A COMPARISON OF TWO MODELS

DESIGNED TO TEACH AUTISTIC CHILDREN A MOTOR TASK

by

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A COMPARISON OF TWO MODELS DESIGNED TO TEACH AUTISTIC CHILDREN

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ABSTRACT

The purpose of this investigation was to compare the efficiency of two instructional models designed to teach autistic children a bowling task. One strategy (referred to as the extra-stimulus prompt model) utilized extensive physical, visual and verbal prompts while the second strategy (referred to as the within-stimulus prompt model) deemphasised such prompts. In the latter model, prompts were included within the task analysis of the motor skill. This was done to avoid the stimulus overselectivity phenomena. Both instructional models included the task analysis of the subject matter as well as the systematic breakdown of a teaching episode. Six male autistic children between the ages of seven and ten took part in the study. A group design was utilized with three subjects being placed in each of the two conditions. A pre-test to determine bowling skill level found subjects to be functioning at the same level. The dependent variable in this investigation was skill improvement on the bowling task as demonstrated by the task analytic level achieved by each subject. Statistical analysis revealed that the extra-stimulus prompt group did significantly better than did the within-stimulus prompt group ($p < .05$).

RESUMÉ

Le but de cette étude était de comparer l'efficacité de deux méthodes d'instruction élaborées en vue d'enseigner à des enfants autistiques à jouer aux quilles. La première stratégie d'enseignement (appelée méthode d'incitation extra-stimulus) faisait largement appel à l'incitation physique, gestuelle et verbale alors que la seconde (appelée méthode d'incitation within-stimulus) minimisait l'utilisation de ces formes d'incitation. Dans cette dernière stratégie, les incitations se trouvaient incluses a l'intérieur même de l'analyse de tâche de l'habileté motrice en question. Ceci avait pour but d'éviter l'émergence du phénomène de sursélectivité du stimulus. Chacune des deux stratégies comprenait également une analyse de tâche de l'habileté enseignée de même que la présentation systématique et graduée des instructions. Six garçons autistique de sept à dix ans ont participé à la recherche. Un devis inter-groupe a été utilisé; trois sujets ont été soumis à la première méthode d'instruction et les autres, à la seconde. Un pré-test a indiqué que les deux groupes étaient équivalents en ce qui a trait à l'habileté de jouer aux quilles. Le changement intervenue chez les sujets au niveau de cette habileté, tel que mesure par le niveau atteint à l'analyse de tâche, constituait la variable dépendante. Les analyses statistiques ont révélé que la méthode d'incitation extra-stimulus était significativement plus efficace que la méthode d'incitation within-stimulus pour enseigner aux sujets à jouer aux quilles ($p < .05$).

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TABLE OF CONTENTS

CHAPTER		PAGE
I	INTRODUCTION	1
	1.1 Physical Activity Programs for Developmentally Delayed Children	1
	1.2 The Syndrome of Autism	3
	1.3 Statement of the Problem	10
	1.4 Hypothesis	10
	1.5 Delimitations	10
	1.6 Limitations	11
	1.7 Definitions	12
II	REVIEW OF LITERATURE	15
	2.1 Introduction	15
	2.2 Definition of Autism	15
	2.3 Etiology	20
	2.4 Educational Approaches	21
	2.4.1 Parental Involvement	22
	2.4.2 Structure	23
	2.4.3 Behaviour Modification Techniques	24
	2.5 Learner Characteristics	25
	2.5.1 Imitation	26
	2.5.2 Motivation	27
	2.5.3 Self-Stimulation	29
	2.5.4 Generalization of Treatment Gains	30
	2.6 Stimulus Overselectivity	31
	2.7 Play Characteristics	39
	2.8 Motor Performance	42
	2.9 Summary	47

III METHODOLOGY 51

3.1 Subject Selection 51
3.1.1 Autistic Subjects Profile . 51

3.2 Models of Instruction, ... 56
3.2.1 The Extra-Stimulus Model of Instruction 57
3.2.2 The Within-Stimulus Model of Instruction 65

3.3 Control of Extraneous Variables . . 68
3.3.1 Adverse Behavioural Reactions to Novel Environments 68
3.3.2 Lack of Motivation 69
3.3.3 Self-Stimulatory Behaviour . 71

3.4 Design 71

3.5 Procedures 72
3.5.1 Observational Period 72
3.5.2 Administration of Experimental Conditions . . . 73

3.6 Training of Observers 77

3.7 Pilot Study 77

3.8 Statistical Treatment 79

IV RESULTS 80

4.1 Inter-Rater Agreement 80
4.1.1 Training of Observers . . . 80
4.1.2 Inter-Rater Agreement . . . 81

4.2 Prompts Provided to the Within-Stimulus and Extra-Stimulus Prompt Groups 81

4.3 Reinforcement Provided to the Within-Stimulus and Extra-Stimulus Prompt Groups 83

4.4 Punishment Provided to the Within-Stimulus and Extra-Stimulus Prompt Group 84

4.5 Task Analytic Levels Achieved by the Within-Stimulus and Extra-Stimulus Prompt Groups 85

V DISCUSSION 88

5.1 Comparison of Bowling Skill Level Between the Within-Stimulus and Extra-Stimulus Prompt Groups . . . 88

5.2 Nature of the Task 89

5.3 Effects of Increased Exposure to Instruction 93

5.4 Physiological Aspects of the Task . 94

VI SUMMARY AND CONCLUSIONS 97

6.1 Summary of Rationale and Hypothesis 97

6.2 Summary of the Methodology 98

6.3 Summary of the Findings 104

6.4 Conclusions 105

6.5 Implications 105

6.6 Recommendations for Further Study . 107

APPENDIX A 109

APPENDIX B 112

APPENDIX C 117

APPENDIX D 124

APPENDIX E 126

APPENDIX F 128

APPENDIX G 130

APPENDIX H 133

REFERENCES 135

LIST OF TABLES

TABLE		PAGE
1	Number of Prompts Provided to the Within-Stimulus and Extra-Stimulus Prompt Groups	82
2	Reinforcements Provided to the Within-Stimulus and Extra-Stimulus Prompt Groups	83
3	Punishment Given in the Within-Stimulus and Extra-Stimulus Prompt Groups	84
4	Task Analytic Levels Achieved by the Within-Stimulus and Extra-Stimulus Prompt Groups	86
5	Trials Required to Reach a Given Task Analytic Level	134

LIST OF FIGURES

FIGURE		PAGE
1	Prompt Categories	62
2	Hierarchy of Extra-Stimulus Prompts . . .	63
3	Task Analytic Level Achieved by the Within-Stimulus and Extra-Stimulus Prompt Groups Over 332 Trials	87

CHAPTER 1

INTRODUCTION

1.1 Physical Activity Programs for Developmentally Delayed Children

During the past decade there has been increased emphasis on quality educational interventions for developmentally disabled individuals (Wehman & Schleien, 1981; White, 1980). Concurrently, there has been a dramatic shift away from education in residential/hospital settings towards education in more community based, integrated milieus (Wehman & Schleien, 1981). These changes have been hastened by the introduction in the United States of Public law 94-142, ensuring that all handicapped children have educational services meeting their unique needs in as least restrictive an environment as possible. The importance of developing appropriate social skills becomes a major concern as more handicapped individuals are deinstitutionalized. The teaching of culturally normative, age appropriate leisure skills is seen as one vehicle to achieve these ends (Sherrill, 1981; Wasson & Watkinson, 1981; Wehman & Schleien, 1981). The importance of developing leisure skills for the developmentally handicapped individual has also been stressed because of its role in play development (Crowe, Auxter & Pyfer, 1981; Watkinson & Wall, 1979), in the improvement of selected physical fitness parameters (Sherrill, 1981; Wiseman, 1982), and in the satisfaction and enjoyment experienced while engaging in physical activity

(Groves, 1979).

Appropriate instructional methods are of paramount importance if optimal learning of physical activity skills is to occur. A system demonstrated to be effective is the task analysis approach (Wall, Watkinson & Shatz, 1979; Wehman & Schleien, 1981; Wessel, 1975). Within this framework the following six steps are frequently employed (Wehman & Schleien, 1981):

1. Identification of instructional goals.
2. Instructional analysis of learning goals.
3. Identification of learners' entry skills.
4. Development of criterion referenced performance objectives.
5. Selection and use of instruction methods.
6. Evaluation.

The PREP Play program (Watkinson & Wall, 1979) is an example of the task analysis model employed to teach selected play skills to young mentally retarded children. Components of the PREP Play program include a) the initial assessment of learners' skills, b) the analysis and prescription of instructional goals/tasks, and c) the evaluation and monitoring of progress. An additional feature of this program is a system of individual interventions employed by the instructor during a teaching episode. At the pre-response, and post-response stages, a range of prompts are employed dependent upon the skill level demonstrated by the learner. There are four categories of prompts: physical, visual, verbal and no prompts. This

system, referred to as the response prompting continuum, also includes a range of prompts within each category. A major feature of this continuum is the successive decrease in the amount of teacher intervention as the learners' skill increases. The instructor locates the learners' entry point on a particular target skill with respect to the amount of assistance required and systematically works through the prompts until the learner is able to perform the skill independently. As skill increases, teacher intervention decreases.

Moving from one prompt to another within a category, or to another category (e.g. visual prompt to verbal prompt) necessitates the lessoning or "fading" of the previous prompt. An example of fading within the physical prompt category would be the use of physical support for a shorter period of time, or a reduction in the amount of support given for the duration of the instructional sequence.

In summary, the PREP Play program is an example of a task analysis model that includes the initial assessment of learner abilities, the analysis and prescription of culturally normative play skills, a system of teacher intervention and the evaluation and monitoring of student progress.

1.2 The Syndrome of Autism

First identified by Kanner (1943), autism is seen as a severely incapacitating developmental disability, generally appearing during the first three years of life (Ritvo &

Freeman, 1978; Wing, 1976). The frequency of the disorder is five occurances out of every 10,000 births, and is four times as likely to occur in males as in females. Observed throughout the world, autism is found in families of all racial, ethnic and social backgrounds. Though the specific etiology of the disorder is unknown at the present time (Rutter, 1978), autism is believed to be caused by some form of brain abnormality, determined by more than a single factor (Prior, 1979; Ritvo & Freeman, 1978). As there is no known cause of the disorder and because of the extreme heterogeneity of the autistic population (Dunlap, Koegel & Egel, 1979) definitional and diagnostic problems abound. Nonetheless, when a child is referred to as autistic he/she will typically display a majority of the following characteristics (Koegel, Egel & Dunlap, 1980).

1. Lack of appropriate speech.
2. Lack of appropriate social behavior.
3. Apparent sensory deficit.
4. Lack of appropriate play.
5. Inappropriate emotional behavior.
6. High rates of self-stimulatory behavior.
7. Isolated areas of high level functioning.

There appears to be a paucity of data concerning gross motor development and proficiency in autistic individuals (Reid & Morin, 1981). Though early reports (Kanner, 1943; Wing, 1966) suggested normal motor development and abilities, more recent research disputes these earlier findings (Geddes, 1977; Ornitz, 1977; Singleton, 1974). In

a recent report, Reid, Collier and Morin (1983) assessed the skill level of autistic students on a wide range of gross motor tasks. The findings suggested acute deficiencies across tasks both qualitatively and quantitatively. Morin and Reid (1985) assessed the motor abilities of autistic adolescents in a formal test and a guided free play setting and observed considerable inability across motor tasks, corroborating the earlier findings of Reid et al. (1983).

Though there has been a considerable amount of research regarding educational intervention for autistic students with respect to behavioural (e.g. maintenance of eye contact, attention to task), academic and social skills (Bartak, 1973; Callias, 1978; Dunlap, et al., 1979; Koegel, et al., 1980; Koegel, Rincover & Egel, 1982; Lovaas, Koegel, Simmons & Long, 1973; Sigman & Ungerer, 1981) little work has been done in the area of physical education programming. As it appears that autistic children are deficient in basic motor skills, the question now to be addressed is how to teach them. As noted, the task analytic model of education(demonstrated by the PREP Play program) appears to be a worthwhile exemplar to pursue. The use of task analyzed instructional sequences has been employed with autistic children with positive results in the teaching of self-help skills (Simonson, 1979), language acquisition (Simonson, 1979) and the suppression of inappropriate behavior (Koegel, Firestone, Kramme & Dunlap, 1974).

Though the use of prompts has been widely employed in the teaching of a variety of skills to both mentally

retarded and autistic students, it has been recently suggested (Koegel & Rincover, 1976; Lovaas, Koegel & Schreibman, 1979; Mosk & Bucher, 1984; Rincover, 1978; Schreibman, 1975; Schreibman & Charlop, 1981; Schreibman, Koegel & Craig, 1977) that such an approach to education may in fact interfere with the learning of autistic individuals. The detrimental effect of prompting is hypothesized to emanate from an abnormally limited attentional scope manifested by autistic children. This has been referred to as stimulus overselectivity, or overselective attention (Lovaas, Schreibman, Koegel & Rehm, 1971).

It has been proposed (Lovaas et al., 1979) that many autistic children respond to an extremely limited part of their environment. More specifically it was noted (Lovaas et al., 1971) that when presented with a complex stimulus display, the behavior of autistic learners typically came under the control of a very limited part of that display. This overselectivity phenomena does not imply that autistic individuals are extremely efficient learners selecting only those cues that are relevant (Koegel et al., 1980). On the contrary, it has been observed frequently that these children respond to only a part of a relevant cue or a feature of the environment which is irrelevant to the task or situation (Gersten, 1980).

An illustration of this behavior would be an individual discriminating between a male and female figure solely on the basis of shoe colour (Schreibman & Lovaas, 1973). Indeed, there have been clinical reports of autistic

children who were unable to identify a caregiver if that individual had had a hair cut, or removed his/her glasses. There has been an accumulation of evidence suggesting that the autistic child's overselective responding may be largely responsible for behavioural deficits in such areas as language acquisition (Lovaas et al., 1971), transfer of learning (Koegel & Rincover, 1976), social development (Schreibman & Lovaas, 1973), and observational learning (Varnie, Lovaas, Koegel & Everett, 1979). Also, as previously alluded to, overselective responding may negatively effect the use of extra stimuli (prompts) to increase learning (Koegel & Rincover, 1976; Koegel & Schreibman, 1977; Lovaas et al., 1979; Rincover, 1978; Schreibman, 1975; Schreibman & Charlop, 1981).

Prompts are considered to be extra stimuli added to a learning environment (Koegel et al., 1980). Thus the child must now respond to multiple cues - the prompt(s), and the training stimulus. In order for learning to occur, the prompt stimulus must be gradually withdrawn, or 'faded' so that the learner is responding in a progressively more independent manner (Koegel et al., 1980; Watkinson & Wall, 1979). It is with the shifting of attention from the prompt stimulus to the training stimulus that autistic children experience considerable difficulty (Koegel & Rincover, 1976; Rincover, 1978; Schreibman & Charlop, 1981). An example of prompt fading difficulty in the motor domain would be shifting attention from the tapping of the knee (prompt stimulus) to indicate correct positioning for a long jump to

the generalized maintenance of the correct angle of knee flexion (training stimulus). It thus appears that the PREP model is composed of extra-stimulus prompts which might prove problematic with learners who are autistic.

Schreibman (1975) reasoned that a prompting system that did not require the learner to attend to simultaneous multiple stimuli would be effective in teaching autistic children. Hence Schreibman designed a system of prompts, referred to as within-stimulus prompts, in which the cues are exaggerated features of the training stimulus. This system does not require attention to added stimuli as is the case in traditional prompting procedures. For example, in teaching a child to discriminate between the letters p and b, a teacher might emphasize, by exaggeration, the stems of the letters as their direction is the relevant component of the discrimination (the other features being redundant). The exaggerated components are then gradually faded to the point where the learner is discriminating between letters of a normal size. Because the prompt is part of the task, the learner is not required to attend to additional cues. Investigations by Schreibman (1975), Schreibman & Charlop (1981), Rincover (1978) and Nelson, Gergenti & Hollander (1980) have suggested that within-stimulus prompts can be effectively employed in the education of autistic individuals. To date, researchers studying overselective attention and the use of within-stimulus prompts have used discrimination learning tasks (Gersten, 1980; Schreibman et al., 1977). An exception is the work of Nelson et al.

(1980). In their investigation the authors compared an "extra prompt" procedure to a "no extra prompt" procedure in a shoe lacing task. Subjects in the "no extra prompt" condition mastered the task in a significantly shorter period of time when compared to subjects in the "extra prompt" group. Within-stimulus prompts as described by Schreibman (1975) were not utilized in this investigation.

In developing appropriate gross motor programs for autistic individuals, an understanding of the behavioral deficits manifested by this population, as well as a clear understanding of the task analytic approach to motor skill acquisition appear to be of considerable importance. It has been noted that autistic children are deficient in motor skills. There is, therefore, the need for programs designed to enhance their functioning in this area. Although the PREP Play program has been found to be effective in teaching culturally normative gross motor skills to moderately mentally retarded students, research of the overselectivity phenomena suggests that the use of extra-stimulus prompts, through the response prompting continuum, may have a deleterious effect on the autistic child's performance. A modification of the PREP Play program utilizing within-stimulus prompts may therefore be beneficial. There have been no studies to the author's knowledge that have examined the relative merits of extra-stimulus prompts and within-stimulus prompts with regard to the acquisition of gross motor skills by autistic children.

1.3 Statement of the Problem

The purpose of this investigation was to study the relative efficacy of a within-stimulus prompt model and an extra-stimulus prompt model in teaching a bowling task to young autistic children.

1.4 Hypothesis

Given the same number of trials, subjects who receive the within-stimulus model of instruction will attain a higher task analytic level of performance on the bowling task than subjects who receive the extra-stimulus model of instruction.

