



## **Terms and Conditions of Use of Digitised Theses from Trinity College Library Dublin**

### **Copyright statement**

All material supplied by Trinity College Library is protected by copyright (under the Copyright and Related Rights Act, 2000 as amended) and other relevant Intellectual Property Rights. By accessing and using a Digitised Thesis from Trinity College Library you acknowledge that all Intellectual Property Rights in any Works supplied are the sole and exclusive property of the copyright and/or other IPR holder. Specific copyright holders may not be explicitly identified. Use of materials from other sources within a thesis should not be construed as a claim over them.

A non-exclusive, non-transferable licence is hereby granted to those using or reproducing, in whole or in part, the material for valid purposes, providing the copyright owners are acknowledged using the normal conventions. Where specific permission to use material is required, this is identified and such permission must be sought from the copyright holder or agency cited.

### **Liability statement**

By using a Digitised Thesis, I accept that Trinity College Dublin bears no legal responsibility for the accuracy, legality or comprehensiveness of materials contained within the thesis, and that Trinity College Dublin accepts no liability for indirect, consequential, or incidental, damages or losses arising from use of the thesis for whatever reason. Information located in a thesis may be subject to specific use constraints, details of which may not be explicitly described. It is the responsibility of potential and actual users to be aware of such constraints and to abide by them. By making use of material from a digitised thesis, you accept these copyright and disclaimer provisions. Where it is brought to the attention of Trinity College Library that there may be a breach of copyright or other restraint, it is the policy to withdraw or take down access to a thesis while the issue is being resolved.

### **Access Agreement**

By using a Digitised Thesis from Trinity College Library you are bound by the following Terms & Conditions. Please read them carefully.

I have read and I understand the following statement: All material supplied via a Digitised Thesis from Trinity College Library is protected by copyright and other intellectual property rights, and duplication or sale of all or part of any of a thesis is not permitted, except that material may be duplicated by you for your research use or for educational purposes in electronic or print form providing the copyright owners are acknowledged using the normal conventions. You must obtain permission for any other use. Electronic or print copies may not be offered, whether for sale or otherwise to anyone. This copy has been supplied on the understanding that it is copyright material and that no quotation from the thesis may be published without proper acknowledgement.

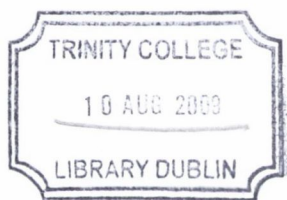


**Against Theoretical Eclecticism and in Support of a Unified  
Conceptual Framework for Autism Intervention Research**

**Sinéad McNally**

A thesis presented to the University of Dublin, Trinity College,  
for the Degree of Doctor of Philosophy

2009



THORIS  
8755

## **Declaration**

I declare that this thesis has not been submitted as an exercise for a degree at this or any other University, and that it is entirely my own work.

I agree that the Library may lend or copy the thesis upon request.

Sinead McWally



## Summary

This thesis aims to highlight and address two key issues in autism intervention research: (1) the role of *theory* in autism intervention research; and (2) the practice of *theoretical eclecticism* in autism intervention and intervention research. It is argued that while both of these issues are critical concerns for autism intervention research, they are currently widely neglected in the research literature and need to be actively addressed by interventionist researchers and practitioners.

In **chapter one**, the current perception of the role of theory in autism intervention and intervention research is outlined. Theory is shown to be perceived as integral to the development and implementation of treatment technologies but its role in the evaluation and appraisal of treatment outcomes is generally minimised. In contrast, we draw attention to the important role of theory in providing the interventionist and researcher with a framework for understanding the mechanisms for change underlying treatment technologies and for explaining treatment outcomes. In particular, the practice of theoretical eclecticism is highlighted as the most significant outcome arising from the neglect of the role of theory in the evaluation of treatment technologies. Theoretical eclecticism occurs when technologies from two conceptually incongruent approaches to autism intervention are implemented without awareness, or acknowledgement, of the different ways in which the theories underlying these technologies account for change and development in intervention. The two conceptual approaches to autism intervention that are most widely implemented in the practice of theoretical eclecticism are behavioural- and developmental-based approaches, and these are briefly outlined in the opening chapter.

The conceptual framework of both of these approaches to autism intervention is further outlined and discussed in detail in chapters two and three. In **chapter two**, the theory and conceptual framework of the most prominent behavioural approach to autism intervention, Applied Behaviour Analysis (ABA), is presented and discussed. The conceptual framework of ABA models of intervention is founded on the theory of operant conditioning and the philosophy of radical behaviourism, and these are discussed with regard to their effectiveness and appropriateness in explaining impairment in autism,

identifying mechanisms of change during intervention, and ability to contribute to autism research.

In **chapter three**, the shared theoretical principles and conceptual framework of a developmental approach to autism intervention are outlined and discussed in detail. The principles of developmental psychopathology are discussed as particularly representative of a developmental conceptual framework for autism intervention. These principles include an emphasis on underlying processes, individual differences, and a multi-level analysis of factors that affect development. The conceptualisation of autism and language acquisition shared by proponents of this approach is discussed and evaluated with regard to its ability to explain impairment in autism, change in intervention, and contribution to autism intervention.

**Chapter four** highlights and discusses the conceptual incongruence of behavioural- and developmental-based approaches to autism in relation to the practice of theoretical eclecticism. The negative impact of theoretical eclecticism on autism intervention and intervention research is outlined and further explored through several examples of its practice in intervention research. We argue that theoretical eclecticism presents a particularly important problem for autism intervention research and as such should be addressed by interventionists and intervention researchers. A method for overcoming the problem of theoretical eclecticism is outlined: interventionists and intervention researchers are urged to make explicit the theoretical principles and philosophical assumptions that underlie the technologies they use, including the interventionist's conceptualisation of autism (i.e. theory of dysfunction) and understanding of the mediating variables in treatment outcome (i.e. theory of change). In particular, we argue that interventionists and researchers should take time to develop and outline a unified conceptual framework for explaining all aspects of the intervention where possible, including potential limitations of the conceptual framework.

In **chapter five**, the current findings from autism research which should potentially inform a unified conceptual framework are discussed with regard to language intervention for children with autism. A developmental conceptual framework is adopted and outlined as the most appropriate current approach to understanding and explaining language impairment in children with autism.



In **chapter six**, two empirical studies are presented that explore this method for overcoming theoretical eclecticism in autism intervention research (as outlined in chapters four and five). In the first study, the effectiveness of a behavioural treatment technology for increasing motor speech production is compared with that of two eclectic treatment technologies. This study illustrates the negative impact of theoretical eclecticism on the evaluation of treatment outcomes. In the second study, the effectiveness of treatment technologies developed from two unified but incongruent conceptual approaches to increasing motor speech production (i.e. behavioural and developmental) are compared. Comparable outcomes in terms of quality of motor speech production were found in both behavioural-and developmental-based treatments, but higher rates of speech production attempts were found in the behavioural-based intervention. The study also highlights the need for greater consideration of the role of individual differences and environmental factors in contrasting two treatment conditions, and the need for extensive theorising about the mechanisms which mediate participant performance in language intervention.

In the concluding chapter (**chapter seven**), the implications of the conceptual analysis in section one and empirical study in section two for autism intervention and intervention research are explored, and several recommendations for future research are put forward. In particular, the importance of theoretical and conceptual issues in current research on best practice is highlighted, and it is proposed that these issues should inform contemporary debates regarding the effectiveness and appropriateness of ABA intervention for children with autism. It is also proposed that a lack of awareness, or negative perception, of the role of theory in the science of autism intervention has a particularly detrimental impact on the development and implementation of new and more effective treatment technologies for children with autism. Several recommendations for future empirical research are also made.

## **Acknowledgements**

So many people have helped and contributed to this thesis throughout the past three years and it is a privilege to be able to thank them here.

I would like to thank my supervisor, Jean Quigley, for her dedication and commitment in supervising this thesis and for her encouragement in my pursuit of my research interests. I would like to thank her especially for her infectious enthusiasm for all things language-related and for the many enjoyable discussions about this research which helped make the thesis write-up a particularly positive experience.

I would also like to thank Sheila Greene and Nick McDonald for their invaluable comments and critical appraisal of the thesis throughout the research process.

I would like to say thank-you to my parents for their unyielding love and support in all aspects of my life, and for inspiring in me a love of learning from a very young age. I would like to thank my older brothers and fellow academia enthusiasts, Donncha and Mark, for always watching out for me. To the “little lads” who now tower over me, Brian, Pádraig, and Colm, thank you so much for the many laughs and hugs, and for being you!

I would like to thank Mairead.

A special thank-you to the McNally clan. I feel incredibly lucky to have had the support of two incredible families behind me throughout my studies and I am very proud to submit my thesis as a McNally.

A huge thank-you to all the postgrads in the psychology department. I would not have been able to get through the gruelling hours of the past few months but for their constant encouragement, high spirits, and many, many cups of tea! I would like to thank Michael for his comments on the experimental phase of this thesis, James and Caoilte for their kindness and thoughtfulness in helping me to the finish line, Thanks also to the administrative and technical staff for their tremendous help and many kindnesses.

I would like to thank the IRCSET and the NCSE for funding this research.

A very special thank you to the children who took part in this study, and to Jenny and Juliet, for their generosity in facilitating the experimental phase of this thesis.

Finally, for Tom, to whom I dedicate this thesis.

**Table of Contents**

*page*

**DECLARATION**

**SUMMARY**

**ACKNOWLEDGEMENTS**

**TABLE OF CONTENTS**

**SECTION I: A Conceptual Analysis of the Role of Theory in Autism Intervention Research**

|                                                                                             |          |
|---------------------------------------------------------------------------------------------|----------|
| <b>CHAPTER 1: Theory in Autism Intervention: Implications for Intervention and Research</b> | <b>2</b> |
| 1.1 Introduction                                                                            | 2        |
| 1.2. Autism                                                                                 | 3        |
| 1.2.1 Diagnosis and Classification                                                          | 3        |
| 1.2.2 Research                                                                              | 4        |
| 1.2.3 Models of Intervention                                                                | 8        |
| 1.3 Current Role of Theory in Autism Intervention Research                                  | 12       |
| 1.3.1 Definition of Theory and Conceptual Framework                                         | 13       |
| 1.3.2 The Current Role of Theory in Autism Intervention                                     | 14       |
| 1.3.3 Reasons for the Current Perception of Theory in Intervention Research                 | 16       |
| 1.4 Impact of the Current Role of Theory on Autism Intervention Research                    | 19       |
| 1.4.1 Understanding Change in Intervention                                                  | 19       |
| 1.4.2 Optimising Intervention Outcomes                                                      | 21       |
| 1.4.3 Identifying the Target Population of an Intervention                                  | 22       |
| 1.4.4 Scientific Discovery and Development                                                  | 23       |
| 1.5 Potential Role of Theory in Autism Intervention                                         | 25       |
| 1.5.1 Identifying a Positive Role for Theory in Autism Intervention Research                | 25       |
| 1.5.2 Theory of Autism in Intervention (a): A Theory of Dysfunction                         | 25       |
| 1.5.3 Theory of Autism in Intervention (b): A Theory of Therapeutic Change                  | 26       |



|                                                                                            |             |
|--------------------------------------------------------------------------------------------|-------------|
|                                                                                            | <i>page</i> |
| 1.6 Two Conceptual Approaches to Autism and Intervention:<br>Behavioural and Developmental | 28          |
| 1.6.1 Behavioural-based Intervention Approaches                                            | 28          |
| 1.6.2 Developmental-based Intervention Approaches                                          | 31          |
| 1.7 Summary                                                                                | 31          |
| <b>CHAPTER 2: Operant Conditioning Theory in Autism Intervention</b>                       | <b>34</b>   |
| 2.1 Applied Behaviour Analysis (ABA)                                                       | 34          |
| 2.1.1 Introduction                                                                         | 34          |
| 2.1.2 Philosophy                                                                           | 36          |
| 2.1.3 Theory                                                                               | 40          |
| 2.1.4 Conceptualisation of Autism                                                          | 42          |
| 2.2 Prominent Models of ABA Intervention                                                   | 46          |
| 2.2.1 Discrete-Trial Training ABA (DTT-ABA)                                                | 46          |
| 2.2.2 Normalised ABA Models of Intervention                                                | 51          |
| 2.2.3 Mixed Models                                                                         | 54          |
| 2.3 Impact of a Behavioural Conceptual Framework on Autism Intervention Research           | 54          |
| <b>CHAPTER 3: Developmental Theory in Autism Intervention</b>                              | <b>57</b>   |
| 3.1 A Developmental-based Approach to Intervention                                         | 57          |
| 3.1.1 Introduction                                                                         | 57          |
| 3.1.2 Philosophy                                                                           | 58          |
| 3.1.3 Theory and Conceptualisation of Autism                                               | 60          |
| 3.1.4 Developmental Theories of Language in Autism                                         | 65          |
| 3.2 Developmental Models of Autism Intervention                                            | 68          |
| 3.2.1 Shared Principles and Common Strategies                                              | 68          |
| 3.2.2 Developmental Social Pragmatic Model (DSPM)                                          | 69          |
| 3.3 Impact of a Developmental Conceptual Framework on Autism Intervention Research         | 75          |
| <b>CHAPTER 4: Theoretical Eclecticism in Autism Intervention</b>                           | <b>78</b>   |
| 4.1 Introduction                                                                           | 78          |
| 4.2 Theoretical Eclecticism                                                                | 79          |
| 4.2.1 Definition and Prevalence of Theoretical Eclecticism                                 | 79          |
| 4.2.2 Development of Theoretical Eclecticism in Autism Intervention Research               | 79          |

|                                                                                                              |    |
|--------------------------------------------------------------------------------------------------------------|----|
| 4.2.3 Two Conceptually Incongruent Approaches to Autism Intervention                                         | 80 |
| 4.3 The Effects of Theoretical Eclecticism in Autism Intervention Research                                   | 82 |
| 4.4 Examples of Theoretical Eclecticism in Autism Intervention                                               | 85 |
| 4.4.1 ABA Models of Intervention                                                                             | 86 |
| 4.4.2 Developmental Models of Intervention                                                                   | 87 |
| 4.5 Addressing Theoretical Eclecticism in Autism Intervention                                                | 91 |
| 4.5.1 Reinterpreting an Operant Conditioning Theory of Children with Autism from a Developmental Perspective | 91 |
| 4.5.2 Developing a Unified Conceptual Framework                                                              | 95 |
| 4.6 Summary                                                                                                  | 99 |

## **SECTION II: An Experimental Investigation of Theory-Based Technologies in Autism Language Intervention**

|                                                                                                    |            |
|----------------------------------------------------------------------------------------------------|------------|
| <b>CHAPTER 5: Identifying an Appropriate Conceptual Framework for Autism Language Intervention</b> | <b>100</b> |
| 5.1 Child Language Acquisition (CLA) Research                                                      | 102        |
| 5.1.1 Definitions of Language and Communication                                                    | 102        |
| 5.1.2 CLA Research on Typical Language Development                                                 | 104        |
| 5.1.3 CLA Research on Atypical Language Development in Autism                                      | 107        |
| 5.1.4 CLA Research on Nonverbal Children with Autism                                               | 114        |
| 5.2 Available Technologies for Increasing Language in Nonverbal Children with Autism               | 114        |
| 5.2.1 Introduction                                                                                 | 116        |
| 5.2.2 Behavioural Technologies                                                                     | 117        |
| 5.2.3 Developmental Technologies                                                                   | 125        |
| 5.3 Summary                                                                                        | 127        |

**CHAPTER 6: An Experimental Investigation of Optimal Teaching Technologies for Increasing Motor Speech Production in Severely Language-Impaired Children with Autism** 130

6.1 Introduction 130

6.2 Background to Increasing Motor Production in Severely Language-Impaired Children with Autism 131

    6.2.1 Research Evidence 131

    6.2.2 Comparing Behavioural and Developmental Models of Language Intervention 132

6.3 Experiment One 135

    6.3.1 Method 135

    6.3.2 Results 145

    6.3.3 Discussion 150

        6.3.3.1 Theoretical Eclecticism in Empirical Research 151

        6.3.3.2 Individual Differences in Empirical Research 154

6.4 Experiment Two 156

    6.4.1 Method 156

    6.4.2 Results 160

    6.4.3 Rate 161

    6.4.4 Discussion 166

        6.4.4.1 Prominent Role for Theory in Comparative Research 166

        6.4.4.2 Individual Differences in Empirical Research 169

6.4.5 Limitations of the Study and Recommendations for Future Research 173

**CHAPTER 7: Conclusion** 176

**REFERENCES** 190

**APPENDICES** 195



## **SECTION I: A Conceptual Analysis of the Role of Theory in Autism Intervention Research**

This thesis is divided into two sections. Section one of the thesis provides a conceptual analysis of: (1) the perception of the role of theory in autism intervention research; (2) the practice of theoretical eclecticism in autism intervention and intervention research; and (3) the several ways in which theory and theoretical eclecticism are dealt with in the research literature. This conceptual analysis is divided into four chapters: chapter one addresses the widespread absence or neglect of theory in intervention research, particularly in the evaluation of intervention technologies; chapter two outlines the theory and conceptual framework of an ABA approach to autism intervention; chapter three outlines the theory and conceptual framework of a developmental approach to autism intervention; and chapter four discusses problems with the most frequent method of integrating technologies from both of these incongruent conceptual approaches, namely, theoretical eclecticism in intervention. In chapter four, two approaches for addressing the practice of theoretical eclecticism are explored: the first method involves reinterpreting an existing theoretical framework in line with another theoretical framework; the second method involves the development of a unified and informed conceptual framework from which intervention technologies may be developed, implemented, and evaluated, and it is this method which is further explored in the experimental section of the thesis.

In section two, the empirical applications of the conceptual analysis in section one are explored. In chapter five, the most recent research findings on language development in children with autism are outlined with regard to informing an appropriate conceptual framework for developing language intervention, and the conceptual frameworks of a behavioural and a developmental approach to language intervention are delineated and discussed as two maximally divergent, but unified, conceptual approaches. In chapter six, an empirical study is reported in which these two conceptually divergent approaches to autism language intervention are compared. The empirical study is presented as both an empirical exploration and illustration of the potential role of theory in autism language intervention

## **Chapter 1**

### **Theory in Autism Intervention: Implications for Research and Intervention**

#### **1.1 Introduction**

Autism is one of the best validated (Bailey, Philips, & Rutter, 1996) yet least well understood of the childhood disorders. Various neuropsychological theories of the cause of, and dysfunction in, autism abound (e.g. Weak Central Coherence theory) yet no theory has been proposed that can account for the specific triad of impairment found in autism. However, research on behavioural symptoms has increased understanding of the type and quality of impairments in autism, and has further directed theoretically driven research on the aetiology of, and path of impairment in, autism. Theory therefore plays a pivotal role in directing research on autism and informs the development of appropriate and effective interventions for autism. However, while theory plays a critical role in the development of intervention technologies for children with autism, we propose that theory does not currently play as critical a role in intervention studies on the evaluation and implementation of these technologies. In this chapter, the current absence and neglect of theoretical debate in autism intervention research is illustrated and several limitations that the negative status of theory in intervention research places on the quality and effectiveness of both autism research and autism intervention are highlighted. Several researchers have previously highlighted this problem in the context of psychological interventions for developmental disorders but the issue of the critical role of theory in autism intervention remains inadequately addressed by current intervention researchers. We propose that the current status of theory in autism intervention research is problematic and needs to be addressed by intervention researchers in order to better develop and evaluate effective technologies for treating children with autism.



## **1.2 Autism**

### **1.2.1 Diagnosis and Classification**

Autism, or autistic disorder, is a pervasive developmental disorder (PDD) characterised by several impairments in social and communicative functioning and by repetitive or stereotyped interests and behaviours. It is one of three closely related childhood disorders known collectively as Autism Spectrum Disorders (ASD), and the terms autism and ASD are often used interchangeably in the research literature (Caronna, Milunsky, & Tager-Flusberg, 2008). However, while autism is one of the best validated childhood disorders (A. Bailey, Philips, W. & Rutter, M., 1996), the related ASDs of Asperger's Syndrome and PDD-NOS (pervasive developmental disorder – not otherwise specified) are not as well defined and reliably diagnosed (Tager-Flusberg, Joseph, & Folstein, 2001). Thus, in this thesis we will use the term 'autism' to refer only to autistic disorder and the term 'ASD' to refer to the collective group of related PDD disorders, including autism, Asperger's Syndrome, and PDD-NOS.

Autism affects approximately four times as many boys as girls, with up to 10 times as many boys as girls diagnosed with ASD (Hill & Frith, 2003). A marked increase in prevalence rates for both autism and ASD has led to fears of an autism epidemic. However, epidemiological research suggests that the apparent rise in prevalence is due to an increased awareness of the disorder, better diagnostic tools, and a broadening of the autism construct to include a spectrum of disorders rather than just a core disorder (Haq & Le Couteur, 2004). Rutter, however, has also cautioned that the possibility of an actual rise in prevalence cannot yet be ruled out (Rutter, 2005). Currently, the prevalence rate for autism is estimated at 10 in 10,000, while for ASD it is 30-60 in 10,000 (Haq & Le Couteur, 2004; Rutter, 2005; Volkmar, Lord, Bailey, Schultz, & Klin, 2004).

To meet the diagnostic criteria for autism a child must exhibit: two qualitative impairments in social functioning; one in communicative functioning; and evidence of restricted, repetitive and stereotyped interests and behaviours. Onset of the disorder must also occur before 3 years of age and the child must not meet criteria for any other disorder (Association, 2003). Current diagnostic criteria reflect Kanner's original

description of the disorder (Kanner, 1943), yet the past two decades of intense research on autism have significantly altered how autism is conceptualised. Specifically, interdisciplinary research from psycholinguistics, cognitive and developmental psychology, genetics, and neurobiology, has expanded our knowledge of the aetiology of autism, the form and function of behaviours, and the prognosis for future development in young children with autism. A degree of consensus has also been reached on best practices for children with autism despite significant conceptual differences between the developmental and behavioural-based approaches that currently dominate autism intervention (Dunlap, 1999; Stephens 2005).

### **1.2.2 Research**

The field of autism research includes many distinct areas of investigation with distinct research targets. Research teams in each area often adopt a multidisciplinary approach in order to understand the different levels and types of impairment specific to autism (Volkmar et al., 2004). For example, in order to develop an effective understanding of the dysfunction in autism, researchers investigating language impairment in autism may incorporate findings from neurobiological research on the brain mechanisms involved in language development, developmental psychological research on typical levels and stages of language development, and psycholinguistic research on the pre-requisite skills necessary for language development to occur. Target areas of investigation may also overlap with research on social and communicative impairment informing language studies, and neuropsychological profiling studies guiding genetic research on the aetiology of autism. A brief overview of the major research areas and findings in relation to autism is, therefore, provided in this section. This overview is not intended to be exhaustive but rather to give a flavour of the breadth and depth of research on autism and the many approaches that can be taken with regards to this disorder.

Neuropsychological research typically aims to identify the underlying processes involved in autism-specific impairments, and many of the prominent psychological theories of autism have been derived from research in this area. To provide an adequate theory of autism researchers must be able to explain and account for all three categories of impairment in terms of a single underlying deficit. The primary neuropsychological



theories of autism have been Theory of Mind (ToM) (Charman et al., 2000), Weak Central Coherence (WCC) (Frith & Happé, 2005), and Executive Dysfunction (ED) (Russell, 2004), (Lord & McGee, 2001). The research generated by these three theories has furthered our understanding of autism but to date no theory has adequately explained the three categories of impairment and why they cluster together in individuals with autism. Hence, investigations into the ToM hypothesis have allowed researchers to tease out the respective roles of language and cognition in the typically poor outcomes for autistic individuals on false belief tasks and in the social use of language, but it cannot account for repetitive interests and stereotyped behaviours. WCC and ED have also led to the investigation of the unique cognitive profiles of individuals with autism providing a greater opportunity to examine autistic strengths, including savant skills, rather than focusing exclusively on autistic deficits. However, neither WCC nor ED can adequately account for the uniquely autistic impairment in the social and pragmatic use of language.

One branch of neuropsychology has addressed the problem of the heterogeneity of behavioural symptoms in individuals with autism by profiling subgroups of these individuals according to cognitive and linguistic functioning (Joseph, Tager-Flusberg, & Lord, 2002; Tager-Flusberg & Joseph, 2003). Research on cognitive and linguistic profiles and on the identification of potential phenotypic subtypes has further informed and directed aetiological research in the search for the genetic origins of the disorder. However, while this line of neuropsychological research may be potentially useful for genetic and intervention studies, behavioural heterogeneity may not be an accurate index of genetic heterogeneity (see Rutter, 2005).

Genetic and aetiological research on autism would suggest that autism is a multifactorial disorder, “caused by multiple genes and some, as yet to be identified non-genetic factors” (Rutter, 2005, p. 236). Autism is a highly heritable disorder, with siblings of children with autism being 50 times more likely to develop ASD than children in the general population (Frith & Happe, 2005). Genetic research in support of a conceptualisation of autism as a multifactorial disorder would also indicate that the genetic liability thought to be a major risk factor for ASD involves a liability for the broader autism phenotype and not for core autism deficits. At a neuropsychological level of research, Happé et al. have suggested that the triad of impairment in autism is not the

result of a single genetic mutation or of a single overarching neuropsychological impairment. Rather, they suggest that these impairments are separate impairments that cluster together and that we should thus concentrate on looking for separate genetic causes and separate neuropsychological models for each type of impairment (i.e., social, communicative, and imaginative) (Happé, Ronald, & Plomin, 2006). As well as changing how we should investigate and hypothesise about autism, this shift in conceptual approach would also mean that, at the level of intervention, each category of impairment should be treated independently, rather than the therapist trying to treat autism as a whole.

Research studies on the broader autism phenotype have revealed that many autistic traits and characteristics are found in the general population, with family relatives of individuals with autism scoring high for autistic characteristics. This research supports the dominant construct of autism as one of a spectrum of disorders. In this construct of autism as a spectrum, the general population may be conceptualised as functioning at one end of the spectrum and is least affected by autistic characteristics, while individuals with autistic disorder may be conceptualised as functioning at the other end of the spectrum and are those who are most affected by social, communicative and imaginative impairments (Constantino & Todd, 2003). For example, in one study of 177 typically developing children, over one third were found to have extremely intense interests and of these children almost 75 percent were boys (DeLoache, Simcock, & Macari, 2007). This finding further supports the construct of autism as a spectrum disorder.

Developmental, psycholinguistic and neurobiological research on the social and communicative deficits in autism has significantly altered the current conceptualisation of impairment in autism. For example, several researchers have suggested that the diagnostic categories of social and communicative impairment in autism are not mutually exclusive, but rather, that their many sub-domains are intricately linked (Charman & Stone, 2008). As such, the social impairment of 'failure to develop peer relationships appropriate to developmental level' may in many children be linked to, or even dependent upon, the communicative impairment '[in]ability to initiate or sustain a conversation with others' (Association, 2003). Thus, research in autism assessment has led to a move towards combining these two diagnostic categories (Charman & Stone,



2008). Theories of impairment in social and communicative functioning typically use behavioural symptoms as a guide to understanding the underlying processes or capacities that are affected in autism. Developmental and psycholinguistic research on atypical behaviours in autistic infants has highlighted two pre-linguistic capacities as particularly relevant in atypical development in autism, namely, the capacities for joint attention and symbol use (Wetherby, 2008). Infants and young children with autism have been found to be particularly impaired in the ability to share, initiate and respond to joint attention in social interactions (Mundy & Crowson, 1997; Mundy, Sigman, & Kasari, 1990), a capacity which is considered integral to language and communication development in typical children (Tomasello, 2003; Trevarthen & Aitken, 2001). Among impairments in the capacity for using symbols, impaired imitation has been found to be a significant predictor of language outcomes for children with autism (Rogers et al., 2006; Thurm, Lord, Lee, & Newschaffer, 2007). As we shall see later, findings such as these are incorporated into the conceptual framework of intervention approaches in different ways and used to derive new technologies for intervention according to the theoretical and philosophical commitments of that approach. These findings on the prerequisite behaviours for social and communicative development serve to further illuminate one of the core and defining features of autism, namely, impairment in the social and pragmatic use of language. This impairment spans both social and communicative diagnostic categories, is found in the broader autism phenotype, and appears to be common to all individuals on the autistic spectrum.

