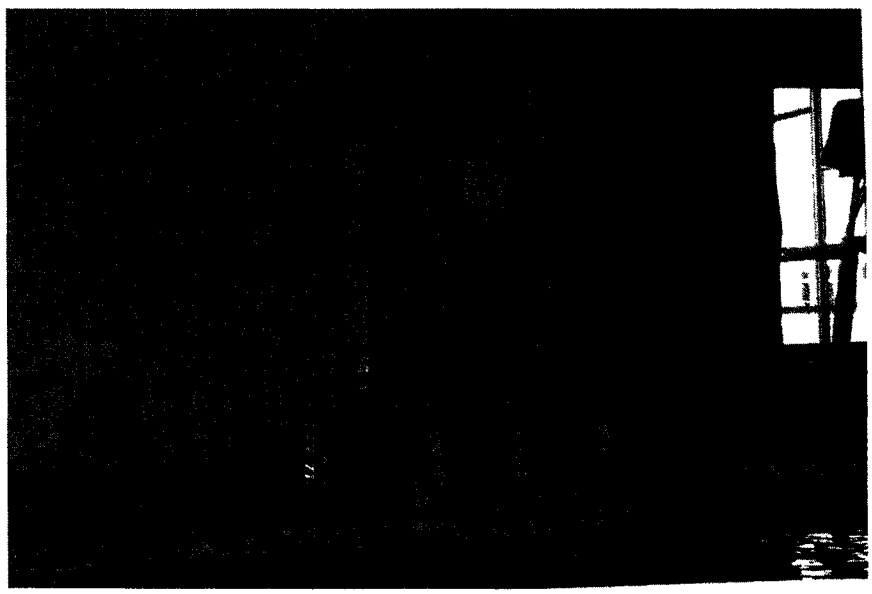
Week	Length of Session	Change Before		Time in Pool		Change After		Transition	
	(min)	(min)	%	(min)	%	(min)	%	(min)	%
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									

Appendix G

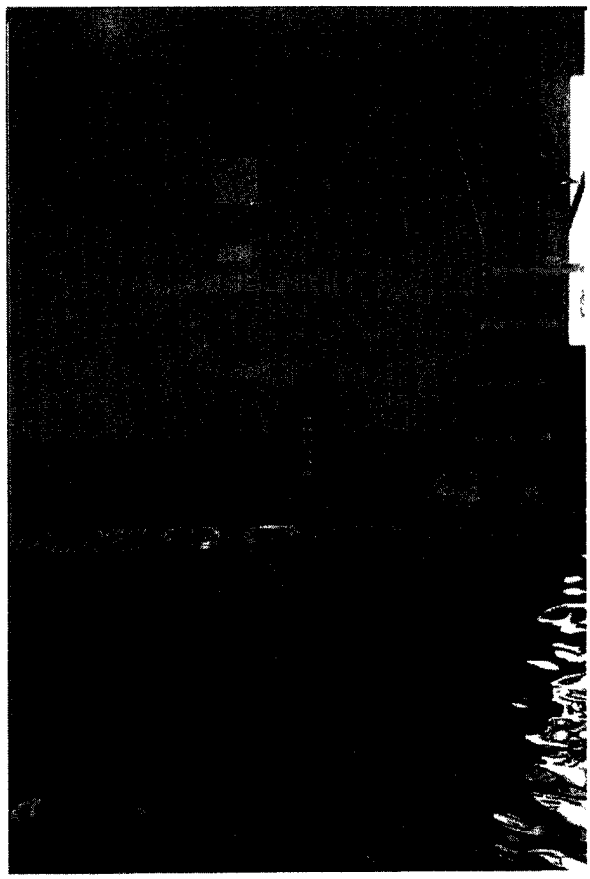
(Additional Study Pictures)



Set-up of warm-up schedules

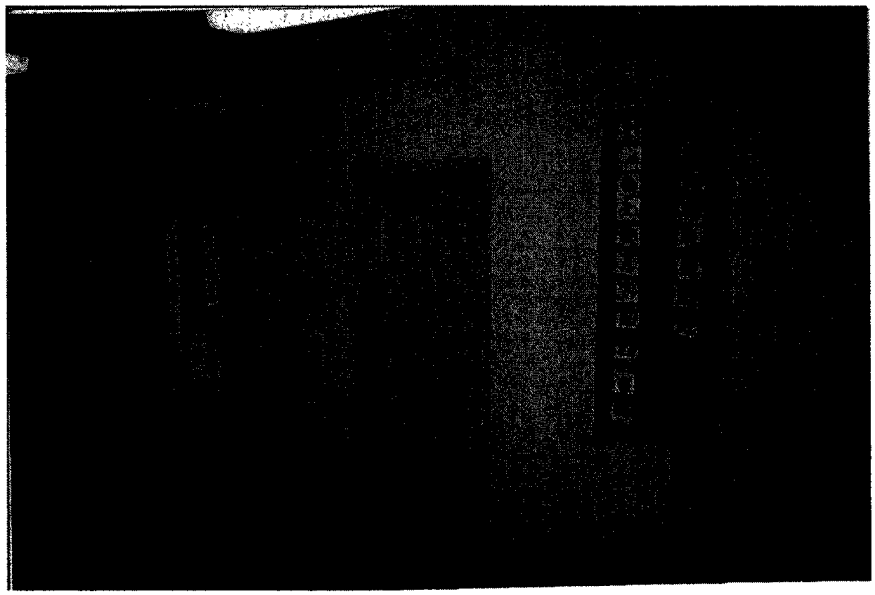


Set-up of warm-up schedules

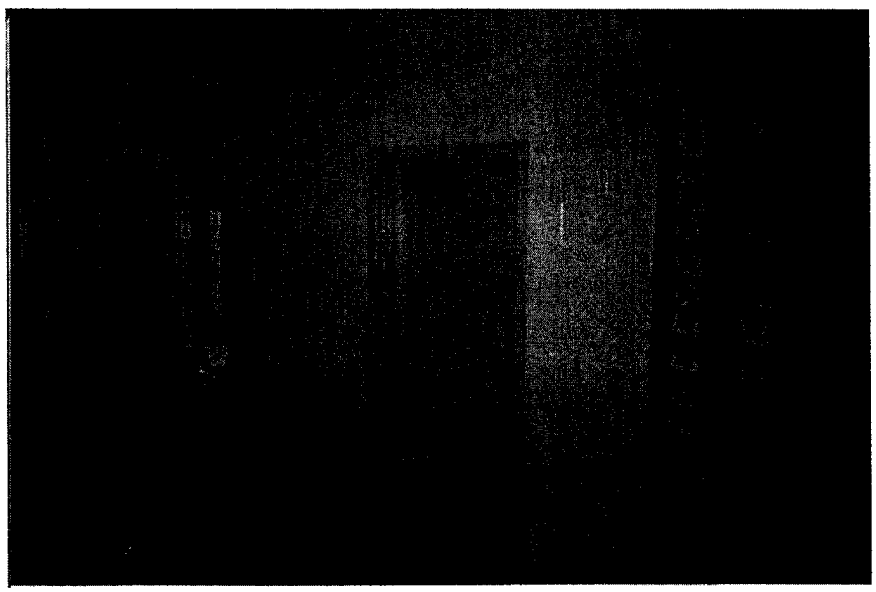


Set-up of a Work System

Set-up of a Work System



Set-up of the Changeroom before the Swimming Lesson



Se-up of the Changeroom after the Swimming Lesson