1.5 Delimitations

1.5.1 Because overselectivity decreases as age increases (Eimas, 1969; Fischer & Zeeman, 1973; Gersten, 1983; Hale & Morgan, 1973; Hale & Taweel, 1974; Olson, 1971; Schrover & Newsom, 1976) only preadolescent children between the ages of 6 years 11 months and 10 years 3 months were used in the study.

1.5.2 Because overselectivity increases as cognitive level decreases (Butler & Rabinowitz, 1981; Gersten, 1983; Prior, 1979; Schrover & Newsom, 1976; Wilhelm & Lovaas, 1976) and because the majority of autistic students are, as well, mentally handicapped, the subjects utilized in this investigation were diagnosed as mentally retarded as well as autistic.

1.5.3 Only male subjects were used in the study.

1.5.4 Because of considerable controversy in the area of diagnosis and assessment of autistic individuals, and due to the young, male, mentally handicapped sample utilized, inferences to other autistic students must be done with caution.

1.5.5 As the degree of overselelctivity manifestred may be a function of the task utilized (Gersten, 1983), generalizations of findings to other tasks should be done with caution.

1.6 Limitations

This investigation is seen to have the following limitations:

1.6.1 The motivational level of autistic children is often low, intrinsic motivation being frequently absent (Egel, 1980; Koegel & Egel, 1979; Prior, 1979). Though considerable effort was made to elicit optimal performance from all subjects through task structure and reinforcement techniques it cannot be assumed that efforts were maximal or even across subjects.

1.6.2 The subjects in this investigation were not tested individually in order to ascertain the degree to which overselectivity was present. The literature has suggested that young, mentally retarded autistic learners evidence a high degree of overselectivity (Frankel, Timmons III, Fichter & Freeman, 1984; Gersten, 1983; Koegel & Rincover, 1976; Koegel & Schreibman, 1977; Koegel & Wilhelm, 1973; Lovaas et

al., 1979; Lovaas, Newsom & Reynolds, 1974; Lovaas & Schreibman, 1971; Rincover & Koegel, 1977; Schrover & Newsom, 1976; Schreibman, 1975; Schreibman & Lovaas, 1973; Wilhelm & Lovaas, 1976). The sample has been picked with this in mind. Further, the teachers and psychologists working with these students anecdotally noted incidents of overselective responding.

1.6.3 As there is evidence that autistic learners react adversely to environments with which they are unfamiliar (Ritvo & Freeman, 1978) three subjects were tested individually in their school gymnasium, while the other three subjects were tested individually in a large classroom familiar to them. The two environments were made as similar as possible.

1.7 Definitions

The following terms are from Watkinson & Wall (1979).

Action Cue - Words that motivate an individual to perform a given skill, though not a description of that skill.

Complete Manipulation - The physical moving of an individual's body through a desired movement.

Complete Skill Demonstration - An accurate, often exaggerated demonstration of the total skill to be performed.

Gestural Prompting - The use of a gesture that, while not representing a part of the skill or desired response, does indicate what movement is expected.

Imitative Initiation - An individual performing a skill after he has watched another person performing that skill.

Initiation in Free Play - An individual performs a skill appropriately in free play without the benefit of a peer demonstration.

Initiation with Environmental Goal - Given an individual placing an object in the environment that encourages the performance of a skill, the learner performs this skill without communicating with anyone.

Manipulative Prompting - Physical assistance provided by the instructor at some point during a response.

Minimal Guidance - The tapping, or prodding of a child in order to indicate what body part is to be moved, or to give general directions to the student.

Partial Skill Demonstration - An accurate demonstration of a component of a skill.

Response Prompting Continuum - A range of physical, visual and verbal prompts the purpose of which is to increase correct, independant responding on the part of the learner.

Skill Cue - A verbal prompt focusing an individual's attention on the key features of a task.

Skill Mind - A verbal description of the desired skill.

Further definitions.

Discrete Trial Format - The careful ordering of the basic elements of the learning process: instruction - prompt - response - consequence - intertrial interval (Koegel et al., 1980).

Extra-Stimulus Prompt - An extra stimulus provided to guide an individual to a correct response (Koegel et al., 1980).

Fading - The gradual removal of a prompt (Koegel et al., 1980).

Probe Trial - The collection of baseline data on an intermittent rather than a continuous basis.

Task Analysis - A teaching method in which any given task is systematically analyzed, and then structured into progressively more difficult performance objectives.

Within-Stimulus Prompt - A prompt that is an exaggerated feature of the training stimulus.

CHAPTER II

REVIEW OF LITERATURE

2.1 Introduction

The purpose of this investigation was to study the relative efficacy of a within-stimulus prompt model and an extra-stimulus prompt model designed to teach autistic children a bowling task. In this chapter, literature relevant to the study will be reviewed in the following sections: (2.2) Definition of Autism, (2.3) Etiology of the Syndrome, (2.4) Educational Approaches, (2.5) Learner Characteristics, (2.6) Stimulus Overselectivity, (2.7) Play Characteristics, (2.8) Motor Performance, and (2.9) Summary.

2.2 Definition of Autism

There have been frequent attempts to specify the behaviours confirming the diagnosis of autism since Kanner first described the syndrome in 1943. However, methodological problems have hindered the development of an objective classification system. Frequently rating scales have depended upon parental reports rather than objectively defined behaviours (Freeman, Ritvo, Torick, Guthrie & Schroth, 1981); objective reports in clinical settings quantified particular behaviours but have not described the syndrome in its totality and appropriate comparison groups have not been utilized in order to account for specific behaviours apparent in other populations (Freeman, Guthrie, Ritvo, Schroth, Glass & Frankel, 1979).

As well as a lack of objective diagnostic criteria (Koegel et al., 1980) there has been the tendency for researchers to use various labels which describe similar if not identical individuals (Ritvo, 1976; Wing, 1976). Kanner (1943) used the term 'early childhood autism' based on his contention that the syndrome can appear after two and even three years of normal development. Other labels used by researchers include childhood schizophrenia (Bender, 1947) and symbiotic psychosis (Mahler, cited in Berlin, 1978). In 1956, Eisenberg and Kanner extended the potential age of onset of autism to thirty months, a change since justified by others (Ritvo & Freeman, 1978; Wing, 1976). This extension of age of onset has resulted in researchers occasionally grouping early infantile autism with psychoses which do not usually emerge until later childhood or adolescence (Rutter, 1978).

The classic syndrome as originally described by Kanner (1943) included the following features: inability to develop relationships with people; delayed acquisition of speech; non-communicative use of speech once developed; delayed echolalia; pronominal reversals; repetitive and stereotyped play behaviours; an insistance on the maintenance of sameness; lack of imagination; good rote memory and normal physical appearance. After the original clinical description (1943), Kanner reduced the number of essential features to five and later, to two (Eisenberg & Kanner, 1956); the latter two being "extreme aloneness" and "preoccupation with the preservation of sameness". Rutter

(1978) acknowledged the necessity of determining the essential features of the syndrome but noted that researchers have used Kanners' five or two points without reference to his carefully noted clinical occurances and frequently have changed criteria completely. Finally, Koegel et al., (1980) note that the term autism refers to a syndrome in which all of the symptoms need not be present in each case, therefore, one autistic individual may display a group of behaviours different, to varying degrees, from that of another.

A number of researchers (Koegel et al., 1980, Ritvo, 1976; Wing, 1976) have suggested that until the underlying etiology and pathology of the disorder have been discovered, operational definitions should be utilized. Recently the importance of a general definition of autism has been de-emphasized and researchers have concentrated on assessing individual observable behaviours (Koegel et al., 1980). A definition is still being pursued, but within this model it is done on the basis of which observable behaviours co-vary and/or are controlled by the same variable. It is hypothesized that this approach to definition would remedy, to a large extent, the problems of communication between researchers and selection of a treatment approach.

Rutter (1978) outlined a definitional approach that is "child centered" as opposed to "behaviour centered". He listed four essential criteria:

1. Onset before the age of 30 months.

2. Impaired social development that is not in keeping

with the child's intellectual ability.

3. Delayed and deviate language development that is not consistent with the child's intellectual level.

4. "Insistance on sameness" manifested by stereotyped play behaviours, and an abnormally strong resistance to change.

Though other investigators have listed similar criteria, Rutter suggested that individuals also be described clearly in terms of their intellectual level and neurological status. It was suggested that a multi-axial approach be employed whereby the behavioral syndrome, intellectual level, medical conditions and psychosocial situation are described on independent axes.

Despite the problems alluded to, a behaviourally based definition of autism was developed under the direction of Dr. Edward Ritvo and accepted by the National Society for Autistic Children in 1977. It has been stressed (Ritvo & Freeman, 1978) that this definition will be modifed based on the results of further research. Essential criterion for a definition of autism include the following:

1. Appearance of primary features before thirty months.

2. Disturbances of developmental rates and/or sequences.

3. Disturbances in responding to sensory stimuli.

4. Disturbances in speech, language and cognitive abilities.

5. Disturbances in the ability to relate to people, objects and events.

Secondary features vary with age and include disturbances of thought, mood and behaviour, inappropriate fears, lack of appreciation of danger and stereotypic repetitive movements. In the severe form of the disorder, aggression and/or extreme self-abusive behaviour is present.

Current research indicates that 60 percent of autistic children have IQ scores below 50, 20 percent between 50 and 70, while the remaining 20 percent score above 70 (Bartak, 1978). Extreme variability is apparent with performance being best on tasks requiring visual-spatial skills or rote memory and poorest on tasks dependent upon sequential logic, symbolism and abstract thought.

To summarize, methodological problems have hindered the development of an objective classification system. Recently the importance of a general definition has been emphasized less, while researchers concentrate more on assessing individual observable behaviours co-varying and/or being controlled by the same variable (Koegel et al., 1980; Ritvo, 1976; Wing, 1976). A second definitional approach listing essential criteria but also describing individuals in terms of intellectual level and neurological status has been employed (Rutter, 1978). A behaviorally based definition (Ritvo & Freeman, 1978) has been accepted by the National Society for Autistic Children and will be modified dependent upon further research findings.

2.3 Etiology

Researchers attempting to identify the underlying etiology have been divided broadly into two camps from the time the autistic syndrome was first introduced into the child psychiatric literature. One perspective views autism as an emotional disturbance, the cause of which is largely, if not exclusively, environmental (Bettelheim, 1950; Eisenberg, 1957; Goldfarb, 1961; Kanner, 1943). The other perspective postulates that the symptoms are best understood as representative of a physical dysfunction within the central nervous system (Ornitz, 1977; Ritvo, 1976; Rutter, 1978; Wing, 1976).

The proposed psychosocial environmental cause of autism holds that the individual is normal at birth. The factor leading to problems within the child most frequently discussed in the literature is parental abnormality (Bettelheim, 1950; Eisenberg, 1957; Goldfarb, 1961; Kanner, 1943). Data supportive of this explanation for autism are largely anecdotal and have not stood up to objective investigation (Wing, 1976). Autism has been seen to effect children of all racial and ethnic backgrounds and is found in families with the expected normal distributions of personality, intelligence and social class (Ritvo, 1976). Thus there do not appear to be consistently identified environmental causes of the disorder.

The concensus of opinion at this point is that autism is a disease of the brain, the specific etiological agent(s) causing the organic pathology being unknown. Researchers

have suggested various locii of abnormality including the reticular activity system (Ornitz, 1974), the vestibular system (Ornitz, 1974) and the mid-brain and left hemisphere (Delong, 1978; Prior, 1979). Biochemical research has recently concentrated on neurotransmitters, specifically the groups of monoamines (dopamine, norephinephrine, and seratonine) (Yawiler, Geller & Ritvo, 1976).

To conclude, autism is thought to be caused by a dysfunction in the central nervous system, but the specific etiological factor or factors resulting in this dysfunction have not yet been identified (Ritvo, 1976; Rutter, 1978). Data has not been forthcoming supportive of the hypothesis that autism is caused by the psychological environment (Lovaas et al., 1979; Ritvo, 1976; Wing, 1976).

2.4 Educational Approaches

Initially, autistic behaviour was thought to be a conscious withdrawal from parental pathology (Bettelheim, 1967) or from improper parenting techniques (Ferster, 1961, cited in Marcus, Lansing, Andrews & Schopler, 1978) and therefore affective concerns of the child were considered of paramount importance. Treatment was directed at fostering appropriate emotional ties between parent and child with the teaching of functional skills occurring only after this had been accomplished. As parents were seen as contributing to, if not causing their child's autism, treatment of the child generally excluded them (Marcus et al., 1978). Optimal treatment often involved either removal of the autistic

child from the home to a residential setting, or extensive utilization of play therapy (Marcus et al., 1978). A flexible and permissive environment was utilized thereby allowing the child to develop in his/her own way (Bartak, 1978). As previously outlined, these initial assumptions regarding etiology have not been supported (Koegel et al., 1980; Prior, 1979; Ritvo, 1976; Rutter, 1978; Wing, 1966).

2.4.1 Parental Involvement

The change from an environmental to a physical orientation with regard to causality had two distinct yet related effects. First, parents began to demand quality educational services, involving themselves to a greater degree in their children's education (Kelly & Samuels, 1977; Newsom, 1980). This pressure from parents and from professional organizations, coupled with the passage in the United States of the Education of All Handicapped Act in 1975 (PL 94-142) resulted in many autistic children receiving publicly funded educational services (Newsom, 1980). Though the accessibility of educational facilities has increased considerably since 1975, the quality and resources remain irregular and inconsistent.

Secondly, the orientation of treatment has changed considerably. It is now accepted that effective treatment of autistic children must involve a working partnership between the professional and the parent (Dunlap et al., 1979; Koegel et al., 1980; Marcus et al., 1978; Schopler, 1978; Tanguay, 1976). A prime reason parents are now trained as co-therapists is the lack of generalization shown

when specific skills have been learnt by the student in a school or clinic setting. By training parents in educational techniques the therapeutic environment is effectively extended to include the child's natural environment. In this manner the opportunities for generalization, transfer and maintenance of educational gains are increased (Koegel et al., 1980; Lovaas et al., 1973). In a one to four year follow up study of twenty autistic students involved in behaviour therapy (Lovaas et al., 1973) it was noted that only those discharged to parents trained in behaviour modification techniques maintained or improved upon their gains. In the other post-treatment environments (untrained parents and institutions), gains were quickly lost. Recent research (Dunlap et al., 1979; Kelley & Samuels, 1977; Lovaas et al., 1973; Marcus et al., 1978) suggests that parents are capable of learning and effectively employing behaviour modification techniques.

2.4.2 Structure

Over the past ten to fifteen years there has been a pervasive movement away from permissive non intrusive instruction towards a more highly structured situation (Dunlap et al., 1979; Wing, 1976). This structure has been viewed as imperative for the educational and behavioural advancement of the student (Bartak, 1978; Callias, 1978; Koegel et al., 1980; Newsom, 1980). Bartak and Rutter (1973) examined three educational settings differing widely in their educational orientation. A psychotherapeutic

environment, A emphasized free play with little direct teaching; B was considered an educational unit without a standard structure; and C was a highly structured unit which emphasized the teaching of functional age appropriate skills. The results suggested that children learnt the specific skills educators actively attempted to teach; that behavioural improvements were situation specific; and that children showing the greatest improvement were from the structured educational setting. Bartak (1978) notes that structuring of the students responses through task selection and presentation and the control of stimuli effecting the student, through environmental manipulation, appears to supply the external control and organization generally not present within the learner.

2.4.3 Behaviour Modification Techniques

A consequence of the change in etiological orientation has been the proliferation of behaviour modification programs designed to educate autistic learners (Dunlap et al., 1979). Though there remains controversy regarding the use of behavioural techniques (Prior, 1979; Wing, 1976) a large number of researchers and practitioners view behaviour modification as the method of choice when treating autistic learners (Dunlap et al., 1979; Flaherty, 1976; Koegel et al., 1980; Lovaas et al., 1973; Margolis, 1977; Newsom, 1980; Ritvo, 1976). Dunlap et al., (1979) outlined specifically why they believe behaviour modification to be well suited to educational settings:

1) It offers an applied research methodology that

focuses on the needs of the children.

2) Its effectiveness can be determined by objective data rather than subjective impressions.

3) It does not blame parents but instead recruits them for therapeutic interventions.

4) It is based on principles of learning that can be easily taught to non professionals.

5) It has succeeded in teaching autistic children a variety of adaptive behaviours.

During the past fifteen years behavioural interventions have been demonstrated to be effective in teaching a wide range of skills to autistic learners (Dunlap et al., 1979; Koegel et al., 1982; Lovaas et al., 1973; Margolis, 1977; Prior, 1979). Despite the benefits of this approach a number of concerns have been identified (Lovaas, 1978; Prior, 1979; Wing, 1976). These include a) the specificity of treatment gains, b) a lack of spontaneous and creative use of the learned behaviour and c) the relatively slow pace at which progress is made. In dealing with these problems, researchers have increasingly utilized parents as co-therapists and built in generalization procedures in their programs thus increasing the chances for generalized gains among autistic learners (Lovaas, 1978; Prior, 1979).

2.5 Learner Characteristics

There are a number of behavioural characteristics considered important in the education of autistic children. These include imitation learning, motivation, self-

stimulation and generalization and maintenance of treatment gains (Dunlap et al., 1979; Koegel et al., 1980). Stimulus overselectivity will be discussed in a separate section.

2.5.1 Imitation

Autistic children are particularly deficient in the ability to imitate, rarely doing so in a spontaneous manner (DeMeyer, Alper, Berton, DeMeyer, Churchill, Hingtzen, Bryson, Pontius & Kimberlin, 1972; Prior, 1979; Wing, 1976). As imitation greatly facilitates learning, lack of ability in this area may partly account for autistic learners' impoverished behavioural repertoire (Margolis, 1977).