In contrast, language functioning is much more variable (Tager-Flusberg, 2001). Hence, although some children are fluent language users, a significant number of children with autism do not acquire functional language at all; Lord and Paul have estimated that up to 50% of children with autism do not acquire functional speech (Lord et al., 1997). However, this percentage appears to be decreasing due to earlier and better diagnosis and access to intervention at a younger stage of development. Language is one of the key prognostic indicators for children with autism (Tager-Flusberg & Joseph, 2003; Tager-Flusberg et al., 2001) and, consequently, teaching language and communication skills to children with autism is considered a key component for any effective intervention.



Attempts have also been made to map the developmental trajectory of autism (Volkmar et al., 2004). Interest in the neurobiology and developmental trajectory of autism has been influenced by the finding that the diagnosis of autism remains relatively stable from the age of two onwards. However, the development of children with autism is not always linear and appears to be affected by several variables (e.g., social abnormalities appear to increase from early preschool to school age and then decrease in adulthood) (Volkmar et al., 2004). Nonetheless, the investigation of potential brain-behaviour relations is a major research area in the field of autism and has impacted on theories of autism and the conceptual frameworks guiding the major intervention approaches for autism. Research on brain plasticity in particular has led to several theories about the potential impact of early intervention on the developmental course of autism and the development of technologies that may affect change in the early neurobiological pathway of autism (Dawson, 2008; Niemann, 1996).

### **1.2.3 Models of Intervention**

Behavioural- and developmental-based approaches currently dominate autism intervention research (Rogers, 2008). In this thesis, the term *approach* will be used to refer to a group of intervention models that are unified by a shared conceptual framework, including shared theoretical, philosophical, and methodological commitments. Any given approach may include several *models* of intervention and these models will be examined as examples of the application of the overall conceptual framework in a specific format of intervention. The term ‘model’ of intervention is therefore used to denote the specific application of an overall approach in a narrowly defined format. Models of a particular approach to intervention differ from each other only in the extent to which the tenets of the overall conceptual framework are adhered to and the way in which these tenets are implemented. As such, models may be based on slightly different theories of autism and intervention but these theories are developed from shared and fundamental theoretical principles.

ABA is the primary behavioural approach to autism intervention and may be considered an umbrella term for several behavioural models of intervention that share an operant conditioning theory of learning (Cooper, Heron, & Heward, 2007; Prizant &

Wetherby, 1998). Traditionally, ABA has been to the fore in providing structured psychosocial intervention for children with autism and this approach to intervention has accumulated a vast number of empirical and efficacy studies demonstrating success in teaching specific skills to many children with autism (Volkmar et al., 2004). Recently, interventions designed to target autism-specific social and communicative deficits have been developed from theories of language acquisition that emphasise the role of social interaction in language development. These interventions adopt a developmental approach to language and prioritise the social context in which language is acquired. Currently, the technologies of both behavioural- and developmental-based intervention approaches are widely disseminated and empirically investigated. However, direct comparison studies are traditionally difficult to conduct and have been lacking (Gernsbacher, 2003).

### Applied Behaviour Analysis

ABA is not specifically an autism intervention but it has nonetheless played a particularly prominent role in autism intervention (Kimball, 2002; Volkmar et al., 2004). ABA is a dynamic intervention approach (Dunlap, 1999) and is constantly developing its technologies. Behaviour Analysts were among the first to attempt to intervene with children with autism (Lovaas & Smith, 1989) by using behaviour modification to alter behavioural symptoms of autism (Ferster, 1961; Lovaas & Smith, 1989; Prizant & Wetherby, 1998). Behaviour analysts approached autism as a disorder of behaviour and applied technologies developed from the theory of operant conditioning to change behaviour through systematic manipulation of the environment (Lovaas & Smith, 1989). While a discrete-trial format was initially the most widely used ABA form of intervention with children with autism, several different models of intervention have since been developed and implemented with these children, including Incidental Teaching and Pivotal Response Training (Delprato, 2001).

A vast number of empirical studies on the effective use of ABA for children with autism have been conducted (Matson, Benavidez, Compton, Paclawskyj, & Baglio, 1996; Rosenwasser & Axelrod, 2001; Schreibman, 2000). Most of these studies comprise single-case studies (Dunlap, 1999) and demonstrate the successful use of behavioural



technologies to either increase positive, or decrease negative behaviour in several areas of functioning, including, language, social, academic, and self-help (Matson et al., 1996). One behavioural technology with extensive applications in autism intervention is the Functional Assessment of behaviour (Grey & Hastings, 2005). The development of Functional Assessment (FA) highlighted that problem behaviours serve a function for the individual, and by identifying this function more appropriate and helpful behaviours can be taught to replace the problem behaviour (Iovannone, 2003).

Several studies investigating comprehensive ABA programmes (Birnbrauer & Leach, 1993; Cohen, Amerine-Dickens, & Smith, 2006; Lovaas, 1987; Smith, Groen, & Wynn, 2000) have shown an increased level of functioning for many children with autism. However, no single intervention approach has been shown to be the most effective for all children with autism (Dunlap, 1999; Prizant & Rubin, 1999). At an empirical level, reviews of these studies have revealed methodological flaws that undermine the respective studies' findings and the ability to draw definite conclusions from the results (Gernsbacher, 2003). Studies of different approaches to autism intervention also routinely fall prey to these flaws (Aldred, Green, & Adams, 2004), which include the non-randomised assignment to conditions and inadequate pre- and post- testing of participants (Gernsbacher, 2003). To address these concerns, (Smith et al., 2000) conducted a randomised control trial (RCT) study comparing the effectiveness of ABA to a control parent-instructed treatment group. Although the results of this study were less dramatic than that of Lovaas' earlier UCLA study (Lovaas, 1987), Smith's truly experimental study reflects a scientific commitment to the effective investigation of ABA intervention for children with autism, and this RCT study is still one of the few RCT studies carried out on any autism intervention (Gernsbacher, 2003).

At the level of intervention, concerns have been raised about problems with the generalisability of behaviours across different settings (Koegel, Koegel, & McNerney, 2001), the unnatural context of discrete trial training and the intensity of intervention required (Heflin & Simpson, 1998), and the lack of depth of intervention effects (Bodfish, 2004). However, ABA is a constantly evolving discipline, and models such as Incidental Teaching, Pivotal Response Training, and Natural Environment Training have been developed in response to the first three criticisms (Delprato, 2001; Koegel et al.,



2001). Currently, the general consensus about the use of ABA in autism intervention is that it is an effective tool and may be used to good effect with many but not all children with autism (Dunlap, 1999; Heflin & Simpson, 1998; Lord & McGee, 2001). Further, the use of behavioural technologies in non-ABA interventions is often overlooked as is the extent to which many autism interventions rely on behavioural methodologies (Dunlap, 1999; Ogletree & Oren, 2001).

### Developmental Models

A developmental-based approach to autism intervention shares many similar structural elements with a behavioural-based approach. As such, developmental-based models are semi-structured, typically involve one-to-one practice, and focus on the child's individual level of functioning and ability. Conceptually, however, developmental models of intervention are derived from theories of, and research on, the specific social-communicative impairments in autism (Mundy et al., 1990; Tager-Flusberg, 2001). Consequently, developmental models primarily target social-communicative impairments (Aldred et al., 2004) and do so from developmental theories of child language acquisition and dysfunction. Developmental social pragmatic models are primarily concerned with increasing social-communicative interactions rather than with the form they take (e.g. language), and all communication attempts, no matter how unusual, are viewed as intentional (Ingersoll et al., 2005).

Prominent developmental-based models include the Developmental Social-Pragmatic Model (DSPM) (Aldred et al., 2004; Ingersoll et al., 2005), and the Developmental, Individual Difference, Relationship-based (DIR or Floortime) Model. While the body of research on these interventions is not as vast as that amassed in behavioural research over the last four decades (Rogers, 1996), nevertheless the conceptual framework of these interventions draws on a vast amount of empirical research on autism specific impairments (Aldred et al., 2004).

A consensus on early autism intervention has emerged that suggests that while “no evidence exists to favour one approach over another as a general intervention for children with autism”, some interventions may prove more beneficial than others, and several elements that should be included as best practice in interventions for children

with autism have been identified (Dunlap, 1999). These include the use of structured intervention providing routine and predictability, multiple opportunities for social-communicative interaction, family involvement, and child engagement (Dunlap, 1999; Iovannone, 2003; Stephens, 2005). Indeed, Volkmar et al. have suggested that the many commonalities among intervention approaches may signal a less divisive attitude between advocates for various interventions (Volkmar et al., 2004). However, behavioural- and developmental-based approaches to autism intervention are developed from theoretically distinct psychological models (Volkmar et al., 2004) and thus we should remember that two very different conceptual frameworks have led to similar but not identical interventions. As such, theory and conceptual framework will play a critical role in understanding why and how these shared aspects of intervention constitute best practice.

### **1.3 Current Role of Theory in Autism Intervention**

The absence of both a fully effective theory of autism and an adequate understanding of its aetiology has meant that interventions for autism are largely symptomatic in nature (Bodfish, 2004; Pelios & Lund, 2001). However, research on autism has been critical in revealing the need for communication development in autism intervention (Bruinsma, 2004), the need to teach the pragmatic aspects of social and communicative interaction (Tager-Flusberg, 2001), and the importance of early, autism-specific intervention in improving the prognosis for individuals with autism (Dunlap, 1999). As such, our understanding of what autism is (i.e., its genetic and neurobiological origin, specific triad of impairments, and striking abnormalities in social functioning) is crucial in guiding the development of effective interventions for autism (Bodfish, 2004). Thus, theory and research guide the development of intervention, allowing us to further understand ‘what works’, and more importantly, why it works.

Intervention approaches vary in how they conceptualize autism, psychology, and science and in the extent to which they incorporate research findings on autism into their conceptual approach. We are primarily concerned with the conceptual framework of two



prominent psychosocial intervention approaches, behavioural- and developmental-based interventions, and the theory of autism which guides them.

### 1.3.1 Definition of Theory and Conceptual Framework

In this thesis our understanding and use of the word *theory* is as defined by Kazdin:

[...] theory is used to refer to an explanatory statement that is intended to account for, explain, and understand relations among variables, how they operate, and the processes involved. (Kazdin 1999, p. 533)

Within any intervention approach there will be theoretical differences among various models of the intervention. Nevertheless all models within a single approach to intervention share certain theoretical, philosophical and methodological tenets about how autism should be investigated, understood, and explained. The shared theoretical, philosophical, and methodological commitments of all the models within a single approach to intervention are defined here as the *conceptual framework* of a model or approach. A conceptual framework thus provides “an overall orienting view” for researchers (Kazdin 1999, p. 533) committing them to a particular method for investigating and treating autism. Given the many related theories of child development and language acquisition that inform developmental-based interventions, and given the several theoretical streams in contemporary behavioural research, the term ‘conceptual framework’ will be used to refer to the overarching theoretical, philosophical and methodological commitments that unite a particular intervention approach and distinguish it from another. This is in contrast to the use of the term ‘theory’ to refer to how autism and the intervention process is understood and explained within a specific intervention model or overall approach. Thus, we situate each intervention approach both within a broad conceptual framework and the narrower theory guiding its implementation.<sup>1 2</sup>

---

<sup>1</sup> In our use of these terms we share Kazdin’s understanding that the difference between the two “pertains to the level of abstraction and also the testability of key propositions” (Kazdin, 2000 p. 338).

<sup>2</sup> It is worth noting that our understanding and use of the term theory also reflects a particular conceptual framework and a specific understanding of psychology as science. By using this definition of theory we assume several philosophical and methodological commitments that differ most notably from a behavioural conceptual approach (see, for example, Martens et al.’s definition of scientific theories as “statements of functional relations based on empirical observations ...” (Martens et al., 2000 p.370). We will further



Throughout this thesis we will address two theory-related questions in various intervention-related contexts. These questions are **(1) what is the current perception of the role of theory and conceptual framework in autism intervention research?;** and **(2) what role should theory and conceptual framework play in autism intervention?** Both questions are intricately linked, such that the current status of theory in autism intervention has been strongly influenced by practitioners' and researchers' perception of the role theory should play in autism intervention.

### **1.3.2 The Current Role of Theory in Autism Intervention Research**

The current status of theory in autism intervention research is problematic in two distinct albeit related ways. Firstly, there is a decided *absence* of theoretical and conceptual debate in intervention empirical studies; and secondly there is a noticeable *neglect* of theory in the implementation of intervention technologies. The absence of theoretical discussion in intervention research is evident in the lack of consideration in empirical studies of the impact of theoretical, philosophical, and methodological commitments on the effectiveness of an intervention approach; and the neglect of theory is most visible in the use of theoretically incongruent technologies in eclectic intervention approaches. Furthermore, the problematic absence and neglect of theory in intervention research are related concerns, with the absence of theoretical consideration in research studies affecting the degree to which theory is neglected in the implementation of an intervention.

#### The Absence of Theory in Intervention Empirical Studies

Theoretical debate, and the construct of conceptual framework, is most noticeably absent from what Hughes refers to as the “relatively recent enthusiasm within professional psychology for identifying and promoting empirically supported treatments (ESTs)” (Hughes 2000, p. 301). In these treatment studies, researchers are primarily concerned with demonstrating the efficacy, or internal validity, of an intervention and not with how change is brought about (Hughes, 2000a). The absence of theory in the recent

---

discuss conceptual incongruence between behavioural and developmental approaches to autism intervention in chapters 2, 3, and 4.

proliferation of treatment efficacy studies has been highlighted by several researchers and clinicians who caution against excluding theoretical and conceptual debate in the development, investigation, and evaluation of, intervention approaches (Hersch, 2001; Hewitt, 2001; Hughes, 2000a, 2000b; Kazdin, 1999, 2000):

Much of the [recent treatment] research reflects empiricism at its best, and its worst, namely, repeated demonstrations that various treatments produce change and are better than no treatment. Very little in the way of theory guides therapy research and hypotheses about mechanisms or moderators of change. (Kazdin, 1999, p. 533)

The absence of theory in the discussion of mediating variables in intervention research has led some researchers to call for “qualitatively different” research that can account for outcomes in a more “conceptually rich manner” (Ollendick & King, 1998 p. 165). Providing such a conceptually rich framework would involve acknowledging underlying philosophical assumptions and theoretical commitments, a process that is often overlooked or inadequately addressed by many intervention researchers (Hersch, 2001).

Several researchers have posited that theory has quite a prominent role in intervention studies but that its role is in the initial development of the intervention and not in the final evaluation of its effectiveness (Kratochwill & Stoiber, 2000; Sheridan, 2000):

We would argue that many ESIs [empirically supported interventions] have had the benefit of a close linkage to theory early in their development but as documented efficacy occurred in research, work on interventions became *technology oriented* when these interventions were transported to applied settings. (Kratochwill, 2000, p. 353)

It has also been suggested that the shortcomings of empirical intervention studies reside not in the absence of theory but rather in the random use of interventions without adequate consideration of the rich conceptual framework from which they have been developed and thus the neglect of theory in intervention is a practice issue (Doll, 2000; Sheridan, 2000). However, highlighting that theory plays a necessary role in the initial development of intervention technologies and that it is in the practice of an intervention that interventionists and researchers neglect to attend to the theoretical framework of the intervention only serves to indicate where the neglect of theory lies. It is in the evaluation of why and how an intervention works that the theory and implicit assumptions of the



interventionist and researcher should be brought to the fore, and it is during this stage of the research process that theory is most absent. In highlighting the current lack of consideration for the role of theory in many empirical studies on autism intervention, we are not negating the original role of theory in developing a particular intervention. Rather we are trying to bring that role to the fore and make explicit the theoretical, methodological, and philosophical assumptions inherent in the intervention approach in order to better understand not only *what* changed in an intervention, but *why* it changed. Further, as we shall discuss later, although it is well established that interventions are now “technology oriented” it does not necessarily follow that they should be technology-oriented.

### The Neglect of Theory in Autism Intervention Research

The neglect of theory in autism intervention research can be found in the eclectic practice of theoretically incongruent technologies (Apel, 1999; Hewitt, 2000). The eclectic implementation of intervention technologies is a common practice in autism intervention and occurs when an interventionist implements technologies without considering how that technology is thought to effect change in intervention according to the theory from which it was developed. This can also occur when an interventionist does acknowledge theoretical inconsistencies between technologies from different approaches, such as behavioural- and developmental-based approaches to autism, and attempts to address these inconsistencies by adopting the theoretical framework of the particular technology being implemented at the time (Orvaschel, 1999). Thus, while absence and neglect of theory can be similar concepts, neglect occurs when the theory underlying technologies is understood or acknowledged but is inadequately addressed or inappropriately used. As we shall see, the neglect of theory that underlies this practice negatively impacts on the quality and future development of autism intervention in several ways.

### **1.3.3 Reasons for the Current Perception of Theory in Intervention Research**

Of the hundreds of intervention studies that look for treatment effects, relatively few researchers attempt to explain why and how these particular effects occur in each treatment programme (Kazdin, 1999). Before looking at the role theory should play in



autism intervention we must first ask why theory is currently so visibly absent from intervention research literature. We may ask, with Hughes (2000), why “researchers and practitioners have become so enamoured of facts and so distrustful of theory”? (p. 254). One possible reason for the current status of theory comes from an emphasis during the last ten years on identifying empirically supported interventions and on finding intervention technologies that can be reliably used to improve functioning in children with autism. The questions asked by educational authorities and funding bodies are predominantly whether an intervention works, whether it is effective, and whether it should be reimbursed financially (Kazdin, 1999). Consequently, researchers investigating autism may develop a variety of psychological theories of autism, from Weak Central Coherence theory to “Extreme Male Brain” theory, and return to the drawing board if these theories fail to adequately explain and account for autism. However, researchers investigating autism intervention are seeking a pragmatic if not a perfect solution to autism intervention, one that provides objective grounds for using one intervention above another even if we do not yet know why the intervention is working to a certain degree. Thus researchers may prefer to stick with a scientifically conducted and empirically researched approach to intervention that appears to be working, even if only to a limited extent, “rather than to waste time considering something radical and perhaps airy-fairy” (Philips, 1996 p. 1013, cited by Hughes, 2000).

This would indeed appear to be the case among intervention researchers who prefer a behavioural conceptual approach to autism intervention.<sup>3</sup> Researchers investigating autism intervention must find and reliably demonstrate support for interventions that work, and that help children with autism ‘right now’ in order to present “the strongest justification for their services (e.g., for third-party payment)” (Hughes, 2000, p. 303). An unfortunate outcome of the proliferation of these studies is the now common tendency to equate best scientific practice with efficacy studies and an adherence to interventions with the most empirical support, a tendency which further undermines the positive role of theory in the development of better and more efficacious interventions in the future (Hughes, 2000).

---

<sup>3</sup> See Lovaas & Smith, 1989, p.p. 18, 19, and 20, for an exposition of a popular behavioural conceptualisation of the role of theory in research and intervention.

A behavioural-based approach, e.g. Applied Behaviour Analysis, to autism intervention particularly lends itself to the demands of intervention consumers and government funding bodies seeking identifiably efficacious interventions. Behavioural researchers have traditionally underrated the role of theory in research and intervention (Shimp, 1989; Skinner, 1950) preferring instead to emphasise inductive methods for collecting and analysing data (Lovaas & Smith, 1989). In a behavioural conceptual framework, theory serves as a statement of “functional relations based on empirical observations” (Martens, 2000, p. 370) that allows the researcher to organize and make use of data. As such, theory is not used to “account for, explain, and understand relations among variables, how they operate, and the processes involved”, but rather to operationalise constructs and demonstrate functional relationships (Hughes, 2000). It is not surprising then that an approach that prioritizes data driven research will best meet the current demand for efficacy studies. Indeed, this empirically-driven approach has been to the fore in developing intervention technologies for children with autism with hundreds of efficacy studies that empirically support the use of behavioural intervention for many children with autism (Volkmar et al., 2004). However, even though theory may not be conceptualised within a behavioural approach to have played as significant a role in the development of behavioural technologies, a behavioural conceptual framework shares with all conceptual frameworks extensive theoretical, philosophical, and methodological commitments. Hence, while behavioural-based intervention approaches are more “technology oriented” than developmental-based approaches, theory and conceptual framework play a critical role in behavioural approaches, even if not brought to the fore in autism intervention efficacy studies.

The absence of theoretical debate in autism intervention research is also a cause of the neglect of theory in intervention research and practice. That is to say, if theory is visibly absent from empirical research and thus not thought to play an important role in the evaluation and implementation of empirically supported interventions, then interventionists will be less aware of the hazards of implementing technologies from different approaches without an adequate theoretical or conceptual framework for doing so. The absence of consideration of theoretical and conceptual issues in the debate on the effectiveness of empirically supported interventions thus further perpetuates the neglect



of theory in the practice of these technologies and in the research that is further generated from this practice.

#### **1.4 Impact of the Current Role of Theory on Autism Intervention Research**

The absence and neglect of theory in intervention research affects both the quality and integrity of that research in four ways:

1. Limitations are placed on understanding *how* and *why* an intervention achieves change
2. Our ability to optimise intervention outcomes and improve intervention in the future is restricted
3. Our ability to identify for *whom* the intervention is most effective is limited
4. Our ability to entertain alternative explanations and explore alternative possibilities is negatively constrained

##### **1.4.1 Understanding Change in Intervention**

The first limitation is a direct result of the absence of theoretical discussion in autism intervention research and is cited often by concerned researchers and practitioners, namely, that without understanding the conceptual framework and theoretical underpinnings of a given intervention we cannot attempt to understand how and why an intervention is working (Apel, 1999; Hewitt, 2001; Hughes, 2000a, 2000b; Jensen, 1999; Kazdin, 1999, 2000). This problem in turn impacts on the other four problems identified above. That is, not being able to understand why an intervention is working means that we cannot optimise the level of effectiveness of an intervention, we cannot identify who this intervention may work best for and who it may not, we may find that the intervention works less effectively outside of the laboratory because we do not understand why it worked in the laboratory in the first place; and when an intervention does not work, we



cannot change how we understand the problem with the intervention because we do not have an informed conceptual framework to challenge, change, or move away from.

The absence of the role of theory in intervention research and development undermines the scientific integrity of research. It is not good scientific practice to implement programmes for which we have empirical support but which may or may not be targeting the intended problem, e.g. autism-specific impairment. For example, an intervention technology may lead to surface changes in behaviour that are highly contextualised but these contextualised responses may not reflect deeper level changes in social and communicative functioning and understanding. This problem has been highlighted by Bodfish (2004) and will be discussed further in chapter two, section 2.2.1. Science, therefore, must not only demonstrate experimental control over phenomena but also explain the phenomena in question (Hughes, 2000). Similarly, the scientific role of theory in developing interventions is often overlooked in the search for data and demonstrable outcomes:

Part of being a scientist involves using theory to guide intervention because *theory is what brings science to practice* [my italics]. Without a theory, clinicians will not be able to explain why a certain cause had a special effect. (Apel, 1999 p. 105)

Conversely, interventions which are implemented on the basis of an extensive and ostensibly appropriate theory of autism-specific impairment, but which are implemented without empirical support for the effectiveness and appropriateness of such a theory, pose significant problems for autism intervention and research. That is, interventions which have been developed and implemented on the basis of a coherent and comprehensive theory of autism must also be subject to empirical testing and open to comparative analysis with other autism interventions. One intervention for autism, derived from a neuropsychological theory of dysfunction in autism and currently implemented without such empirical support or comparative analysis, is the Miller Method (Miller, 2000). Without empirical research on the extent to which this approach is effective, and without experimental research on the ways in which this approach affects change in individuals with autism, this intervention lacks scientific validity and is a good example of the limitations of implementing theory-driven interventions without empirical support.

However, it is argued in this thesis that the prevalent emphasis on “what works” rather than on why an intervention works has also led to a decided neglect of theory in the implementation of intervention technologies, and that this neglect of theory is a significant problem in autism intervention research. One particularly negative outcome of this neglect is the practice of theoretical eclecticism, which is defined in this thesis as the implementation of theoretically incongruent technologies. This eclecticism appears to stem from the currently disproportionate emphasis on “science-based” outcome-driven studies above those studies that include an exposition of conceptual framework and a theoretical account of why the intervention is working. Several researchers have also called for a broader knowledge base for the development of intervention, including theory, clinical and educational data, and knowledge of best practices, social values and empirical data, rather than developing interventions solely on the basis of empirical research (Prizant & Rubin, 1999; Shonkoff, 1996).

Interventionists and researchers, including students, may take an eclectic approach to intervention and therapy in one of two ways: (1) they may use a variety of technologies from a variety of perspectives without understanding the theory behind each technology; or (2) they may adopt one conceptual approach to intervention but implement technologies from a conceptually incongruent intervention (Orvaschel, 1999). Essentially, both forms of eclecticism reflect an absence of understanding both in “what they [practitioners] are doing” and of “the relation between theory and practice” (Orvaschel, 1999, p. 548).

In the first form of theoretical eclecticism, the interventionist or researcher may implement technologies from theoretically incongruent approaches without an awareness of the theoretical divergence of the respective approaches. A significant concern with this practice in intervention is that an ineffective and an effective technology may be implemented simultaneously. The ineffective technology may lessen the impact or successful implementation of the effective technology and may thus actually hinder progress (Hewitt, 2000). The second form of theoretical eclecticism occurs when an interventionist uses technologies from theoretically incongruent approaches with an awareness, but minimal acknowledgement, of the theoretical divergence of the respective approaches. Often in attempting to overcome theoretical inconsistencies the



interventionist will adopt the conceptual framework underlying the technology that is being implemented at the time. The particularly negative impact of this form of eclecticism on the quality of autism intervention research will be discussed in detail in chapter four. It will also be argued that theoretical eclecticism in any form is not an ideal practice in autism intervention, and one that can only be checked by bringing the critical role of theory and understanding back to the fore in intervention research.

#### **1.4.2 Optimising Intervention Outcomes**

The second problem affects the quality of intervention in practice, and arises from both the absence and neglect of theory in intervention research and practice. For example, many researchers do not make explicit the theoretical principles upon which a technology is based and how it is thought to affect change in intervention, and this reflects a noticeable absence of theory in intervention research. If an interventionist subsequently chooses to implement this technology without understanding why the technology is thought to work this represents a neglect of theory. Together, the absence of theoretical debate at the level of evaluating an intervention and the neglect of theory at the level of implementing an intervention may combine to undermine the effectiveness of an empirically supported technology by limiting the interventionist's ability to implement the technology in the manner and context for which it was developed. The effectiveness of a given technology is only as good as the therapist's understanding of that particular technology, including why and how it works.

Thus, without a comprehensive understanding of why we are using a particular approach for children with autism we may not be able to effectively put that intervention into practice (Kazdin, 1999, 2000). This problem reflects concerns about the capacity for generalisation of research from the laboratory to the clinic or school where the intervention is being put in place. Many efficacy studies are carried out in psychology labs or specialized school settings and often replicated studies carried out in natural school and home settings are not as effective. While this may be due to confounding variables, such as variation in individual ability, or the inconsistent use of intervention technologies, it is also likely to be significantly affected by inadequate theorising and insufficient understanding of the mechanisms involved in intervention (Kazdin, 1999).



### **1.4.3 Identifying the Target Population of an Intervention**

The third problem arising from the negative status of theory in autism intervention is that it limits us in how well we can identify those who will benefit from a particular kind of intervention approach. In the absence of sufficient theorising as to why and how a technology is thought to work, we may be recommending the wrong treatment for the wrong child. Further, the absence of theory in evaluating interventions will limit our ability to choose between two empirically supported interventions and to judge the adequacy of an approach in its ability to account for the particular impairment and the individual skills of the child. For example, if a child on the autistic spectrum is a fluent speaker but is impaired in the social and pragmatic use of language we would be more likely to recommend an intervention approach that is guided by a theory that can account for and explain the processes involved in this particular skill above an approach that cannot adequately account for this aspect of the language acquisition process. To be in a position to make this more scientifically grounded choice, however, we would first have to be informed as to the theoretical and conceptual background of the available approaches. Outcome and efficacy studies which do not address the theory underlying intervention technologies, may identify strategies that can produce change, but only theory can allow us to explore these changes and find out how a treatment works for certain individuals (Kazdin, 2000). Adequate theorising about the processes of change would thus allow the interventionist and researcher to more efficiently identify for whom a treatment will be best suited.

### **1.4.4 Scientific Discovery and Development**

The fourth and final problem that results from the absence and neglect of theory in autism intervention research affects our ability to develop novel methods for approaching autism-specific impairments when a given intervention technology fails. That is, we need to be aware of the theory and conceptual framework of the intervention that we are using in order to be able to change or develop better interventions when limitations arise. All interventions are conducted within a conceptual framework that directs and guides treatment to target particular variables in theory-specific ways, i.e. every intervention is constrained by the particular conceptual approach and theoretical grounding of the people

implementing it. If we practice an eclectic approach to intervention, thereby neglecting to appreciate the theory that underlies the various technologies we are using, then we would simply change methodology and hope for the best. Similarly, if we are uninformed about both the nature of impairment and the theoretical framework of the approach that we are using, it may be tempting to persist with a particular intervention in spite of visible limitations. In contrast, adequate understanding of both the disorder and how this is conceptualised within an intervention approach would allow the clinician or therapist to choose an alternative approach in the face of particular limitations. Further, certain types of conceptual framework may actually preclude the generation of new hypotheses and conceptual shift. This is more likely to be found paradoxically in conceptual approaches that favour data-driven research and that minimize the role of theory in scientific research. As Jensen writes:

[...] excessive pressures to obtain immediately practical results and short-range gains may inadvertently lead to the selective deemphasis of theory development and theory modification, compromise long-term possibilities for therapeutic breakthroughs, and erode prospects for increased scientific understanding. (Jensen, 1999 p. 553)

This warning by Jensen summarizes the negative impact that short-term positive gains in empirical research may have when efficacy studies continue to be carried out without a greater awareness of, and debate on, the role of theory in providing an understanding of the processes of change in autism intervention. The need to provide for increased scientific understanding is particularly significant for autism intervention because relatively little is still understood about the aetiology and neurobiological and psychological mechanisms of the disorder. It is thus essential that the conceptual approach of any intervention used to help children with autism provide a research-informed conceptualisation of the disorder and clarify how and what processes are thought to be affected in autism intervention. The conceptual approach must also allow room for critical challenges, change in direction, and the development of new and creative approaches when limitations in existing technologies are found. Failing to do so would mean that an intervention approach to autism risks theoretical stagnation and isolation from progress in other areas of autism research (Hughes, 2000a, 2000b; Jensen, 1999).



In looking at the negative impact the current neglect of theory is having on the development of both our understanding of, and interventions for, autism it is clear that theory should play a much greater role in the empirical, data-driven studies that dominate autism intervention research. Theory clearly plays a huge role in the development of autism intervention but its role in the evaluation and application of intervention approaches is conspicuously minimized. Theory is essential to good science and this does not stop at the initial stages of intervention development. However, different conceptual approaches to intervention conceptualise science and the scientific role of theory in different ways. Hence, it is equally important to look at the overarching conceptual framework of an approach to identify the philosophical and methodological commitments that in turn determine the approach an intervention takes to science, research, and theory development.

## **1.5 Potential Role of Theory in Autism Intervention**

### **1.5.1 Identifying a Positive Role for Theory in Autism Intervention Research**

Autism is a complex and poorly understood disorder in terms of aetiology and underlying deficits. Behavioural heterogeneity, and individual differences in response to treatment, further frustrates research into understanding and explaining the unique triad of impairments in social, communicative, and imaginative functioning. However, a current lack of knowledge about the aetiology of autism, and the processes that are primarily affected by impairment in autism, should not discourage us from seeking to attain such knowledge. Further, limitations in current understanding of the disorder do not mean that interventions should be implemented in the absence of in-depth, conceptual framework detailing how autism is conceptualised within an approach including a theoretical exposition of how change is brought about in the disorder, i.e., what processes are affected during intervention. We have discussed the negative impact this neglect of theory has for the effective implementation of intervention, the development of better intervention practices in the future, and furthering our understanding of the disorder.

In highlighting the critical role of theory in autism intervention, we must now ask ourselves what that theory should address if it is to adequately account for, and enable technological developments to effectively target, autism-specific deficits. In addition, we will look at current conceptualisations of autism and examine the impact these conceptual approaches potentially have for future development in the understanding, explanation, and treatment of autism. Theories in autism intervention can address many different aspects of both the disorder and the intervention and thus we will use Kazdin's (2000) distinction between a "theory of dysfunction" (or a theory of aetiology) and a "theory of therapeutic change" (or a theory of why and how change occurs in intervention) in order to look at the ideal tenets of an effective and appropriate theory of autism.

### **1.5.2 Theory of Autism in Intervention (a): A Theory of Dysfunction**

A theory of dysfunction involves hypotheses about factors leading to the disorder and the processes underlying the current disorder. Knowing the origin or cause of a disorder may direct us to effective methods of changing the current symptoms and may highlight moderators that affect the efficacy of current interventions and the prognosis for therapeutic change. However, understanding the aetiology of the disorder will not necessarily impact on the development of effective interventions for autism as the mechanisms underlying the cause of a disorder may be inaccessible to the interventionist or irreversible (Kazdin, 2000). Typically, neuropsychological research has focused on developing theories of dysfunction in order to inform intervention development and improve the effectiveness of current interventions.

Theories of autism and the conceptual approach of autism interventions need to explain and account for the triad of social, communicative and imaginative impairments in terms of dysfunction and change during intervention. For example, autism research has shown that social and communicative impairments are particularly characteristic of the disorder. Social-communication research has in turn identified two autistic deficits that appear to have a cascading effect on other areas of development, e.g. language: (1) impaired capacity for joint attention; and (2) impaired capacity for symbol use (Wetherby, 2008). An adequate theory of the dysfunction in autism must have a good understanding of both of these deficits, and an informed strategy for overcoming these



impairments. Beyond these well-defined social-communicative characteristics, a theory of autism must also be able to account for individual differences in cognitive and linguistic ability, which range from evidence that almost three quarters of children with autism score in the mental retardation range on tests of IQ (Tager-Flusberg et al., 2001) to evidence of unusual spikes of ability in some children. There is, therefore, a strong possibility that some children with autism may be using alternative learning strategies to achieve gains comparable to typically developing children.

**1.5.3 Theory of Autism in Intervention (b): A Theory of Therapeutic Change**

Interventions are typically more concerned with theories of therapeutic change, although these theories are not necessarily made explicit in empirical efficacy studies. Every intervention approach has either an explicit or implicit theory of change which is used to guide the development of new techniques and to understand the outcomes of efficacy studies. For behavioural-based interventions change is conceptualised in terms of environmental contingencies, and is brought about by changing the reinforcement history of the individual. For developmental-based interventions, change is conceptualised as occurring at the level of cognitive and affective processes, and is brought about by providing opportunities to learn developmentally-appropriate skills that will offset any developmental deviation. These theories are often used to *describe* change in intervention rather than *explain* change in terms of processes. However, it is only when explaining change in terms of a particular theory that we can attempt to unravel why an intervention is working, and how and where it may be limited.

In accounting for therapeutic change, a conceptual approach to autism intervention must be informed by developmental research to some degree if it is to set developmentally appropriate targets for improvement. Biology and environment also impact in different ways on a child at different stages of development and thus the timing of an intervention should be based around knowledge of these processes and their relation to development. Theories must also enable the clinician to predict or anticipate changes in the child’s developmental trajectory that go beyond changes in specific behaviours targeted in an intervention (Hughes, 2000). In addition, a conceptual framework for autism intervention should be able to account for individual differences in outcome such

that we can identify what change is due to maturational processes and what changes are due to intervention processes. Some children with autism, despite similar assessment scores, achieve different outcomes. We need to identify and isolate contextual factors from child factors in order to understand why some children achieve better outcomes than children with similar disabilities (Hughes, 2000).

A conceptual approach to autism intervention therefore needs to address both the disorder (theory of dysfunction) and the intervention (theory of therapeutic change). Given that very little is known about the aetiology of autism beyond the strong genetic component involved, it is not surprising that many intervention approaches focus on behavioural symptoms and have used this lack of knowledge to support approaches that do not address the “autism” in these behaviours. However, even though the cause of the disorder is not known, the reliability of the autism diagnosis and construct of a triad of autistic impairments means that it is important not to dismiss or undermine potential autism-specific moderators that may affect the success of an intervention. Similarly, we should not give up on understanding the mechanisms underlying dysfunction in autism given that understanding these mechanisms may lead to better interventions. Rather, by making explicit theoretical assumptions about the type of dysfunction in autism and the processes involved in this dysfunction it may be possible to test these assumptions through intervention. In this way, the intervention researcher can ensure that the aim of intervention is not only to treat individuals with autism but also to further our understanding of the disorder. For example, a common premise in autism intervention programmes is that children with autism need to be taught everything (Lovaas & Smith, 1989; Pelios & Lund, 2001). By making this assumption an explicit hypothesis, intervention researchers could investigate whether or not children with autism demonstrate instances of learning without direct instruction and further investigate this aspect of cognitive functioning through intervention research. Currently, this assumption is rarely challenged despite a lack of empirical evidence for the assumption (M. Dawson, Soulières, Gernsbacher, & Mottron, 2007).

The problem is, therefore, not that we do not yet understand the processes that are involved in autism-specific impairments but rather that we are not trying to improve our understanding of them through intervention research (Apel, 1999; Hewitt, 2000; Kazdin,



2000). We are making little effort to understand autism if we do not theorise about and actively explore potential causes and mechanisms of the disorder through our approach to intervention. A method for bringing theories of dysfunction and therapeutic change to the fore in intervention research is outlined in chapter four, and the important role of these types of theories will be actively explored in an experimental study on speech production in children with autism in chapter six.

## **1.6 Two Conceptual Approaches to Autism and Intervention: Behavioural and Developmental**

In this final section on theory and conceptual framework we will briefly look at the conceptual frameworks of two prominent psychosocial intervention approaches before examining them, and the theories associated with each framework, in greater detail in chapters two and three.

### **1.6.1 Behavioural-based Intervention Approaches**

Behavioural-based approaches have a long history of application and success in autism intervention, as well as a considerable number of empirical studies investigating the effects of behavioural technologies on autistic behaviours (Matson, Benavidez, Compton, Paclawskyj, & Baglio, 1996). Part of this is attributable to the behavioural conceptual framework that directs interventionists to focus on practical change in the environment and behaviours rather than change in the individual and in psychological variables. At a time when autism was poorly understood and education of children with autism thought to be almost impossible, behaviourist clinicians and researchers focused on the individual behaviours expressed by children diagnosed with autism and applied behaviour modification strategies to exert change in specific behaviours (Lovaas, 1987; Lovaas & Smith, 1989). The effectiveness of behavioural intervention for some individuals with autism has inspired three decades of intense behavioural research on improving and applying behaviour modification principles to help individuals with autism. Key to this

conceptual approach is a positivist premise that observable variables are the only variables that can be objectively and, thus, scientifically investigated. This conceptual approach also includes a prioritization of inductive methodology and reluctance to use theory other than in an organizing and descriptive capacity. Behavioural interventions for autism share a commitment to the theory of operant conditioning as developed by Skinner (Cooper et al., 2007) a theory that describes the functional relationship between behaviour and environment (including other behaviours). Within a behavioural approach to autism intervention, the often heterogeneous behaviours of individuals with autism are conceptualised in terms of the laws of operant behaviour and not in terms of cognitive, emotional, social, or neurobiological mediating variables.

However, the several models of behavioural autism intervention that fall under the ABA conceptual framework vary in their conceptualisation of autism and the extent to which they are informed by research developments in other disciplines. All ABA models of autism intervention nonetheless share a commitment to the theory of operant conditioning and the laws of operant behaviour. Thus several of the philosophical, theoretical, and methodological commitments shared by behavioural intervention researchers can be found in Goldfried's self-description:

I am, and at heart have always been, a methodological behaviourist, attracted more to a bottom-up than a top-down view of theory. Deriving our principles from what we observe is the bottom-up approach to theory construction advocated by Skinner several decades ago. It also reflects the contemporary pragmatic approach to developing guidelines for psychosocial interventions with children (Silverman, 1997; Silverman & Kurtines, 1997), where the emphasis is on doing what works. (Goldfried, 1999, p. 547)

### **1.6.2 Developmental-based Intervention Approaches**

Developmental-based interventions, on the other hand, share a post-positivist conceptual approach to science and autism intervention. For developmental theorists, psychological variables, including cognitive, linguistic and affective processes, should and can be scientifically investigated. Observable variables are not considered to be more objective than psychological variables because theory is seen to affect all observations and methodological approaches (Laudan, 1996) and research instruments, including data collection procedures, are no longer seen as neutral or objective (Harre, 2000). In contrast



to an emphasis on behavioural symptoms and environmental contingencies, in a developmental psychopathology conceptualisation of autism, cognitive variables (including mental representations) are thought to mediate between an individual's prior experience and current behaviours (Hughes, 2000). A developmental conceptual framework also incorporates developmental theories of child language acquisition and theories of the social-communicative impairments specific to autism. Theories under this conceptual umbrella hypothesise about the cognitive and social processes that mediate these impairments and about the mechanisms that must be targeted in intervention in order to overcome these impairments.

Philosophical differences between proponents of these two diverging conceptual approaches to autism intervention can often lead to heated exchanges about which approach is best. Indeed, in chapters two and three we debate the merits of each conceptual approach in terms of how they benefit intervention research and further our understanding of autism. However, we should not be concerned that researchers and clinicians differ in their conceptual approach to autism intervention but rather that the philosophical premises upon which intervention approaches are based are not adequately discussed in the intervention research in terms of the effect they have on how respective researchers interpret findings and on how autism is understood. As Hersch writes:

The problem is that more often than not these underlying philosophical assumptions are overlooked or not dealt with in a sufficiently conscious, explicit, detailed, and reflective manner. Frequently they are left at a vague, imprecise, and implicit level, and occasionally they are disavowed outright (as in the atheoretical stance). Yet these hidden assumptions continue to exert a highly significant influence upon the ways in which the psychologist's and psychoanalyst's understandings of a particular case or issue will be framed, organized, or subtly structured. (Hersch, 2001, p. 2).

Proponents of these diverging approaches also tend to insulate themselves in a particular research circle, surrounded by similar-minded thinkers and dismissive of alternative theoretical endeavours. Thus, Goldfried speaks of "institutional systems" put in place to maintain a theory, "systems that are political, social, and economic in nature and can often develop lives of their own" (Goldfried, 1999, p.544). To undo the negative role scientific journals have in often perpetuating a narrow and insular conceptual approach to research, Hughes recommends a new format for psychological journals whereby researchers from different theoretical and philosophical perspectives can engage with

each other's work and develop a more integrative explanation for the effects of autism intervention and the mechanisms through which change is brought about (Hughes, 2000).

### **1.7 Summary**

Despite developments in autism research, the aetiology of autism has yet to be identified. Interventions, therefore, remain primarily symptomatic in nature. Nonetheless, intervention technologies have been developed on the basis of specific theoretical, philosophical, and methodological premises regarding the nature of autistic impairments and how they should be addressed in intervention. While the role of theory and conceptual framework is thus an integral part of the initial development of intervention technologies, the role of theory in helping us to understand the particular outcomes of intervention is noticeably neglected by many intervention researchers. In particular, the theoretical and philosophical assumptions of the intervention researcher are seldom explicitly stated in research papers and the processes thought to be affected by the intervention are rarely discussed in empirical and efficacy treatment studies. As such, it is difficult to narrow down the mediating variables in the intervention under investigation and to identify ways of effecting change in the future. Further, neglect of the significant role theory could play in allowing us to choose between interventions has led to a practice of technological eclecticism whereby technologies from conceptually divergent intervention approaches are implemented without a full appreciation of the theory underlying them. Where a researcher does acknowledge the theoretical incongruence between technologies derived from different approaches, he or she often adopts the conceptual premises underlying the technology being implemented at any given time, a practice which we have defined as theoretical eclecticism. Before discussing the import of theoretical eclecticism for autism intervention and research in chapter four, the conceptual framework of behavioural-based intervention approaches will be examined in chapter two and the conceptual framework of developmental-based intervention approaches will be examined in chapter three. Both chapters highlight the theoretical



incongruity of behavioural and developmental conceptual approaches to autism intervention.

## **Chapter 2**

### **Operant Conditioning Theory in Autism Intervention**

#### **2.1 Applied Behaviour Analysis (ABA)**

##### **2.1.1 Introduction**

Applied Behaviour Analysis is an umbrella term for a group of behavioural interventions that share an underlying commitment to a theory of operant conditioning and a radical behaviourist philosophy, but that often differ in the type of technologies implemented. Applied Behaviour Analysis (ABA) is one of three major branches of behaviour analysis and involves the systematic application of behavioural technologies derived through the combined efforts of research in the other two branches of behaviour analysis, namely: the experimental analysis of behaviour, and behaviourist philosophy (Cooper, Heron, & Heward, 2007). ABA intervention approaches range from highly structured interventions that incorporate massed trials and target specific and narrowly defined skills, to loosely structured and child-led interventions that are typically conducted in natural settings and that target pivotal skills that are thought to underlie several more general skills. Often ABA interventions incorporate both structured (e.g. Discrete-Trial Training) and natural (e.g. incidental teaching) behavioural technologies in one overarching mixed-model of intervention where the decision to use a given technology is based on the particular type of behaviour that the interventionist wishes to target. Discrete-Trial Training (DTT) is perhaps the most well known model of ABA intervention, and has been widely publicised due to the work of O. Ivar Lovaas and colleagues who initially used this approach to demonstrate significant behaviour change in children with autism (Lovaas, 1987; Lovaas & Smith, 1989, 2003). However, limitations in this approach led to the development of ‘normalised’ behavioural models which targeted slightly different behaviours using different behavioural technologies (Delprato, 2001). The limitations that arise in natural or normalised behavioural approaches are in turn addressed by the development of new behavioural intervention technologies and thus the field of ABA is in a constant state of change and development (Dunlap, 1999).



ABA is thus a comprehensive approach to autism intervention incorporating a number of behavioural models that have been developed from experimental and conceptual behavioural research and we will discuss each of these specific models of intervention individually. However, ABA as a general approach to autism intervention has certain philosophical and theoretical premises that are shared by all ABA models of intervention and we will first outline the shared conceptual commitments of ABA models of intervention.

ABA is not specifically an autism intervention but it has nonetheless played a particularly prominent role in autism intervention (Kimball, 2002; Volkmar, Lord, Bailey, Schultz, & Klin, 2004). As we shall see, ABA is not an autism-specific approach to autism intervention because ABA models are not based on a theory of autism but rather on a theory of the *behaviours of children with autism* (Lovaas & Smith, 1989). As such, ABA represents a unique conceptual approach in the field of autism intervention research, one that is radically divergent from the framework of the dominant neurodevelopmental conceptual approach to autism research.

In this chapter, we propose that the theoretical incongruity between a behavioural and a non-behavioural approach to autism research and intervention approaches is under-examined in intervention research and that this is due to the general lack of awareness of the role of theory in intervention research as highlighted in chapter one. We outline the salient features of an ABA conceptual framework including the theory and philosophy of this approach and the specific conceptualisation of autism that guides the development of ABA intervention programmes. This serves to highlight significant theoretical incongruities between behavioural and non-behavioural intervention research, in particular the conceptual framework of the developmental psychopathological approach to intervention research which will be outlined in chapter three. We propose that these theoretical incongruities are a particular concern for autism intervention research in the practice of theoretical eclecticism because behavioural and non-behavioural approaches to autism posit significantly different levels and types of processes that affect the development and expression of autism.

### 2.1.2 Philosophy

The scientific nature of ABA intervention is particularly important to proponents of this approach who often emphasise that ABA is a science (Kimball, 2002; Schreibman, 2000). In order to appreciate the entire conceptual framework of ABA, therefore, it is important to understand the philosophy of science upon which it is based. The conceptual framework of ABA includes many scientific principles that are also common to most traditional psychological approaches. These principles include a strong emphasis on empiricism, experimentation, prediction, control, observation, replication, parsimony, and philosophic doubt (Cooper et al., 2007). However, ABA adopts several principles of a philosophy of science that are currently unpopular in non-behavioural psychological approaches (Trochim, 2006), most notably positivism:

Its strong interest in methodology, its frequent assumption that theory is separable from method and observation, and its tendency to favor rather atomistic approaches are all characteristic of positivistic research enterprises. (Shimp, 1989, p. 166)

A key premise that is often implicit in this view is that observable behaviours can be described and investigated without recourse to theory (Shimp, 1989). That is to say, that observation is thought to be objective and not theory-laden. Accordingly, observable variables are thought to be more amenable to, and more appropriate for, scientific investigation than unobservable variables, although private events such as thoughts and feelings are not always considered to be unobservable behaviours and thus are not necessarily beyond scientific investigation. A positivist conceptualisation of observation also undermines the role of subjective bias and theory in the selection of variables for empirical investigation and in the collection and interpretation of the data on these variables (Garrison, 1986). Induction is thus considered a critical and suitable methodology for empirically investigating the variables that control and shape behaviour (Lovaas & Smith, 1989). Lovaas has posited that induction allows the interventionist to make “relatively few inferential leaps” enabling him to “accumulate facts piece by piece” without the prism of theoretical bias to detract from discovering facts in the data (Lovaas & Smith, 1989, p. 20). While Shimp (1989) has pointed out that these philosophical tenets are not necessary for, or integral to, a behaviourist philosophy of science, these



assumptions are nonetheless widespread and largely unchallenged in behavioural research:

[...] it seems to me that an entirely satisfactory interpretation of the nature of observation is one of the remaining unsolved problems facing behavior analysis (Shimp, 1989 p. 164).

A recent example of the implicit role of this premise in the conceptual framework of ABA, namely, that observation can be purely objective, can be found in the widely read textbook *Applied Behaviour Analysis* (Cooper et al., 2007). In their introduction to the philosophy that underlies ABA, Cooper et al. cite empiricism as an integral pillar of the approach and define objectivity as that which is

independent of the individual prejudices, tastes, and private opinions of the scientist [...] Results of empirical methods are objective in that they are open to anyone's observation and do not depend on the subjective belief of the individual scientist (Zufuss, 1985, p. 9 cited by Cooper et al., p. 5)

This definition of objectivity in scientific investigation is, however, untenable according to the post-positivist philosophy of science which currently dominates the field of psychology. In this philosophy of science, psychologists view all observation as fallible and all theories as revisable. Post-positivist psychologists nonetheless maintain that behaviour can be explored and understood in a systematic and scientific manner (Trochim, 2006). We propose that one reason why the issue of the nature of observation remains largely unaddressed by behavioural intervention researchers (Shimp, 1989) is that a positivist view of observation as objective and free from theoretical bias ties in neatly with the focus and methodology of the experimental analysis of behaviour and Applied Behaviour Analysis, namely that laws of operant behaviour can be readily identified in the analysis of behaviour and that these principles represent facts as opposed to theoretical constructs. If observation is not affected by the subjective belief of the researcher as Cooper et al. (2007) suggest, then the principles of operant behaviour as developed by Skinner may be viewed as a set of laws that are revealed to the researcher through careful data collection and not as a theory of behaviour that is affected by the subjective approach of the researcher.

A positivist conceptualisation of science reflects many features of the philosophy of behaviourism that guides ABA. There are many types of ‘behaviourisms’ (Staats, 1999), including the better known philosophies of methodological behaviourism and radical behaviourism. The philosophy of behaviourism underlying an ABA approach to autism intervention is radical behaviourism. Skinner was the first proponent of radical behaviourism which began as an off-shoot of methodological behaviourism. In methodological behaviourism, behaviour is experimentally manipulated to discover functional relations between observable variables, and the scientific validity of investigating events that are not operationally defined by objective assessment is rejected, although methodological behaviourists often acknowledge the existence of inner processes and private events (Cooper et al., 2007). Skinner, however, proposed that behaviourism should also be concerned with accounting for internal or “private” events and set about developing a framework that would allow for the investigation of these events according to the principles of operant behaviour, or operant conditioning theory. This theory is integral to the conceptual framework of ABA and will be discussed in the next section on theory. Skinner’s behaviourism is radical, therefore, because he wanted to consider private events from a behavioural perspective. For Skinner, private events are behaviours that differ from observable behaviour only by their inaccessibility. Rather, we observe these behaviours by “coming into contact with them”: “what is felt or introspectively observed is not some non-physical world of consciousness, mind, or mental life but the observer’s own body” (Skinner, 1974, pp. 18-19, cited by Cooper, p. 13). Thus what is felt by the individual is still subject to the same laws as observable events which, according to Skinner, include operant conditioning principles.

Both radical and methodological behaviourism can be viewed as antithetical to *mentalism*:

[...] mentalism may be defined as an approach to the study of behaviour which assumes that a mental or “inner” dimension exists that differs from a behavioral dimension. This dimension is ordinarily referred to in terms of its neural, psychic, spiritual, subjective, conceptual, or hypothetical properties. Mentalism further assumes that phenomena in this dimension either directly cause or at least mediate some form of behaviour, if not all. (Moore, 2003, pp. 181-182, cited by Cooper, p. 12.)



Mentalism also includes the belief that internal states cause action and that mental capacities such as cognitive, social, and affective processes affect behaviour as much as the external environment. Skinner's main objection to mentalistic accounts of behaviour was that such accounts do not add to a functional understanding of behaviour and that often the constructs used in these accounts require further explanation as to how and why they have developed in the first place (Cooper et al., 2007). However, unlike methodological behaviourism, radical behaviourism proposes that internal events can be understood but that to do so they must be conceptualised as lawfully determined behaviours that are also subject to the principles of operant behaviour, or theory of operant conditioning.

Staats has expressed concern about the impact of radical behaviourism on behaviour therapies, advocating instead a philosophy of psychological behaviourism as a more appropriate philosophical framework with which to approach behavioural intervention. One of his concerns is that radical behaviourism is "still mired in the simplistic anti-mentalism of Watson and Skinner" (Staats, 1999, p. 370) and so this philosophy provides limited ways of bridging the conceptual gap with non-behavioural psychology. As a result, behaviourists who wish to integrate therapy research with research from traditional psychology are forced to use non-behavioural concepts and constructs which are at odds with their conceptual framework. We defined this practice as theoretical eclecticism in chapter one and Staats views this practice as a logical outcome of a philosophy that conceptually negates the role of affect and other mediating variables in the development and maintenance of behaviours. To overcome this theoretical eclecticism, he proposes that a more appropriate and effective philosophy for guiding behavioural therapies for psychological disorder is found in the philosophy of psychological behaviourism. Staats suggests that it is better to attempt to address these variables through a unified behavioural framework that enables the interventionist to directly conceptualise and describe these variables rather than using a framework that forces the interventionist to incorporate non-behavioural terms to address these factors (Staats, 1999). Psychological behaviourism is also a positivist behavioural philosophy (Evans, 1999) and the constructs used to account for psychological disorder are similarly opposed to the mentalistic conceptualisation of private events and mediating variables

typically found in non-behavioural psychology. However, the philosophy of psychological behaviourism provides a conceptual framework for addressing several variables which radical behaviourist philosophy does not. Thus, Staats not only addresses theoretical eclecticism in behavioural intervention approaches and the negative impact this eclecticism has on the interventionist's ability to identify mediating variables and potential pathways for development and change; he also outlines a behavioural alternative for developing a unified conceptual framework with which to approach psychological disorders.

Despite concerns with the philosophy of radical behaviourism, it is an integral part of an ABA conceptual approach to autism research and intervention. Together with a predominant focus on inductive methodology and observable variables, the conceptual framework guiding ABA is radically different from that of developmental interventions for autism. While the positivist tenets of objective observation and induction are implicit features of most behavioural conceptual frameworks, they are not necessary premises for behavioural approaches. However, all ABA approaches are strongly committed to the theory of operant conditioning and the corresponding principles of behaviour, the development of which has been strongly influenced by positivist thinking.

### **2.1.3 Theory**

Skinner and other radical behaviourists did not view theory as having a primary role in science. Theory was thought to summarise the data which was collected and analysed through objective, inductive methods (Shimp, 1989). As such, Skinner proposed that much of science could be conducted without recourse to theory (Skinner, 1950). Thus the principles of operant behaviour and the 'laws' of operant conditioning which he developed through the experimental analysis of behaviour are not spoken of as theories but rather as principles that are 'discovered' through systematic manipulation of the environment (Cooper et al., 2007). However, as previously discussed, in a post-positivist view of science this process would be deemed impossible and theory is thought to play an integral role from the very beginning of even the most stringently designed scientific investigation (Garrison, 1986; Laudan, 1996). Therefore, unless one adheres to the premise that observation is theory-less and completely objective, the principles of



behaviour and laws of operant conditioning must also be viewed as theories and thus we will refer to them as such.

ABA interventions share a commitment to the principles of operant behaviour, or theory of operant conditioning, as developed by Skinner in his experimental analysis of behaviour. The theory of operant conditioning is thus a central premise of ABA and centres on the three-term contingency (antecedent-behaviour-consequence) which is thought to shape behaviour:

[...] operant conditioning, which encompasses reinforcement and punishment, refers to the process and selective effects of consequences on behaviour. (Cooper et al., 2007, p. 46).