Motor imitation, developed early and with minimal encouragement by nonhandicapped children appears highly problematic for autistic learners, regardless of functional level (DeMeyer et al., 1972; Prior, 1979). In one investigation DeMeyer et al. (1972) noted that autistic learners performed significantly poorer than a group of mentally subnormal boys on three tasks: body imitation, motor-object imitation and spontaneous object use. Autistic learners were most deficient in body imitation and least deficient in spontaneous object use. The authors cited short term memory deficiency as a possible cause of imitative disability. Other explanations include motivational deficiencies (Prior, 1979; Varni, Lovaas, Koegel & Everett, 1979) stimulus overselectivity (Varni et al., 1979) and cross modal learning deficits (DeMeyer et al., 1972). It has been documented (Metz, 1965; Prior, 1979; Wing, 1976) that autistic children are able to learn

to imitate though rarely in a spontaneous fashion. Imitative skills have been developed through operant conditioning methods (Lovaas, 1966) and physical guidance (Metz, 1965; Wing, 1976). Problems of generalization and spontaneous use remain in evidence (Prior, 1979).

2.5.2 Motivation

A characteristic lack of motivation has been cited by many researchers and practitioners (Dunlap et al., 1979; Egel, 1980; Koegel et al., 1980; Reid et al., 1983) as a major block to educational gains for autistic children. Autistics are seen to respond less to environmental stimuli, or to show much longer latencies than do normal children (Egel, 1980). It has been pointed out (Koegel et al., 1980) that autistic children frequently do not test alternate responses, explore novel environments nor seek out food or comfort even when easily obtainable. When interest is shown towards a particular stimuli, it is usually restricted to a very small portion of the environment (Koegel & Egel, 1979).

Over the past ten year researchers have assessed a variety of methods potentially influencing motivation. With respect to reinforcement, some areas examined include: the effect of constant vs. varied reinforcer presentation (Egel, 1980); the functionality of the response in procuring reinforcement (Williams, Koegel & Egel, 1981) and contingent sensory stimulation as reinforcement (Rincover, Newsom, Lovaas, & Koegal, 1977). Findings indicated that varying the reinforcer resulted in more frequent and faster responses than a constant reinforcer presentation (Egel,

1980). In addition, functional reinforcers (e.g. lifting the appropriate container and finding a raisin underneath) have proved to be more effective than nonfunctional reinforcers (e.g. receiving a raisin for correctly identifying a picture of a cat). Investigators found the use of functional reinforcers to result in rapid acquisition of the target response. The establishment of meaningful natural reinforcers (e.g. social praise) has been difficult (Koegel et al., 1980; Lovaas, 1978). Resultantly teachers and caregivers generally rely on edible rewards to motivate and maintain student behaviour. Problems associated with primary (edible) reinforcement include a) artificiality, as they often exist only in treatment settings; b) lack of generalizability due to utilization only in certain restricted environments and c) satiation on the part of the learner (Koegel et al., 1980). These difficulties may be avoided through the use of sensory stimulation as reinforcement. Rincover et al. (1977) noted that short presentations of a child's preferred sensory event (e.g. soft light, music) contingent upon correct responding were effective in eliciting high levels of responding that were durable over time.

In addition to the type and variety of reinforcement, research has examined methods by which to move autistic students to the point at which they will be reinforced. Koegel and Egel (1979) suggested that when doing a learning task, autistic children make many incorrect attempts thus lessening the chance of being reinforced, thereby decreasing

motivation to perform. The authors developed a system of verbal and manual prompts whereby a student remained on task until it was completed thereby receiving a reward. Results indicated increased and improved task performance. Following the direction of Egel (1980), Dunlap and Koegel (1980) observed the effects of stimulus novelty on motivation. The authors noted improved and stable responding over time when autistic children were presented with a variety of tasks within a training session. The presentation of a single task during a training session resulted in initially high scores that decreased over time. The results of current research indicate avenues by which increased motivation of autistic learners across environments may be realized.

2.5.3 Self-Stimulation

Self-stimulatory behaviours such as hand flapping, mouthing objects, spinning objects and rocking are particularly striking characteristics of autistic children (Dunlap et al., 1979; Margolies, 1977; Watters & Watters, 1980). These stereotypic, repetitive behaviours present a major obstacle to learning in such varied areas as discrimination learning, social play, appropriate toy use and language acquisition. It has been observed (Koegel et al., 1974; Koegel et al., 1980; Lovaas & Schreibman, 1971) that learning is disrupted when the individual engages in self-stimulatory behaviour, yet recovers or improves when such behaviour is repressed. As self-stimulation has presented one of the most resistant obstacles to the

education of autistic learners, its reduction is viewed as imperative early in the treatment process (Dunlap et al., 1979; Koegel et al., 1980; Margolies, 1977).

Procedures utilized to suppress self-stimulation have included 'positive practice overcorrection' (Foxx & Azrin, 1973); reinforcement of responses incompatable with self-stimulation (Deitz & Repp, 1973); physical punishment (Foxx & Azrin, 1973; Koegel & Covert, 1972); sensory extinction (Rincover, 1978) and physical exercise (Watters & Watters, 1980).

2.5.4 Generalization of Treatment Gains

It has been demonstrated (Lovaas et al., 1973) that while considerable gains in a classroom/treatment setting may be apparent, autistic children usually do not maintain these skills in other environments unless special intervention techniques are employed. Two explanations have been presented for this inability to maintain skills in extra-therapy environments: a) Frequently a small number of often irrelevant stimuli control a particular behaviour. The likelihood of these stimuli being present in the extra-therapy environment is often slight (Lovaas et al., 1979); b) The learner discriminates between environments on the basis of differential reward schedules and ceases to respond in the environment(s) where fewer rewards are available (Koegel & Rincover, 1977). Approaches to increase generalization include: a) the thinning of reward schedules in the therapeutic environment and provision of intermittent reinforcement in the extra-therapy environments (Koegel &

Rincover, 1977); b) use of two or more instructors in teaching target skills (Koegel et al., 1980) and c) instruction occurring in a variety of settings (Koegel et al., 1980). The current emphasis on utilizing parents as co-therapists appears to be important with respect to generalization and maintenance of treatment gains.

2.6 Stimulus Overselectivity

It has been suggested by a number of researchers (Gersten, 1983; Kolko, Anderson & Campbell, 1980; Schreibman & Charlop, 1981; Schrover & Newsom, 1976) that many autistic children respond to a very restricted part of their environment. More specifically it was observed (Lovaas et al., 1971) that when presented with a complex stimulus display, behaviour typically comes under the control of a very limited part of that display. Due to the restricted nature of the stimulus control, this phenomena has been referred to as stimulus overselectivity, or overselective attention (Lovaas et al., 1971). It has been emphasized (Gersten, 1980; Koegel et al., 1980; Lovaas et al., 1979) that this term does not imply that autistic individuals carefully scan the environment in order to select highly relevant cues. On the contrary, the literature suggests (Gersten, 1980; Lovaas et al., 1979; Schreibman & Lovaas, 1973) that frequently these learners respond only to a part of a relevant cue or a feature of the environment which is completely irrelevant to the task.

Overselectivity was first demonstrated experimentally

by Lovaas et al., in 1971. In their classic experiment, samples of autistic, mentally retarded and nonhandicapped children were taught to respond to a complex stimulus display containing three components: a) a visual stimulus (160w red floodlight), b) an auditory stimulus (white noise at a moderately high level) and c) a tactile stimulus (a touch on the leg). After each subject responded by pressing a lever when the three stimuli were presented simultaneously, the stimuli were presented individually to observe which stimulus controlled the subject's responding. The results indicated that the nonhandicapped children responded equally to each component while the autistic subjects responded primarily to one of the components. The mentally retarded subjects responded at a level between the two extremes. Since the autistic students could be trained to respond to nonfunctional cues, the deficit was not believed to be related to a specific sensory impairment.

Subsequent investigations have shown overselectivity in two stimuli (auditory and visual) situations (Lovaas & Schreibman, 1971) and in cases when stimuli fall within the same modality (Koegel & Wilhelm, 1973; Reynolds, Newsom & Lovaas, 1974; Schreibman & Lovaas, 1973). No sensory preference has been clearly noted in the literature (Prior, 1979).

Although a substantial number of studies emanating from a variety of laboratories have demonstrated that autistic children are overselective (Frankel et al., 1984; Gersten, 1983; Lovaas et al., 1979; Prior, 1979; Schreibman & Koegal,

1977; Wilhelm & Lovaas, 1976) its role (if any) in the etiology of the syndrome is speculative at best. Studies have demonstrated overselective responding in mentally retarded individuals (Lovaas et al., 1971; Wilhelm & Lovaas, 1976) young normal children (Schover & Newsom, 1976) and learning disabled children (Bailey, 1981). It has also been demonstrated (Wilhelm & Lovaas, 1976) that overselectivity varies with IQ since a low IQ group (x=39.2) responded, on the average, to 1.6 of a possible three cues in a discrimination task, while the high IQ group (x=65.7) responded to 2.1 cues. The nonhandicapped IQ group responded to all three cues. Other researchers have suggested a link between overselectivity and chronological age (Eimas, 1969; Schover & Newsom, 1976) and mental age (Prior, 1979).

Regardless of the etiological role of stimulus overselectivity most autistic learners attend to their environment in an overselective manner long after their nonhandicapped peers. This results in the autistic learner's behaviour coming under the control of a limited part of his/her environment thereby retarding development (Lovaas et al., 1979; Schreibman et al., 1977). The literature on autism suggests that stimulus overselectivity may be a contributing factor to deficiencies in such diverse areas as social behaviour (Schreibman & Lovaas, 1973), language acquisition (Lovaas et al., 1971), observational learning (Varni et al., 1979) generalization and transfer of treatment gains (Rincover & Koegel, 1975) and the effective

use of prompts to guide correct responses (Koegel & Rincover, 1977; Koegel, Schreibman, Britten & Laitinen, 1979; Rincover, 1978; Schreibman, 1975; Schreibman & Charlop, 1981).

The difficulty autistic learners have in utilizing extra stimuli to direct learning has generated a considerable amount of research aimed at the development and refinement of appropriate prompts and prompt fading techniques (Dunlop et al., 1979). A prompt has been defined by Lovaas et al. (1979, pg. 1242) as "extra stimuli added to the environment to ensure correct responding". As many autistic learners are initially unable to give correct responses, they are frequently guided toward the appropriate answer through verbal, auditory, tactile or visual cues that are separate from the training stimulus. If learning is to take place, the prompts must be removed or "faded" so that the individual responds to the training stimulus by itself. The overselectivity hypothesis suggests that using extra stimuli (prompts) to guide responding actually makes learning more difficult, as most prompting procedures require the learner to attend to multiple cues - the prompt(s) and training stimuli (Schreibman, 1975).

Koegel and Rincover (1976) demonstrated the negative effects of extra cues on autistic students' learning. Autistic and nonhandicapped learners were pretrained to respond differentially to two colours (red and green). These colours were then used as prompts to teach more difficult discriminations (e.g. a low pitched noise was

coupled with the colour red and a high pitched noise with the colour green). The colours were then faded gradually leaving only the training stimulus. The nonhandicapped children learned 3.1 of a possible four discriminations, while the autistic group learned an average of 1.2 discriminations. An additional study by Schreibman (1975) observed the same difficulties with prompts. The autistic learners responded correctly to the discrimination when the prompt was present but performed at a chance level when the prompt was removed. Rincover (1978) noted the paradox that the most severely handicapped learners, those needing the extra guidance of prompt and prompt fading procedures appear to benefit the least from them.

In order to circumvent the problem of attending to simultaneous multiple stimuli (prompt stimuli and training stimuli), Schreibman (1975) developed a prompting system in which a saliant feature of the discrimination task was altered or exaggerated so as to attract the selective attention of the learner. Once this had been accomplished, redundant task features were introduced and the exaggeration of the relevant component gradually reduced. This procedure was thought to offer a prompt fading technique with more lenient attentional requirements. Schreibman hypothesized that if a prompt did not require the learner to attend to simultaneous multiple stimuli, it could be successfully used. This was referred to as a "within-stimulus prompt" model.

In her 1975 study, Schreibman compared two prompting

procedures used to teach auditory and visual discriminations to autistic children. The first method used an added cue - or "extra-stimulus" prompt- to aid in teaching the discriminations, thus requiring the learner to attend to both prompt and training stimulus. The second method involved a "within-stimulus" prompt consisting of an exaggeration of the relevant component of the training stimuli. The results demonstrated that the within-stimulus model effectively taught the discriminations while the extra-stimulus model did not. Rincover's (1978) findings confirmed those of Schreibman (1975) regarding the superiority of the within-stimulus model over the extra-stimulus model in learning a discrimination task. Rincover expanded upon Schreibman's work by demonstrating the importance of choosing a within-stimulus prompt that is distinctive to the 'correct' stimulus (S+). The 'correct' stimulus may be thought of as that to which the researcher wants the subject to attend. Further research (Schreibman & Charlop, 1981) examined within-stimulus prompt fading that manipulated the relevant component of the discrimination. In one condition the relevant component of the 'correct' (S+) stimulus was faded in while the 'incorrect' (S-) stimulus was held constant. In the second condition the relevant component of the S- training stimulus was faded in while the S+ training stimulus was held constant. Though both within-stimulus prompting procedures were effective, seven of eight children learned the discrimination more quickly and with fewer errors when the relevant component of

the S+ was faded in, the S- training stimulus being held constant. The authors related these findings to the literature on stimulus novelty.

A study by Nelson et al. (1980) compared a colour coded 'extra prompt' procedure to a procedure in which no prompts were employed in teaching autistic children to lace shoes. The authors observed that subjects taught with the colour coded extra-stimulus prompts had significant difficulty transferring their skills to a naturalistic, non colour coded condition.

While the aforementioned studies have attempted to work around the problem of stimulus overselectivity by employing within-stimulus prompts, another avenue of research has tried to teach autistic learners to respond on the basis of multiple cues. Findings by Schrover and Newsom (1976) indicated that through overtraining an already learned discrimination, the number of cues to which autistic children responded could be increased. Schreibman et al. (1977) lent further support to the suggestion that stimulus overselectivity is modifiable. These researchers found overtraining on its own not sufficient to decrease overselectivity, however, prolonged interspersal of unreinforced trials with component cues among reinforced trials (with the stimulus complex) eliminated overselective responding in 13 of 16 autistic subjects.

Koegel et al. (1979) examined the effect of schedule of reinforcement on overselective responding. Their results indicated that a partial schedule of reinforcement coupled

with overtraining resulted in substantially decreased overselectivity. Overtraining was not found to be effective if a continuous schedule of reinforcement was used.

In summary several observations can be made. A considerable number of studies (Frankel et al., 1984; Gersten, 1983; Kolko et al., 1980; Lovaas et al., 1971; Schover & Newsom, 1976; Schreibman & Lovaas, 1973) have noted that mentally retarded, autistic learners come under the control of an extremely restricted range of stimuli. This phenomena, termed stimulus overselectivity, has been observed under a wide variety of stimulus conditions and has been seen to effect most autistic learners as well as some mentally handicapped (Gersten, 1983; Wilhelm & Lovaas, 1976) and learning disabled individuals (Bailey, 1981). This phenomena has also been seen in young normal children (Eimas, 1968).

Presently, any role of overselectivity in the etiology of the autistic syndrome is unknown. Nonetheless most of these children respond to their environment in a highly restricted fashion thus negatively effecting their development in many behavioural, social and cognitive areas.

Receiving considerable attention is the autistic child's inability to effectively utilize traditional prompting and prompt fading techniques (extra-stimulus prompts). Resultantly, investigators have focused upon prompting techniques making fewer attentional demands of the learner (within-stimulus prompts, distinctive feature fading procedures) (Mosk & Bucher, 1984; Rincover, 1978;

Schreibman, 1975; Schreibman & Charlop, 1981) and upon broadening the attention of autistic learners (Koegel et al., 1979; Schover & Newsom, 1976; Schreibman et al., 1977). Research into the within-stimulus prompt model and into methodologies designed to broaden attention suggest that overselective responding may be circumvented or reduced, thus enabling children to respond to their environment in a more normal fashion.

2.7 Play Characteristics

There is a substantial literature concerning the play behaviours of autistic learners. Studies have, for the most part, dealt with a) the prevelance of self-stimulatory, nonfunctional behaviour (Koegel et al., 1974; Strain & Cooke, 1976; Watters & Wood, 1983; Wing, Gould, Yeates & Brierley, 1977); b) the solitary, asocial nature of the play (Black, Freeman & Montgomery, 1975; Ritvo, 1976; Strain & Cooke, 1976); c) the absence of symbolic play (Riquet, Taylor, Benaroya & Klein, 1981; Ungerer & Sigman, 1981; Wing et al., 1977) and d) toy play characterized by repetitive inappropriate actions with familiar objects (Black et al., 1975; Ferrera & Hill, 1980; Koegel et al., 1974; Tilton & Ottinger, 1964). These major deficiencies in play behaviour are viewed as obstacles in the development of social relationships (Black et al., 1975; Strain & Cooke, 1976), appropriate object use (Koegel et al., 1974; Tilton & Ottinger, 1964), motivation (Ferrara & Hill, 1980), recreational and gross motor abilities (Hawkins, 1982; Morin

& Reid, 1985) and language comprehension (Ungerer & Sigman, 1981).