The three-term contingency is the basic unit of analysis in the analysis of operant behaviour and is the fundamental building block of treatment programmes in ABA autism intervention. In this contingency, an antecedent is the stimulus that occurs immediately before behaviour and a consequence is the stimulus that occurs immediately following behaviour. A consequence may selectively lead to an increase in the future occurrence of a given behaviour (reinforcement) or it may selectively lead to a decrease in behaviour (punishment). If the selective effects of a consequence on behaviour (in terms of either an increase or decrease of behaviour) occur in the presence of the same antecedent stimulus, this antecedent is then said to be a discriminative stimulus for that particular behaviour. Skinner developed several principles of behaviour based on this contingency which describe functional relations between behaviour and one or more of its controlling variables. Skinner also stipulated that to be a principle, a functional relation must demonstrate generality across organisms, species, settings and behaviours (Cooper et al., 2007). The most significant principles include the principles of reinforcement, punishment and extinction and these principles are incorporated into all behavioural interventions. Reinforcement is by far the most widely applied principle of operant behaviour:

Positive reinforcement is a functional relation defined by a two-term contingency: A response is followed immediately by the presentation of a stimulus, and, as a result, similar responses occur more frequently in the future (Cooper et al., 2007, p. 46).

Operant conditioning is a cohesive, internally consistent and systematic theory that is easily manualised; that is, the technological applications of the theory are easy to outline for intervention programmes (Rogers, 2008). Similarly the principles of operant behaviour allow for the consistent operationalisation of behaviours and other variables that are manipulated through experimental and intervention research. However, Staats has highlighted that while the theory's functional approach to human behaviour and learning is appealing to therapists, it is overly simplistic in accounting for something as complex as human behaviour. Staats (1999) describes operant conditioning as a two-level theory: the first level is the development of animal behaviour principles; the second level is the application of these principles to human behaviour, and suggests that from a behavioural standpoint this theoretical approach is particularly limited in accounting for the complex human repertoires such as language. However, Skinner extended the theory of operant conditioning to account for language learning. In this theory, language is defined as verbal behaviour and is conceptualised as several operant behaviours that are subject to the same laws of operant behaviour as other behaviours (Skinner, 1957). While this theory of language acquisition has been extensively rejected by researchers in the field of psycholinguistics (Altman, 2001), the theory of verbal behaviour is widely used in ABA models of intervention to develop technologies for teaching language to children with autism (Carr & Firth, 2005; Sundberg & Michael, 2001).

#### **2.1.4 Conceptualisation of Autism**

Theorising about the cause and development of autism as a neurodevelopmental disorder is rare in behavioural literature (Kimball, 2002; Lovaas & Smith, 1989). This outcome is specific to the philosophy of radical behaviourism that informs the conceptual framework of ABA interventions. Radical behaviourism posits that empirical investigation is only scientific when it is directed at observable variables such as behaviour (including private events, which are conceptualised as observable behaviours that are accessible to the individual only) and therefore the behavioural symptoms of autism are conceptualised as the most appropriate target for scientific theorising and investigation. Hypotheses that posit unobservable mediating variables, such as neuropsychological theories of autism, are not considered appropriate variables for scientific investigation. Furthermore, by



conceptualising autism in terms of its behavioural symptoms we can observe the effects of the principles of operant conditioning on these behaviours and discover a practical method of effecting change on behavioural symptoms. A basic conceptualisation of autism in ABA is that of a disorder of behaviour wherein an initial neurological insult or deviation predisposes the individual to develop atypical behaviours which can then be best understood in terms of the principles of operant behaviour (Kimball, 2002; Pelios & Lund, 2001). As such, the behavioural symptoms of autism are thought to be amenable to change through the effective application of these principles (Cooper et al., 2007).

A key premise of this conceptualisation of autism as a “mismatch between a deviant system and average or typical environments rather than a disease” (Lovaas, 1987, p. 22)<sup>4</sup> is that ABA treats “independent behaviours” and not an underlying deficit. That is, while behaviour analysts acknowledge an initial impairment in neurological pathways of development, the theory of operant conditioning is thought to provide an adequate conceptualisation of impairment in terms of behavioural symptoms (Leaf & McEachin, 1999). Theories of autism are really, therefore, theories of children with autism, as highlighted by Lovaas and Smith in their comprehensive behavioural theory of *autistic children* (Lovaas & Smith, 1989). The disorder of autism is not directly conceptualised in this approach; rather, the behaviours of children with autism are conceptualised in terms of the theory of operant conditioning. Hence, while all behavioural theories of autism acknowledge some impairment at a neurological and genetic level (Carr & LeBlanc, 2004; Lovaas & Smith, 1989; Pelios & Lund, 2001),<sup>5</sup> most behaviour analysts posit that the laws of operant conditioning are sufficient for understanding the subsequent development and expression of the disorder (Lovaas & Smith, 1989; Rosenwasser & Axelrod, 2001; Smith, Groen, & Wynn, 2000).

Several arguments have been put forward in support of this conceptualisation of autism. The first is that “children with autism are as distinct from each other as they are from typically developing children” (Kimball, 2002, p. 66), and that these children often demonstrate great heterogeneity in the form, type, and severity of symptoms. Lovaas and

---

<sup>4</sup> Note that non-behavioural approaches to autism do not conceptualise autism as a disease but as a neurodevelopmental childhood disorder (Bailey, Philips, & Rutter, 1996; Volkmar et al., 2004).

<sup>5</sup> One notable exception is Drash and Tudor’s theory of autism as a “contingency-shaped disorder of verbal behavior” (Drash & Tudor, 2004) which posits that the aetiology of autism lies in impaired environmental interactions and not neurological impairment.

Smith (1989) have therefore argued that it is more beneficial to conceptualise these children in terms of the individual behaviours they demonstrate and not in terms of a shared, as yet to be identified, deficit(s). The second argument made in support of this conceptualisation of autism is that the cause of autism, which appears to be multifactorial, is not yet well understood and that the heterogeneity of autism is further evidence that autism is “a poorly supported hypothesis” (Lovaas & Smith, 1989, p.19). According to this argument it may thus be an inappropriate use of resources to try to research and address an underlying deficit when we have not yet found the cause or origin of the disorder. Pelios and Lund similarly claim that “there appears to be no point of departure for an intervention aimed at treating autism” (Pelios & Lund, 2001, p. 688). The third argument states that even if an underlying deficit were identified it is unlikely that change can be directly affected in the child’s neural architecture or social, cognitive, or affective processes. Therefore, several behaviour analysts argue for the pragmatic benefits of a behavioural conceptualisation of autism which looks at environmental and correspondingly accessible means of affecting change in the behaviours of children with autism (Lovaas & Smith, 1989; Pelios & Lund, 2001).

Several problems can be found with this behavioural conceptualisation of children with autism. For example, Kimball’s (2002) assertion that children with autism differ from each other as much as they do from typically developing children is immediately undermined by his subsequent assertion that, “nonetheless, to varying degrees these children *share certain defining characteristics* [my italics] with respect to communication, socialization and motoric skills, and they do, *as a group* [my italics], benefit educationally from one comprehensive approach to instruction.” (p. 66). Similarly, almost twenty years on since the publication of Lovaas and Smith’s (1989) article, autism is now recognised as one of the best validated childhood disorders (Bailey et al., 1996). It could be argued that Lovaas and Smith’s concerns about the validity of the construct of autism is simply a reflection of the times in which it was made (1989), but several other authors continue to cite this article as an appropriate exposition of a behavioural theory of children with autism without addressing the currently unsupported reservations which Lovaas and Smith (1989) had about the validity of the autism diagnosis (Kimball, 2002; Pelios & Lund, 2001; Sundberg & Michael, 2001).



Another difficulty with the above arguments in favour of a behavioural conceptualisation of autism is that much more is now understood about the particular nature of impairment in autism. Research indicates a primary dysfunction in social-communication (Mundy & Crowson, 1997; Mundy, Sigman, Ungerer, & Sherman, 1986; Wetherby & Woods, 2008; Whitman, 2004) and specific impairment in the prerequisite behaviours which impact on this domain of functioning (Aldred, Green, & Adams, 2004; Osterling & Dawson, 1994; Wetherby, 2008). In contrast, it is important to note that a current lack of understanding does not mean that an adequate understanding of the cause(s) and dysfunction in autism will not be attained or that it should not be sought. If, as Pelios and Lund suggest, autism is not well understood and psychological theories are extremely limited in accounting for an autism-specific deficit, it does not necessarily follow that we should not try to conceptualise the disorder in terms of its specific deficits. To do so would entail limiting the potential for future investigation and development in understanding autism, and correspondingly limit the development of more effective interventions.

Carr and Le Blanc (2004) have further challenged this assumption by stating that no amount of operant behaviour principles can account for the defining social deficits in autism and that behavioural theories of these children cannot extend to the aetiology of the disorder or negate that autism is a unified and valid disorder construct. However, they have highlighted pragmatic and valid reasons for applying the principles of operant behaviour to the individual behaviours these children exhibit and understanding the maintenance and expression of these symptoms according to the theory of operant conditioning. This conceptualisation of autism clearly highlights the role of the laws of operant conditioning as lying in the early shaping and *expression* of the behavioural symptoms of autism. The distinction is therefore made between neurobiological variables and environmental determinants and provides a conceptual basis for the application of the theory of operant conditioning to understanding and explaining the behavioural symptoms in autism. However, this conceptualisation of autism does not provide constructs for understanding autism-specific impairments beyond environmental mediators and, as such, suffers the limitations discussed in the final section of this chapter.

Behavioural conceptualisations of autism have varied and developed over the years. However, all proponents of an ABA approach to autism intervention conceptualise the behaviours of children with autism as shaped and affected by the laws of operant conditioning. In the next section each of the individual ABA approaches to autism intervention are examined, including the subtle theoretical differences that guide the development of each particular intervention.

## **2.2 Prominent Models of ABA Intervention**

### **2.2.1 Discrete-Trial Training ABA (DTT-ABA)**

Discrete Trial Training (DTT), or the Lovaas approach to autism intervention, is a particularly well known form of ABA. DTT teaching sessions are highly structured, are conducted in a pre-specified setting (usually table-top set-up) and according to a highly prescribed format. The role of the teacher is thus to initiate teaching episodes, maintain instructional control, and follow highly delineated teaching programmes. The concept of demonstrating and maintaining ‘instructional control’ is a particularly important one in DTT programmes and these programmes are often easily identified by their adult-directed style of intervention (Prizant & Wetherby, 1998; Schramm, 2007). Instructional control is also referred to as compliance training in behavioural literature (Leaf & McEachin, 1999) and is defined by Schramm (2007) as a method of increasing the child’s willingness to follow the instructor’s lead. It is considered to be particularly important in the early stages of intervention. While many contemporary behaviour analysts view instructional control as a positive aspect of intervention and as necessary to a “positive working relationship” (Schramm, 2007, p.1), compliance training is also characterised as a challenging process or battle between the caregiver and the challenging and deviant behaviours of severely challenged children with autism. Hence, Leaf & McEachin (1999) recommend that sometimes it may be better to end a session prematurely if the child is frustrated and unwilling to participate, rather than to always insist on establishing control



over the child in every situation, and console the caregiver with the reassurance that he or she does not need to “win every battle!!!” (p. 144).

In DTT, task analysis of complex skills, such as language comprehension, is carried out to break skills into smaller parts which are then targeted in specific teaching episodes. These sub-features, which may be quite small, are then taught one at a time and each skill component must be mastered before the next component is taught. Individual teaching episodes are dedicated to teaching a particular feature or sub-skill, each episode consisting of a series of massed discrete trials. Each trial contains a *discrete* beginning (antecedent), middle (behaviour) and end (consequence), and thus represents a three-term contingency,<sup>6</sup> which as we saw earlier is the foundation for the theory of operant conditioning. The beginning of a trial is marked by the presentation of an antecedent to the child to which he or she must respond (the middle of the trial) and whose behaviour in turn is consequated by the teacher (the end of the trial) (Leaf & McEachin, 1999). Teaching episodes, therefore, are highly repetitious and concentrated, providing the child with numerous opportunities to respond in such a way as to elicit reinforcement for a specific response behaviour (Prizant & Wetherby, 1998). In each trial, the child’s response is immediately sought so that it can be reinforced. The principle of reinforcement is particularly important throughout discrete trial training, as is the contingent use of prompts to guide correct response behaviours that will elicit reinforcement. The use of prompts must, however, be faded as early as possible to avoid cue dependence and to aid generalization of behaviours across different settings and in the presence of other social partners. The overall goal of DTT is thus for “the overall quality of responses to improve over time” (Leaf & McEachin, 1999, p. ) and this is carried out by adjusting the requirement for earning reinforcement, a process also known as the shaping of behaviour through differential reinforcement.

All skills are considered to be learned according to the same principles of operant behaviour, and hence language is taught in the same manner as other skills such as motor development and compliance. Several skill domains (e.g. linguistic, cognitive, and social) are addressed simultaneously such that a child will experience a variety of social,

---

<sup>6</sup> There are two additional stages in discrete trials: a prompt by the teacher (optional) after the antecedent is delivered, and a pause after delivery of the consequence so that there is a distinct break between trials.

linguistic, motor, and cognitive programmes each day (Pelios & Lund, 2001). Larger skills such as language are viewed as composite skills that can be sub-divided into smaller more narrowly defined skills. Sub-skills such as expressive and receptive language are then further broken down into more minute skills (Leaf & McEachin, 1999) such as the ability to say “yes/no” (an expressive language skill), the ability to understand labels (a receptive language skill), or the ability to say one’s name (an expressive language skill).

In their handbook to DTT intervention, Leaf and McEachin list several sub-skills posited by proponents of this approach to be integral to language acquisition, and they describe the DTT protocol for teaching each of these individual skills. Sub-skills include receptive instructions, receptive labels, functional communication, verbal imitation, expressive labelling, conversation (basic, intermediate, and advanced), pronouns, verb tenses, and plurals (Leaf & McEachin, 1999). The pre-requisite skills necessary for the child to effectively learn each of these sub-skills through discrete trial training are also defined in this model of intervention. Thus, for example, to learn to understand the names of items that other people are talking about (a skill called receptive labelling in DTT) the child must first be able to demonstrate imitation and matching skills. Receptive skills, on the other hand, are not a necessary prerequisite for labelling words but receptive skills are found to be usually necessary for learning to read. As such, while Leaf & McEachin suggest that target behaviours should be “developmentally sequenced” (p. 9), developmental research on the stages of language development and the necessary prerequisites for language acquisition do not necessarily inform this approach to language learning.

Proponents of both DTT and mixed models of ABA (i.e. DTT and normalised approaches) have made several contentious claims about learning in autism and these claims are specific to a DTT theory of autism intervention:

1. Children with autism can learn just as much as other children in certain environments (Lovaas & Smith, 1989)
2. “[...] Your child probably will not finding speaking, playing or socializing to be internally rewarding... If he did, he most likely would not have a diagnosable



disorder.” (Leaf & McEachin, 1999)

3. “[C]hildren with autism have many difficulties that need to be addressed *individually* [my italics]” (Pelios & Lund, 2001)
4. Children with autism “need to be taught virtually everything, and the teaching needs to proceed piece by piece rather than in major steps” (Lovaas and Smith 1989, p. 23 cited in Pelios and Lund, 2001, p. 691)
5. “Presently, behaviour analytic intervention is the only approach that is established as effective in producing significant and long-lasting improvements for children with autism” (Smith 1996, p. 689).

With regard to the first claim, there is limited evidence and support for the assumption that children with autism learn as well as typically developing children once the environment is right. Research on ‘recovery’ from autism is inconclusive, with most research indicating varied outcomes even among individuals with similar symptoms (multifinality) (Prizant & Rubin, 1999; Rogers & Vismara, 2008). This claim also implies that the same learning mechanisms are involved for children with autism as for typical children in those children who show gains in behavioural intervention. However, research on autism would suggest that there are multiple paths to development (G. Dawson & Faja, 2008) and that children with autism may use several compensatory ways of learning that follow a different process than that involved in typical development. This claim is thus substantially uninformed by typical development and the many variables that determine development beyond environmental contingencies.

There is a similar lack of evidence for the second comment made by Leaf and McEachin (1999) in *A Work in Progress*. This comment is based upon a circular argument for a behavioural approach to autism intervention: the autistic child does not find speaking, playing or socialising reinforcing; therefore, he has a disorder; and we know he has a disorder because he does not find speaking, playing, or socialising reinforcing. Further, this statement implies that autism is a disorder of reinforcement (or desire), whereas much of the research on autism would suggest that it is a disorder of social impairment arising from an initial problem in genetic and neurological substrates (Akshoomoff, Pierce, & Courchesne, 2002; G. Dawson, 2008). This position is

misleadingly simplistic in its representation of a very complex disorder and undermines the individual differences in developmental pathway, including differences in impairment in cognitive, emotional, motor, and social domains (DiCicco-Bloom et al., 2006).

The third and fourth assertions make very similar assumptions about the learning capacities in children with autism, yet very little is known about the learning processes and capabilities of the autism population. Further, a basic distinction must be made among children with autism as to whether they have or do not have functional language, and particularly little is understood about the level of functioning and individual differences in nonverbal children with autism (Bodfish, 2004). Empirically, Dawson et al. (2007) have challenged the assumption that cognitive strengths in autism are simply “low-level by-products of high-level deficits” (p. 657) rather than direct manifestations of intelligence by demonstrating that individuals with autism are not disproportionately impaired on a test of fluid intelligence (e.g. Raven’s Progressive Matrices). Research which targets autism abilities and strengths as well as impairments is needed to inform us about the nature of intelligence and functioning in individuals with autism. Presently the statement that children with autism need to be taught “virtually everything” is unsupported by empirical evidence. This statement also presents a very simplistic view of the learning process, one that necessarily follows from a behavioural conceptual framework. This view of learning, and of language acquisition, is linear rather than hierarchical (Hewitt, 2004) and does not reflect the evidence that numerous variables, including social interaction, cognitive processes, and affect, mediate learning and development.

The final claim has perhaps received the most attention in autism intervention literature. This frequently made claim, which indicates ABA as the only effective intervention for autism, is completely rejected by non-behavioural researchers in the field of autism intervention (Dunlap, 1999; Gernsbacher, 2003; Prizant & Wetherby, 1998; Rogers, 2008). Rather, the empirical support for behavioural and non-behavioural interventions would suggest relative strengths and weaknesses in each approach, with limitations in methodology and experimental research particularly relevant for all intervention approaches. ABA as an overarching approach to autism intervention has amassed a significantly greater amount of empirical studies and several more years of



practice in autism intervention than developmental approaches. However, the outcome data on these approaches indicates mixed results including relative success in helping some but not all children with autism. This claim is, therefore, misleading in that it implies that DTT is appropriate for all ages and populations (as directly expressed by Leaf and McEachin, 1999, p. 12). It is unlikely that the acquisition of skills as varied as language comprehension and affect-sharing will be taught equally well by one teaching approach or methodology, such as operant conditioning, or that a single set of technologies will effect change in all individuals to the same extent. Research suggests that several mediating variables such as intelligence, affect, social motivation, and genetic susceptibility affect the development of these complex abilities in both typically and atypically developing children (G. Dawson & Faja, 2008), and the role of operant conditioning in child development is yet to be adequately demonstrated.

The positions adopted in the above statements are particularly contentious in their exclusion of developmental and neuropsychological research on the processes involved in learning and development. As such, behaviour analysts have raised concerns about DTT technologies suggesting that they might be simply treating the symptoms of the disorder and not the core deficits. Bodfish neatly sums up this concern and suggests a return to research on autism, and not just the behavioural symptoms of autism, as a way forward in the effective development of behavioural intervention:

Simply put: treatments may bring about less flapping, more words, and more interactions when flexibility, meaning, and friends are what is needed. [...] Novel approaches for treating the core features of autism may lie in efforts to link emerging basic studies of the early development and early identification of autism with existing early intervention approaches. (Bodfish, 2004, p. 323)

In response to these concerns about the conceptual framework of an exclusively discrete-trial model of ABA intervention, and in response to limitations in the generalisation of behaviours learned in DTT to other settings, more naturalistic and integrated ABA models of intervention have been developed.

### **2.2.2 Normalised ABA**

Normalised behavioural interventions for autism differ structurally from DTT models in both conceptual framework and practice of intervention. Normalised interventions are

significantly more child-directed in that the child selects the antecedent stimuli, instruction occurs under free-operant conditions in loosely structured sessions (i.e. the child “evidences a particular want”), and there are a variety of naturally occurring instructional settings. Whereas in DTT the same response is targeted for several episodes, in normalised models there is no specific order of target responses because the child’s interest will determine the focus and direction of the intervention programme (Delprato, 2001). Thus, prompt strategies also vary according to the child’s response and this differs from the teaching protocol in DTT strategies, wherein the prompt level remains constant. Reinforcers are also functionally related to target responses and vary from setting to setting, and liberal shaping is preferred to shaping procedures for specific responses in DTT sessions (Delprato, 2001).

Normalised behavioural approaches, therefore, may be more facilitative of language development than highly structured discrete trial models (Rogers, 2008). Conceptually, normalised approaches actively incorporate research findings from developmental and other non-behavioural psychological approaches to autism (L. K. Koegel, Koegel, Fredeen, & Gengoux, 2008). In particular, findings from research on the autism-specific deficits in social-communicative functioning have had a major impact on the conceptual development of these approaches. Thus findings on specific impairments in pre-linguistic joint behaviours and symbol use are targeted using operant conditioning technologies in natural highly motivating settings (Jones & Carr, 2004). All attempts to communicate are reinforced and child initiated language is preferred (R. L. Koegel, O’Dell, & Dunlap, 1988). Normalised behavioural interventions utilise several strategies to increase the child’s motivation to communicate including interrupting natural routines with pauses, disrupting chains of behaviour, and using establishing operations to ‘set-up’ motivating environments for the child (e.g. restricting access to a preferred toy until the beginning of a language intervention and then using this toy as a motivating reinforcer to elicit conversation or other social-communicative interaction). The development of the behavioural technology of functional assessment, which seeks to allow the interventionist to systematically identify the function of behaviour, also played a significant role in the development of these behavioural models of intervention. Functional assessment’s emphasis on the communicative function of challenging behaviours enabled behavioural



interventionists to highlight the communicative function of language as opposed to the form of language which was often taught simultaneously with, or even before, communicative aspects of language in early DTT intervention (Prizant & Wetherby, 1998).

There is strong empirical evidence that these intervention approaches are more suited to language development in nonverbal children with autism than traditional DTT models (Delprato, 2001; R. L. Koegel et al., 1988). However, normalised behavioural interventions, and their respective technologies, share with a DTT model of intervention the principles of operant behaviour and, therefore, data collection is integral to the approach and must be carried out even in the natural settings of normalised language programmes. Data collection involves the measurement of discrete behavioural responses and success is measured in terms of the number of correct target responses. Therefore, even though normalised and DTT intervention models may appear to be structurally different they are conceptually very similar. As we shall see in chapter three, while normalised behavioural models appear to have more in common structurally with developmental-based language programmes, normalised ABA interventions diverge significantly in underlying theory and philosophy. For example, data collection during developmental interventions is less intensive because it is more difficult to collect data relevant to the types of interactions and behaviours that a developmental interventionist conceptualises as indicative of success (Prizant & Rubin, 1999), and video taping and time sampling procedures tend to be used. Further, normalised interventions view the role of affect as limited in the learning process, which is a direct result of the philosophy of radical behaviourism that guides all ABA intervention approaches. Hence, even though affect is addressed to a greater extent in normalised interventions than in DTT approaches (R. L. Koegel et al., 1988), emotions still tend to be “taught” through labelling in repetitive practice in even normalised behavioural models, whereas emotion plays a central role in the type and quality of social interaction that is modelled in developmental interventions.

### **2.2.3 Mixed Models of ABA Intervention**

Despite the development of normalised behavioural interventions, DTT models of ABA have seen a rise in popularity as discussed earlier, and traditional and normalised behavioural approaches are currently often used simultaneously in autism intervention in a complementary fashion. Indeed, Leaf and McEachin (1999) recommend that all ABA programmes incorporate some degree of DTT intervention. Hence, reading and writing programmes may use discrete trial format, while initiating language programmes may occur in more natural settings using normalised behavioural technologies. The models of ABA intervention discussed here, therefore, highlight that ABA models of intervention are highly compatible because of a well delineated and common theory of operant conditioning and philosophy of radical behaviourism.

## **2.3 Impact of Behavioural Conceptual Framework on Autism Intervention Research**

One fundamental question that therefore arises when we consider normalised ABA and DTT ABA models of intervention is whether or not operant conditioning can explain how typical and atypical children learn to communicate and acquire language? Cognitive, developmental, and psycholinguistic research would suggest that it cannot (Altman, 2001). Given that we know so little about autism, caution is warranted with regards to how we treat individuals in intervention. That is to say, that several assumptions are made in ABA interventions about the learning capacities and general functioning of children with autism that go beyond the existing findings from research on autism; and, despite experimental research in behavioural psychology, it is still a fundamental premise of ABA intervention that the principles of operant behaviour are the primary or sole mediating variables in intervention. A theory of operant conditioning will not therefore inform us about the underlying processes and types of impairment in autism beyond the principles of behaviour, and a philosophy of radical behaviourism precludes the development of hypotheses that would direct research to non-environmental mediating variables. This places limitations on the future direction and potential development of



research in gaining a better understanding of autism beyond how the environment can affect observable behaviour.

A particular concern exists regarding the use of the theory of Verbal Behaviour to develop language programmes for children with autism, and the technologies developed from this theory will be discussed further in chapter 5 (section 5.2.2). This concern arises from the current role of Verbal Behaviour theory in psycholinguistics and in speech language therapy, specifically, that “purely behavioural approaches to language have not been the preferred practice for young children for at least two decades” (Hewitt, 2004, slide 6). This is primarily because an operant conditioning theory of child language acquisition cannot account for several linguistic facts. For example, it is not possible to teach every word that a child will eventually produce or understand, and input studies do not support an operant conditioning theory of language learning (Hewitt, 2004). In contrast to learning theories of language acquisition, nativist accounts of child language acquisition have gained considerable support in the field of psycholinguistics. Nativist theories, such as Chomsky’s Language Acquisition Device (LAD) (Chomsky, 2006), attempt to account for the generativity of language by positing that a particular part of the brain is pre-wired to aid language acquisition, and that this area of the brain which is specific to language, is stimulated by exposure to language during typical development. Generativist and nativist theories of child language acquisition may be viewed as conceptually opposed to behaviourist theories of language learning, particularly in the almost completely theoretical nature of their research accounts of language acquisition. Developmental and social-pragmatic accounts of language acquisition, on the other hand, view some kind of biological hard-wiring as necessary for language acquisition to occur but view this hard-wiring as not-specific to language acquisition but rather to perceptual capacities that aid language learning and social capacities that aid the acquisition of language readily and speedily in real-world contexts. A developmental, social-pragmatic approach to child language acquisition research is strongly influenced by both theoretical and experimental research, and will be examined in chapters 3 and 5 as another prominent approach to autism intervention which is most often contrasted with a behavioural approach to autism intervention.

The theory and philosophy of an ABA approach to autism intervention does, however, provide a clear and comprehensive protocol for programme development and intervention. The cohesiveness of the conceptual framework of an ABA approach has meant that behavioural technologies are relatively easy to develop, implement, and replicate across settings. Thus while the conceptual framework of ABA may not best inform us about autism, the strength of this approach lies in the operationalisation of the theory of operant conditioning and the manualisation of behavioural technologies. This may be one reason for the theoretical eclecticism in developmental interventions wherein behavioural technologies are used in an approach to autism with a radically different conceptual framework. Further, we propose that the conceptual framework of an ABA approach to autism intervention has also led to theoretical eclecticism in at least one behavioural model of intervention, namely, pivotal response training (PRT). We propose that PRT represents an example of theoretical eclecticism in autism intervention because constructs from a theoretically incongruent approach (i.e., developmental) are used to direct behavioural technologies to target specific skills and abilities. That is to say, that to develop new, more effective methods of teaching language and social-communicative skills to children with autism and to overcome the problems in generalisation often seen in DTT interventions for many children in this population (Heflin & Simpson, 1998), interventionists in PRT have adopted non-behavioural constructs and concepts, such as joint attention and shared affect, from developmental research which is shaped by an incongruent conceptualisation of autism. While this may appear to represent an effective integration of behavioural and developmental approaches to autism intervention, it is argued in chapter four that pivotal response training reflects the practice of theoretical eclecticism in a behavioural approach to autism intervention and, as such, suffers from limitations in its ability to inform research about the processes underlying autism and the mediating variables in pivotal response intervention.