Recent investigations have examined strategies to improve the quality and quantity of toy play and social play in autistic children. Manipulation of the play environment has been suggested by a number of researchers (Black et al., 1975; Ferrara & Hill, 1980; Strain & Cooke, 1976; Watters & Wood, 1983). In the Black et al. study (1975) four different environments were examined as to their effect on the unstructured play behaviour of autistic students: a) a stark, bare enclosure; b) a small room equipped with large body image apparatus and tunnels designed to facilitate movement; c) a playroom having a large number of age appropriate toys; and d) an outdoor playdeck having swings, slides and a jungle gym. The authors noted findings from their observations of five autistic children. Some subjects engaged in repetitive self-stimulatory play regardless of environment. Within a confined space free of objects (area a) subjects frequently engaged in solitary repetitive behaviour. In environments with multiple objects, subjects related most often to the objects and rarely to peers. Object play was frequently negative, repetitive and observed to be at a manipulative level. Symbolic play was not observed. Most interactions (both positive and negative) occurred within confined spaces (environments a & b) and in a confined space designed to facilitate movement (environment b) the children imitated, modeled and were involved in gross motor play. The results of the Ferrara

and Hill study (1980) also indicated that the social play of autistic individuals could be increased in an environment that was predictable and highly structured. A somewhat conflicting viewpoint was presented by Strain and Cooke (1976) upon observing autistic children during a free play session. As well as noting increased social interaction when play materials requiring cooperation were utilized, the authors hypothesized that stimulus novelty may have increased the incidence of social play.

An investigation by Watters and Wood (1983) examined the relative incidence of non functional self-stimulatory behaviour when autistic students interacted individually with a) soft (stuffed) toys; b) hard toys (e.g. plastic blocks); and c) wheeled toys. The authors found the use of soft toys resulted in considerably more inappropriate play behaviour and high levels of self-stimulation as compared to the nonsoft (hard and wheeled) toys. Their findings suggest a relatively easy way to reduce inappropriate self-stimulatory behaviour while engaging in free play.

The importance of reducing self-stimulatory behaviour has already been alluded to, its interference in appropriate toy play and social play having been carefully documented (Black et al., 1975; Koegel et al., 1974; Watters & Wood, 1983; Wing et al., 1977). In addition to manipulation of the environment researchers have tried to increase appropriate play by directly suppressing self-stimulation in autistic children. Koegel et al. (1974) observed that although high levels of self-stimulatory behaviour and low

levels of spontaneous play were present in a baseline condition, spontaneous appropriate play increased substantially when self-stimulation was suppressed.

2.8 Motor Performance

Though there have been recent investigations examining the motor characteristics and motor development of autistic children (Kraft, 1983; Morin & Reid, 1985; Mosher, 1981; Reid et al., 1983; Reid & Morin, 1981) the literature is characterized by a dearth of information. Early writings (Kanner, 1943) suggested that motor development and coordination were normal for autistic children. Kanner's clinical observations were supported by other researchers (Alderton, 1966; Rimland, 1964; Wing, 1966). More recent investigations (Hawkins, 1982; Morin & Reid, 1985; Reid et al., 1983; Singleton, 1974) have questioned the idea of normal motor development in autistic individuals.

Ornitz, Guthrie & Farley (1977) noted that autistic children were appreciably slower than their nonhandicapped counterparts in achieving motor milestones (holding head erect, sitting without support, etc.) within the first year. These results were based largely on parental reports. DeMyer (1976) compared autistic learners with educable mentally retarded individuals on a variety of motor tasks. The autistic subjects were divided into three groups dependant upon functional level (based on language proficiency and IQ). Tasks in the study included ball play, skipping, running, stair climbing/descending, jumping and

hopping. Results suggested that the autistic learners were similar to the retarded subjects on most skills, the exception being ball play at which the retarded were superior. The authors noted that autistic learners were particularly weak in skills involving object manipulation (e.g. ball play).

As the mentally retarded generally demonstrate gross motor deficits (Rarick, Dobbins & Broadhead, 1976) it would appear that the autistic learners in DeMyer's study were motorically inferior to intellectually nonhandicapped individuals as well. Geddes (1977) study of two young, low functioning autistic twins lends support to the DeMyer conclusions. Singleton (1974) anecdotally observed inconsistancy across skills, diminished motivation, some highly developed splinter skills and a generally poor "body image" with autistic subjects.

Although the appropriateness of a general description of the syndrome of autism has been questioned (Reid & Morin, 1981; Wing, 1976) recent research indicates a generally depressed level of motor functioning in autistic learners when compared to the normal population (Morin, 1982; Reid et al., 1983)

Reid et al. (1983) recently examined the motor performance of a younger (x=10.2 years) and older (x=16.6) group of autistic individuals on a battery of tests adapted from the Bruininks-Oseretsky Test of Motor Proficiency (1978) and Rarick, Dobbins & Broadhead's (1976) motor tests designed for the mentally retarded. Quantitative motor

performance items included, ball catching, target throwing, standing, long jump, vertical jump, mat crawl and a scramble run. Of these measures, qualitative scores were obtained for the following items: catching, standing long jump and target throw. Anthropometric and physical fitness measures were also taken (height, weight, percent body fat, flexibility and abdominal strength). Quantitative performance on the test items was compared to that of educably mentally retarded and nonhandicapped peers. Generally the authors found large deficits in motor performance with the autistic subjects. As well, the autistic groups scored poorly on the physical fitness measures. Though there were considerable inter-individual differences, the authors observed generally depressed motor functioning across autistic subjects with little improvement due to increased age. Anecdotal comments suggested the subjects appeared frequently to be unmotivated, a finding echoed elsewhere in the literature (Egel, 1980; Koegel et al., 1980; Margolies, 1977).

As the Reid et al. investigation utilized a sample of autistic individuals evidencing mental retardation, the relative effect of 'autism' and mental retardation on motor performance remained unknown. In order to investigate more closely the effects of autism on motor performance a relatively high functioning (mean IQ=66) group of male adolescent autistic students was compared on a variety of motor tasks to a group of functionally retarded subjects matched closely on age and IQ (Morin & Reid, 1985). Skills

were assessed quantitatively and qualitatively by means of a formal test situation and qualitatively in a guided play environment. The motor tasks selected included dynamic balance, catching, throwing at a target, standing long jump and running. The authors noted that diffferences in motor performance between groups were task specific. The autistic subjects were qualitatively superior to the functionally retarded group on balance items, however were inferior qualitatively on the overhand throw, standing long jump, and running tasks and demonstrated elementary patterns of movement in all areas. The two groups showed similar skill levels on the catching item. The autistic subjects were not inferior to their matched peers quantitatively. The authors hypothesized that more complex motor tasks might have further differentiated the two groups given the autistic subjects immature movement patterns. The authors concluded that higher functioning autistic learners are capable of purposeful goal directed motor performance.

The results of recent studies (De Myer, 1976; Morin & Reid, 1985; Reid et al., 1983) and clinical observations (Ornitz et al., 1977; Singleton, 1974) suggest deficiencies across many areas of motor performance particularly among lower functioning children. Many questions however remain unanswered. For example, is poor performance primarily a function of physical ability or lack of motivation? Are there isolated areas of particularly high or low functioning? Is motor performance related to functional levels of autism? Of particular importance is the extent to

which physical education can ameliorate motor deficiencies and the deliniation of effective strategies. As a starting point for program strategies, are many of the findings discussed earlier regarding teaching in a classroom setting. It would appear that they apply with equal merit to the gymnasium. Of interest would be investigations examining the following areas as they effect motor skill acquisition: a) the effects of normal peer models; b) the establishment of functional response-reinforcer relationships; c) a comparison of a continuous versus intermittent schedule of reinforcement; d) the effect of multiple teachers and environments on motor skill generalization; e) a comparison of instructors trained in behaviour modification techniques versus those not trained; f) a comparison of the effects of a one to one teaching environment contrasted with a group teaching situation; g) the effect of novel stimuli on maintenance of attention during instruction; h) the suppression of self-stimulation and i) a comparison of a within-stimulus versus extra-stimulus prompt model of instruction.

There has been little examination of physical activity programs with autistic persons even though programs for mentally handicapped learners have been extensively developed (e.g. the PREP Play Program (Watkinson & Wall, 1979), the I Can Program (Wessel, 1975), Project Active (Vodola, 1976)). Programs designed to teach the mentally retarded generally employ a thorough analysis of the learners' entry skills and analysis of components of the

task, criterion referenced testing, appropriate modification of the learning environment and a careful breakdown of teacher behaviours (including specific prompting procedures). To date a prime component of motor programs found effective in teaching the mentally retarded has been carefully structured extra-stimulus prompts (Watkinson & Wall, 1979).

In light of the considerable body of literature suggesting the inefficient and frequently counterproductive use of traditional extra-stimulus prompts, their use in teaching motor skills to autistic children must be questioned. Indeed the purpose of the present investigation was to compare the effectiveness of an instructional model utilizing traditional extra-stimulus prompts with a model utilizing within-stimulus prompts in teaching autistic learners a motor task. The latter approach has been effectively used to teach autistic children discrimination tasks.

2.9 Summary

Though there has been considerable confusion regarding the nature of the autistic syndrome, recent research has started to offer objective data based on behavioural criteria (Ritvo and Freeman, 1978). Though the etiology of the disorder remains unknown, recent research suggests some physical dysfunction within the central nervous system (Koegel et al., 1982; Ritvo and Freeman, 1978; Rutter, 1978). There has been no emperical support of a

psychosocial environmental explanation of the disorder.

With respect to educational intervention, recent findings point to structured settings employing behaviour management techniques as most beneficial to autistic learners (Bartak & Rutter, 1973; Dunlap et al., 1979; Koegel et al., 1980; Newsom, 1980). Involvement of parents and caregivers in their children's education appears imperative for optimal results (Bartak & Rutter, 1973; Dunlap et al., 1979; Kelley & Samuels, 1977; Koegel et al., 1982; Lovaas et al., 1973; Wale, 1978).

Major obstacles to behavioural and cognitive growth include a) inability to generalize gains, b) lack of imitational skills, c) self-stimulation, d) lack of motivation and e) stimulus over-selectivity. Over the last fifteen years, a considerable number of programs designed to combat the aforementioned problems have been developed.

The play behaviour of autistic children has been characterized by a) self-stimulatory behaviour, b) asocial solitary activity, c) an absence of symbolic play and d) inappropriate manipulations of familiar objects. Deficiencies in these areas are seen to negatively effect development in a variety of social and cognitive areas. Methods to improve social and object play have included the manipulation of the play environment (Black et al., 1975; Ferrara & Hill, 1980; Strain & Cooke, 1976; Watters & Wood, 1983), suppression of self-stimulatory behaviour (Koegel et al., 1974) and the direct teaching of requisite and pre-requisite play skills (Lovaas et al., 1973; Strain &

Weizerink, 1975).

In the domain of motor development, past research has been sparse and contradictory (Reid & Morin, 1981). However, recent investigations have suggested considerable deficits in motor skills (Reid et al., 1983). An analysis of appropriate techniques to teach autistic learners gross motor skills is an immediate priority.

Stimulus overselectivity has presented a particularly difficult obstacle to learning for autistic children in such diverse areas as communication (Reynolds et al., 1974), observational learning (Ross, 1976; Varni et al., 1979), socialization (Schreibman & Lovaas, 1973), generalization and maintenance of gains (Lovaas et al., 1979; Rincover & Koegel, 1975) and the appropriate use of prompts (Koegel & Rincover, 1977; Koegel & Schreibman, 1977; Rincover, 1978; Schreibman, 1975; Schreibman & Charlop, 1981). As many different learning situations involve prompts (Lovaas et al., 1979; Rincover, 1978) their effective use is viewed as imperative. As mentioned previously, autistic students, needing the assistance prompting affords, appear not able to benefit from traditional (extra-stimulus) prompting and prompt fading procedures. It is postulated, therefore, that programs designed to teach motor skills to mentally handicapped learners (e.g. The PREP Play program, Watkinson & Wall, 1979; I CAN, Wessel, 1976) may be ineffective because of their extensive use of extra-stimulus prompts. The work by Schreibman (1975), Schreibman & Charlop (1981) and Rincover (1978) in developing prompting and prompt

fading procedures with more lenient attentional requirements (within-stimulus prompts) point to a methodology that may be effective in teaching motor skills to autistic learners. Thus there appears to be a need for further study into prompting procedures that are effective in teaching autistic learners motor skills. The present study addresses this issue by comparing the efficacy of a gross motor program utilizing extra-stimulus prompting with a program designed to avoid the overselectivity problem by employing within-stimulus prompts.

CHAPTER III

METHODOLOGY

The purpose of this investigation was to compare the efficacy of a gross motor program utilizing extensive extra-stimulus prompting with a program designed to avoid the overselectivity phenomena by employing within-stimulus prompts. This chapter is subdivided into the following sections: (3.1) Subject Selection, (3.2) Models of Instruction, (3.3) Control of Extraneous Variables, (3.4) Design, (3.5) Procedures, (3.6) Training of Observers, (3.7) Pilot Study, (3.8) Statistical Treatment.

3.1 Subject Selection

The subjects were six male autistic children between the ages of seven and ten. Accurate diagnosis of autism is of considerable importance (Freeman et al., 1981; Lovaas et al., 1979; Rutter, 1978). Unclear diagnostic criteria have hindered the interpretation of results in past research with this population. In order to ensure an accurate diagnosis of autism, each subject was diagnosed as autistic by two psychologists not associated with this study, based on criteria outlined by the National Association for Autistic Children (Ritvo & Freeman, 1978).

It has been hypothesized by numerous researchers (Lovaas et al., 1971; Schover & Newsom, 1976; Schreibman & Charlop, 1981; Varni et al., 1979; Wilhelm & Lovaas, 1976) that overselectivity is a prominent characteristic of the

majority of autistic children. It has been further suggested that as intelligence quotient decreases, overselectivity increases (Wilhelm & Lovaas, 1976). Schover and Newsom (1976) have noted that younger children evidence a higher degree of overselectivity than older children. For these reasons the subjects selected for the study were young (7-10) and had a concurrent diagnosis of mental retardation at the trainable level. In four cases mental retardation was determined by reference to recently administered standardized tests. In the remaining two cases in which no standardized intelligence tests were administered, mental retardation was confirmed through interviews with the subjects' classroom teacher and the attending psychologist, as well as previous diagnoses present in the subjects' psychological and educational files.

As the ability to accurately comprehend the demands of the instructional situation was of paramount importance, care was taken to ensure a receptive language level sufficient to understand the bowling task. Level of receptive language was ascertained through: a) discussions with the subject's classroom teacher, b) field observation of subjects prior to program implementation and c) correct response to pre-test instruction, that is, "Pick up the bowling ball and roll it towards the pin."

All subjects were enrolled in special education schools in Montreal but lived at home. The schools were designed either for the developmentally disabled or autistic learner. Physical education or recreation programs were provided two

or three times weekly on a half hour basis. None of the subjects showed any physiological, orthopedic or ocular impairments which could have effected performance. Though no subject took medication which effected performance, all medication was carefully noted.

3.1.1 Autistic Subjects Profile

Subject one: Age at time of testing: 10 years. Medication: none. This subject had attended a school for developmentally delayed and/or autistic students for seven years. He was observed to be functioning at the trainable mentally retarded level on the basis of interviews with classroom teachers and attending psychologists as well as psychological and educational files. Specific autistic like behaviours (Ritvo & Freeman, 1978) manifested by subject one included: a) a lack of interest in social interactions with peers; b) inappropriate manipulations of objects; c) extreme variability of mood; d) lack of age appropriate speech (delayed echolalia, reversal of pronouns, flat intonation); e) self-stimulation (rocking, hand flapping); f) self-injurious behaviour (slapping of the side of the head when distraught); g) aggression towards others (kicking, hitting); h) a lack of appropriate social play and toy play.

Subject two: Age at time of testing: 10 years. Medication: none. This subject had been attending a school for developmentally delayed and/or autistic students for five years. Specific autistic like characteristics included: a) a lack of appropriate social behaviour (e.g. avoidance of eye contact, inappropriate touching of staff and peers); b)

a lack of appropriate object use (mouthing of items); c) extreme variability of mood; d) inappropriate, out of context emotional behaviour (extreme tantrums); e) a lack of age appropriate speech (limited vocabulary); f) self-stimulation (rocking, finger contortions, biting of fingers, mouthing of objects); g) aggression (biting, pinching; h) a lack of appropriate social and toy play (e.g. ignoring of peers, nonfunctional manipulations of toys); i) self-injurious behaviour (biting of fingers).

Subject three: Age at time of testing: 10 years. Medication: Thioridazine: ten mg., three times daily. Subject three had been attending schools for developmentally delayed and/or autistic students for seven years. Results from Schopler's Psycho-educational Profile indicated functioning at a three to four year level. Interviews with classroom teachers corroborated these results. The presence of mental retardation was therefore indicated. Autistic characteristics included: a) a lack of appropriate social behaviour (solitary, highly idiosyncratic play, lack of interest in peers); b) inappropriate object use (mouthing, throwing of items, destruction, spinning of objects); c) inappropriate out of context emotional behaviour (laughing, giggling, tantrums); d) inappropriate fear; e) self-stimulation (mouthing of objects, hand flapping, toe-walking, rubbing of hands on own torso, jumping up and down, staring into space, putting fingers in front of his face); f) a lack of appropriate speech; g) tactile defensiveness; h) aggression towards others (hitting and kicking); i)

inappropriate social and toy play.

Subject four: Age at time of testing: 7 years. Medication: none. Subject four had been attending schools for developmentally delayed and/or autistic students for four years. Mental retardation was indicated from results of the Vulpē Assessment Battery and Stanford Binet intelligence test as well as from interviews with teachers and attending psychologists. Autistic characteristics included: a) a lack of appropriate social behaviour (solitary play, ignoring of peers, walking in immediate environment oblivious to people); b) inappropriate object use; c) inappropriate out of context emotional behaviour (screaming); d) self-stimulation (staring or gazing, glassy eyed look lasting more than three seconds, clicking noise, swaying motions); e) a lack of age appropriate speech (single word utterances); f) aggression towards others (biting, punching); g) inappropriate fear (e.g. fear of sitting on a particular chair); h) inappropriate social and toy play.

Subject five: Age at time of testing: 8 years. Medication: none. This subject had been attending a school for developmentally delayed and/or autistic students for four years. Results from the Leiter International Performance Scale and Schopler's Psycho-educational Profile indicated functioning at a mentally retarded level (M.A.: 3-4 years). Autistic features included: a) inappropriate social interactions with peers and adults (solitary behaviour); b) inappropriate use of objects (destruction of materials,

spinning of toys); c) inappropriate and out of context emotional behaviour (crying or laughing for no apparent reason; e) a lack of appropriate speech (single word utterances, echolalia); f) self-stimulation (hand clapping, hand wringing, hand flapping, dance like movements, playing with fingers in front of his face; g) aggression towards others (pinching); h) inappropriate social and toy play.

Subject six: Age at time of testing: 10 years. Medication: Mellaril, 5 mg., twice daily. Subject six had attended schools for developmentally delayed and/or autistic students for eight years. Results of the Psycho-educational Profile indicated functioning at a mentally retarded level (M.A.: 2.5). Autistic characteristics included: a) a lack of appropriate social behaviour with peers and adults (extreme withdrawal); b) a lack of appropriate object use; c) extreme variability in moods (frequent whining episodes); d) no expressive speech; e) self-stimulation (preoccupation with fluids, rubbing of ear, thumb sucking, hand flapping, twirling of body); f) aggression towards others (punching, kicking, scratching when frustrated); g) a lack of appropriate social and toy play.

3.2 Models of Instruction

There were two treatment conditions in this investigation: a) an extra-stimulus model of bowling instruction and b) a within-stimulus model of bowling instruction. Essentially, the extra-stimulus model involved a significant amount of physical, visual and verbal

prompting of the subjects during instruction in addition to the task analysis of bowling, as outlined in Appendix A. The within-stimulus prompt model as well utilized the task analysis of bowling but differed substantially in that minimal physical, visual and verbal prompting was employed.

3.2.1 The Extra-Stimulus Model of Instruction

The extra-stimulus method of instruction was modeled after the PREP Play program developed by Watkinson and Wall (1979). This instructional approach utilized three major intervention techniques: a) a task analysis of the skill to be taught; b) a discrete trial format (Koegel et al., 1980) and c) a clearly delineated physical, visual and verbal prompt system, referred to as the response prompting continuum. Task analysis has been defined in many ways and depends frequently upon the orientation of the particular author (Reid, 1976). For this investigation, task analysis was defined as the sub-dividing of a skill into smaller components which are logically sequenced from easy to more difficult. The task analysis of the target bowling skill is outlined in Appendix A. The task analysis provides a precise description of behaviours required at a particular step (subtask) in order to progress to a more advanced step.

In developing the task analysis of bowling, the following five steps were utilized:

1) A review of relevant research and program material, familiarization with sequences of normal child development, observation of skilled performers and consultation with subject matter experts with regard to

the task analyzed. Subject matter experts refers to individuals who a) had had extensive experience in the sport of bowling and b) had worked with mentally handicapped learners.

2) The terminal performance objective for each step was written in behavioural terms, clearly specifying the desired performance, the conditions under which it must be performed and the criterion of adequate performance (Mager, 1975).

3) Sequencing of the subtasks (task analytic steps).

4) Elimination of unnecessary or redundant component skills.

5) Addition of further subtasks.

Steps two, three, four and five were determined with the input of 3 experts in the area of autism and motor performance. The sequencing and addition or deletion of various subtasks was carried out through the observation of autistic children moving through the task analysis during a pilot study. For clarity, the task analysis (Appendix A) has been presented in tabular form.

A second distinctive feature of the extra-stimulus model of instruction is the utilization of a discrete trial format of instruction (Koegel et al., 1980). This format provides control and efficiency of learning by carefully ordering the basic elements of the learning process. These elements include: a) the presentation of instruction, b) an optional prompt, c) the child's response, d) the consequences administered by the teacher (reinforcement or

punishment) and e) a distinct inter-trial interval.

The instruction, presented as either a command or a question, must be salient, easily discriminable, appropriate to the task and presented only when the subject is attending. In light of the autistic child's difficulty in selecting appropriate cues (Koegel & Rincover, 1977; Lovaas et al., 1979; Schreibman, 1975) and the interference of self-stimulatory behaviour on skill acquisition (Koegel et al., 1974), attention to the task before instruction was regarded as imperative (Koegel et al., 1974; Wing, 1976).

The prompt(s), presented subsequent to or concurrent with the instruction is employed to ensure correct responding on the part of the learner. Prompts may also be presented concurrent with the consequences of a particular response in order to give specific information feedback concerning the individual's performance. This presentation of prompts was a major component of the extra-stimulus model of instruction and will be detailed extensively in a following section of the treatment.

Consequences are considered important in the acquisition of specific skills as they determine the probability of a particular response occurring again (Kazdin, 1975; Koegel et al., 1980). Because the motivational characteristics of autistic children are not well understood, it is not safe to assume that traditional reinforcers or punishers will be effective. Thus it appears that an initial task in teaching these children is to clearly identify those consequences that are functional for

a particular individual. Consequences must be: a) contingent upon the specified behaviour, b) applied consistantly, c) applied unambiguously and d) be easily discriminable in order to achieve optimal results in the teaching of a specific skill (Koegel et al., 1980). How reinforcers were utilized in this investigation is outlined in the subsequent section dealing with the control of extraneous variables (section 3.3).

The final component of the discrete trial format is the intertrial interval, or time period between the consequences of one trial and the instruction for the next trial. Though a universal optimal length for the intertrial interval has not been identified, it appears one does exist for each individual and is dependent upon the child, the behaviour being taught and whether the behaviour is in the process of being acquired or being maintained (Koegel et al., 1982; Koegel et al., 1980). In this investigation the intertrial interval was kept constant at 20 seconds for all subjects. This interval is consistent with that employed in studies of the overselectivity phenomena.

The discrete trial format has been observed to be effective in teaching autistic children a wide range of behaviours in a number of different settings (Koegel et al., 1982; Koegel et al., 1980). It is viewed as particularly applicable to a one to one teaching situation, which occurred in this investigation.

The third major intervention technique of the extra-stimulus prompt model is referred to as "the response

prompting continuum" (Watkinson & Wall, 1979). This continuum provides a systematic addition of prompts to the environment in order to enhance learning. Prompts have been defined as stimuli that are added to the learning environment to ensure correct responding (Koegel & Rincover, 1977). For the purpose of this study, this type of prompting will be referred to as extra-stimulus prompting.

These extra-stimulus prompts, as previously mentioned are employed at two points within a discrete trial: a) during the pre-response phase, while instruction is being given and b) during the post-response phase, as consequences are being administered. The pre-response prompts are hypothesized to provide maximal information regarding the correct performance of the task at any given level of the task analysis, and thus increase the likelihood of correct responding on the part of the learner (Watkinson & Wall, 1977). Extra-stimulus prompting during the post-response phase is believed to provide specific information feedback concerning an individual's performance at any given level of the task analysis. Extra-stimulus prompting may consist of physical, visual or verbal interaction. More than one prompt may be given concurrently. A general outline of the three levels of prompting follows(from Watkinson & Wall, 1979).

Physical

Physical prompts include those behaviours in which the teacher directly contacts the child's body or body parts. They may be preceded by a visual prompt and should usually

be paired with a verbal cue.

Visual

Visual prompts are non-contact teaching behaviours that focus the child's attention on key features of the skill under instruction. They are generally accompanied by verbal cues.

Verbal

Verbal prompts are any sounds, words or sentences that the teacher uses to obtain a skill response.

An important aspect of the response prompting continuum is the systematic decrease in the amount of assistance given the child by the teacher during a discrete trial and over trials. This assistance, in the form of extra-stimulus prompting in the pre and post-response phases, is gradually decreased to the point where the individual is performing independently. As the skill level of the student increases, there is a decrease in the amount of teacher intervention, via extra-stimulus prompts. This is illustrated in Figure 1 (Watkinson & Wall, 1979, p. 33).

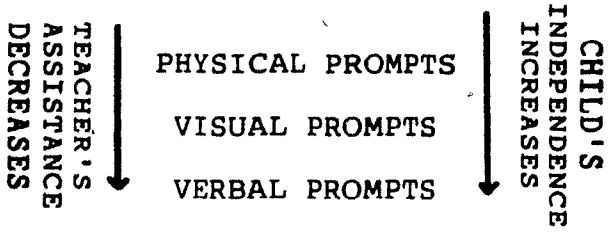

Figure 1. Prompt Categories

The response prompting continuum, as utilized in this investigation, is composed of the three prompting categories outlined above, each category being further subdivided into

three levels. This hierarchy of extra-stimulus prompts is shown in Figure 2 (Watkinson & Wall, 1979, p. 35).

Physical prompts

- Complete Manipulation (CM)
- Manipulative Prompting (MP)
- Minimal Guidance (MG)

Visual Prompts

- Complete Skill Demonstration (D)
- Partial Skill Demonstration (PD)
- Gestural Prompting (G)

Verbal Prompts

- Skill Cue (SC)
- Skill Mand (SM)
- Action Cue (AC)

Figure 2. Hierarchy of Extra-Stimulus Prompts

Examples of categories and levels within the response prompting continuum are found in Appendix B.

In order for the learner to move towards skilled performance on the task, teacher intervention is faded. An example of fading in the physical prompt category is as follows: The instructor moves from swinging the subject's arm completely through the desired motion (complete manipulation) to positioning and swinging the child's arm only during the beginning of the action, the child completing the motion independently (manipulative prompting). The next step in fading within this prompting category would be to tap the child's arm in order to

encourage him to begin the appropriate arm action (minimal guidance). Generally stated, successive prompts within a given category provide a learner with less information concerning skillful performance of the task, thereby encouraging greater independent behaviour.

When a child is functioning consistently at the highest level within a particular category, he/she then moves up to the next extra-stimulus prompt category. In fading prompts from one category to another the instructor delays the application of the prompt being faded, attempting to elicit the response at the next highest level. If a child does not respond appropriately at the higher prompt category, the teacher will reinstate the lower level prompt. To prepare the learner for performance with verbal prompts alone, these are presented in conjunction with either the physical or visual prompt. Using the previous example, the instructor would say to the student, "Swing your arm smoothly" as the learner is physically moved through the desired motion.

In addition to delaying assistance at a lower prompt level, fading is accomplished by decreasing the instructor's proximity to the learner. The instructor's proximity to the learner is the greatest when employing physical prompts, but is decreased as the learner moves through the response prompting continuum towards independent performance.

In summary, movement toward independent skilled performance is accomplished in three ways with the response prompting continuum: a) the instructor systematically reduces assistance by moving through prompting levels that

offer progressively less physical, visual or verbal information; b) the instructor gradually decreases proximity to the learner, thereby increasing independent performance and c) assistance at a given extra-stimulus prompt level is delayed, giving the learner an opportunity to respond with less intervention, therefore more independently.

Briefly summarizing the extra stimulus model of bowling instruction, three main intervention techniques were employed: a) task analysis of the target skill; b) use of a discrete trial format of individualized instruction and c) use of the response prompting continuum. This treatment condition is a modification of the PREP Play Program (Watkinson and Wall, 1979). The task analysis and extra-stimulus prompts utilized have been outlined in appendices A & B. Definitions and illustrations of the different extra-stimulus prompts utilized in the bowling task have been presented in Appendix C.

3.2.2 The Within-Stimulus Model of Instruction

The second treatment employed in this study was the within-stimulus model of bowling instruction. This model emanates from the growing body of literature on stimulus overselectivity, which suggest that autistic learners demonstrate an extremely narrow focus of attention when presented with a stimulus display (Koegel & Rincover, 1977; Lovaas et al., 1971; Schreibman, 1975). It has been argued that this inability to focus on any more than an extremely small part of a given environmental display is responsible for many of the severe behavioural deficits manifested by

this population (Koegel & Rincover, 1977; Rincover & Koegel, 1975; Schreibman & Lovaas, 1973; Varni et al., 1979). Overselective attention is thought to have considerable implications in the use of prompts in instructional programming for autistic students (Koegel & Rincover, 1977; Lovaas et al., 1979; Rincover, 1978; Schreibman, 1975). The stimulus overselectivity hypothesis suggests that the addition of "extra stimuli" in the form of prompts to a learning situation will result in impaired learning, as the autistic child must attend to multiple stimuli - the training stimulus (in this investigation, the bowling task) and the prompt stimuli (e.g. physical manipulations, demonstrations, verbal cues, etc.). In order for learning to take place, the student must be able to respond to the training stimulus independently, thus necessitating the gradual fading of the prompts. It has been demonstrated (Koegel & Rincover, 1977; Schreibman, 1975) that autistic children have difficulty shifting their attention from the prompt stimulus to the training stimulus (e.g. bowling). Thus the fading of prompts is observed to be a major problem for autistic learners.

One feature of the within-stimulus model of bowling instruction is the absence of extra-stimulus prompts in teaching sessions. It has been suggested (Lovaas et al., 1979; Rincover, 1978; Schreibman, 1975; Schreibman & Charlop, 1981) that a model of prompting not requiring attention to simultaneous multiple cues would be effective in teaching autistic learners. Thus in the within-stimulus

model, the prompts are actually exaggerated features of the training stimulus. The exaggerated features of the bowling task involve a) barriers guiding the path of the ball and b) orange pathways leading to the pins at some task analytic levels. As the child's skill level increases, the features of the bowling task become less exaggerated until, at the highest level of functioning at a given distance, there is no exaggeration. The within-stimulus prompts (exaggerations of task components) are gradually faded when the learner has demonstrated criterion level responding at a particular task analytic level. For example, if the learner has reached criterion while bowling from five feet with the aid of a 14 inch orange pathway with the barriers on either side, the next step in the learning progression would involve lessening the aid (within-stimulus prompt) by removing the barriers. In this system of instruction, the learner does not have to respond to multiple cues, as the prompts are not extraneous to the training stimulus, but rather part of it.

The within-stimulus prompts were built into the task analysis of the bowling skill (Appendix A), and were utilized in both the extra-stimulus and the within-stimulus models of instruction. As in the extra-stimulus model of instruction, the within-stimulus model employed the discrete trial format, the difference being the absence of extra-stimulus prompts in the pre-response and post-response phases. Rather, all prompts were manipulations of the task itself, as outlined in the task analysis.

To summarize, the within-stimulus model of bowling

instruction was primarily characterized by the absence of extra-stimulus prompting of a physical, visual or verbal nature. Alternatively, the task itself was systematically changed within the framework of the task analysis to provide progressively fewer and less obvious within-stimulus prompts at a particular distance.

The similarities between the two instructional approaches were: a) the inclusion of a task analysis of the subject matter employing within-stimulus prompts and b) the utilization of the discrete trial format. The extra-stimulus prompt and within-stimulus prompt models differed substantially with regard to the utilization of extra stimuli to enhance learning. The former program used extra stimuli extensively, through the response prompting continuum. The within-stimulus model did not use extra-stimulus prompts, instead relying on manipulation of the bowling task.

3.3 Control of Extraneous Variables

Motivational and behavioral difficulties demonstrated by autistic learners interfere significantly with their learning. In the following section, specific areas of concern will be outlined along with the measures employed to minimize their effect.

3.3.1 Adverse Behavioral Reactions to Novel Environments

It has been empirically and clinically observed that when autistic learners are confronted with novel environments (physical location, instructions, task demands)

they frequently react adversely, manifesting inappropriate behaviors and inattention to the target task (Ritvo & Freeman, 1978; Wing, 1976). It has been further noted that changes within a routine (e.g. stimuli presented, instructors present, layout of the teaching environment) tend to disturb the learner. To minimize these potential problems, the following steps were taken:

1) The subjects were familiarized with the instructor through three half-hour visits. Two of these visits took place in the subject's classroom and one in a gymnasium setting. The visits happened within a two week time period prior to testing, and were on separate days.

2) In every instance, testing occurred in an environment familiar to the learner. This environment remained the same across trials for a particular subject.

3) All instruction was routinized and kept predictable. The specific teaching format is outlined in the procedural section of this chapter.

3.3.2 Lack of Motivation

A severe problem encountered by individuals teaching autistic children is the learner's lack of interest in, or attention to, the task. This is manifested by lack of eye contact, off-task behaviour and infrequent task attempts (Dunlap & Koegel, 1980; Egel, 1980; Koegel & Williams, 1980; Strain et al., 1979). In order to maximize attention to and interest in the task the following procedures were employed:

1) Structuring of the bowling task in both conditions so that incidents of correct responding were increased thereby maximizing opportunities for reinforcement. An example of this was the use of barriers and/or lanes to guide the learner at many task analytic levels.

2) Organization of the environment to make performance of the task the most attractive option available. This was accomplished in two ways: a) by making the bowling task as reinforcing as possible (by noting what is reinforcing to the subjects in the pre-instruction observation period and through discussion with significant individuals in the child's environment) and b) through reducing the amount of alternative stimulation available in the environment. Alternative stimulation was reduced by a) removing or covering all other manipulable items; b) having the principal experimenter, recorder and subject the only individuals present and c) by keeping the environment constant from session to session.

3) Attentional cues were presented verbally in a clear and concise manner. If this was not sufficient to elicit eye contact and attention to the task, the attentional cues were repeated, and the subject's shoulders held firmly by the investigator. If there was a specific technique to elicit attention that was effective for a given individual (determined through pre-program observation and discussion), it was employed. An example of this would be a clap of the

hands while stating the subject's name. Instruction took place only when subjects were quiet, demonstrating eye contact and attending to the task.