## **Chapter Three**

### **Developmental Theory in Autism Intervention**

#### **3.1 A Developmental-Based Approach to Intervention**

##### **3.1.1 Introduction**

Autism is a complex neurodevelopmental disorder and although the construct of autism is extremely well validated, the behavioural expression of the disorder can vary greatly among individuals in the form, severity, and timing of symptoms. Theories of autism must try to address not only this heterogeneity in behavioural symptoms and individual differences in the autism population but also explain the processes that are affected by the disorder and describe the interface between biological, environmental and psychological factors (Whitman, 2004). Although no one theory has been proposed that can adequately explain both cause and dysfunction in autism, a prominent conceptualisation of autism is that of a disorder of neurodevelopment characterised by behavioural symptoms in three areas of functioning. Behavioural symptoms are typically conceptualised as reflecting impaired underlying processes (Bishop, 2008), and the processes affected are often hypothesised to be social- and communication-specific (Wetherby, 2008; Wetherby & Woods, 2008). This conceptualisation is dominant in genetic, neuropsychological, developmental, and psycholinguistic research on autism (Bailey et al., 1996; Volkmar, Lord, Bailey, Schultz, & Klin, 2004) and it reflects a shared philosophical approach to the scientific investigation of autism and common theoretical premises about the level and type of dysfunction specific to autism.

Recently a developmental psychopathology approach has gained prominence as an overarching conceptual framework for autism research and intervention, and is thought by several researchers to provide the best framework for integrative, multidisciplinary research on autism (Cicchetti & Sroufe, 2000; G. Dawson, 2008; G. Dawson & Faja, 2008; Hughes, 2000a; Walden & Hurley, 2008). Developmental psychopathology provides a framework for investigating both how disorders arise and how they are maintained (Walden & Hurley, 2008). A developmental psychopathology approach to autism research is based on principles of development derived from

developmental psychology and is informed by research developments in many diverse disciplines that investigate autism. Many developmental models of intervention fall under this conceptual approach to autism and we shall therefore outline the philosophical and theoretical premises of a developmental psychopathology approach to autism in order to identify the common conceptual principles upon which these models have based their particular intervention technologies.

In this chapter we outline the shared conceptual framework of developmental models of autism intervention, including common philosophical, theoretical, and technological commitments. In doing so we aim to demonstrate fundamental incongruities between the philosophical and theoretical principles of a behavioural approach (outlined in chapter two) and a developmental approach to intervention. We propose that theoretical incongruence is of most concern in the practice of theoretical eclecticism, and the negative impact that this has on the quality and effectiveness of autism intervention research will be discussed in chapter four.

### **3.1.2 Philosophy**

Non-behavioural psychological research approaches, including developmental psychopathology, are currently dominated by a post-positivist philosophy of science. The principles of a post-positivist philosophy of science were first developed in reaction to what many philosophers of science viewed as the unsustainable tenets of positivism (Laudan, 1996). Of primary concern for these philosophers was the tenet that scientific observation could be free from subjective bias if carried out correctly and this tenet was subsequently shown to be flawed (Garrison, 1986). As we saw in chapter two, this tenet is often put forward by behaviour analysts (Cooper, Heron, & Heward, 2007; Lovaas & Smith, 1989) and thus represents a marked divergence in philosophical approach to scientific investigation between behavioural and developmental research approaches.

Rather, non-behavioural psychologists accept that all observation is theory-laden and further that it is never possible to fully confirm or disprove a theory based on empirical data alone. The grounds for this philosophy of science will be presented in chapter four but for our purposes here it is sufficient to highlight that developmental psychologists include several paths to knowledge and understanding about any given



phenomena, including experimental science and conceptual analysis. Data alone is not considered sufficient in allowing the researcher to choose between two approaches, models or technologies of intervention but rather he or she must include subjective criteria such as practical judgement and wisdom in order to learn about the target phenomenon. 'Objectivity' is sought by incorporating the subjective judgement of as many informed agents as possible (Garrison, 1986; Trochim, 2006), including, in the case of autism intervention research, clinicians, parents, teachers, and the individual with autism.

A post-positivist philosophy of science thus also rejects the positivist tenet that theory functions to sum up research data, but rather designates the role of theory as integral to the scientific process in directing the researcher to collect specific types of variables according to specific methodologies. In this philosophy of science, therefore, the researcher must make explicit his implicit theoretical assumptions about the variables investigated in research and explore potentially competing explanations for the phenomena he sees. Developmental intervention researchers, therefore, must have a keen awareness of their own conceptualisation of the type and level of impairment in autism, the processes that are affected during intervention, and possible competing explanations for intervention outcomes. A post-positivist philosophy of science thus provides a framework for creative theorising and the development of new directions of research in autism intervention. This is particularly important given that current intervention technologies are not successful for a significant number of children with autism and that very little is known about the processes that underlie functioning in this population. The tenets of this philosophy also mean that the theory underlying a developmental model of intervention must be explicit and amenable to testing and thus encourages an open approach to autism research and investigation. Intervention research can also be used to further inform us about the underlying deficits in autism because the processes thought to be involved in intervention change are clearly delineated in the intervention approach.

### **3.1.2 Theory and Conceptualisation of Autism**

A developmental approach to psychopathology involves specific conceptual assumptions about the nature of development, disorder, research, and intervention. One of the central assumptions of a developmental approach to psychopathology is that typical and atypical development are mutually informative (Hinshaw, 2008). That is to say, that developmental researchers assume that understanding typical development will enable us to better understand atypical development and, further, that deviations in development can enhance our understanding of the processes involved in typical development (Karmiloff & Karmiloff-Smith, 2001). For example, research on the role of pre-linguistic behaviours, such as joint attention behaviours, in the language development of typically developing infants has led to an increase in research on the notable absence of these behaviours in most children with autism. Research on the impact of these social deficits on the later language development of children with autism in turn further informs our understanding of the crucial role these behaviours play in typical development. Research findings on the crucial role of prelinguistic behaviours in the development of language is particularly important in a developmental approach to child language acquisition as they provide support for the developmental concept of the continuity between preverbal and verbal communication. Another example of the way in which research on atypical development informs research on typical development can be found in studies of the uneven profiles of ability in the autism population which some researchers suggest would indicate that typical development has a modular basis and that accounts of all child development should therefore be modular in approach (Lewis, 2002).

In a developmental approach to child psychopathology, development is conceptualized as a complex process, shaped by the “co-action” of biological, environmental and maturational factors (Walden & Hurley, 2008). Development is also thought of as an ongoing process, one that occurs throughout the lifespan with the processes involved in development in a constant state of organization and reorganization (Whitman, 2004). In this framework, development occurs in multiple domains and can involve either growth or decline (i.e., it is multidirectional). Development affects social, cognitive, affective and physical domains but processes in each of these domains can impact on each other and general development in several ways. One example of how



delayed or impaired development in one domain can impact on development in another domain is in the negative impact of social deficits on the language capacities of children with autism. A social deficit can have a cascading effect on language acquisition by decreasing the child's motivation to engage socially with others at a very young age, thereby reducing opportunities for social interaction and exposure to language while simultaneously limiting the language input to which the child will attend. Restricted language input can further limit the child's ability to match words to objects, affecting word acquisition later in development. Hence, in this example we see the transactional nature of development as one that requires a multi-level analysis if we are to understand all of the factors that determine or shape development.

To conduct a multi-level analysis of developmental disorders, developmental psychopathology must necessarily incorporate a truly interdisciplinary approach. Genetic, neurobiological, psycholinguistic, developmental and behavioural psychological research is integral to understanding development in disordered populations such as autism. In particular, genetic and neurological research has been highlighted as critical in effectively investigating the interface between biology and environment in the development of autism. The manner in which brain and behaviour affect each other is conceptualised as bidirectional: not only do genes determine brain development and processes in multiple domains but "social and psychological experiences can modify gene expression and brain structure, functioning, and organization" (Cicchetti & Sroufe, 2008, p. 258). In this conceptualisation of development, experience can radically affect gene expression. Walden (2008) discusses "evocative genotype-phenotype interactions" as one example of the bidirectional influence between biology and experience. This type of interaction is thought to occur when some parents of Down's syndrome children respond differently to their children's social interactions than to those of typically developing children. Parents often do this by anticipating requests for assistance and inadvertently preventing children from initiating social interaction through communicating requests. In this example, parents' responses may be shaped by their child's genetically determined craniofacial features which are perceived as more youthful, and thus parental responses may in turn negatively impact on the child's language and social-communicative development (Walden & Hurley, 2008). Hence, we see the complexity of the developmental interface

between brain and experience where “genetic propensities interact with experiences to produce atypical experiences leading to undesirable outcomes” (p. 275).

Similarly, experience can shape neural development at both structural and functional levels. Neurobiological tests during research studies on the processes underlying atypical development are, therefore, necessary to determine the exact nature of the relationship between brain and experience. According to Cicchetti (2002), two groups or types of neural processes are affected by experience. Those that are affected during critical or sensitive periods, such as some language acquisition processes, are conceptualised as “experience-expectant processes” and those that are not limited by time restrictions but rather may occur throughout the course of development are “experience-dependent”:

An important central mechanism for experience-dependent development is the formation of new neural connections in contrast to the overproduction and pruning back of synapses often associated with experience-expectant processes (Greenough et al., 1987). Since experience-dependent processes can occur throughout the life span, social interventions, psychotherapy, and pharmacotherapy, in conjunction with individuals’ self-righting tendencies, have the capacity to repair brains that are afflicted with disorders. (Cicchetti, 2002, p. 1413)

Thus experience may play a significant role in changing the path of development even in disordered populations and psychosocial interventions may therefore have a potentially valuable impact on the development of autism if they target appropriate behaviours and processes for change. Given that experience plays such a critical role in brain development, context is always prioritised in a developmental psychopathological approach to autism. In essence, within this approach researchers seek to contextualize psychobiological factors in order to discover both biologically determined processes and the potential effect environmental manipulation may have on the expression of those factors in intervention. For example, in Mundy and Crowson’s (1997) developmental theory of autism, a frontal lobe insult (initial pathological process) is hypothesised to lead to disturbed early social communication processing. Disturbed social communication processing is then thought to limit the amount of social input that the child may gain and which is necessary for shaping neurological connections (secondary neurological disturbance). Mundy and Crowson describe this theory of autism as a



cybernetic model of autism in which *an initial neurological disturbance in children with autism feeds back upon itself* to give rise to additional, and perhaps pernicious components of the neurodevelopmental disturbance associated with this syndrome (Mundy & Crowson, 1997, p. 669).

According to this theory of autism, therefore, psychosocial intervention that targets early social behaviours by providing necessary social input may positively alter the developmental path of the child with autism.

In a developmental approach to psychopathology it is also considered important to identify factors that may protect development as well as identifying risk factors. Risk factors are defined by Hinshaw (2008) as antecedent variables that predict dysfunction while protective factors are variables and processes that “mitigate risk and promote more successful outcomes than would be expected in the presence of risk factors” (Hinshaw, 2008, pp. 13-14). An example of a protective factor for children with autism might be a highly motivating and structured home environment during infancy and early development. Again, appreciating the context of development is critical in this theory of risk and protective factors because the individual’s environment may impact on why risk factors predict dysfunction in some individuals and not in others and in what way protective factors may offset potentially deviant outcomes.

A common premise of developmental approaches to autism is that no single cause for autism will be identified but rather atypical development will be found to result from the interaction of several factors, across multiple domains, and at different levels. Thus a linear model of causation will not be adequate for explaining the kinds of deficits we see in autism. The related processes of multi- and equi-finality exemplify this conceptual approach to causality. Multifinality is said to occur when a single risk factor leads to several different developmental outcomes and equi-finality refers to the occurrence of similar outcome states from apparently different developmental pathways (Hinshaw, 2008, p. 17). Both processes reveal the interactional and transactional nature of development, including the individual differences that exert influence on development. Again, the important role of context in determining developmental outcome can be seen when the presence of risk factors does not lead to the same developmental outcome for all individuals. Rather, environmental prosthesis early in development can affect development at a neurological level and have a cascading affect on cognitive, affective,

and social processes and thus allow children at risk of disordered development to access protective factors and achieve outcomes that would not be predicted by the presence of certain risk factors. Conversely, a particularly adverse environment can negatively influence typically developing children (e.g. language development in feral children).

We have seen that several researchers have highlighted that there are multiple pathways to development (Hinshaw, 2008; Walden & Hurley, 2008; Wetherby & Woods, 2008; Whitman, 2004). Individual pathways to development also highlight the role of individual differences in a developmental psychopathology conceptualisation of developmental processes, and Whitman has suggested that their impact on developmental outcome should not be underestimated (Whitman, 2004). In the autism population in particular there is enormous variability in intellectual and language functioning. This variability would suggest that there are different developmental pathways, including underlying processes and mechanisms that lead to the marked variability in functioning in individuals with autism. As such, developmental researchers are interested in within-group differences (e.g. language differences in children with autism) as well as differences between groups (e.g. language differences between all typically and all atypically developing children) (Whitman, 2004).

A developmental approach to autism is clearly process oriented. This is perhaps the most significant conceptual divergence between a contemporary behavioural approach and developmental approach to autism research and intervention. Both contemporary behavioural-based models and developmental-based models prioritize individual differences in developing individual intervention plans for children with autism. However, in a behavioural-based approach to intervention differences are conceptualized in terms of observable behavioural symptoms, whereas in a developmental-based approach individual differences are conceptualized as present in several different processes (e.g., cognitive, linguistic) and levels (e.g. genetic, neurobiological, personality). While most behavioural models of autism intervention posit a genetic or neurological cause of autism, autism symptoms and dysfunction are conceptualised in terms of environmental variables and operant conditioning principles. In a developmental framework, however, it is considered essential to theorize about and



investigate process constructs and the impact that social, cognitive, affective, and linguistic processes exert on developmental outcomes. Thus, according to Whitman:

[...] a comprehensive theory should recognize that autism is a complex disorder that involves a variety of symptoms, deficiencies, and atypical behaviours which fall into the domains (arousal/affective, sensory, motor, cognitive, language, social, and self-regulation) [...] The task of a comprehensive theory is to describe how these various symptoms and the *processes underlying them* [my italics] are interrelated. (Whitman, 2004, p.145)

Similarly, Dorothy Bishop described one of Uta Frith's major contributions to autism research as her promotion of a theoretical framework that would allow the researcher to investigate underlying deficits and processes involved in the development and expression of autistic symptoms, and hence to distinguish "between observed behaviour and the underlying cognitive and neurobiological processes that mediate that behaviour" (Bishop, 2008).

### **3.1.3 Developmental Theories of Language Acquisition**

A developmental approach to child language acquisition is particularly prominent in psycholinguistics and has contributed much to our understanding of both typical and atypical language development. In particular, the work of Bruner, Bates, and Tomasello have highlighted the critical role of social interaction and environmental factors in the emergence of language (Tomasello, 2003; Tomasello & Bates, 2001). In a developmental approach to language acquisition, language and communication are conceptualised as *emerging* first through intentional communication, then through the development of symbolic communication, and finally in the development of linguistic communication. Throughout the emergence of language, the child is viewed as an active participant in the acquisition process, one who actively constructs knowledge and meaning through social interaction with caregivers and peers. Hence, context and experience are also central to a developmental conceptual approach to language acquisition. Caregivers are thought to scaffold their child's language development in numerous ways. One clear way in which parents have been found to intuitively affect their child's language development is through contingent responding where the parent or caregiver becomes increasingly

demanding in the types of communicative gesture or language attempts that they will accept from the child before they respond in the way desired by the child.

In a study on teacher responses to the communicative attempts of children with autism, Keen et al. (2005) found that teachers did not respond to communicative attempts in the classroom 37 percent of the time, despite interpreting the same acts as intentional communicative acts in an earlier interview. In particular, acknowledgement was the least likely teacher response and this may represent a problem for special education given that the scaffolding of prelinguistic behaviour is integral to language development. However, this study also highlights that the optimal rate of attention for prelinguistic behaviours is not yet known and thus further studies on this particular aspect of social-communication are necessary to identify whether rate of attention is further contributing to impairments in language development or whether indeed this level of attention is sufficient. As previously mentioned, psycholinguistic research on atypical language development in Down's Syndrome children has highlighted the potentially negative impact of experience on the language acquisition process. The impact of parental styles in both typical and atypical language development have been well documented, yet little is known about the role of parental styles on the language development of children with autism (Siller & Sigman, 2002). This may be due to previously unfounded negative depictions of the role that parents played in the development of their child's autism. However, parents of children with autism are often advised to talk to and interact with their child in a very precise manner, specifically, in a precise and direct manner which is at odds with the natural parenting style of parents of typically developing children (Siller & Sigman, 2002):

[...] parent training interventions in autism often explicitly instruct caregivers to structure their interactions so that the adult follows through on his or her clear expectations about what the child should do and how the child should do it [...] Although children with autism have been shown to demonstrate more on-task behavior, relevant use of material, and educational progress in a setting that involves high levels of task-directed structure [...] an association with the child's social responsiveness and language development has not been shown. (p. 79)

Caregivers are not the only agents assigned a crucial role in the child's language development. The infant child is also conceptualised as actively shaping the behaviours of those around him or her through prelinguistic behaviours such as contingent smiling,



cooing, laughing, and gaze sharing thereby altering the type and frequency of the social input he receives. Stern (1985) describes these prelinguistic capacities for social communication in terms of three abilities: interattentionality (the ability to share the focus of attention), interintentionality (the ability to share intention) and interaffectivity (the ability to affective states) (as discussed in Wetherby & Woods, 2008, p. 179). Together these three abilities enable the infant to achieve the capacity for “intersubjective relatedness” which includes the understanding that the infant and other people have minds and subjective experiences that can be shared. A hypothesized core deficit in this capacity is central to the Theory of Mind theory of dysfunction in autism put forward by several researchers to account for the primarily social deficit in autism (Baron-Cohen, 2001; Tager-Flusberg, Joseph, & Folstein, 2001).

Inherent in this approach to language acquisition is the concept of continuity between preverbal and verbal communication. Developmental studies on precursors to language development have well established that preverbal communication capacities are necessary for language acquisition (Gernsbacher, Sauer, Geye, Schweigert, & Goldsmith, 2008; Jusczyk & Aslin, 1995; Kuhl, 2007; Kuhl, Coffey-Corina, Padden, & Dawson, 2005). Further, in autism, the prelinguistic capacities for joint attention and symbolic communication are particularly impaired and have prognostic significance for developmental outcomes. The concept of continuity between preverbal and verbal behaviour is very important in determining the type of behaviours targeted in developmental social pragmatic interventions for autism and *how* these behaviours are targeted. Similarly, developmental interventionists conceptualise linguistic functioning in terms of functioning across other developmental domains (e.g. cognitive, social). This is particularly pertinent where external behaviours may not be age appropriate but may make sense given the child’s stage of cognitive development.

A common feature of developmental approaches to language acquisition is the use of alternative methods of communication during language intervention. Clearly, children who have not developed functional language need an alternative method of communication and these methods are integral in improving the quality of life for non-verbal children. There is also some evidence that the use of alternative methods of communication with children with autism may lead to gains in speech (Millar, Light, &

Schlosser, 2006; Rogers, 2008). However, several mechanisms have been posited to underlie the oral dyspraxia of this subgroup of children with autism (Rogers, 2008), including imitation difficulties, a deficit in the pragmatics of social interaction and language use, or a “true underlying speech dyspraxia” (Rogers, 2008, p. 170). Therefore, the extent to which alternative communication systems, such as PECS (Picture Exchange Communication System), may lead to speech gains will be affected by the type of impairment underlying the child’s dyspraxia. In our study on the comparative effectiveness of increasing speech communicative attempts in language-impaired children with autism, the use of alternative methods of communication was not incorporated into the developmental or behavioural treatment conditions in order to reduce confounding variables in the treatment conditions.

### **3.2 Developmental Models of Autism Intervention**

#### **3.2.1 Shared Principles and Common Strategies**

The basic principles and concepts of developmental psychopathology inform the conceptual framework of developmental models of intervention for autism. Thus we see an emphasis on and awareness of: (a) the context in which intervention occurs; (b) the child as an active participant in the learning process; (c) a relationship of mutual determination and reciprocity between interventionist and child; (d) typical developmental processes and the identification of developmentally appropriate behaviours for atypically developing populations; (e) the child’s functioning in areas other than the target area of a treatment programme; (f) individual differences in functioning; and (g) processes underlying change including variables that mediate intervention outcomes.<sup>7</sup> Developmental psycholinguistic research also plays a major role in developmental interventions for autism given the particularly social-communicative deficits that characterize this population. Therefore, we also see a particular emphasis on:

---

<sup>7</sup> See Hinshaw (2008) for a detailed outline of the central tenets of a developmental psychopathology framework for intervention.



(a) the role of affect in social interaction; (b) increasing joint attention behaviours; (c) using environmental manipulation to “set up” opportunities for communication; and (d) viewing all behaviour as intentional communicative behaviour. Indeed, developmental interventions for autism primarily target social-communicative behaviour, including the pragmatic aspects of language use. Prominent intervention models for children with autism include Developmental Social-Pragmatic (DSP) models (Gerber, 2003; Ingersoll, Dvortcsak, Whalen, & Sikora, 2005), the Developmental, Individual difference, Relationship-based (DIR) model (Greenspan, 2003), and the PROMPT model (S. J. Rogers et al., 2006). Of these three developmental models, DSP approaches target social communication specifically and the defining features of a developmental approach to autism intervention will be discussed here in the context of the DSP approach primarily. However, both the DIR and PROMPT models share many similar tenets and methodologies of DSP approaches and our discussion of the DSP model will incorporate analysis of these two models also.

### **3.2.2 Developmental Social Pragmatic Model (DSPM)**

DSP approaches to autism intervention largely target social communication and language development. As with all developmental interventions, a key premise of the DSP model is that interventions for atypically developing populations should be based on knowledge about typical development and the processes that underlie them. Thus an adequate understanding of typical language acquisition processes is critical to the approach, which “rests on the universals, processes, and facts of typical language acquisition” (Gerber, 2003, p. 74).

Gerber cites Lahey’s conceptualization of language as the convergence of form, content, and use as an adequate reflection of the complexity of the language system from a developmental viewpoint (Gerber, 2003). For example, this conceptualisation of language allows us to recognise that a child may have difficulty with speech production (form of language) but not with meaning or understanding (content of language), thereby highlighting alternative forms of communication as an appropriate target for intervention. In other words, the child’s overall language development is targeted above isolated language skills such as speech production (Gerber, 2003, p. 76). Similarly, developmental

interventionists maintain a keen awareness of the level of functioning in areas other than language development in order to identify appropriate contexts and target behaviours for intervention. Development is conceived of as an integrative, interactional process, and thus the child's cognitive and social-affective capacities are thought to impact on language development in a reciprocal and multi-determined way.

To target the capacities that are thought to underlie language acquisition and development, the context of a DSP intervention is designed in such a way as to maximise its effectiveness as a "data source for the child's internal representation of language" (Hewitt, 2001, p. 187). Hence, the locus of control for language learning lies not primarily with the interventionist or in environmental contingencies, but rather in the child and his or her own cognitive, social, affective, and linguistic capacities. The environment is thought to serve as a scaffold for the development of these processes and as such several strategies have been developed within a DSP approach to maximise the potential for social interaction, linguistic input and modelling, and shared affect and attention. Some of these strategies include playful obstruction, sabotage, violating familiar routines, and 'in sight-out of reach' (Ingersoll, 2005, p. 213). By playfully obstructing the child's progress in certain games or movement throughout intervention, the interventionist sets up a natural obstacle in an undemanding and friendly way that requires the child to engage with the person causing the obstruction. Similarly, sabotage of expected routines or games draws the child's attention to the object of focus of the interventionist and encourages shared affect and attention. Strategies such as violating familiar routines and placing items in sight but out of reach of the child also function in a similar way to encourage the child in a motivating and friendly environment to engage with another person, to express through affective communicative behaviours their thoughts and feelings about a situation or experience.

Hewitt suggests that this emphasis on intersubjectivity encourages the interventionist to constantly imagine themselves in the place of the child (Hewitt, 2001, p. 187), an outcome which is considered to be a strong positive in an intervention which highly prioritizes what the child thinks (Kamhi, 2000). Gerber (2003) also views intersubjectivity as integral to the learning process suggesting that "motivation for learning language is the infant's need to sustain intersubjectivity with other persons"



(Gerber 2003, p. 77). A related basic tenet of programme development in developmental intervention is that it is better to maintain a repetitive, monotonous routine of natural interaction that is favoured by the child and directed by his focus of attention than it is to create a new context for social interaction by providing an artificial, adult-directed or structured environment. Thus even repetitive or stereotyped routines and behaviours are considered to be functional for the child and to be effective avenues for contextualising social interaction and motivating the child to participate.

The above strategies, and emphasis on environmental manipulation, further serve to highlight the role of motivation in increasing child participation in intervention. Correspondingly, a basic tenet of a DSP model of autism intervention is that the child must be motivated to attend if they are to acquire meaningful language and social communication skills:

The intent is to mimic natural language development processes in an intensified form. [...] the child must desire to attend to the input and attribute meaningfulness to that input, if they are to develop language. (Hewitt, 2001, p. 187)

To increase this motivation, the developmental interventionist follows the child's lead and attends to that which the child is also attending. A facilitative rather than a directive approach is advocated whereby the child is offered choices and alternatives to the task at hand, their intent to communicate is always acknowledged, and a variety of communicative functions and forms are modelled for the child (Prizant & Wetherby, 1998). This is thought to provide the child with a sense of control and reduce problems of compliance which often occur when a child is in a demanding and undesirable situation. Attending to that which motivates and interests the child also provides an affectively and linguistically rich environment in which the child is provided with the maximum opportunity to attend to the social-communicative function of the linguistic input. In short, effective intervention is thought to be that which mimics what usually happens naturally in interaction. However, Prizant et al. (1998) caution that the degree to which an interventionist is facilitative or directive will always depend on how the child is reacting to or interacting with the interventionist. Studies have shown that by following the child's lead and sharing their focus of attention, rates of language during intervention increase

(McDuffie, Yoder, & Stone, 2005). McDuffie et al. (2005) have also found that commenting predicted increased language comprehension and production and they have suggested that child-led environments may encourage the child to comment more on objects of interest to them, including shared experience. This study further supports a developmental conceptual approach to intervention for atypically developing children by highlighting the possibility of “an alternative pathway” to word learning that appropriate environmental prosthesis, such as following the child’s lead, may provide.

Likewise, Siller and Sigman (2002) hypothesised that parents who scaffold their child’s language development and acquisition of social-communicative behaviours by following their child’s lead and synchronising their vocalisations with the target of their child’s attention would enhance their child’s language development. They based their hypothesis on the finding that maternal synchronisation has been found to predict later language development in typically developing children (Carpenter et al. 1998) and found that this was also true of atypically developing children with autism where higher levels of synchronisation led to superior communication skills over time. Interestingly, they also found that despite the clear social deficits of the autistic children in the study, caregivers still synchronised their social-communicative behaviour as much as parents of typical children and children with other types of atypical development when matched for level of language functioning. For autism interventions, the findings of this study raise the question of how much synchronisation is optimal for language development to be enhanced. With regard to the quality of the utterances that were synchronised with the child’s attention, the strongest predictors of later language development were synchronised utterances that were high in quality but that were also *undemanding* in quality (Siller & Sigman, 2002). This finding supports other research on the type of feedback that should be given to children with autism and those with delayed or atypical language development. For example, Prizant and Wetherby (1998) discuss the importance of providing feedback to a child’s communicative attempts that demonstrates either (a) conditional acceptance in which the child’s attempt is acknowledged and may be corrected in a positive and non-judgmental way or (b) unqualified or unconditional acceptance with corresponding expressions of positive affect. They also note that while both responses may help to increase motivation and expose the child to richly affective



interactions, the latter type of feedback is typically more common in interactions with younger infants at an earlier developmental stage (Prizant & Wetherby, 1998). By taking into account the developmental stage of the child including functioning in other areas of development, the interventionist can decide upon whether positive unconditional or positive conditional feedback will be the most appropriate for the child in question.