3.3.3 Self-Stimulatory Behaviour

Self-stimulatory behaviours are considered to be defining characteristics of autistic children (Dunlap et al., 1979; Ritvo & Freeman, 1978) and to interfere in their education. It has been suggested (Koegel et al., 1974; Lovaas, 1977; Wing, 1976) that when an autistic child is engaging in self-stimulatory behaviour he/she may not be able to attend to relevant stimuli. In order to increase the likelihood of on-task behaviour, self-stimulation was supressed. This was accomplished by reinforcing responses incompatible with self-stimulation (Mulhern and Baumeister, 1969) (e.g. if a subject self-stimulated by gazing at the ceiling, he was reinforced if he was looking in a direction other than the ceiling) and by telling the subject to stop self-stimulating and to attend to the task.

3.4 Design

The experimenter administered both the extra-stimulus and within-stimulus models of bowling instruction. There were three subjects in each condition. Initial bowling ability level was ascertained by having subjects independently attempt selected steps within the task analysis. These steps are outlined in Appendix D. Where the subject independently performed to criterion was the point at which instruction began. As all subjects were

unable to perform to criteria at any of these points, baseline functioning was monitored at the first step of the task analysis.

Baseline performance was established through two probe trials (Horner & Baer, 1978; Wassor & Walkinson, 1981). Two probe trials were utilized as due to the nature of the bowling task, improvement of performance may occur during baseline due to practice. A probe trial consisted of each subject independently bowling five consecutive times. As no subjects reached criteria under baseline conditions, the results of the pre-test were confirmed. That is, all subjects were indeed performing at level one of the task analysis.

The dependent variable in this investigation was the task analytic level achieved by each subject. A group design was utilized, three subjects being in each of the two conditions.

3.5 Procedures

This investigation consisted of two phases: the first was an observational period during which the investigator observed all subjects in two separate environments; the second part of the study consisted of the administration of the two experimental conditions, the extra-stimulus and within-stimulus models of bowling instruction.

3.5.1 Observational Period

The observation of subjects took place over at least three half-hour periods, two observations occurring in the

student's classroom, and one in the gymnasium. These observations were on separate days within a two week period prior to the commencement of the experimental program. Subject observation occurred for the following reasons:

1) Familiarization with subject's behavior patterns (e.g. self-stimulation, aggressive behavior, on-task behavior) across environments.

2) Observation of specific idiosyncratic behaviors that may have effected the student's suitability as a subject.

3) Observation of specific techniques by which attention is elicited.

4) Informal observation of subject's gross motor abilities in order to note any obvious orthopedic impairments. 5) Observation of the subject's level of receptive language.

6) Familiarization of the subject with the researcher.

During each half hour observation period, twenty minutes were utilized for observation, while ten minutes were spent in interaction with the subject. During the twenty minute observation period, anecdotal notes were taken regarding the aforementioned six areas of concern.

3.5.2 Administration of Experimental Conditions

For a subject to be included in the investigation, consent from the principal caregiver and the educational institution was obtained. The administration of extra-stimulus and within-stimulus bowling instruction took place in environments familiar to the subjects. In order to

ensure that the environments were as similar as possible, the following variables were standardized:

1) Room Dimensions: Instruction took place a) in a partitioned gymnasium measuring 19 feet by 32 feet, or b) a classroom measuring 20.5 feet by 27.5 feet.

2) Lighting: Incandescent lighting was utilized.

3) Distracting Items: The bowling apparatii were the only manipulative items in the instructional environment.

4) Presence of Others: The instructor and one full-time recorder/observer were the only individuals present other than the subjects. This was consistent across subjects and across environments.

In order to ensure that there was a significant difference in the amount of extra-stimulus prompting between the two programs and that with the exception of extra-stimulus prompting the subjects in each condition were treated in the same manner, a trained observer monitored the instructor's behavior during all instruction. Monitoring of the following behaviours took place:

1) Extra-stimulus prompts given subsequent to or concurrent with instruction.

2) Reinforcement given for correct responding.

3) Punishment given for inappropriate behaviour.

4) Extra-stimulus prompts given upon completion of the task (specific performance feedback).

The objectivity of the observer was checked with the help of a second observer. Both analyzed ten video taped

trials of each of four subjects (two in each condition). Upon comparing the results of the second observer with those of the full-time observer a measure of inter-rater agreement was obtained. The training of observers will be outlined in a subsequent section of this chapter.

It should be noted that regarding punishment, verbal reprimands and the firm retrieval of subjects exhibiting off-task behaviours were the only procedures utilized. Each instance of any of the above behaviours were noted on a recording sheet (Appendix E). Within each category of behaviours, only a numerical record was kept. In other words the precise type of prompt, reinforcement or punishment was not noted. Though specific methods of eliciting attending behaviour, and or presenting consequences (reinforcement and punishment) differed between subjects, care was exercised to ensure that for correct and for inappropriate behaviors, subjects were treated in a like manner.

Each subject received instruction in a one-to-one setting, during school time. Generally, thirty, bowling trials occurred during each instructional session. Sessions usually lasted between 20 and 25 minutes. If, at any point, the instructor judged the behaviour of a subject to be incompatible with instruction, the session was terminated. A record of the number of trials performed in each session was kept by the observer. A maximum of five instructional sessions took place weekly.

An outline of a teaching session follows and is

applicable to subjects in both experimental conditions:

1. The instructor met the subject at his classroom and accompanied him to the instructional site.

2. The instructor brought the subject to the starting line of the bowling task (designated by a yellow strip 2 feet by 6 inches).

3. The subject's attention was secured by the procedures outlined in section 3.3.2 (3).

4. The following instruction was presented to subjects: "Name", "I want you to roll the ball and hit the pins."

5. The subject performed the bowling task at the appropriate task analysis level.

6. The subject received individualized reinforcement for his effort.

In the extra-stimulus prompt condition, there were physical, visual or verbal prompts given, a) concurrent with or subsequent to performance, and b) concurrent with or subsequent to reinforcement. Prompts occurred independently, or in combination (e.g. the instructor tapping the child's knee - physical prompt, while saying "bend your knee more" - verbal prompt). After the completion of one trial and before the commencement of another, there was an 'intertrial interval' of approximately 20 seconds. This was consistent across subjects. In order for subjects in both groups to move from a less skilled to a more skilled step of the task analysis, criterion performance (as outlined in Appendix A), had to be

independently reached.

3.6 Training of Observers

As previously mentioned, observers were trained to record teacher behaviour. Training occurred in the following manner: two hours of inservice instruction took place during which the experimental programs (extra and within-stimulus prompt) were presented. Explanations and examples, both verbal and written of the following were presented: a) response prompting continuum, b) reinforcement and c) punishment.

In order to ensure the above mentioned concepts were understood clearly by the observers, two methods of evaluation were employed: a) observers wrote a test evaluating their understanding of the response prompting continuum, a score of 100% being required to participate in the study (see Appendix F) and b) observers watched a 20 minute videotape in which an autistic student received bowling instruction. Observers were required to identify specific incidents of a) extra-stimulus prompting, b) reinforcement and c) punishment.

3.7 Pilot Study

A pilot study involving six autistic children, three receiving instruction in each experimental condition, took place. The reasons for undertaking the pilot study included: a) evaluation and ammendment of administrative procedures, b) evaluation of the efficacy of the bowling

task analysis and response prompting continuum and c) changes in equipment used.

As a function of the pilot study, a number of specific changes in procedure and equipment were made:

1. Initially the classroom teacher was to take the subjects to the test site. This was altered so that the experimenter met the subject at his classroom and accompanied him to the instructional site.

2. The pre-test given initially to establish the entry point on the task analysis for the subjects involved trials at many different task analytic levels. As subjects in the pilot study appeared to be getting much practice, the number of pre-test entry points was reduced to three.

3. The orignal task analysis contained 39 steps. Upon observation during the pilot study 25 steps were deleted.

4. The optimal length of an instructional session was established to be 25 minutes.

5. Initially, regulation 'duck pins' and a 3-1/2 pound bowling ball were utilized. It was noted that generally the subjects did not have sufficient hand strength to hold and roll the ball. Therefore a number of different balls and pins were tried. Based on the pilot study, a rubberized softball and 12 inch plastic

pins (outlined in Appendix G) were utilized for the present study.

3.8 Statistical Treatment

The task analytic level obtained by each subject was the main dependent measure in this investigation. Visual analysis of graphs was employed in order to determine whether the instructional models were effective in bringing about improved performance on the part of the subject. To compare the number of prompts, reinforcers, punishers and task analytic level achieved in the extra-stimulus prompt model and the within-stimulus prompt model, the Mann-Whitley U test was used.

CHAPTER IV

RESULTS

The purpose of this investigation was to study the relative efficacy of a within-stimulus prompt model and an extra-stimulus prompt model of teaching a bowling task to young autistic children as determined by the task analytic level achieved. The present chapter is divided into the following sections: (4.1) Inter-rater agreement, (4.2) Prompts provided to the within-stimulus and extra-stimulus prompt groups, (4.3) Reinforcement provided to the within-stimulus and extra-stimulus prompt groups, (4.4) Punishment provided to the within-stimulus and extra-stimulus prompt groups, (4.5) Task analytic levels achieved by the within-stimulus and extra-stimulus prompt subjects.

4.1 Inter-Rater Agreement

4.1.1 Training of Observers

The training of observers was carried out through observation of videotaped teaching sequences and the study of relevant materials such as the definition of particular prompts, reinforcers and punishers. Having viewed the instructional videotape and studied the materials, the two observers wrote a test requiring identification of specific types of extra-stimulus prompts. One hundred percent correct responding was required in order to take part in the investigation. Both observers scored one hundred percent on

the written test. The test is included in Appendix G.

4.1.2 Inter-Rater Agreement

An inter-rater agreement score (ratio of Agreed upon observations/Total number of observations x 100) was established in order to determine the fulltime observer's skill at recording extra-stimulus prompts, reinforcements and punishments given. A second observer joined the full time observer in viewing 40 videotyped instructional sequences of four subjects. Each subject was viewed for ten teaching episodes. Two of the subjects were in the extra-stimulus prompt group while two were in the within-stimulus prompt group. Agreement was computed for incidences of extra-stimulus prompting, reinforcement and punishment. Of 156 individual judgments across subjects there was agreement 131 times, or 84 percent of the time. There was an average of nine judgments to be made during each teaching episode. A teaching episode typically lasted approximately thirty seconds. It was concluded therefore that the fulltime observer was accurate in identifying incidents of extra-stimulus prompting, reinforcement and punishment.

4.2 Prompts Provided to the Within-stimulus and Extra-stimulus Prompt Groups

The number of extra-stimulus prompts given to each group was the factor purported to distinguish between the two instructional approaches. Table 1 includes the number of extra-stimulus prompts provided to each subject in each

of the groups across all trials. The Mann-Whitney U test (Seigel, 1956; pgs. 116-121) was significant ($p < .05$) thus indicating that the extra-stimulus prompt group indeed received significantly more extra-stimulus prompts than did the within-stimulus prompt group during the instructional process.

TABLE 1

Number of Prompts Provided to the Within-Stimulus and Extra-Stimulus Prompt Groups

Prompting Condition	Subject	Number of Prompts	U
Within-Stimulus	1	39	
	2	191	
	3	83	
	Total	313	0*[a]
Extra-Stimulus	4	1598	
	5	2368	
	6	1635	
	Total	5596	

Note: All subjects received 332 trials

[a]The extra-stimulus prompt group were given significantly more extra-stimulus prompts.

*$p < .05$

4.3 Reinforcement Provided to the Within-Stimulus and Extra-Stimulus Prompt Groups

The number of reinforcements given each subject are indicated in Table 2. In order to establish if significantly more reinforcement had been given to one group or the other, a Mann-Whitney U test (Seigel, 1956; pgs. 116-121) was performed on the data. The results were non-significant, thereby indicating a relatively even distribution of reinforcement between the groups.

TABLE 2

Reinforcements Provided to the Within-Stimulus and Extra-Stimulus Prompt Groups

Prompting Condition	Subject	Number of Reinforcements	U
Within-Stimulus	1	593	
	2	1200	
	3	736	
	Total	2537	Non-significant
Extra-Stimulus	4	1102	
	5	998	
	6	995	
	Total	3085	

Note: All subjects received 332 trials.

4.4 Punishment Provided to the Within-Stimulus and Extra-Stimulus Prompt Group

Table 3 includes the number of punishments given each subject. A Mann-Whitney U test (Seigel, 1956; pgs. 116-121) was conducted to determine whether there was significantly more punishment given to one group than the other. The results of the test indicated that the amount of punishment given to each group did not differ significantly.

TABLE 3

Punishment Given in the Within-Stimulus and Extra-Stimulus Prompt Groups

Prompting Condition	Subject	Number of Punishments	U
Within-Stimulus	1	11	Non-significant
	2	41	
	3	23	
	Total	75	
Extra-Stimulus	4	9	
	5	8	
	6	97	
	Total	114	

Note: All subjects received 332 trials.

4.5 Task Analytic Levels Achieved by the Within-Stimulus and Extra-Stimulus Prompt Groups

The dependent variable in this investigation was the task analytic level reached by the subjects in the two experimental conditions. The higher the level achieved the better the performance. The individual results are shown in Table 4 and are graphed in Figure 3. In order to determine whether or not there was a difference between the groups, the Mann-Whitney U test (Seigel, 1956; pgs. 116-121) was again utilized. The test indicated that the extra-stimulus prompt group scored significantly better ($p < .05$) than did the within-stimulus group with respect to task analytic level achieved.

TABLE 4

Task Analytic Levels Achieved by the Within-Stimulus and Extra-Stimulus Prompt Groups

Prompting Condition	Subject	Task Analytic	U
Within-Stimulus	1	5	
	2	1	
	3	5	
	Total	11	0*[a]
Extra-Stimulus	1	11	
	2	11	
	3	8	
	Total	30	

Note: All subjects received 332 trials.

[a]The extra-stimulus prompt group group did significantly better with respect to task analytic level achieved.

*$p < .05$

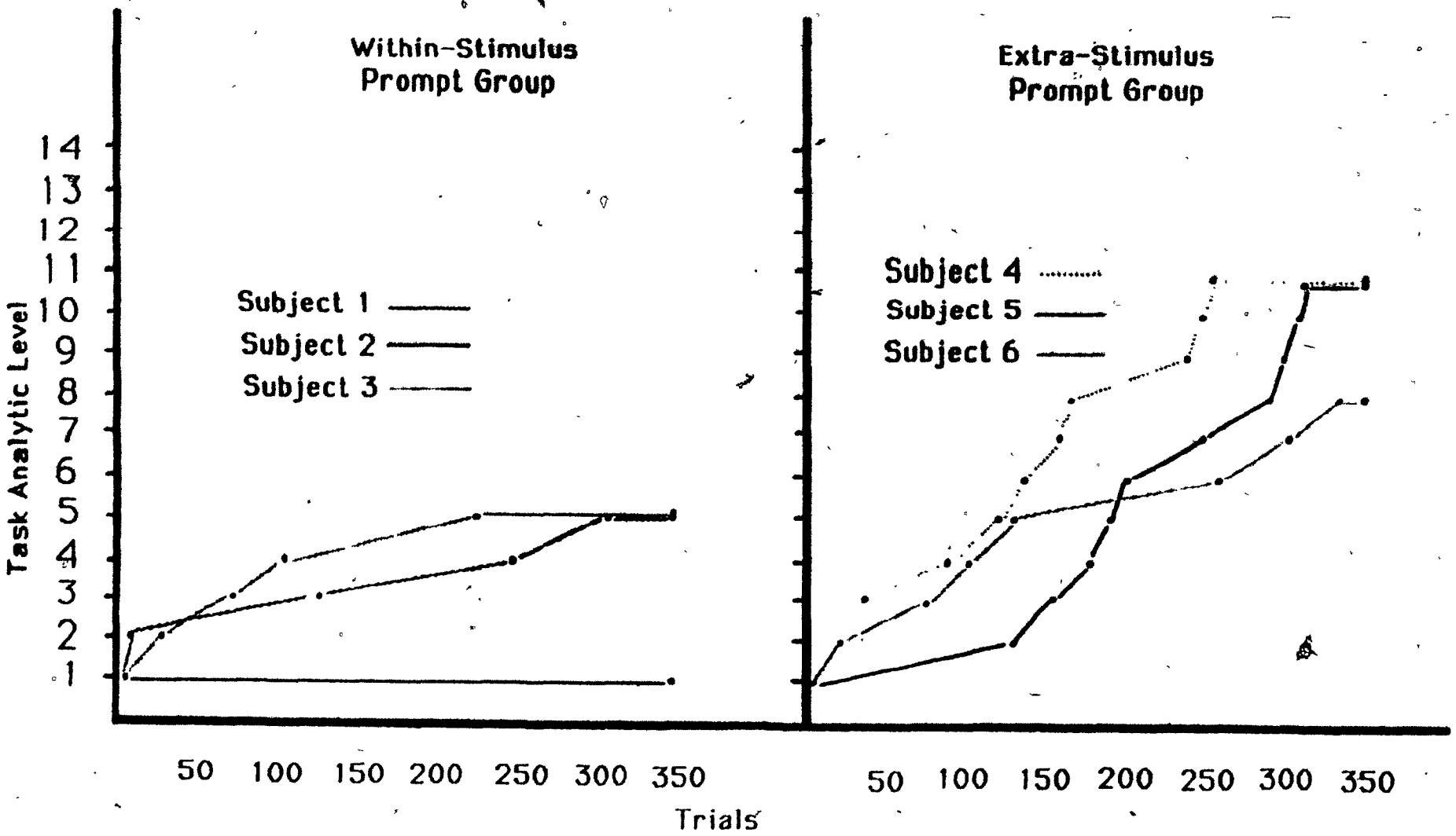

Figure 3 Task Analytic Level Achieved by the Within-Stimulus and Extra-Stimulus Prompt Groups Over 332 Trials

CHAPTER V

DISCUSSION

The purpose of this investigation was to study the relative efficacy of a within-stimulus prompt model and an extra-stimulus prompt model designed to teach autistic children a bowling task. This chapter is divided into the following sections: (5.1) Comparison of bowling skill level between the within-stimulus prompt and extra-stimulus prompt groups, (5.2) Nature of the task, (5.3) Effects of increased exposure to instruction, (5.4) Physiological aspects of the task.