This example further highlights the active consideration of individual differences throughout DSP interventions. One outcome of a simultaneous emphasis on both individual differences and universal developmental processes is that congruent views of the intervention process are maintained between the child, interventionist, and family. Rogers (2008) has suggested that the many factors that determine the form and content of developmental programmes may be a limitation for developmental interventions because the conceptual framework behind this approach is less easy to operationalise than behavioural theories of learning. This concern echoes Prizant and Rubin's fear that such an approach may be difficult to coordinate across caregivers and services (Prizant & Rubin, 1999). However, difficulty in operationalising a theoretical framework does not necessarily mean that the theory behind the intervention is not appropriate or effective. Rather, a greater degree of specialisation and training may be necessary to effectively practice a developmental approach to autism intervention. For example, the interventionist must be aware of functioning in other areas of development such as cognitive, social, and affective domains, and the potential reciprocal interaction between these domains that can determine developmental pathways and individual differences in development. Further, constructs such as self-esteem, sense of self and the child's viewpoint are very much part of a developmental conceptual framework and the interventionist must be able to be aware of these factors to develop appropriate programmes that respect and develop these child-related constructs.

Developmental intervention approaches to social communication and language development in children with autism must also consider several linguistic factors in developing programmes to target these reciprocally determining domains. These include the need to adjust linguistic and social input in order to maximise the impact of the social-communicative interactions which take place in developmental intervention on the child's underlying social and linguistic processes. Adjusting linguistic and social input

includes simplifying the type and exaggerating the type of words used, reducing sentence length, slowing the rate of speech and clearly segmenting speech (Prizant & Wetherby, 1998). However, the very nature of language and its social-communicative function must not be lost in simplifying language for atypically developing children (Gerber, 2003). Most importantly in DSP intervention is the interventionist's contingent responding to communicative attempts by the child and the scaffolding of social-communicative behaviour to aid language developmental processes. Two key premises underlie this practice in developmental intervention programmes: (1) all communicative attempts by the child should be interpreted and responded to as intentional; and (2) nonverbal and verbal development are on a continuum and as such nonverbal communication should be a primary concern in interventions for developing communication in nonverbal children with autism. The first premise holds that all communicative attempts by the child are functional and intentional. By conceptualising communicative attempts in this way the interventionist is automatically engaging the child in a social and communicative interplay that optimises opportunities for the child to practice and acquire essential prelinguistic skills such as shared attention, shared affect, and meaning.

For developmental programmes, the second premise entails a predominant emphasis on the role of nonverbal communication in language development and the potentially disproportionate amount of time that an interventionist may have to spend addressing this aspect of language development before he or she can begin to address more formal aspects of language such as syntactical and semantic knowledge. Nonverbal communication has also been found to be a better predictor of later language development than early speech (P. Mundy, Sigman, & Kasari, 1990), a finding which further suggests that interventionists should be very aware of this particular stage of language development. Prelinguistic behaviours that occur in nonverbal communication include eye gaze and gestures to initiate and respond to joint attention. McDuffie et al. (2003) refer to these behaviours as "triadic attention" skills which occur in episodes of "triadic interaction" (i.e. social interaction between infant and caregiver). An emphasis on these behaviours reveals the underlying goals of a developmental intervention approach to autism where the interventionist seeks to teach meaning and understanding of language and social-communication, rather than teaching the child to perform target behaviours



that may not represent a true underlying understanding of what and why the child is performing these behaviours (S. J. Rogers et al., 2006). Similarly, progress is thought to occur in language intervention programmes only when the interventionist provides enough *salient* modelling of language for the child to acquire language through linguistic, cognitive and social processes.

This is markedly different from an emphasis on observable behaviour (e.g. the number of words produced in a session) as evidence of progress in language learning found in ABA intervention approaches (Gerber, 2003). Rather, within a developmental intervention framework, several variables including internal processes mediate language development and, therefore, simply increasing observable behaviours will not necessarily correspond to facilitating necessary language acquisition processes. Together, the principles and methodologies of a developmental framework for autism intervention reveal an acknowledgement and acceptance of the child’s current level of functioning and developmental stage by the developmental interventionist.

**3.3 Impact of a Developmental Conceptual Framework on Autism Intervention Research**

Empirical studies that evaluate the effectiveness of the DSP model and other developmental approaches to autism intervention are lacking. Given that the intervention may be particularly difficult to implement in a consistent and effective manner, the absence of research studies on the outcome of these interventions must be addressed. Aldred et al. evaluated the effects of a social-communication intervention on language and social functioning that was directly developed from research findings on both autism and typical language development and that targeted parents of children with autism (Aldred, Green, & Adams, 2004). In this intervention approach, parents participated in workshops that included information on communication therapy skills, developmental psycholinguistics, and communication intervention strategies. In particular, shared attention, parental sensitivity and responsiveness, and communication strategies for

acknowledging and elaborating upon communicative attempts were emphasised (Ingersoll et al., 2005). Most importantly, this study addressed concerns about a potential lack of consistency and specificity in the implementation of developmental social-communication interventions by providing a manual for implementing the intervention. The outcome of the study revealed cost-effective gains in social interaction, reciprocity, communication and language skills, and marked language gains in young severely impaired children with autism (Aldred et al., 2004). Similarly, Ingersoll et al. found preliminary support for a developmental intervention for autism that was developed from a social-pragmatic theory of language acquisition (Ingersoll et al., 2005). The results of this single-case study revealed increased spontaneous use of speech by the child with parents and speech language therapists. This study provides only preliminary support for a developmental approach to autism intervention because of the small sample size of the study (i.e.  $n=3$ ). As Ingersoll et al. highlight, more studies with larger sample sizes, representing a wider range of ages and abilities, are necessary to further investigate the efficacy of this approach (Ingersoll et al., p. 221).

In a comparison study investigating the effectiveness of a developmental intervention approach for children with autism, Salt et al. (2002) found significant gains for the treatment group on all of the Vineland scales except communication, and improvement on imitation measures, joint attention and social interaction. However, there was no significant difference in language performance between groups and no increase in rate of development for the experimental group. The results of the study, therefore, indicate mixed support for the approach and more comparison studies are needed to evaluate the extent to which developmental approaches are positively impacting on development in children with autism (Rogers & Vismara, 2008).

One often cited limitation of this approach to autism intervention is that the many goals of a developmental conceptual framework and many factors thought to mediate development may lead to different emphases on mediating variables across developmental interventions (Prizant & Rubin, 1999). Thus, for example, DSP models emphasise social-communicative, including linguistic, functioning, while the DIR model focuses more on affective and interpersonal development through social interaction. This concern is related to the potential problem of radical 'internalism', which may occur



where researchers overemphasise the determining role of unobservable variables or phenomena for which there is little theoretical and experimental support. However, the developmental theories of autism and language development which are included for discussion in this thesis have been chosen because of their adequate representation of developmental principles and hypothetical constructs, which are explicitly stated and which are actively challenged and researched in relation to understanding autism and language development.

Given that very few systematic and comprehensive studies have been conducted on the outcome of different forms of developmental intervention for children with autism (Rogers, 2008), it remains a significant problem that the degree of impact that these approaches have on atypical development is not well known. It is also unknown whether or not developmental interventions, such as those discussed above, can be effectively implemented across service providers and within different settings. However, one of the major advantages of using a developmental conceptual framework with which to develop autism intervention is that the framework provides several directions for future development and progress in autism research. That is to say, that the many aspects that are accounted for in developmental conceptual frameworks, including the multi-disciplinary nature of the approach, provide several well-informed avenues for investigation throughout intervention and beyond.

## **Chapter 4**

### **Theoretical Eclecticism in Autism Intervention**

#### **4.1 Introduction**

In chapter one, we argued for an increased awareness of the theory underlying intervention technologies and for a greater consideration of the conceptual framework of an intervention approach when evaluating its effectiveness and appropriateness as an autism intervention. In particular, a critical role of theory in allowing the researcher to identify the processes of change in an intervention (i.e. the mediating variables) was argued for, as well as the individual differences that moderate change (i.e. the moderating variables). In chapters two and three, two diverging conceptual approaches to autism intervention, namely behavioural (chapter two) and developmental (chapter three) approaches, were presented. The particular conceptualisation of autism unique to each intervention approach was also emphasised and both conceptualisations were shown to be theoretically incongruent. That is, the philosophies underlying both approaches posit significantly divergent premises about the processes involved in typical learning, disordered development, and progress in intervention.

In this chapter, we take a more in-depth look at one of the negative outcomes arising from the absence and neglect of theoretical debate in intervention research, namely, theoretical eclecticism. Theoretical eclecticism occurs when an interventionist or researcher implements technologies that have been developed from theoretically incongruent intervention approaches without attempting to resolve theoretical differences in how each approach conceptualises autism and processes of change in intervention. We propose that theoretical eclecticism is particularly harmful for autism intervention because it limits our ability to understand what, how, and why change occurred in intervention, it affects the quality of the implementation of an intervention, and it limits opportunities for intervention development and the discovery of new and better technologies for change in autism intervention. We outline a method for resolving theoretical eclecticism that would enable the interventionist and researcher to approach autism with a unified conceptual framework from which to develop technologies for, and



investigate the type of impairment underlying, autism. We also propose that a developmental approach to autism currently provides the best conceptual framework for this purpose.

**4.2 Theoretical Eclecticism**

**4.2.1 Definition and Prevalence of Theoretical Eclecticism**

Despite philosophical, theoretical, and methodological differences between behavioural and developmental models of autism intervention, there is much overlap between these intervention approaches (Prizant & Rubin, 1999). This overlap often involves one approach ‘borrowing’ the technologies or constructs of another without trying to understand these borrowed features in terms of their own conceptual framework. We propose that theoretical eclecticism is a common occurrence in autism intervention. Theoretical eclecticism is found in single models of intervention that use two or more sets of theoretical constructs to explain different aspects of a child’s behaviour. It is found in interventions that adopt technologies developed from an approach with a radically incongruent theoretical framework, wherein the interventionist explains the effects of each technology in terms of the framework from which it was developed. It is also found in the recommendations of intervention researchers for the use of the most empirically supported technologies with an acknowledgement of, but little concern for, the theoretical differences that underlie technologies from different approaches. The prevalence of the practice of theoretical eclecticism will be further highlighted later in our examination of several examples of the prominent occurrence of theoretical eclecticism in autism intervention research.

**4.2.2 Development of Theoretical Eclecticism in Autism Intervention Research**

Theoretical eclecticism may have resulted from a combination of factors: (1) theory is not thought to play an important role in the development and evaluation of effective interventions for autism and thus the negative impact of theoretical eclecticism on

intervention has thus far not been recognised by many researchers in this area; (2) researchers and practitioners are often seeking to identify “what works” in a pragmatic attempt to help individuals with autism even if we do not yet know why and how technologies are effecting change; and (3) developmental approaches to autism intervention are relatively new and have not yet established as wide a range of developmental-specific technologies for autism intervention as behavioural models, thus requiring the interventionist to ‘borrow’ effective technologies from behavioural models. Firstly, theoretical eclecticism would appear to be a direct result of the absence and neglect of theoretical debate in the evaluation and implementation of intervention technologies, as discussed in chapter one, and arises when we underestimate the potential impact that theory may have on the development and progress of intervention research. Hence, eclecticism occurs when we do not assign significance to the entire conceptual framework of an intervention approach and instead rely exclusively on outcome and efficacy studies of autism intervention.

Secondly, an exclusive reliance on efficacy studies perpetuates the practice of theoretical eclecticism by demonstrating the relative success of mixed-model approaches to intervention and further encourages the interventionist to rely on what works best at any given moment rather than on developing an adequate understanding of why it works. Thirdly, theoretical eclecticism may reflect a *perception* of developmental-specific technologies rather than existing limitations in the approach. That is to say, that developmental-based technology is not as operationalised as behavioural technology because of the very nature of the theoretical and philosophical assumptions that underlie developmental approaches to autism. Thus, developmental approaches to autism may never develop technologies that correspond to those in behavioural intervention approaches simply because developmental theories of autism do not posit the same principles of learning that guide behavioural approaches.

#### **4.2.3 Two Conceptually Incongruent Approaches to Autism Intervention**

In chapters two and three we examined the conceptual frameworks of both a behavioural- and developmental-based approach to autism intervention, including the theoretical, philosophical, and methodological commitments inherent in each framework. We saw



that while both approaches have led to the development of several structurally similar models of intervention, such as Pivotal Response Training (a normalised-ABA model of intervention) and the Developmental Social Pragmatic Model (a developmental model of intervention), the theories underlying these models of intervention are strikingly divergent.

Behavioural-based models of intervention are unified by a shared commitment to the theory of operant conditioning and the philosophy of radical behaviourism. In this conceptual framework, all behaviours, including atypical ones, are conceptualised as subject to the laws of operant conditioning. Autism is thus conceptualised in terms of its behavioural symptoms and the laws of operant behaviour that determine the expression of these behaviours. The radical behaviourist philosophy of this framework also precludes theorising about mental processes or internal mechanisms underlying these behaviours, including the possible mediating role of social, emotional, or cognitive processes in behavioural expression. Hence, behavioural-based research on autism intervention investigates the role of a specific set of principles on the behaviours of the individual with autism. Specifically, research is directed at demonstrating the effect of the laws of operant conditioning on behavioural expression and how the application of these laws can effect change in autism symptoms. The laws of operant conditioning are not experimentally tested but rather this type of research investigates the application of the technologies derived from these laws.

In contrast, developmental-based approaches are unified by a developmental psychopathology conceptualisation of autism. No single theory unifies all models of intervention in this approach. Rather, a developmental conceptual framework is characterised by a shared commitment to principles of typical and atypical development as put forward in several theories of development. These principles include: that typical development can inform research on atypical development; that there are multiple pathways to development; and that a multi-level analysis of autism will best present a full picture of functioning in autism. Developmental models of intervention also share a post-positivist philosophy of science that acknowledges grounds for the experimental investigation of mental processes and unobservable variables that may mediate outcomes for individuals in autism intervention. Hypothesis testing and theory development are

integral to the scientific philosophy of a developmental-based approach to autism intervention, and a key goal of this approach is to identify the underlying processes and core deficits of autism.

These two approaches are, therefore, radically different in how they conceptualise autism (e.g. in terms of behavioural laws versus underlying mental processes) and in how they conceptualise the scientific process (e.g. as an inductive process of confirming the effects of operant principles on behaviour versus as a hypothetico-deductive methodology of testing hypotheses about the processes underlying behaviour). Despite incongruity in conceptual frameworks, interventionists of one approach often implement the technologies and constructs of the other approach and do so without resolving underlying theoretical differences. That is, these interventionists practice theoretical eclecticism and do so without an awareness of the potentially negative impact this practice may have on the quality and effectiveness of both autism research and intervention.

#### **4.3 The Effects of Theoretical Eclecticism in Autism Intervention Research**

Theoretical eclecticism primarily affects intervention research by limiting our ability to identify the processes that underlie the particular type of impairment presented. Behavioural and developmental approaches to autism intervention contrast sharply in their perception of the role of theory in directing research, and in the development and assessment of intervention programmes. The implementation of theoretically eclectic technologies limits how effectively we can manipulate the intervention environment to explore and investigate autism, including the individual capacities of the child. That is, by not focussing on theory and thus not trying to account for the technologies we use we are immediately limiting ourselves to trying to treat a disorder when we could also be trying to simultaneously investigate it. Further, the means by which we are attempting to treat the disorder are limited if we cannot account for change and effectively implement them. In contrast, by implementing technologies that have been developed from a unified, well developed framework, and that are fully understood by the interventionist, he or she



would be in a better position to theorise further about the underlying deficits in autism and the causes of change or lack thereof. Given that much remains to be understood about autism, including its aetiology and the capacities of individuals with autism, it is vital that the full potential of interventions to inform us about the nature of autism is exploited. This cannot be done, however, if the interventionist is using technologies that are not well understood by them but that they nevertheless believe to be effective.

Theoretical incongruence between intervention approaches to autism means that technologies developed from a behavioural approach are difficult to explain in terms of a developmental approach unless the interventionist goes to great pains to do so, and this would necessarily mean highlighting the importance of theory in the intervention process. One illustration of this problem can be found in Tager-Flusberg's recommendation that operant methods be used by psycholinguistic researchers to investigate several aspects of language functioning in nonverbal children with autism (Tager-Flusberg, 1999). Tager-Flusberg notes that operant or behavioural technologies are used by behaviour analysts to investigate certain types of variables in relation to autism but laments that they "have not used them [operant techniques] to address the kinds of questions that psycholinguistics ask" (Tager-Flusberg, 1999) and recommends that operant techniques should thus be used by non-behavioural researchers to investigate psycholinguistic hypotheses. However, it is important to acknowledge why behaviour analysts do not use operant technologies to investigate psycholinguistic concerns. This is because the theory of operant conditioning does not provide the behavioural researcher with a rationale and methodology for doing so.

In order to conduct the type of research proposed by Tager-Flusberg, a non-behavioural researcher would have to employ behavioural technologies within an entirely different conceptual framework to that upon which the technologies were first developed. While we propose that this is both a possible and appropriate method of using behavioural technologies to investigate non-behavioural hypotheses (see section 4.5), it is not clear whether Tager-Flusberg also recognises the necessity of re-interpreting behavioural technologies in terms of the conceptual framework of the psycholinguistic researcher in order to adequately explain the processes of change in intervention. Rather, it would appear that she is advocating a form of theoretical eclecticism whereby the

researcher uses theoretically incongruent constructs and technologies to explain processes of change in the target variables of psycholinguistic research. If she is advocating the former approach to the use of theoretically incongruent technologies in autism research, then this approach will best allow the researcher to identify and explain the processes of change affecting outcome in intervention research. If she is recommending the latter, however, then the psycholinguistic researcher must use theoretically opposed constructs to explain the processes of change that occur in the use of behavioural technologies and will be immediately limited in explanatory power.

A second major way in which theoretical eclecticism impacts on autism intervention research is by making it extremely difficult to identify mediating variables in autism intervention. The process of identifying mediating variables involves careful task design and explicit theorising, and has been very difficult to carry out in autism intervention research (Rogers & Vismara, 2008). The eclectic use of theoretically incongruent technologies in a single intervention approach makes it doubly difficult to identify mediating variables and moderators of outcome success in intervention. For example, if we use operant technologies such as the contingent use of reinforcement to shape accurate speech production but do so in a natural child-directed environment that reflects developmental principles of language acquisition do we say that it is the principle of reinforcement that is the mediating variable in outcome or that the child's internal processes including a desire to communicate in a natural, motivating environment is the mediating variable? As we shall discuss later, one way to overcome this problem is to reinterpret behavioural technologies in light of a developmental conceptual framework and make explicit the theoretical basis for the intervention from the very beginning. Thus the principle of reinforcement may be understood as simply the use of contingent reward to increase motivation to respond, a concept which fits with Bruner's theory of contingent shaping of an infant's language by caregivers. However, this method entails prioritising the role of theory in autism intervention and bringing conceptual analysis to the fore of autism intervention research, and this is rarely done in the development and assessment of autism intervention.

It is also important to be able to identify whether an intervention is effecting change in behavioural symptoms or whether the entire disorder is affected (Lewis, 2002).



This is particularly difficult to do if we are using technologies from two conceptual approaches that understand the processes involved in typical and atypical development in very different ways. For example, a radical behaviourist conceptualisation of autism precludes the investigation of cognitive, social, and affective processes unless this can be done within the limits of operant conditioning theory (Cooper, Heron, & Heward, 2007) and thus constrains the level at which we can analyse the outcomes in intervention. In this conceptual approach, a decrease in challenging behaviours may be conceptualised as evidence of improvement in autism whereas a developmental researcher might question whether change in observable symptoms is evidence of improvement in core processes and autism deficits.

The third and final way in which theoretical eclecticism negatively impacts on autism intervention research is in limiting the future development of more effective interventions. This problem is directly related to the limitations that eclecticism places on furthering understanding of the processes in autism and on identifying mediating variables in an intervention. That is, in limiting our ability to investigate and understand autism-specific impairment and the processes that underlie them, and in preventing our ability to identify new and relevant mediating variables in autism intervention, theoretical eclecticism necessarily leads to restrictions on the development of new and better intervention technologies. If we cannot say what causes impairment in autism, and if we cannot identify what feature of the technologies used in intervention are actually impacting on that intervention, then we cannot find ways in which to overcome particular difficulties that will arise in intervention and will persist in the use of relatively effective but not well understood technologies.

**4.4 Examples of Theoretical Eclecticism in Autism Intervention**

Several examples of theoretical eclecticism can be found in the autism intervention literature. Theoretical eclecticism is perhaps most commonly seen in developmental-based, or non-behavioural, autism interventions where behavioural technologies are used

to affect change in behaviour or improve outcome when developmental-based technologies are ineffective or lacking. One reason why theoretical eclecticism may be less of an issue in behavioural intervention approaches is because radical behaviourist philosophy and the principles of operant behaviour that guide ABA models of intervention are extremely well delineated, internally consistent, and highly cohesive (Ogletree & Oren, 2001; Rogers, 2008). The theory of operant conditioning is also easily applied to any number of behaviours and contexts, and ABA models of intervention are concerned with the strict application, and evaluation of technologies derived directly from these principles. Even when limitations in the effectiveness of a given technology arise the theory of operant conditioning directs the interventionist to seek a solution in the principles of operant behaviour and thus interventionists rarely look beyond these principles in conceptualising behaviour or to account for change and development.

#### **4.4.1 ABA Models of Intervention**

The most significant instance of theoretical eclecticism in behavioural models of intervention can be found in ABA approaches to personality disorders and abnormal psychology whereby terminology and constructs from traditional psychology are adopted by behaviour therapists when discussing and analysing psychological disorders (Staats, 1999). Staats suggests that behaviour therapists are forced into this eclecticism because the theory of operant conditioning, and the philosophy of radical behaviourism upon which it is based, does not provide adequate methods for conceptualising or addressing “personality and the knowledge products of abnormal psychology” (Staats, 1999, p.371). Furthermore, it attempts to resolve this eclecticism by advocating a different behavioural philosophy, namely, psychological behaviourism. Psychological behaviourism explicitly addresses traditionally non-behavioural concepts, such as emotion and causes of personality disorders, in terms of response-response mediation and basic behavioural repertoires. These are strictly behavioural constructs and are not reliant on traditional psychological theories of internal variables and psychological constructs. Thus Staats argues, as we do, that it is better to approach a disorder from within a unified theoretical framework which includes constructs for addressing that disorder rather than using one which has “no or poorly developed tools for the task” (p. 371). In chapter two, the



appropriateness of a behavioural conceptual framework in the development of effective interventions for psychological disorders, including autism, was examined and evidence against the effectiveness of this framework was discussed.

#### **4.4.2 Developmental Models of Intervention**

The more widespread theoretical eclecticism that can be seen in developmental-based intervention approaches to autism has been highlighted by Ogletree and Oren (2001) who note that despite being strictly anti-behavioural in theoretical approach, many speech-language pathologists include principles of operant behaviour in their description of optimal intervention for speech and language disorders, such as autism (Ogletree & Oren, 2001). They attribute this eclecticism to a failure by non-behavioural interventionists to acknowledge the contribution of ABA to speech-language pathology. However, we would question Ogletree et al.'s assertion that ABA principles are "inextricably woven into the fabric" of interventions for disorders such as autism which implies that the principles of a theory of operant conditioning are consciously used by interventionists but not given due recognition. Rather, we attribute the use of behavioural terminologies and technologies within an incongruent theoretical approach to a neglect of the significance of theory and conceptual unity in development and assessment of autism interventions. That is to say, behavioural technologies appear to be implemented within non-behavioural interventions in a way that suggests that the interventionist does not have the necessary tools to explain the technology in terms of their own conceptual framework and that often they do not see any need to do so. Thus, as we shall discuss later, the technologies that Ogletree et al. define as behavioural-specific, such as time-delay and imitation, are not necessarily ABA technologies but rather may be reinterpreted within a non-behavioural conceptualisation of autism and learning as delayed responding and imitation, respectively. However, this point is rarely advanced by the developmental interventionists that implement behavioural technologies and terminology in decidedly non-behavioural interventions for autism.

While Verbal Behaviour does not feature among contemporary theories of child language acquisition, the relative success of intervention programmes based on Verbal Behaviour has led to an increased demand for a more widespread implementation of the

approach (Sundberg & Michael, 2001). The use of behaviourist principles to teach language in non-behaviourist language interventions is yet another case where ‘[...] discrepancy in our practice seems unchecked’ (Apel, 1999). When it comes to research on child language acquisition,

We simply cannot acknowledge that children’s language is dually affected by external influences (social and cultural domains) as well as internal influences (cognitive and affective domains) and still maintain a behaviorist’s approach. (Apel, 1999, p.104)

As in the use of behaviourist principles such as reinforcement and establishing operations in non-behaviourist interventions for autism, the widespread use of Verbal Behaviour techniques for language ‘training’ by non-behaviourist speech language pathologists seems contradictory. Furthermore, by ignoring theoretical discrepancies in the eclectic use of behaviourist and more developmentally-informed tools to teach language, the clinician risks more than hindering the child’s therapeutic progress:

When intervention is provided without a theoretical foundation, clinical scientists can never be sure why certain aspects may work with a program and others do not. (Apel, 1999, p.104)

Instead of simply using “what works”, Apel recommends that intervention for language learning be based on a clearly defined and coherent theory of language acquisition. Further, this theory of language acquisition must be consistent with what we now know from language research and our current definition of what language is: ‘ASHA defines language as a dynamic system embedded in and influenced by the biological, social, cultural, cognitive, and affective domains and contexts we face daily (ASHA Committee on Language, 1983)’ (Apel, 1999, p.100).

The problems that arise from the current inattention to theory and theoretical eclecticism are most apparent in many of the recent recommendations by intervention researchers on best policy in choosing between interventions. Rogers (2008) suggests that “interventionists need to master several different intervention approaches” (p. 166) in order to best identify the appropriate strategies and technologies for individual children with autism. This recommendation is based on the finding that no one intervention has been found to be effective for all children with autism, suggesting that some children will respond better in different interventions (Prizant & Rubin, 1999; Prizant & Wetherby,



1998; Rogers, 2008). However, recommending that the interventionist be trained in a wide variety of technologies from very different approaches to autism underestimates the critical differences in theoretical and philosophical principles between behavioural and developmental approaches, the impact these principles have on how intervention is structured and implemented, and the long-term limitations eclecticism places on the development of better technologies and a deeper understanding of autism.

Rogers and Vismara (2008) similarly recommend that proponents of various models separate the content of teaching (that which incorporates the theory and philosophy of the approach) from the process of teaching (the technologies developed from the theory underlying the approach) in order to better allow interventionists to pick and choose “the most effective combinations of curricular sequences and teaching practices for specific outcomes” (p. 35). This recommendation underestimates the impact of conceptual approach on the effective development and implementation of autism interventions in two ways: (1) eclecticism in intervention practice necessarily involves theoretical eclecticism which impacts negatively on the intervention *research* in all of the above ways; (2) using technologies without a full appreciation of the theory behind those technologies may lead to limitations in intervention *implementation*. This second concern has been raised by behaviour analysts who note that limited outcomes in eclectic interventions which use behavioural technologies as a substantive part of teaching practice may be due to limited conceptual understanding and expertise in the principles of operant behaviour.

The same limitations could also be found in developmental technologies that are implemented without a full conceptual understanding of the theoretical basis of the approach. The principles developed from developmental social pragmatic theories of autism and language impairment are much more difficult to operationalise and practice in a systematic and consistent way and may thus require a high level of expertise in developmental psycholinguistics for effective implementation of the approach. Further, separating intervention technologies from their theoretical and philosophical backgrounds may suggest to the interventionist that they do not need to consider the philosophical and theoretical bases for each technology and thus impacts negatively on the quality and effective use of the particular technology. Hence, while it is necessary to use the most

effective technologies in a context-appropriate way it may not be best practice to recommend that technologies from different approaches be implemented in an eclectic fashion. Rather, we propose and later discuss a methodology for reinterpreting these technologies within a unified conceptual framework that provides the interventionist with a theoretical and philosophical justification for the use of every technology which they employ.

As highlighted in chapter one, there is currently a disproportionate emphasis on empirical studies in autism intervention research, studies which do not address the implications of treatment outcomes for research on the cause and type of dysfunction in autism (Hughes, 2000). The implicit partitioning of technology and theory in this, largely, atheoretical approach to intervention research can also be found in Wetherby's recommendation that interventionists use technologies that have "demonstrated utility", each technology representing "an additional tool in the toolbox of interventionists" (Wetherby, 2008, p. 155). However, efficacy studies and demonstrations of effectiveness in studies of particular interventions are limited in their generality beyond those particular contexts, especially if the theoretical basis for particular technologies is not well understood. Therefore, technologies will not be applied effectively in other contexts and with children who have different behavioural symptoms unless the conceptual grounding for the technology is appreciated by the interventionist. Further, to effectively use a technology and to recommend its effective use in the future, an interventionist must also appreciate the philosophical and theoretical assumptions of the approach upon which the technology is based and clarify the exact mechanisms by which they understand change to occur through the use of this particular technology. For example, some developmental autism researchers may not have a true understanding of a developmental approach to intervention which should involve explicit theorising about the mechanisms underlying development and change (Tronick, 2007). If not, the interventionist risks adopting a "pot-luck" approach to intervention in an ill-informed search for "what works" for children with autism.