5.1 Comparison of Bowling Skill Level Between the Within-Stimulus and Extra-Stimulus Prompt Groups

The experimental hypothesis stated that given the same number of trials, subjects who received the within-stimulus model of instruction would evidence greater skill improvement on a bowling task, as demonstrated by a higher task analytic level achieved, than would subjects who received the extra-stimulus model of instruction. The results indicated that the extra-stimulus prompt group performed significantly better than did the within-stimulus prompt group ($p < .05$). Therefore the hypothesis was rejected. The extra-stimulus group received significantly more extra-stimulus prompts ($p < .05$) while the groups did not differ with respect to reinforcements and punishments. As the groups were treated in a like manner in all respects

except for the number of extra-stimulus prompts, the significant difference observed in task analytic level achieved was attributed to the method of prompting. There are a number of factors that aid in the interpretation of the results. These will be addressed in the following sections.

5.2 Nature of the Task

There has been an extensive body of literature established regarding stimulus overselectivity and its detrimental effect on the use of prompts with autistic learners. This fact not withstanding, work in this area has involved discrimination learning with the exception of one study to the author's knowledge, that being Nelson et al. (1980). This investigation contrasted the use of colour coded laces (defined as "extra prompts") with a no extra prompt condition. The authors found that subjects who utilized colour coded laces had significant difficulty transferring their skills to a situation in which colour coding was not employed. There have been no studies, to the author's knowledge, that have examined the use of within-stimulus and extra-stimulus prompts in the learning of a gross motor skill. It is possible that the present findings may be explained by certain characteristics of the motor task including a) use of the learners' preferred modality while prompting, b) use of haptic cues, c) physical movement of subjects through the task, d) proximity of the extra-stimulus prompts to the training stimulus and e)

potential reinforcing properties of the prompts or task.

In a 1980 investigation Kolko et al. attempted to establish whether the sensory modality that is overselected could be predicted in advance from a measure of sensory preference. Their investigation emanated from reports (Rincover, Cook, Peoples & Packard, 1979) that a dominant or a preferred modality may exist for autistic individuals on an individual basis. In their study Kolko et al. established the sensory modality preferred by the autistic subjects, given a choice between an auditory (music) and visual (slides) stimulus. Upon testing for stimulus-overselectivity it was found that the autistic learners attended to only one aspect of a compound auditory-visual stimulus. In all cases the sensory modality attended to was that chosen during the preference test. In the present study cues involving the auditory (listening to instructions), visual (observing demonstrations) and haptic (the learner being moved through the required movement) senses were employed regularly in the extra-stimulus prompt condition. Thus the opportunity for a subject to be prompted in his preferred modality was generally present.

In addition, research by Frith and Hermelin (1969) and Prior and Chen (1975) has indicated that autistic children seem to be aided particularly by haptic cues. Using discrimination learning tasks, Prior and Chen (1975) found the performance of autistic subjects to be superior to that of non-autistic controls when tactile feedback was provided. The bowling task in the present study required gross

movements and thus the physical cues employed in the extra-stimulus prompt condition offered many opportunities to obtain tactile feedback both in the pre- and post-response phases of instruction.

In a 1978 study, Rincover theorized that proximity of the extra-stimulus prompt to the training stimulus might effect the use of prompts. In teaching a discrimination task children were first pretrained to respond to an exaggerated feature of the "correct" stimulus which was then utilized as a prompt. In this experiment the exaggerated feature was the bar on the top of the letter J. Once the subject responded to this stimulus, the pre-trained feature was presented along with the target discriminations (the word JAR correct; the word SON incorrect). The size of the pre-trained cue was then systematically reduced until there was no exaggeration. In this experiment the authors attempted to establish whether this distinctive feature (the bar of the letter J) would be more effective as a prompt if it was spacially separate from the 'correct' stimulus (i.e. J̄AR). The findings supported their hypothesis that more discriminations would be learned when the prompt was presented "in its normal position", not spacially separate from the 'correct' stimulus (i.e. J̄AR vs. J̄AR). Thus assuming that in the present study the learner demonstrating a correct motor pattern was the experimental task, then the prompt of moving the learner through the task was, in fact, superimposed onto the task. This situation may parallel Rincover's notion of prompts being effective if they are

physically close to the task. Thus since the present task allowed the subjects to be prompted in their preferred modality, included haptic feedback and involved some prompts that were superimposed upon the task, the extra-stimulus prompts were not detrimental to learning, as predicted.

Despite the negative influence of the overselectivity phenomena on prompting, Wing (1976) and Schreibman (1975) have suggested anecdotally that this may not be the case with respect to physical prompts. Wing (1976) theorized that austistic individuals may learn gross motor skills by being moved through the activity, thus circumventing the problem of imitation. As alluded to, the physical prompts used in the present study generally involved movement of the subject through the task in differing degrees.

In Schreibman's (1975) original work on within and extra-stimulus prompts she noted that pre-training of subjects to respond to a buzzer by pressing a bar was accomplished by the experimenter putting the subjects hand on the bar, in effect, a physical extra-stimulus prompt. This procedure was effective in teaching the subjects to respond independently to the buzzer. In discussing why an extra-stimulus prompt was effective at an early stage of training Schreibman, speculated that a) the procedure incorporated the child's response with the prompt (that is the experimenter moved the child's hand to the bar) and b) that the extra-within stimulus distinction was not critical when teaching a motor response. Though her experiment was not designed to test these hypotheses, her speculative

comments as well as the importance of physically moving a child through a motor skill (Wing, 1976), of keeping the prompt close to the task (Rincover, 1978), of utilizing the haptic modality (Prior & Chen, 1976) and of offering a range of prompts thus allowing a subject to be prompted in his preferred modality support the findings of the present investigation. Based on the physical nature of both the task and part of the response prompting continuum (the physical prompts) one might argue that this type of prompt was particularly effective, while the other extra-stimulus prompts employed (various demonstrations and verbal cues as outlined in Appendix C) were simply not attended to.

In addition, there is the possibility that the nature of the physical prompts (i.e. having one's body moved smoothly through a given motion) may have been reinforcing in and of itself. The physical prompts may have been effective due to their reinforcing properties rather than the feedback afforded by the prompts. As reinforcing properties of physical interventions are likely to be highly individual, further investigation in this area is needed.

5.3 Effects of Increased Exposure to Instruction

Recent work (Koegel et al., 1979; Koegel & Schreibman, 1977; Schover & Newsom, 1976; Schreibman et al., 1977) has attempted to deal directly with the overselectivity problem by teaching autistic individuals to use extra-stimulus prompts rather than be hindered by them. Among the approaches used was overtraining (continued exposure to a

task once it has been mastered) (Schover & Newsom, 1976). The authors noted that overtraining increased the number of cues responded to by autistic children. In the present study, the motor pattern elicited during early stages of instruction in the extra-stimulus condition was similar to that elicited at later task analytic levels. Thus physical prompts may have been overtrained at later task analytic stages, allowing the students to attend to the other types of prompts. The increased use of these prompts could then explain the extra-stimulus prompt groups improved performance relative to the within-stimulus prompt group and thus the contradiction of the original hypothesis.

5.4 Physiological Aspects of the Task

A recent investigation by Kern, Koegel, Dyer, Blew and Fenton (1982) examined the effect of physical exercise on self-stimulation and appropriate responding in autistic children. Their results demonstrated that brief jogging sessions decreased subsequent levels of self-stimulation and increased appropriate play and academic responding. The authors discussed possible physiological reasons for their findings. Specifically, research has suggested that strenuous physical activity results in the release of beta-endorphins and changes in acetylcholine levels (Von Euler, 1974 cited in Kern et al., 1982), which have been shown to positively influence motivation (LeMoral, Kools and Bloom, 1979 cited in Kern et al., 1982) and improve attention (Sandman, George, Walker and Nolan, 1976 cited in

Kern, 1982). Kern et al., found this information particularly interesting with respect to autistic children who are seen to have considerable difficulty with motivation (Dunlap and Koegel, 1980; Koegel and Egel, 1979) and overselective attention (Frankel et al., 1984; Gersten, 1983; Lovaas et al., 1971; Schreibman, 1975). The bowling task was not designed to be considered 'strenuous' physical activity, however given the generally low fitness level of autistic individuals (Reid et al., 1983) and the length of each instructional session (approximately twenty minutes) changes in physiological status resulting in increased attention to prompts cannot be completely ruled out. As the extra-stimulus prompt condition involved multiple prompts (physical, visual and verbal) the subject's ability to effectively utilize them was potentially increased due to their physiological status.

In conclusion, possible reasons for the superior performance of the extra-stimulus prompt group over the within-stimulus prompt group largely focus on the physical nature of the task and of some of the prompts. With respect to prompting, the movement of the learner through the task has been viewed as effective by Wing (1976) and Schreibman (1975) though both observations appear to be anecdotal in nature. Appropriate use of haptic cues by autistic learners has been indicated by a number of researchers (Frith & Hermelin, 1969; Prior & Chen, 1976). In a more systematic manner Rincover (1978) noted that the proximity of the prompt to the learner appeared to be an important variable.

With respect to the present study it was, as well, postulated that the physical prompting may have been reinforcing to the learner. This information points to the potential importance of physical extra-stimulus prompts, or manual guidance in the bowling task. Regarding the task, the physical demands made of the learner may have altered his physiological state in a manner conducive to improved attention to multiple cues. It seems therefore that an instructional model which includes physical prompting in particular may be effective in teaching autistic learners gross motor skills.

CHAPTER VI

SUMMARY AND CONCLUSIONS

The purpose of this investigation was to compare the efficacy of gross motor instruction employing extensive extra-stimulus prompting with instruction designed to avoid the overselectivity phenomena by employing only within-stimulus prompts. The task was the teaching of a bowling task to young autistic children. This chapter contains the summary and conclusions of the study and is subdivided into the following sections: (6.1) Summary of Rationale and Hypothesis, (6.2) Summary of the Methodology, (6.3) Summary of the Findings, (6.4) Conclusions, (6.5) Implications, (6.6) Recommendations for Further Study.

6.1 Summary of Rationale and Hypothesis

As autistic individuals have demonstrated acute deficiencies in the area of motor abilities (Geddes, 1977; Morin & Reid, 1985; Ornitz, 1977; Reid et al., 1983; Singleton, 1974) examining appropriate teaching strategies is of importance.

The task analytic model of education appears to be a worthwhile exemplar to pursue as it has been used with success in the teaching of selected skills to autistic children (Koegel et al., 1974; Margolies, 1977; Simonson, 1979) and, as well, has been effective in teaching selected play skills to young mentally retarded learners (Watkinson & Wall, 1979). Within this approach specific verbal, visual,

or physical prompts are frequently utilized to guide learner responses. These have been referred to as extra-stimulus prompts.

Recently, it has been suggested that the use of prompting may interfere with the learning of autistic individuals due to the phenomena referred to as stimulus overselectivity. Stimulus overselectivity suggests that autistic learners respond to an abnormally limited part of their environment and thus are not able to simultaneously attend to the training stimuli and to the prompts. To circumvent this problem Schreibman (1975) designed a prompting procedure in which the prompts were exaggerated features of the training stimulus, thus not requiring attention to multiple stimuli. This she referred to as within-stimulus prompting. This approach was effective in teaching autistic learners a discrimination learning task.

The present study was designed to examine whether a traditional model of intervention utilizing verbal, visual and physical prompts or a model designed to avoid the overselectivity phenomena by using within-stimulus prompts would be most effective in teaching a bowling task to autistic learners.

6.2 Summary of the Methodology

The subjects in the investigation were six male autistic children between the ages of seven and ten. Subjects were diagnosed as autistic by two psychologists not associated with this study, based on criteria outlined by

the National Association for Autistic Children (Ritvo & Freeman, 1978). As overselectivity is observed to increase as the intelligence quotient decreases (Wilhelm & Lovaas, 1976) subjects had a concurrent diagnosis of mental retardation at the trainable level. As a higher incidence of overselectivity has been noted in pre-adolescent children (Schover & Newsom, 1976) all subjects were between seven and ten years of age. All subjects were enrolled in special education schools in Montreal and lived at home.

Two treatment conditions were employed in this investigation: a) a within-stimulus model of bowling instruction and b) an extra-stimulus model of bowling instruction. The within-stimulus model was primarily characterized by an absence of physical, visual or verbal extra-stimulus prompts. Rather within-stimulus prompts were altered systematically within the structure of the task analysis in a manner providing fewer and less obvious prompts as bowling skill improved. Within-stimulus prompts were integrated features of the bowling task. As these prompts were part of the training stimulus and not extraneous to it, the learner was not required to attend to multiple cues, a situation thought to interfere with learning for autistic children due to the stimulus overselectivity phenomena. Skill level was determined by the task analytic level achieved (as outlined in Appendix A).

An additional feature of the within-stimulus model of instruction was the utilization of the discrete trial format

of instruction (Koegel et al., 1980). This educational approach orders the following elements: a) presentation of instruction, b) an optional extra-stimulus prompt, c) the student's response, d) the consequences administered and e) a distinct inter-trial interval. In the within-stimulus model of instruction, the extra-stimulus prompts were not applied.

The extra-stimulus model of instruction utilized three main intervention procedures: a) task analysis of the target skills, b) use of the discrete trial format of instruction (Koegel et al., 1980) and c) use of the response prompting continuum (Watkinson & Wall, 1979). The task analysis and discrete trial format were identical to those employed in the within-stimulus model of instruction, the extra-stimulus model making use of the same within-stimulus prompts. The response prompting continuum involved the use of extra-stimulus prompts which were utilized within the discrete trial format subsequent to or concurrent with instruction. Extra-stimulus prompts may also have been presented concurrent with the consequences of a particular response.

Thus the similarities between the two instructional approaches were a) the use of the same task analysis involving within-stimulus prompts and b) the utilization of the discrete trial format. The within-stimulus and extra-stimulus instructional models differed dramatically in that the extra-stimulus model extensively used physical, visual and verbal prompts to guide learning while the

within-stimulus model used these prompts minimally.

A number of motivational and behavioural difficulties manifested by autistic individuals interfere with their learning. Novel environments and sudden changes in routine have been observed to adversely effect the learning of autistic students due to the manifestation of inappropriate behaviours and decreased attention to the target task (Ritvo & Freeman, 1978; Wing, 1976). To minimize these potential problems a) the subjects were familiarized with the instructor through three half-hour visits; b) in every instance testing took place in an environment familiar to the learner and c) all instruction was routinized and kept predictable with respect to format and time frame.

A lack of motivation manifested by inattention to the task, lack of eye contact, infrequent task attempts and off-task behaviour (Dunlap & Koegel, 1980; Egel, 1980; Koegel & Williams, 1980; Strain et al., 1979) also present serious obstacles to learning by autistic children. In order to maximize attention to the task, the following procedures were employed: a) organization of the environment to make the performance of the task the most attractive option available; b) structuring of the bowling task so that incidences of correct responding were increased thereby maximizing opportunities for reinforcement; c) verbal presentation of attentional cues in a clear and concise manner and d) presentation of reinforcers that had been demonstrated (through pre-program and in-program observation and discussion) as effective with a particular

subject.

Furthermore, self-stimulatory behaviour has been observed to seriously hamper autistic individual's ability to attend to relevant stimuli in a given situation (Koegel et al., 1974; Wing, 1976). For this reason self-stimulatory behaviour was suppressed. This was effected by reinforcing responses incompatible with self-stimulation (Mulhern & Baumeister, 1969) and by telling the subject to stop self-stimulating and to attend to the task.

Two phases were employed in data collection. To begin with, there were three half-hour observational periods to familiarize the researcher with the subjects' behaviour patterns and linguistic skills as well as to allow the subjects to become familiar with the researcher. The second phase of the investigation consisted of establishing baseline performance levels and administering the two experimental conditions, the extra-stimulus and within-stimulus models of bowling instruction. Instruction in the two conditions took place in environments familiar to the subjects. These environments were made as similar as possible to each other by standardizing room dimensions, lighting, number and type of distracting items and the presence of individuals other than the principal investigator. A trained observer monitored the instructor's behaviour to ensure that there was a significant difference in the amount of extra-stimulus prompting between the two conditions (the feature distinguishing one approach from the other) and that with the exception of extra-stimulus

prompting, the subjects in each condition were treated in a like manner. The following behaviours were monitored: a) all extra-stimulus prompting during a discrete trial; b) all reinforcement; c) all punishment and d) the number of pins knocked down by a subject during a discrete trial.

To ensure that the observer was accurately monitoring the investigator's behaviours, a second observer analyzed 40 videotaped trials (10 trials of each of four subjects). Comparison of the results of the fulltime observer with those of the second observer, yielded a measure of inter-rater agreement. The observers received two hours of inservice training during which the experimental programs were presented.

Subjects received instruction in a one-to-one setting during school time. Sessions generally lasted between 20 and 25 minutes with approximately 30 bowling trials occurring during each session. If behaviour was judged to be incompatible with instruction the session was terminated. A maximum of five instructional sessions took place each week. A teaching session for both experimental conditions was made up of the following steps: a) the instructor met the subject at his classroom and brought him to the instructional site; b) the instructor brought the subject to the starting line of the bowling task and secured his attention; c) the instruction '"name" I want you to roll the ball and hit the pins'; d) the subject performed the task at the appropriate task analytic level; e) the subject received reinforcement for his effort. As previously noted, in the

extra-stimulus model of instruction physical, visual and verbal prompts were given during a discrete trial. There was an inter-trial interval of approximately 20 seconds. To move from a less skilled to a more skilled step of the task analysis, criterion performance (as outlined in Appendix A) had to be attained.

The task analytic level achieved by each subject was the dependent measure in this investigation. To compare the effectiveness of the extra-stimulus prompt model and the within-stimulus prompt model, the Mann-Whitney U test was used. This statistical tool was, as well, utilized to detect differences, if any, in the number of reinforcements and punishments given to each group. To observe whether or not the instructional models were effective in bringing about improved performance, visual analysis of graphs was employed.

6.3 Summary of the Findings

On the basis of 84% inter-rater agreement, it was decided that the observer was accurate in identifying incidents of extra-stimulus prompting, reinforcement and punishment. The results of the Mann-Whitney U test indicated that the extra-stimulus prompt group received significantly more extra-stimulus prompts ($p < .05$) than did the within-stimulus prompt group. There was no significant difference between groups with respect to the number of reinforcements and punishments given. With respect to the dependent variable, the task analytic level achieved, the

subjects using the extra-stimulus prompt model of instruction performed significantly better ($p < .05$) than did the subjects using the within-stimulus prompt model.

6.4 Conclusions

Based upon the findings and within the limitations of this study, the following conclusion is made. An extra-stimulus prompt model of instruction, (i.e. a model employing a task analysis including within-stimulus prompts, a discrete trial format and a system of physical, visual and verbal prompts referred to as the response prompting continuum) was more effective than a within-stimulus model of instruction (i.e. a model employing task analysis including within-stimulus prompts and a discrete trial format but not utilizing physical, visual or verbal cues) in teaching autistic children a bowling task.

6.5 Implications

Certain implications may be derived from the present study. To begin with, traditional extra-stimulus prompting techniques were observed to be effective in teaching young autistic subjects a gross motor skill. This is particularly encouraging as physical, visual and verbal prompting procedures are frequently encountered in the child's daily environment. As previously noted, specific prompting procedures are contained in the PREP Play Program (Watkinson & Wall, 1979) which was developed and extensively field tested with mentally retarded students. This prompting

system has been designed with the acquisition of culturally normative gross motor play skills in mind, an area of demonstrated deficiency in autistic learners (Morin & Reid, 1985; Reid et al., 1983). Thus physical educators working with autistic children should be able to utilize currently available and well established prompting systems. In addition to autistic children learning from a readily available teaching technique (extra-stimulus prompts) the results also suggest that these children may respond in a manner similar to that of normal children in a motor learning situation.

In discussing the findings it was hypothesized that in particular the physical prompts may have been responsible for the improvement in performance demonstrated by the extra-stimulus prompt group. If indeed this is the case research with respect further demarcation of physical prompts may be warrented.

With respect to the description of subjects taking part in this investigation, care was taken to describe their behaviour and functional level in a precise manner and to utilize widely accepted diagnostic criteria (Ritvo & Freeman, 1978). By doing so it was felt that some of the confusion surrounding the diagnosis of autistic individuals may have been avoided. Physical educators doing research with atypical individuals may, in future, reduce confusion in diagnosis by describing precisely behaviours presented.

6.6 Recommendations for Further Study

Based on the results of the present study, the following are recommended as areas of further investigation:

1. As the autistic subjects in the present study in the extra-stimulus prompt condition received both within-stimulus prompts (through the task analysis) and extra-stimulus prompts, it cannot be assumed that the extra-stimulus prompt system (the response prompting continuum) on its own was responsible for the improved scores. Potentially an interaction between the within- and extra-stimulus prompts resulted in enhanced performance. Further study of the relative contribution of each system is then recommended.

2. As the extra-stimulus prompts utilized included physical, visual and verbal cues presented simultaneously and/or concurrently it is not clear which type of cue or combination of cues was in fact responsible for enhanced performance. It appears, therefore, that investigation aimed at identifying the type of extra-stimulus prompt or combination of extra-stimulus prompts most effective in enhancing motor performance would yield important information with respect to educational strategies for autistic individuals.

3. Positive behavioural and educational changes have been noted after 15 minutes of intensive exercise (Kern et al.,1982). A comparison of the rate and level of learning of gross motor skills by individuals having had an intensive period of exercise prior to skill instruction and by

individuals not having had such a period may shed some light on the importance of physiological status in gross motor skill acquisition by autistic children.

APPENDIX A

TASK ANALYSIS

TASK ANALYSIS

Terminal Performance Objective: From a distance of 15 feet the subject will roll a rubber seamless softball towards ten 12-inch red plastic bowling pins, knocking down a total of at least 25 pins over five consecutive trials.

Task Analyses

Task Analytic Level	Distance From Pins	Orange Pathway (track) Length	Orange Pathway (track) Width	Barriers Located Three Inches Outside the Track On Either Side
1	5 feet	5 feet	7 inches	No
2	5 feet	5 feet	14 inches	Yes. Length- 5 ft
3	5 feet	5 feet	14 inches	No
4	5 feet	No pathway		No
5	10 feet	10 feet	7 inches	Yes. Length-10 ft
6	10 feet	10 feet	7 inches	No
7	10 feet	10 feet	14 inches	Yes. Length-10 ft
8	10 feet	10 feet	14 inches	No
9	10 feet	No pathway		No
10	15 feet	15 feet	7 inches	Yes. Length-15 ft
11	15 feet	15 feet	7 inches	No
12	15 feet	15 feet	14 inches	Yes. Length-15 ft
13	15 feet	15 feet	14 inches	No
14*	15 feet	No pathway		No

* Task analytic level 14 is the terminal performance objective.

The following variables remained constant across task analytic levels:

1. A rubber seamless softball was independently rolled towards ten 12-inch red plastic bowling pins.
2. A score of at least 25 pins knocked down over five consecutive trials was required before a subject advanced to the next task analytic level.

APPENDIX B

RESPONSE PROMPTING CONTINUUM

RESPONSE PROMPTING CONTINUUM

Taken from: Watkinson, J. & Wall, A.E. The PREP Program: A preschool play program for moderately mentally retarded children. Paper presented to the First International Symposium on Adapted Physical Activity, Quebec, Que., 1977.

PHYSICAL PROMPTS

All three levels of physical prompting should usually be paired with a verbal prompt.

Complete Manipulation gives the child the greatest amount of assistance. When teachers use complete manipulation, they actually physically move the child's body through the desired response. This usually involves all of the following:

1. Positioning the child's body in an appropriate posture to begin the response;
2. Applying force to the child's limbs in the direction of the desired movement; and
3. Continuing application of force until the response is completed.

Example: The child is working on jumping down. The teacher puts the child on the box and holds both hands, pulling down so that the child's knees bend. The teacher then pulls up on the child's hands to lift him, and holds on until the child's feet are on the floor.

Manipulative Prompting is used when the child performs the response relying on the physical assistance of the instructor at some point during the response. This assistance may come at the beginning, at the end or in the

middle of the response. Either the child or the instructor may initiate the prompt. It may include the following:

1. Manipulation of the child's total body or any body part into position for beginning or completing the response;
2. Providing physical support to maintain balance.

For Example: The child jumps off a box at waist height and reaches for the teacher's hands for landing. The teacher grasps for the child's hands to provide assistance in the landing phase of the jump.

Minimal Guidance involves contacting the child's body to give direction or to signal what body part is to be moved. It may include:

1. Tapping a body part to signal the child to move it;
2. Prodding the trunk or body part to maintain movement; or
3. Prodding to encourage a child to begin or complete a response.

Example: The teacher taps the child's feet to prompt the initiation of a jump.

VISUAL PROMPTS

All three levels of visual prompting are generally accompanied by a verbal prompt.

Complete Skill Demonstrations are accurate, and often exaggerated, demonstrations of the complete skill with the apparatus or implement used.

Example: The teacher climbs onto a box and jumps off saying 'Jump off the box'.

Partial Skill Demonstrations are accurate demonstra-

tions of a component of a skill. This may include any of the following:

1. Giving a skill demonstration without the equipment;
2. Giving an exaggerated demonstration of the movement of one body part; or
3. Giving a demonstration of the starting or ending position for a response.

Example: The teacher demonstrates the take-off position for jumping but does not jump.

Gestural Prompting involves the use of a gesture that does not represent part of the skill or desired response but does serve to indicate what movement is expected.

Example: The teacher points to the floor to indicate that the child should jump down.

VERBAL PROMPTS

Skill Cues serve to focus the child's attention on the key features of the movements required to complete a skill. It may be an action word that describes a component of the skill.

Example: In teaching jumping the teacher may say 'bend your knees' and 'swing your arms'.

Skill Mands provide a verbal description of the desired skill. They are specific action words that can be used in commands or questions.

Example: "Jump down".

Action Cues are words that motivate the child to perform a given skill. They are not descriptions of the

skill itself.

Examples: "One, two, three, go!"; "Are you ready?".

APPENDIX C

EXTRA-STIMULUS PROMPTS

UTILIZED IN THE BOWLING TASK

EXTRA-STIMULUS PROMPTS
UTILIZED IN THE BOWLING TASK

A. PHYSICAL PROMPTS

Level I. Complete Manipulation (CM)

Complete manipulation includes all of the following.

i) Instructor positions the subject in the appropriate posture to begin the bowling task, that is:

a) shoulders squared to the target;

b) leg opposite to dominant arm leading by half a foot length;

c) legs shoulder width apart;

d) knees bent to approximately a 120 degree angle;

e) torso flexed at a 45 degree angle to the ground;

f) head up, looking at the target.

ii) Instructor moves the subject through the task by:

a) grasping the subject's dominant hand at the wrist, and smoothly moving the bowling arm through an arc from 50 degrees behind the vertical plane to 90 degrees in front of the vertical plane, releasing the ball as the subject's bowling arm passes his front foot.

Level II. Manipulative Prompting (MP)

Manipulative prompts may include any, but not all, of the following.

i) Squaring of the shoulders to the target.

ii) Moving leg opposite dominant arm to half a foot length in front of other foot.

iii) Positioning of the legs shoulder width apart.

iv) Bending of the knees to approximately a 120 degree angle.

v) Flexing of the torso to a 45 degree angle to the ground.

vi) Spreading of the subject's fingers on the ball.

vii) Grasping of the subject's dominant arm and initiating the backswing.

viii) Grasping the subject's dominant hand at the wrist and smoothly moving the arm through an arc from 50 degrees behind the vertical plane to 90 degrees in front of the vertical plane.

ix) Grasping the subject's dominant hand, and smoothly moving the arm through an arc from 50 degrees behind the vertical plane to 90 degrees in front of the vertical plane aiding release of the ball as the subject's arm passes his lead leg.

Level III. Minimal Guidance (MG)

Minimal guidance may include any of the following:

i) Tapping/touching of the subject's shoulders

to signal correct positioning.

ii) Tapping/touching of the subject's knees to signal that a change in knee flexion is required.

iii) Tapping/touching of the subject's left or right foot to signal that a change in positioning is required.

iv) Tapping/touching of the subject's torso (front or back) to signal that a change of positioning is required.

v) Tapping/touching of the subject's dominant arm to: a) initiate movement, or b) signal that a change is required.

vi) Tapping/touching of the subject's dominant hand to signal that a change of hand position is required.

B. VISUAL PROMPTS

Level I. Complete Skill Demonstration (D)

i) The instructor will demonstrate the complete bowling skill, exaggerating the salient features of the task, those being: 1) shoulders squared; 2) leg opposite to dominant hand leading by a 1/2 foot length; 3) knees bent at approximately a 120 degree angle, 4) the torso flexed at a 45 degree angle to the ground and 5) feet shoulder width apart.

Level II. Partial Skill Demonstration

A partial skill demonstration may include a demonstration of any, but not all of the

following.

i) Shoulders squared to the target.

ii) Foot opposite dominant arm 1/2 a foot length in front of the other foot.

iii) Knees bent to approximately a 120 degree angle.

iv) Torso flexed to a 45 degree angle to the ground.

v) Fingers spread comfortably around the ball.

vi) A demonstration of the starting position of the bowling task (numbers i to v above).

vii) The smooth movement of the bowling arm through an arc from 50 degrees behind the vertical plane.

viii) The smooth movement of the bowling arm through an arc from 50 degrees behind the vertical plane to 90 degrees in front of the vertical plane, releasing the ball as the bowling arm passes the front foot.

Level III. Gestural Prompting.

i) Pointing to the subject's shoulders to indicate a change in position is required.

ii) Pointing to the subject's feet to indicate a change in positioning is required.

iii) Pointing to the subject's knees to indicate a change in position is required.

iv) Pointing to the subject's torso to indicate a change in position is required.

v) Pointing to the subject's fingers on the bowling hand to indicate a change in positioning is required.

vi) Pointing to where the bowling arm should be at the end of the backswing.

vii) Pointing to where the bowling arm should be at the end of the follow through.

viii) Pointing to the target to indicate where the subject's attention should be focussed.

C. VERBAL PROMPTS

Level I. Skill Cue.

The following are skill cues that may be employed.

i) Turn your shoulders.

ii) Bend your knees.

iii) Keep your head up.

iv) Move your foot forward.

v) Move your foot back.

vi) Bend at your middle.

vii) Swing your arm.

viii) Swing your arm smoothly.

ix) Keep your arm straight.

x) Open your legs.

Level II. Skill Mand.

The following are skill mands that may be employed.

i) Roll the ball towards the pins.

ii) Bowl the ball towards the pins.

iii) Can you roll the ball towards the pins?

iv) Can you bowl the ball towards the pins?

v) Roll the ball.

vi) Bowl the ball.

vii) Can you roll the ball?

viii) Can you bowl the ball?

Level III. Action Cue.

i) Are you ready?

ii) Read, set, go!

iii) One, two, three, go!

APPENDIX D

PRE-TEST TO ASCERTAIN

INITIAL BOWLING ABILITY LEVEL

PRE-TEST TO ASCERTAIN
INITIAL BOWLING ABILITY LEVEL

1. From a distance of 15 feet the subject will roll a rubber seamless softball towards ten 12-inch plastic bowling pins, knocking down a total of at least 25 pins over five consecutive trials.

2. From a distance of ten feet the subject will roll a rubber seamless softball towards ten 12-inch plastic bowling pins, knocking down a total of at least 25 pins over five consecutive trials.

3. From a distance of five feet the subject will roll a rubber seamless softball towards ten 12-inch plastic bowling pins, knocking down a total of at least 25 pins over five consecutive trials.

APPENDIX E

SCORING SHEET

OBSERVATION SHEET

SUBJECT'S NAME: _____ SESSION NUMBER: _____

DATE: _____

TRIALS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	TOTAL
Extra-Stimulus Prompts																
Reinforcement																
Punishment																

APPENDIX F

EQUIPMENT UTILIZED

EQUIPMENT UTILIZED

1. One rubber seamless softball.
2. Ten 12-inch red plastic bowling pins.
3. One 7-inch wide, 5-foot long orange 'track' made of Mactac paper.
4. One 14-inch wide, 5-foot long orange 'track' made of Mactac paper.
5. One 7-inch wide, 10-foot long orange 'track' made of Mactac paper.
6. One 14-inch wide, 10-foot long orange 'track' made of Mactac paper.
7. One 7-inch wide, 15-foot long orange 'track' made of Mactac paper.
8. One 14-inch wide, 15-foot long orange 'track' made of Mactac paper.
9. Six 5-foot long wooden barriers (height - six inches).
10. Sony video tape recorder and camera.

APPENDIX G

TEST GIVEN TO OBSERVERS

TEST GIVEN TO OBSERVERS

Identify the prompts administered in examples 1-16 as one of the following:

a) Complete Manipulation
b) Manipulative Prompt
c) Minimal Guidance
d) Complete Skill Demonstration
e) Partial Skill Demonstration
f) Gestural Prompt
g) Skill Cue
h) Skill Mand
i) Action Cue

Indicate your response by writing the appropriate letter in the brackets following each question.

1. The subject's body is manipulated into the correct starting position for the bowling task and the subject is moved through the task by the instructor. ( )
2. The instructor grasps the subject's shoulders and squares them to the target. ( )
3. The subject's knees are bent to approximately a 120 degree angle and the torso is flexed to a 45 degree angle to the ground. ( )
4. The instructor demonstrates the bowling task, exaggerating the salient features. ( )
5. The instructor points to the subject's fingers on the 'bowling hand' to indicate a change of position is required. ( )

6. The instructor touches the subject's dominant arm in order to indicate that a change of position is required. ( )
7. The instructor demonstrates appropriate foot positioning. ( )
8. To indicate action is required, the instructor says "ready, set, go". ( )
9. The instructor points to the target in order to indicate where the subject's attention should be focused. ( )
10. The instructor taps the subject's shoulders to signal correct positioning. ( )
11. The instructor tells the subject to bend his knees. ( )
12. The instructor tells the subject to keep his head up. ( )
13. The instructor demonstrates the starting position of the bowling task. ( )
14. The instructor says to the student, "roll the ball towards the pins". ( )
15. In order to indicate to the subject that he is to roll the ball towards the pins, the instructor says, "are you ready?". ( )
16. The instructor says to the student, "can you roll the ball?". ( )

Answers: 1 (a), 2 (b), 3 (b), 4 (d), 5 (f), 6 (c), 7 (e), 8 (i), 9 (f), 10 (c), 11 (g), 12 (g), 13 (e), 14 (h), 15 (i), 16 (h).

APPENDIX H

TRIALS REQUIRED TO REACH A GIVEN TASK ANALYTIC LEVEL

TABLE 5

Trials Required to Reach a Given Task Analytic Level

Prompting Condition	Subject	Task Analytic Level 1	2	3	4	5	6	7	8	9	10	11	12	13	14
Within Stimulus	1		7	112	247	302									
	2						No Progress								
	3		38	72	132	224									
Extra Stimulus	4		27	34	88	119	128	158	173	230	237	242			
	5		126	149	171	183	195	238	278	283	308	315			
	6		24	70	95	124	249	294	324						

Note: All subjects started at task analytic level 1.

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