Several researchers have suggested that we try to integrate the technologies and conceptual approaches that have been developed to understand and support children with autism (Tager-Flusberg, 1999; Volkmar, Lord, Bailey, Schultz, & Klin, 2004). However,



we would caution that the best way to integrate these conceptually incongruent approaches to autism is not through theoretical eclecticism but rather through the development of an informed, unified conceptual framework, wherein the theoretical and philosophical bases for the technologies developed and implemented within an approach are explicitly stated and well understood by the interventionist. We discuss one method for developing such a framework in the following section.

**4.5 Addressing Theoretical Eclecticism in Autism Intervention**

**4.5.1 Reinterpreting an Operant Conditioning Theory of Children with Autism from a Developmental Perspective**

The eclectic use of technologies from different conceptual approaches to autism intervention is both widespread (Ogletree & Oren, 2001) and frequently recommended by intervention researchers (Rogers, 2008; Rogers et al., 2006; Rogers & Vismara, 2008; Tager-Flusberg, 1999; Wetherby, 2008). However, the issue of theoretical eclecticism must be addressed and resolved if we are to develop better technologies and interventions for autism that also direct future intervention research and development. We propose that one way to do this involves reinterpreting behavioural technologies in light of a developmental psychopathology framework in order to create a unified and informed conceptual framework with which to develop and test intervention technologies and theories of autism. A major premise of this approach is that interventions will be most effectively evaluated, implemented, and further developed only when the theoretical principles underlying the intervention approach are stated explicitly and understood by the interventionist. A second premise of this approach is that ABA approaches to autism already have a unified conceptual framework in place (as discussed in chapter two) but that the philosophy and theory guiding that framework are limited in their ability to adequately explain and address autism as a neurodevelopmental disorder of social-communicative impairment.

Reinterpreting an intervention in terms of the theoretical perspective of another may appear at first appear to contradict our earlier emphasis on the critical role of theory and philosophy in the development and understanding of intervention technologies. However, the relation between a theory and the data it is used to explain is complex, and much of the advances in 20<sup>th</sup> century philosophy of science have shown that the relation between theory and data is not simply a matter of a given collection of data being correlated with one unique theory. This issue is best understood by considering the principle in the philosophy of science known as ‘the underdetermination of theory by data’. Laudan formulates the principle as follows:

That for any finite body of evidence, there are indefinitely many mutually contrary theories, each of which logically entails that evidence. (Laudan 1996, p.31)

There are more radical versions of this principle, but this particular formulation is widely accepted in contemporary, post-positivistic philosophy of science (Laudan 1996). The principle implies that any specific collection of data or evidence is insufficient to provide support for one theory over other possible theories because those other theories may also accord with the data. Likewise, the relation between intervention and the theory upon which it is based is not such that the intervention can only be interpreted in terms of that specific theory.

It is very significant that this principle is associated with post-positivism and, as such, is associated with an opposition to positivism. Conversely, the philosophy of radical behaviourism shares many positivist features (Garrison, 1986; Shimp, 1989), and hence does not take full account of this principle. Therefore, in proposing that the behaviourist technology be ‘re-interpreted’ in a non-behaviourist framework, we are departing from behaviourism’s own assumed view of the relation of their conceptual framework to their technology.

Before addressing this issue in more detail, it is helpful to situate behaviourism’s opposition to the principle of the underdetermination of theory by data in the wider context of its maintaining positivism. Although positivism is an outmoded conception of science and scientific practice, many of its central tenets are apparent in contemporary behaviourism. Integral to this positivist approach is the construct of a ‘language of



science' through which observable phenomena could be objectively described and measured. Accordingly, radical behaviourism posits that observable variables are the only factors amenable to scientific measurement and manipulation (Cooper et al., 2007), although private events are also considered accessible to scientific testing as long as they are conceptualised as behaviours that are subject to the same laws of operant conditioning as observable behaviours (Cooper et al., 2007). Radical behaviourism also relies on highly scientific language to enable the scientist to describe and operationalise the variables that the behaviour analyst observes in the collected data. As such, the role of theory in behaviour analysis is to sum up observations of the data.

However, a positivist view of science quickly became untenable due to several problems observed with the philosophy: (1) theories can never be confirmed, thus creating problems with the inductive methodology favoured by positivists; (2) observation is theory-laden and thus objective or theory-less observation is impossible; and, as we have discussed, (3) all theories are underdetermined by the data, i.e. the data alone is insufficient support for a theory. Behaviour analysts, including Skinner and more recently Lovaas, favoured inductive methodology because it allows the scientist to gather information about observable behaviour without recourse to theory or "large inferential leaps" (Lovaas & Smith, 1989). However, post-positivist philosophy has shown this not to be the case, i.e. it has shown that inductive theories cannot be confirmed and that observation bias also affects inductive observation and reasoning.

Shimp has lamented the lack of clarification of the nature of observation by behaviour analysts and, as we saw in chapter two, contemporary behaviour analysts often still make claims about the nature of observation that sound very positivist in nature. Further, criticism of the objective nature of observation (Bolton, 1999) undermines the radical behaviourism principle that observable behaviours are more scientific than unobservable variables and constructs because they are accessible and amenable to objective measurement. Hence, these tenets of a post-positivist philosophy of science opened the way for an emphasis on processing theories and the mediating role of internal variables in behaviour, personality, and development. It is important to note that post-positivism does not imply that the theory of operant behaviour is not a good scientific theory, but rather that it is a theory like all psychological theories and as such is subject to

the same problems with observation, underdetermination and falsifiability. These issues need to be addressed by proponents of radical behaviourism, otherwise ABA may be in danger of becoming a highly insular approach to autism intervention (Evans, 1999; Hughes, 2000b). It is currently difficult to integrate behavioural research with that of traditional psychology except through theoretical eclecticism.

For autism intervention research these post-positivistic principles provide significant justification for reinterpreting the outcomes of one intervention, including the technologies used, within our own particular framework so long as we acknowledge the same principles in evaluating the merit and validity of our own particular framework. In particular, we may look at the outcome data of behavioural autism intervention studies and try to understand the findings in terms of a completely different conceptual framework. Behavioural interventionists may similarly do the same with findings in developmental studies. However, our purpose here is to show the extent of underdetermination of behavioural theory by the outcome data in autism intervention research in order to highlight that behavioural technologies do not have to be applied eclectically, but can be reinterpreted and understood in terms of the theory of learning and development that underlies developmental approaches to autism.

There are many ways in which behavioural technologies fit with findings from developmental psychological frameworks and it is not difficult to reinterpret these technologies in terms of developmental theory. For example, the use of *child-led* rewards enhances motivation and is in line with research on child-centred therapy to enhance language learning in social situations (Hewitt, 2000). Given the severity of social impairment, enhancing motivation is necessary to engage children with autism in social interaction with their clinician or peer. Further, the use of reward is not specific to a theory of operant behaviour. Task analysis of complex language tasks and the functional breakdown of language also make sense given the type of impairments that neurodevelopmental and psycholinguistic studies have found in children with autism. Drill techniques, essential to behaviourist language ‘training’ programmes, are also not at odds with developmental and psycholinguistic research. For example, Kamhi writes:



(...) frequent repetition and practice should not be viewed as antithetical to communication. Instead practice should be viewed as an effective way to facilitate productive use of speech and language forms in meaningful, communicative situations. (Kamhi, 2000, p. 185)

In fact, several autism interventionists already appear to reinterpret and understand behavioural technologies in light of their own philosophical and theoretical assumptions about autism (Huber & Zivalich, 2004; Zachor, Ben-Itzhak, Rabinovich, & Lahat, 2007). For example, Huber and Zivalich propose that ABA intervention can be understood as compatible with Adlerian theories of disorder and personality (Huber & Zivalich, 2004), and Zachor et al. posit several nonbehavioural-specific moderators and mediators of success in behavioural interventions, including the use of child-led rewards, task analysis of complex tasks, and one-to-one instruction (Zachor et al., 2007).

However, despite the apparent advantages of reinterpreting treatment outcomes of one approach in terms of the conceptual framework of one's own perspective, reinterpretation can only be carried out at the stage of evaluating treatment technologies and does little to advance scientific testing of theories. Rather, we propose that interventionists make explicit their theoretical and philosophical commitments at the outset of intervention research studies in order to best inform the development, implementation, and evaluation of treatment technologies. To do this, we propose developing and making explicit a unified conceptual framework in autism intervention research, as outlined in the next section.

#### **4.5.2 Developing a Unified Conceptual Framework**

Despite an emerging consensus on best practices in autism intervention (Dunlap, 1999; Volkmar et al., 2004) there is no consensus yet as to why these common procedural elements are effective or how they work. Far from supporting the random or eclectic use of technologies simply because they appear to work, several researchers have warned against theoretical eclecticism in intervention development and implementation (Apel, 1999; Hewitt, 2000; Kamhi, 2000). Thus, we cannot develop a coherent framework for overcoming the limitations that inevitably arise in autism intervention if we do not have a systematic, theory-guided approach in the first place. We must be able to account theoretically for everything we implement, and use theory to prescribe technologies and practice rather than the other way around (Apel, 1999). 'Integration' in the form of the

random use of technologies from a variety of theoretical approaches is clearly not to be advised from a scientific point of view. Rather, interventions must be developed from unified and informed conceptual approaches to autism intervention.

An adequate conceptual approach must include room for development and change based on the existing and forthcoming developments in autism research. An adequate conceptual approach must also have a clear and ethical basis for developing and implementing particular procedures for children with autism. Therefore, although we propose that we should avoid theoretical eclecticism in intervention practice and research, we must also be cautious about which unified theory and conceptual framework we adopt. Evans (1999) has highlighted that it makes little sense to avoid the pitfalls of an eclectic theory by using one that is “exclusionary and restrictive”, such as that of ABA, which may limit “new insight and direction” (p. 493). In chapter three we presented significant conceptual and philosophical support for a developmental conceptual approach to autism intervention. Research suggests that developmental psychopathology is already engaging with current issues about the goals, implementation, and understanding of intervention technologies, and may prove a particularly valuable conceptual approach to autism intervention. The close ties between this approach and neurodevelopmental and cognitive autism research mean that a developmental based approach is poised to actively investigate, challenge, and potentially incorporate future findings on this disorder.

A developmental psychopathological approach to autism research and intervention explicitly posits hypotheses about the types of impairment in autism and the processes underlying these impairments. For example, in their study of the role of joint attention in intervention outcome for children with autism, Bono et al. reveal that they made an explicit presumption that all kinds of intervention include episodes of joint attention but found that a greater amount of intervention did not lead to greater language gains (Bono, Daley, & Sigman, 2004). Rather, improved outcome was linked with the child’s ability to respond to joint attention and to their initial language capacities. This approach also specifies the form and content of developmental intervention technologies necessary to address social-communication deficits. Most importantly, a developmental psychopathology conceptual framework for autism intervention is a highly



multidisciplinary approach to autism intervention incorporating and testing many hypotheses about the type of impairment in autism and it is not constrained by positivist restrictions on the types of variables that can be investigated in autism intervention. In an area of research where much remains to be learned about the learning capacities and processes of children with autism, it is important to develop a conceptual framework that will encourage us to entertain alternative hypotheses about the cause and course of autism development.

Recently, Dawson has proposed a model of autism that incorporates a multi-level, transactional approach to understanding both the risk factors and risk processes that may be involved in the development of autism and affect the outcome of intervention (Dawson, 2008). In this model, genetic and environmental risk factors are hypothesised to lead to atypical brain and behavioural development which later result in altered interactions between child and environment (see figure 1). Altered interactions are defined as risk processes and are further affected by impairments in the child's ability to engage in social interaction and negatively impact on the child's ability to utilise linguistic and social input to acquire language and communication skills. Risk processes therefore mediate the outcome effects of risk factors and may even negatively impact on the expression of risk factors. Dawson posits that early intervention that targets risk processes can therefore alter the developmental pathway of autism and may affect the expression of risk factors.

Dawson's "developmental model of risk, risk processes, symptom emergence, and adaptation in ASD" (p. 776) provides an excellent example of an overarching theory of dysfunction and change in autism that makes explicit how autism is conceptualized and how intervention is thought to effect change in outcomes. Dawson has further situated her model of autism in a developmental psychopathology framework and makes explicit the theoretical and philosophical principles of that conceptual framework in approaching autism. The model reflects a multidisciplinary approach to autism research and allows for the inclusion of new findings from autism research and the development of detailed theories of the processes involved at several levels of development including room for correction and change in direction should contradictory evidence come to light. The model specifies the behavioural targets of intervention and the processes which are

hypothesised to be affected by intervention and thus provides hypotheses for experimental testing. Hence, this model represents a detailed coherent framework for conceptualising autism and change in intervention and is open to experimental investigation and theoretical development.

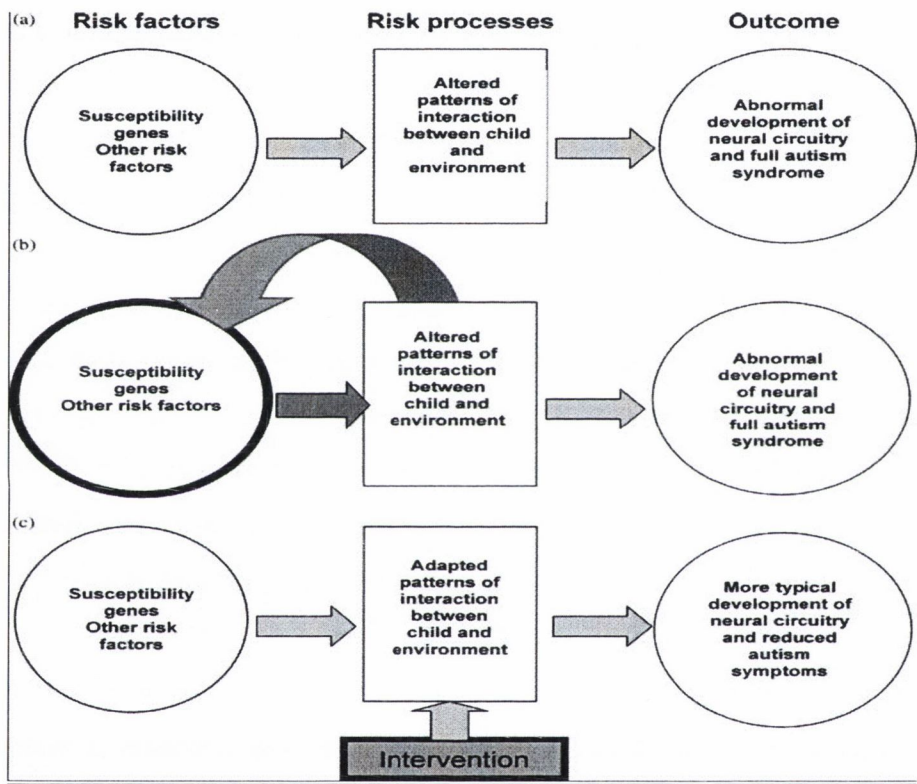


Figure 1: Dawson’s model of risk factors and processes in autism (Dawson, 2008, p. 777)



## **4.6 Summary**

In this chapter we discussed several instances of the practice of theoretical eclecticism in the evaluation and implementation of interventions for children with autism and we saw that this practice appears to arise from the lack of significance attributed to the role of theory in intervention research. We argued that theoretical eclecticism has a significantly negative impact on the quality and effectiveness of autism intervention and research, and that theoretical eclecticism should be raised as a serious issue in autism intervention research. We proposed that in order to overcome the problem of theoretical eclecticism, researchers may reinterpret what many consider to be a narrow behavioural conceptual framework for autism (Hughes, 2000) from the perspective of a developmental conceptual framework. However, we also proposed that this is not sufficient for the development of a unified conceptual framework. Rather, we recommended that researchers must make explicit their conceptual framework at all stages of the research process, including the development, implementation, and assessment of the technologies used in the intervention. It was argued that an appropriate conceptual framework for intervention for children with autism would provide a comprehensive approach to understanding both autism and the processes that are thought to be involved in change and outcome in the intervention. We presented one example of a progressive developmental model of autism cause and dysfunction that is currently expounded by Dawson (2008), and we did so in order to highlight the many perspectives and possibilities for theory-directed research and development that a developmental conceptual framework for autism intervention and research may provide.

## **SECTION II: An Experimental Investigation of Theory-Based Technologies in Autism Language Intervention**

In section one of the thesis, we outlined the widespread perception of the role of theory in autism intervention research and highlighted a significant absence of theorising in intervention studies regarding the underlying cause and dysfunction in autism. We also highlighted the frequent practice of theoretical eclecticism that occurs in autism intervention when the theory and conceptual framework underlying an intervention technology is not given adequate consideration by the interventionist or researcher. We proposed that this eclecticism should be addressed by researchers in the field of autism intervention and we outlined two methods for doing so. The first method involves re-interpreting a technology which has been developed from an incongruent conceptual framework in terms of one's own conceptual framework. The second method involves making explicit the researcher's theoretical and philosophical commitments in the development and implementation of a particular intervention technology from the very beginning of an intervention study, and we provided support for the use of a developmental psychopathology framework as the most appropriate unified conceptual framework from which to develop and evaluate intervention technologies for autism.

In section two of the thesis the research area regarding the development of effective language programmes is specifically targeted. In chapter five, current research on language development in autism is outlined and, in particular, research with regard to the sub-population of children with autism who do not have a functional use of language is discussed. The conceptual approach to language learning of both behavioural- and developmental-based interventions is also outlined. Specifically, the technologies which have been developed from both of these approaches to language learning are examined, and the appropriateness and effectiveness of each technology with regard to the theoretical underpinnings of specific models of intervention is discussed. It is proposed that a developmental approach to language learning in autism intervention currently provides the most appropriate and effective conceptual framework for guiding the development, implementation, and evaluation of language-directed technologies.



Chapter six contains a detailed report of two empirical studies. Both studies compare optimal technologies for increasing motor speech production in non-verbal children with autism. The first study was carried out to illustrate the impact that an absence of theoretical considerations may have on the quality of autism intervention research. In this study, technologies from two theoretically eclectic approaches to autism language intervention (i.e. normalised-behavioural and developmental-behavioural approaches) are compared with a technology from a theoretically unified approach (i.e. Discrete Trial Training approach). The outcomes of this study suggest that comparing theoretically eclectic intervention conditions is problematic and does not allow for the effective identification of mediating variables. In contrast, the second study was designed to illustrate the advantages for autism research in comparing two maximally distinct approaches to autism language intervention, where each approach is developed from a distinct, but unified, conceptual framework. Results from this study reveal comparable outcomes for both behavioural- and developmental-based approaches to language intervention for a sub-group of non-verbal children with autism. This study highlights two important considerations for future empirical research of this kind: (1) the role of individual differences in treatment outcome; and (2) the need for greater theorising about the mechanisms which affect performance of non-verbal children with autism during intervention.

## **Chapter 5**

### **Identifying an Appropriate Conceptual Framework for Autism Language Intervention**

#### **5.1 Child Language Acquisition (CLA) Research**

##### **5.1.1 Definitions of Language and Communication**

Social and communication deficits are well-defined core features of autism (Charman, 2008). Recent research has highlighted that deficits in both social and communicative domains are not independent of each other and may be better understood as impairments in one social-communicative domain.<sup>8</sup> Deficits in a child's capacity for joint attention and symbol use can be considered as social-communicative impairments rather than as purely social or purely communicative. Language development is also affected by, and affects, social-communicative functioning. Indeed language deficits are often investigated as part of impairment in social-communicative functioning. However, language and communication are separate, albeit related, entities. That is to say, it is possible to be communicative without possessing a functional use of language, and it is possible to be a fluent language user with impoverished communicative skills or a lack of communicative intent. For example, research suggests that children with autism who achieve mental age-appropriate scores on tests of receptive and expressive language will still experience pervasive communicative difficulties, such as echolalic speech or impoverished conversation skills (Paul, 2008).

Communication studies and language research on the same population can thus be quite different in research emphasis, the behaviours or constructs investigated, and theoretical focus on processes involved. Traditionally, communication impairment in autism has received a lot more attention than impairment in language development. Stokes defines communication as:

---

<sup>8</sup> For example, some researchers have suggested that "there may be little use in trying to distinguish nonverbal behaviours that are "social" from those that are "communicative"." (Lord & Richler, 2008, p.39.)



[...] a range of purposeful behaviour which is used with intent within the structure of social exchanges, to transmit information, observations, or internal states, or to bring about changes in the immediate environment. (Stokes, 2001)

Communication is necessarily social but not all language use is social or intentional (e.g. echolalia). Communication is therefore more than the language system. For example, communicative impairment in autism involves difficulties in the pragmatics, or *social use*, of language. Language, on the other hand, is a “system of symbols and rules that enable us to communicate” (Harley, 2008) (p.5), a “culturally specific communication system” (Hauser, Chomsky, & Tecumseh Fitch, 2002). This system can be analysed according to capacities necessary for fluency (e.g. perceptual, motor production) or formal features of the system (e.g. syntax, semantics, and prosody). Gerber (2003) cites Lahey’s 1988 work on language acquisition wherein language is described as the convergence of form (phonology, morphology, syntax), content (meaning and semantics), and use (communicative aspects of language including pragmatics) (Gerber, 2003, p. 76). This conceptualisation of language brings together the formal and practical aspects of the language system.

Communication and language studies are clearly closely related and Tager-Flusberg has highlighted the integrative role of three domains – conceptual, linguistic, and social – in the language acquisition process (Tager-Flusberg, 2001). As such, the social-communicative capacities of joint attention and symbol use that are so impaired in autism are intertwined with delays and deviation in language development. Recently, Kuhl has hypothesised that social interaction is essential for natural speech learning, arguing that social processes in the brain “gate” the computational processes that are involved in language acquisition (Kuhl, 2007). Language impairment in autism would appear to support this theory in that impairment in pre-linguistic social-communicative behaviours in autism play a significant role in deviation in the development of language. Further, several researchers have posited a social deficit theory of language impairment in children with autism (Dawson & Faja, 2008; Mundy & Crowson, 1997).

While there is much variability in language functioning, the fact that communication deficits in autism tend to be universal would indicate that language and communication processes can be quite divergent in the role they play in autism. As we

shall see, much of the research on child language acquisition and on language in disordered populations has major implications for how we understand the social-communicative deficits in autism, and understanding autistic social-communicative deficits further informs research on language development in typical and atypical populations.

### **5.1.2 CLA Research on Typical Language Development**

Psycholinguistic research on language development in typical children has played a key role in informing current frameworks of linguistic and social-communicative deviation in children with autism. An inherent premise of this approach is that knowledge of how language should typically develop, i.e., the sequence and timing of language acquisition, will lend insight into the processes responsible for delayed language in disordered populations. Thus research has highlighted certain pre-linguistic behaviours necessary for typical development, and the developmental sequence in which they occur, and the absence or delay of these behaviours may be used to indicate the type of later language and communication delay for any given child (Scheffler et al., 2007). If we can identify where and how language development becomes delayed or disordered we can develop interventions that may target these specific processes or areas of development.

Contrasting the language development of an atypical population, such as children with autism, with that of typically developing children is a common and informative approach to research on language in autism. Language development in children with autism is also often compared with language development in other atypical populations, including children with Down's syndrome, Specific Language Impairment (SLI), and William's Syndrome (WS) (Tager-Flusberg & Caronna, 2007). This approach, however, also has its limitations. Specifically, many possible neurological pathways may be involved in reaching the outcomes we see for different children and therefore we cannot always infer that the same processes, either intact or impaired, have led to a particular outcome. One deviation or mutation early in neurological development can have a cascading effect on future development and thus simply comparing atypical to typical functioning may lead to misinterpreting the cognitive processes that are involved in the particular impairment. Indeed, some researchers have questioned whether children with



autism acquire language through the same processes and following the same developmental pathways as other children, including other developmentally delayed children (Tager-Flusberg, 1999). Some children may thus be using compensatory techniques to overcome particular problems and therefore outwardly appear to be functioning in the same way as typical children. However, psycholinguistic research on child language acquisition allows us to draw certain conclusions about the type and source of delay and impairment in language development in children with autism.

The timing and sequence of events in language acquisition for the typical child is well established. Children from different cultures and languages achieve specific linguistic competencies at set developmental milestones (Field, 2004; Tsao, Liu, & Kuhl, 2004). These milestones are then used as a guideline for the assessment of language delay in atypically developing children. *Perceptual*, *motor*, and *communicative* capacities develop over time in a predictable sequence and at a particular developmental stage. *Perceptual* studies have demonstrated children's immense propensities to parse and explore ambient language even in the first few days of life (Juszyk, 2003). Capacities such as attentional preferences for human language and interaction, preferences for child-directed over adult-directed speech, and sound and categorical discrimination, are apparent within the first few weeks of an infant's life and may be biologically determined (Kuhl, Tsao, Liu, Zhang, & De Boer, 2001). By the time infants are six months old they have begun to distinguish words based on grammatical class by using acoustic and phonological cues. Before children reach one year of age they can use the stress patterns of words to segment linguistic input and can detect syntactic boundaries. Further, perceptual capacities have been found to predict vocabulary size and sentence complexity at age two (Kuhl, Coffey-Corina, Padden, & Dawson, 2005; Tsao et al., 2004), a finding which points to a significant role of speech perception capacities in the acquisition of language. One hypothesis put forward is that advanced phonetic skills may enable the child to progress toward processing their native language sooner by leading to earlier processing of the phonetic cues most pertinent to their native language and thus allowing them to acquire language earlier and achieve greater native language competence (Tsao et al., 2004). Older children with language difficulties have been shown to be impaired in speech perception and this would further support the hypothesis that early speech

perception plays a significant role in language development and thus that the speech perception capacities of at-risk siblings of children with autism may be processes that should be targeted early in developmental intervention.

Early *motor* development in typical infants also follows a particular pattern and sequence of events with early vocalizations providing several functions for the young infant. For example, the development of the laugh vocalization between two and five months of age allows the child to engage in communicative interaction routines with caregivers. Along with cooing sounds that also appear at this stage of development, these vocalizations give the impression that the child is engaging in ‘proto-conversations with the caregiver and constitute important steps in the reciprocal social and communicative engagement between caregiver and child. Research has also shown that the first consonantal sounds produced by the infant typically occur between 4-8 months and are usually plosive /p/, /m/, and /b/ sounds as well as the /k/, /g/ and /oo/ sounds produced earlier in the cooing stage. Babbling (4-8 months) and vocal play allow for greater conversation-like exchanges between the infant and others, and babbling may allow the infant to practice the sounds that will eventually make up his later speech productions. Canonical, or reduplicated, babbling (e.g. /bababa/) is considered a particularly important milestone in language development and children who do not develop canonical babbling by 10 months may be at risk for later language impairment (Paul, 2008).

*Communicative* capacities in the young infant are extremely important for allowing the child to interact with his caregivers and so gain further access to linguistic input and social interaction. Capacities such as eye contact, laughing and cooing, and responding with vocalizations to an adult’s speech, develop in the first few months of life and are pre-requisites for more sophisticated social-communicative capacities such as joint attention (at one year of age) and symbol use. These early communicative capacities reveal the young infant to be an active agent in the complex social interactions between infant and caregiver rather than a passive observer. Both babies and their caregivers continually shape each others’ behaviours and parents often scaffold language development. Bruner highlighted that caregivers instinctively ‘shape’ new communicative behaviours in the child by gradually demanding more complex communicative behaviours (e.g. attempting a speech vocalization) before meeting the



child's desired outcome (e.g. giving the child a sweet) (Paul, 2008). Kuhl, too, notes that "contingent social interaction" by parents when talking to young children appears to scaffold more sophisticated language use than random social interaction (Kuhl, 2007).

### **5.1.3 CLA Research on Atypical Language Development in Autism**

Direct comparisons of early language development in children with autism and typically developing children are difficult to carry out. This is primarily because autism is not reliably diagnosed until the age of two and thus development in the first two years of life is not usually subject to excessive scrutiny. Until recently a diagnosis of autism was usually not made until the age of three or later (Paul, Chawarska, Fowler, Cicchetti, & Volkmar, 2007), but the development of observational tests and assessment procedures aimed at identifying earlier signs of the disorder have lowered the age at which a diagnosis is reliably made. Concern about the autistic child's development usually arises when children do not begin to speak by age two and language impairment is thus one of the first presenting symptoms of autism (Kjelgaard & Tager-Flusberg, 2001). At this stage information about the child's earlier language development can only be gathered by parental report, although much research has also been carried out on home-movies of infants who have been later diagnosed with autism (Osterling & Dawson, 1994; Werner, Dawson, Osterling, & Dinno, 2000). One approach for evaluating early language development in young children with autism is to conduct prospective studies charting development in at-risk infant siblings of children with autism (Dawson & Faja, 2008). Given the high heritability of autism, siblings of children with autism are fifty times more likely to be diagnosed with an Autism Spectrum Disorder (ASD) later in life (Hill & Frith, 2003), and longitudinal research studies on these at-risk infants will therefore include some infants who later develop an ASD and allow us to identify progress in early language development in children on the autistic spectrum.

Of the available research on early language development in children with autism, certain findings have aided our understanding of the core social-communicative deficits in autism. Several studies have recently been conducted on the perceptual capacities of young children with autism to see if impairment in speech perception is one cause of the particular pattern of language impairment in autism. In retrospective parental reports of

early development, parents often report that their child appeared to be deaf in that they did not respond to their name and lacked responsiveness to communicative initiations by others. However studies on the perceptual capacities of infants with autism suggest that these infants are impaired in attentional processes rather than perceptual ability. For example, one study with both toddlers and older children with autism provides preliminary evidence for a reduced preference for child-directed speech (Paul et al., 2007), and some evidence that a lack of interest in speech may be related to language comprehension in young autistic children (Paul et al., 2007). Constantino et al. (2007) have also shown that young children with autism perform similar to typical children on tests of non-native phoneme recognition (Constantino et al., 2007) suggesting that although early perceptual capacities may be impaired, deficits in speech perception are not an enduring deficit. Such research has not been conducted with non-verbal children with autism, however, and it remains possible that such an impairment exists (Constantino et al., 2007).

Data on the early vocalisations of infants who are later diagnosed with autism is limited. To date, there have been no systematic studies of vocal development in very young infants (Paul, 2008). Rather, pre-linguistic (or early linguistic) vocalisations can usually only be studied in preschool children with autism who remain at pre-linguistic levels of communication. Hence, the actual early vocalisation behaviours of children with autism are as yet unknown. Studies of vocalisations in pre-linguistic preschoolers with autism reveal many atypical vocalisations such as tongue-clicking and growling (Wetherby, Yonclas, & Bryan, 1989). Research has also suggested that atypical intonation in prelinguistic vocalisations significantly discriminates young children with autism from typically developing children and other developmentally delayed children. Sheinkopf et al (2000) have reported that children with autism do not have difficulty with the expression of well-formed syllables including canonical babbling (Sheinkopf, Mundy, Oller, & Steffens, 2000). However, they too found many atypical vocalisations such as squeals, growls, and yells (see table II, p.349). They also found that atypical vocalisations were not correlated with joint attention deficits suggesting there may be multiple processes involved in the social-communicative pattern of deficits in children with autism.



One study on predictors of speech fluency in children with autism found strong associations between early oral motor and manual fluency, and later speech fluency (Gernsbacher, Sauer, Geye, Schweigert, & Goldsmith, 2008). Gernsbacher et al. highlight that many aspects of the speech act, such as oral motor skills and manual motor coordination have not previously been conceptualised as integral to the effective use of speech in children with autism which is surprising given that speech is the *articulation* of language and that oral motor skills are strongly associated with speech fluency. Oral motor skills are also strongly associated with manual motor skills and Gernsbacher et al.'s findings further support this link. The finding that manual motor skills are strongly correlated with speech skills suggest that gestural, non-verbal modes of communication may not be available to children with autism who are also speech impaired (Gernsbacher et al., 2008). That is to say, that speech impairment in autism appears to be related to impaired manual-motor skills and that therefore non-verbal children are likely to be impaired in gestural or manual-modal, communication systems as well. This research study therefore further highlights the need to consider language development and dysfunction in autism from several perspectives and to investigate all variables in language and communication development in order to understand the processes involved in language dysfunction and which should therefore be targeted in autism intervention. They also found that pre-linguistic children produced sounds in a similar sequence to typical children, such as an initial preference for easier vowel-like sounds, indicating that these children's oral motor skills fit with the order of language development in typical children. Other studies would also suggest that the association between motor skills and language development is stronger in language-impaired children, such as children with autism, than in typically developing children (Luyster, Kadlec, Carter, & Tager-Flusberg, 2008).

Children with autism have been found to be limited in early sound production and vocal imitation. For example, children with autism have been shown to possess a narrower range of consonant sounds and this is thought to impact on the production of first words in these children (Paul, 2008). First word acquisition is usually delayed in children with autism and is often the first sign for parents that their child may not be developing appropriately. Paul et al. (2007) reported that 36% of children with ASD over

the age of two had no expressive language. For young children who eventually acquire some words, expressive vocabulary growth lags about 6 months behind nonverbal mental age in both autistic children with average and delayed nonverbal cognitive development (Paul et al., 2007). Word combination is also typically delayed even when the child has reached the vocabulary size with which a typical child will begin to produce multiword combinations (100 words). These findings would point to a significant delay in word production in the general autism population and highlight first word learning as a potential target for intensive early language intervention. However, the research presented in this section reveals the interactive effects of delays in several aspects of language development and that therefore targeting early word production will necessarily also involve an integration of knowledge on impairment in manual-motor, oral-motor, speech perception, and vocalisation capacities in children with autism.

Patterns of comprehension impairment in children with autism can vary. Parents often report that their child appears to understand fewer words and commands than typical children. However, research suggests that rather than a comprehension deficit children with autism may be lacking the social-communicative strategies of typical toddlers that allow him or her to respond to others' speech without fully understanding the content of that speech (Paul, 2008). That is to say that, typically developing children appear to have certain social strategies that allow them to respond appropriately to an adult's statement even if they do not fully understand what the adult is saying. Children with autism may have a social deficit that may negatively affect their ability to interact in a way that extends social-communicative interaction between child and care-giver, which in turn affects the degree to which the child is exposed to language input and social-communicative interactions.

There appear to be few differences in expressive and receptive language in verbal children with autism (Kjelgaard & Tager-Flusberg, 2001; Lord & Richler, 2008) but some (pre-linguistic) children have been found to perform better on expressive than receptive language tests, which is uncommon in typical development (Paul et al. 2007). Paul (2008) explains these findings in terms of social-communicative deficits rather than language comprehension ability alone, arguing that young children with autism may be less interested in speech, spend less time listening to it and thus have fewer opportunities



to practice making sense of speech in social-communicative interaction with others. Paul further posits that this lack of interest in speech can have a cascading effect on expressive language later in development and suggests that it is this reduction in social-communicative experience that directly affects the slow growth of receptive vocabulary in children with autism (Paul, 2008, p.89). Discrepantly higher expressive ability may also be due to the reduced need for making inferences when composing one's own discourse, leading to poorer performance on tests of receptive language which require pragmatic skills such as inference-making.

Communicative capacities are clearly also impaired in children with autism. Rates of communicative expression in autism are lower and children are less likely to engage in joint attention behaviours (Wetherby, 2008). Although children with autism are usually able to express wants and needs through gestures, this is typically done using proto-imperative gestures and they exhibit far less proto-declarative acts (Mundy, Sigman, & Kasari, 1990).

Language skills among children with autism are quite heterogeneous. Because it is unlikely that there is a single language phenotype in autism, Tager-Flusberg recommends a "within-group individual approach" when investigating language phenotypes in children with autism (Tager-Flusberg, 2004, p. 78). Heterogeneity in language functioning can range from children who have normal language skills to children who are nonverbal (Tager-Flusberg, Joseph, & Folstein, 2001). Few studies have been conducted on the language functioning of nonverbal children (Tager-Flusberg, 1999). While some children can have normal language skills, most children with autism have some impairment (Luyster et al., 2008). Verbal children with autism do not perform differently on receptive and expressive vocabulary tests, which suggest there is no significant discrepancy between receptive and expressive language skills. Kjelgaard et al. (2001) found distinct profiles among verbal children with autism: children with normal language ability scored equally well on vocabulary tests and tests of semantic and syntactic knowledge, whereas children who were language impaired scored relatively worse on higher order linguistic knowledge than on tests of vocabulary. This finding was replicated by Tager-Flusberg and Joseph in 2003. Further, test results for children with impaired language were comparable to test performances of children with SLI (i.e. poor

performance on nonsense word repetition tests and poorer performance on tests of grammatical ability than on vocabulary tests) (Kjelgaard & Tager-Flusberg, 2001). More recently, Whitehouse et al. have put forward evidence against the SLI hypothesis of language impaired autistic children (Whitehouse, Barry, & Bishop, 2008). Instead, they found that nonsense repetition deficits may arise when there is impairment in multiple autistic domains such as social interaction, communication, and repetitive interests.

Approximately three-quarters of children with autism have IQ scores in the mental retardation range (Tager-Flusberg, 2004). Interestingly, in the results of Kjelgaard's language profiling study, performance on language tests was not necessarily linked to I.Q. Only, children with higher I.Q. scores were able to complete all the language tests and thus IQ accounts for some heterogeneity in language in these children. However, some low IQ children had language skills in the normal range and some high IQ children had impaired language skills. Kjelgaard et al. (2001) suggest that language skills are therefore not always a function of IQ and suggest that language may be a better indicator of current functioning and long-term outcomes for children with autism than IQ.

Tager-Flusberg and Joseph (2003) have shed more light on the types of profiles based on language and cognitive ability that may be identified in the general autism population. Tager-Flusberg et al. (2003) found a high rate of verbal-nonverbal discrepancies and these discrepancies were found almost an equal number of times in both directions. Discrepantly high verbal ability was inversely related to impairment in social interaction and communication, thus supporting the hypothesis that language mediates social functioning in autism. Nonverbal ability (discrepantly high) was related to greater impairment in social communication skills that was independent of overall language ability and overall cognitive ability. Thus, even where a child scored well on language tests, if their nonverbal scores were discrepantly higher than their language scores these children were found to have severe social impairment. This was not true where discrepantly high performance was in the verbal domain which may mean that these children are able to use language skills to help compensate for deficits in nonverbal and social communication domains. This would suggest that the nonverbal profile of some children with autism may represent a distinct and severe subtype of the disorder (Tager-Flusberg & Joseph, 2003).



In considering performance outcomes on tests of cognitive ability it is important to note that language impairment will necessarily have a negative effect on performance outcome on intelligence tests that rely heavily on language skills. Dawson et al. (2007) have reported high scores by nonverbal children with autism on tests of fluid intelligence such as the Raven's Progressive Matrices (M. Dawson, Soulieres, Gernsbacher, & Mottron, 2007). Of the number of children with autism tested, 33% would have been described as low functioning based on their overall WISC-III, but only 5% would have been described as such based on their performance on tests of fluid intelligence. A particular strength, therefore, of Tager-Flusberg et al.'s (2003) research is that they used several tests of verbal and nonverbal functioning to identify differential strengths in verbal and nonverbal ability. Research studies such as this allow not only for better classification of sub-groups of individuals with autism but also for the investigation of both ability and impairment in individuals with autism. Further research investigating differential ability in autism, language and nonverbal functioning will better inform intervention development by allowing the interventionist to utilise the individual's strengths in either language or visual and nonverbal domains to enhance learning, and to find alternative pathways to skill acquisition that respect and support the individual differences of individuals with autism.

Dawson has proposed that a foundational social deficit underlies deviant language development in children with autism (G. Dawson & Faja, 2008). According to this theory, impaired social motivation has a further negative effect on the child's ability to use pre-linguistic social communicative behaviours to attend to linguistic input and the contextual aspects of the language acquisition process. In this way, social communicative deficits lead to delayed and impaired language development. Researchers have also found that oral motor and manual motor skills are stronger predictors of future language development than even these pre-linguistic social communicative behaviours:

Most strikingly, autistic toddlers' oral-motor skills (Thurm, Lord, Lee & Newschaffer, 2007) and their manual-motor skills (Stone & Yoder, 2001) are more predictive of their preschool speech fluency than are measures of social cognition, such as joint attention. (Gernsbacher et al., 2008).

Sutera et al found that motor skills at age two were the single best predictor of best outcomes for children on the autistic spectrum (Sutera et al., 2007), while Thurm et al found that imitation of sounds at age two was especially predictive of expressive language at age five and responding to joint attention predicted outcome development in receptive language (Thurm, Lord, Lee, & Newschaffer, 2007).

#### **5.1.4 CLA Research on Nonverbal children with autism**

Research on future outcomes for children with autism indicates an especially poor prognosis for children who do not acquire some functional language by the age of five. Specifically, the child's level of expressive language at age five has been found to be a strong predictor of eventual functioning (Kobayashi, Murata, & Yoshinaga, 1992 as cited by Thurm et al. 2007). However, Thurm et al. point out that this finding has been qualified by Howlin et al. (2004) who found that many young children who failed to score on verbal IQ tests showed significant improvements in language over time whereas the outcome for those who obtained an adequate verbal IQ score at a young age was variable (Howlin, Goode, Hutton, & Rutter, 2004). Howlin et al. (2004) further found that verbal IQ was limited as a prognostic indicator of future outcome and that the presence of useful speech was also found to be weakly associated with adult outcome:

Over 40% of children who had little or no language when first assessed had developed useful language as adults, and the higher their linguistic levels as adults, the more likely they were to do well on a range of other outcome measures. (Howlin et al. 2004, p. 226)

Thurm et al. suggest that language ability nonetheless impacts upon the child's future outcomes because the presence or absence of language will determine the child's classroom placement and access to social opportunities.

As we have seen, receptive and expressive language skills may be differentially impaired and several factors may be responsible for the type of language impairment in autism (social motivation deficits, oral-motor skills, and manual-motor skills). Nonverbal children constitute a significant percentage of the outcome children in prospective studies (Thurm et al., 2007, p.1731), yet little is known about the current language abilities of these children:



Questions remain about whether these nonverbal children understand any language and whether they perceive speech in the same way as other children do. It is not known whether the source of their difficulties with language stems from deficits in symbolic capacity, motivation to communicate with others, mental retardation, or a combination of all these factors. Until we as researchers begin to study these children, we will not achieve a full understanding of the language deficits that are central to the diagnosis of autism. (Tager-Flusberg, 1999)

This lack of research is a direct result of the difficulties posed by the unique features of this particular population. Nonverbal individuals with autism may suffer more extreme challenging behaviours, and few tests have been designed to test for language-related skills on older children, such as perception and comprehension, that do not require some linguistic skills. For example, performance on many intelligence tests is strongly in favour of those with fluent language skills. Standardized tests are not designed to overcome potentially contextual difficulties for participants and it is not yet clear whether some element of environmental prosthesis would allow nonverbal children with autism to better participate in these tests. Koegel et al. (1997) tested this hypothesis by incorporating behavioural motivational techniques into the testing procedures, comparing performance within participants on both this behaviourally altered test and a standardized test. While results showed better outcomes in the prosthetic condition for verbal participants, the nonverbal participant included in the study did not perform significantly better in either condition (L. K. Koegel, Koegel, & Smith, 1997). Hence, environmental prosthesis can alter outcomes on standardized tests for children with some level of language skill but more research is needed to see if this approach to testing can be used to further investigate the current functioning of nonverbal children with autism.

## **5.2 Available Technologies for Increasing Language in Nonverbal Children with Autism**

### **5.2.1 Introduction**

Language interventions for children who have been diagnosed with autism at age two will necessarily adopt a completely different approach to language teaching than interventions aimed at improving language in older nonverbal children. For children age two or younger, the evidence suggests that much pre-linguistic behaviour such as joint attention and imitation may be taught in structured intensive intervention settings (R. L. Koegel, Koegel, & McNerney, 2001) and this is a very hopeful and exciting time for developments in early intervention. Without knowledge of the processes and mechanisms of typical language development, much of the progress in early language intervention for children with autism would not have been possible. However, teaching language to older nonverbal children with autism presents a different set of challenges for language interventionists. This is because typically developing children at this age are usually fluent language users and have passed through the developmental milestones of language acquisition. The five-year old language learner has a completely different volume and type of experience than the infant language learner and will have developed in several other domains such as motor and cognitive domains of functioning. The underlying cause and nature of impairment in autism is also unknown and we therefore do not know the extent to which cognitive, emotional or social processing impairments are impacting on language development in this population. Further, nonverbal children with autism may represent a unique sub-group in the autism population and less is known about the functioning capacities of this significantly sized autism subgroup than is known about verbal children with autism. Thus, language interventionists must theorise about *what* aspects of language and communication should be taught and *how* these aspects should be taught, and they must do so with very little knowledge about the abilities or impairments of nonverbal children with autism. Interventionists, therefore, must make critical conceptual choices about the best way to try to teach language based on the sparse available data about the cognitive, linguistic, and social capabilities of these children.



The two main approaches to language intervention for nonverbal children with autism are behavioural and developmental. In chapters two and three the impact of the conceptual framework of both of these approaches on autism intervention in general was discussed. Likewise both approaches posit specific theories of language acquisition and are committed to different conceptualisations of language impairment in children with autism. Further, a third conceptual approach currently represents a kind of middle-ground between these two distinct conceptual approaches in that interventionists in this approach use behavioural methodology and technologies to teach skills identified by developmental research as critical to the language acquisition process. These three strands of intervention approach are presented below. They are evaluated with regard to the evidence supporting each approach to language intervention for nonverbal children with autism and with regard to the conceptual strengths of the theories of language acquisition guiding the approaches. Behavioural models of autism language intervention are further evaluated in terms of findings from developmental theories of language acquisition in order to highlight the limited scope of the theory of language acquisition that underlies these models. In turn, a developmental model of language intervention is outlined as providing the most informed unified conceptual framework for autism language intervention.

As we shall see, research on nonverbal children with autism has provided very little guidance on best practice with this particular population and as such many of the approaches must make certain theoretical commitments that may currently represent leaps of faith rather than evidence-based decisions.

### **5.2.2 Behavioural Technologies**

In chapter two we outlined the many types of behavioural intervention that have been developed under the general umbrella of ABA autism intervention. With regard to theories of language acquisition we also saw that behavioural, or learning, theories of language are not considered adequate theories of child language acquisition based on findings from psycholinguistic research on the nature and development of language in the young child. Further, in chapter four we saw that the strategies of a behavioural approach to autism intervention, such as the contingent use of reward, are compatible with

developmental best practice and that outcomes in verbal behaviour interventions can be understood in terms of developmental psycholinguistic theory. However, in looking at this unique and vulnerable population of children with autism we now ask whether a behavioural approach to language learning in intervention could provide best possible outcomes for nonverbal children with autism, given their unique language and cognitive profile. Additionally, we ask if the conceptual framework underlying this intervention approach can provide basic insights into the current functioning and prognosis for this particular population.

### *Discrete Trial Training*

Discrete Trial Training (DTT) was one of the first comprehensive approaches developed from the principles of Behaviour Analysis to be implemented in autism intervention. DTT is still a popular approach to autism intervention and may be incorporated into other behavioural approaches as an effective technology in teaching particular skills to children with autism (Leaf & McEachin, 1999; Lovaas, 1987; Lovaas & Smith, 1989). Discrete trials consist of presenting an antecedent stimulus to the child, waiting for an appropriate response or target behaviour, and responding to the behaviour according to predetermined guidelines. DTT is highly structured and teaching is adult-directed. As such its methods are easy to follow and replicate, and the theory underlying the approach is cohesive and well defined (Rogers, 2008). Initially DTT was thought to be an appropriate method for teaching a broad range of skills including language, social, and communication skills. However, language outcomes for this approach frequently included problems with generalisation and spontaneity of language by the child (Heflin & Simpson, 1998; Prizant & Rubin, 1999; Prizant & Wetherby, 1998). It has also been claimed that discrete trials may be counterproductive to the development of social communication (Mundy & Crowson, 1997). That is to say, that the rigid and unnatural setting of DTT language programmes, including the adult-directed repetitive drilling of isolated units of language at a desk, may undermine language acquisition by removing the social-communicative function of language use (Prizant & Wetherby, 1998). Several reasons have been put forward for the paradoxically good outcomes which often arise from unnatural teaching environments for language acquisition, such as DTT language programmes. As discussed



in chapter four (section 4.5.1), reasons for successful outcomes are often found by re-interpreting behavioural technologies in terms of non-behavioural conceptual frameworks or theories of autism. Another possible explanation for good outcomes in DTT language programmes is that the children who perform well in these programmes could perform equally well in any intensive language intervention, and that outcomes are due to variables that are not specific to behavioural technologies. Comparative studies of language interventions for children with autism are necessary in order to identify whether any intervention would lead to some improvement or whether there are intervention-specific factors that are effectively tapping key mechanisms for language acquisition and development.

### *Verbal Behaviour*

Verbal Behaviour (VB) (Carr & Firth, 2005) and, to a lesser extent, Natural Environment Training (NET) and Incidental Teaching (McGee, Krantz, & McClannahan, 1985) have more recently gained popularity as more appropriate and effective approaches than the DTT approach to teaching language in young children. VB is based on Skinner's theory of verbal behaviour (Skinner, 1957) in which principles of operant behaviour, such as reinforcement and punishment, are applied to language learning. Skinner prioritised the function of language as critical to the learning process, and theorized that the more functionally relevant language is to the child the easier and better it will be learned by the child. Skinner identified several verbal behaviours, or operants (instances of language use that are operated upon by the principles of behaviour), each one representing a type of language unit defined by the function it has for the individual. These are echoic, mand, tact, autoclitic, intra-verbal, transcription, and sequelic behaviours (O'Donohue & Ferguson, 2001). Based on this theory of language learning, verbal behaviour interventionists posit that the most effective way to teach language is to ensure that a verbal behaviour (e.g. a demand for chocolate) is followed by a consequence that reflects the function of the verbal behaviour (e.g. giving the child chocolate). Thus if a child uses the word 'cup' to ask for a drink, giving him a drink contingent upon the verbal request will lead to the increased probability that he will use the word 'cup' to request a drink in the future. In this instance the consequence (receiving the drink) reinforces the child's

language use. For example, a 'mand' is any language unit that functions to allow the child to request or demand an item. As 'mands' are considered to be the most motivating for a child they are usually the first verbal operant taught in a VB programme for children with autism. They require minimal social knowledge and are most motivating because all children will at some stage desire food, drink, or access to items. Another example is the 'tact' operant which is any unit of language that allows the child to communicate shared interest. Hence, the word 'cup' is a mand when the child uses the word to request a cup and it is a 'tact' when the child is drawing attention to the cup for the purposes of sharing interest. Tacts may be more difficult to teach given the lack of interest children with autism tend to show in social engagement and sharing interest with other people.

Language teaching in a VB approach is much more tied to the context for which language use is thought to be intended than teaching in DTT, and can thus be taught away from the desk in natural environments. Indeed according to Skinner's theory teaching in context is critical if the correct function of linguistic behaviour is to be taught. Incidental teaching is similar to VB and again can be taught in behavioural interventions along side VB and DTT programmes. Incidental teaching was first developed to address generalisation problems and also emphasises teaching in context. It is particularly suited to teaching language in that interventionists aim to provide as many verbal models and opportunities as possible for the child to respond in multiple contexts. This approach also aims to capitalize on existing social tendencies in the child and existing capabilities by continually providing reinforcing consequences for language and communicative attempts.

Based on what we know about language and social-communication deficits in this particular population, a behavioural-based approach to language learning in nonverbal children with autism has several strengths. For example, an operant conditioning theory of language learning posits a critical role of motivation and reinforcement. From a developmental perspective, the contingent use of reinforcement in a highly motivating environment may tap the social deficit that many developmental interventionists posit to underlie the particular deficits in language development in autism. Modelling is also extremely important in this approach and a behavioural theory of language learning posits that the child's imitation of modelled language is essential for learning associations



between word and object, speech and communication. From a developmental perspective, non-behavioural autism research has highlighted evidence of attention deficits and poor oral motor coordination in this population and therefore contingent reinforcement of attending and imitation may be conceptualised as effectively increasing language in the nonverbal child by targeting two essential pre-linguistic capacities. A particular strength of a verbal operant approach to language learning may also lie in the fact that older children with autism may have passed by a critical window of opportunity in language development for acquiring pre-linguistic capacities such as shared intentionality and pre-linguistic behaviours such as joint attention and therefore teaching functional units of language may represent the most effective option for language interventionists to increase language production in children with autism.

A common feature of the strengths of a verbal behaviour approach to autism language intervention is that these strengths may be readily understood within a developmental conceptual framework for autism intervention. That is to say, developmental theories of the processes underlying impairment in autism could be used to understand the mechanisms by which the above cited features of a verbal behaviour model of intervention may bring about change in language development in nonverbal children with autism. However, as discussed in chapter four (see pages 93-94), rather than using a developmental conceptual framework to provide support for the use of verbal behaviour technologies, we propose that language intervention technologies should be developed directly from developmental principles of language acquisition and the processes impaired in autism language development. These technologies may be similar in structure to verbal behaviour strategies and target similar behaviours in intervention but the theory of dysfunction and change that underlies these technologies will be radically different and allow the interventionist to develop and investigate more hypotheses about the underlying impairment and abilities of nonverbal children with autism.

Thus a major concern with verbal behaviour technologies in autism language intervention is found at the level of the theory underlying the technologies, namely, an operant conditioning theory of language acquisition. In addition, verbal behaviour technologies for language intervention are based on several premises about language

acquisition for which there is limited support. For example, some behavioural interventionists have claimed that children with autism “have many difficulties that need to be addressed individually” (Pelios & Lund, 2001, p. 688). Pelios and Lund do not, however, cite evidence in support for teaching formal aspects of language independently of one another. Dawson et al. (2007) have raised concerns with regards to frequently made, but unsupported claims, such as this about the nature of intelligence in individuals with autism. Rather, the authors call for caution in the assumptions made regarding autism abilities and impairment (M. Dawson et al., 2007), and this is particularly important in intervention where critical decisions must be made about the type of behaviours that are targeted and the way in which they are taught.

Similarly, there is much evidence that observable consequences are not always necessary for typical language acquisition but rather that simple exposure to language in a social context is a prerequisite for normal development (Tomasello, 2003). Rather, developmental psycholinguistic research suggests that cognitive, linguistic, and social processes are all necessary for language learning to occur and thus environmental contingencies, or behavioural shaping, will not always affect change in the processes involved in language acquisition. Two premises sometimes cited in behavioural literature merit particular attention. One is that the child with autism may represent a blank slate (Lovaas and Smith 1989) which the interventionist fills with knowledge and shapes according to the aims of the interventionist. There is no evidence that children with autism, including those severely language impaired, do not have an independent will, their own thoughts, desires, and emotions, and in short, their own personality. Approaching any child as a blank slate is ethically questionable and does not take adequate account of the active role the child plays in the learning process. A related assumption and one that is equally unsupported by empirical evidence is that children with autism “need to be taught virtually everything, and the teaching needs to proceed piece by piece rather than in major steps” (Lovaas and Smith 1989, cited by Pelios and Lund, 2001, p. 691). The second premise is that learning a behaviour reflects understanding of a behaviour (Feinstein, 2001). Children with autism may be better taught to use motor speech when prompted and to produce greater numbers of speech units in highly structured environments but may lack an understanding of what it is they



are saying. Many children with autism who possess some language appear to have difficulty in using that language, e.g., pronoun-reversal and echolalia in autism. Paul has suggested that echolalia in children with autism may provide evidence that language is learned in chunks rather than a series of individual and meaningful units and that language delayed children such as children with autism use these chunks to represent something in particular. To learn to separate out the meaningful elements of utterances and assign meaning to them, the child may need language intervention that includes extensive social-communicative interaction between child and interventionist.

Generative accounts of language acquisition and Chomsky's argument against a blank state hypothesis and language-learning.

### *Pivotal Response Training*

Pivotal Response Training (PRT) was initially developed as a response to limitations in the DTT approach to intervention (Prizant & Wetherby, 1998) and shares many structural aspects with incidental teaching and VB (Delprato, 2001b). It too is set in a natural environment and, wherever possible, instruction is guided by the child's interest and not the interventionist's. Koegel et al. (2001) have posited that targeting certain pivotal behaviours will have an indirect but widespread effect on related behaviours and would thereby obviate the need to teach every behaviour individually (Koegel, Koegel, & McNeerney, 2001). This was a new behavioural theory of autism intervention that went against Lovaas et al.'s (1989) earlier claim that the autistic child needed to be taught everything. PRT represents a distinct move away from DTT towards a developmental approach to autism intervention in that the intervention researchers in this approach use behavioural technologies to target developmentally identified social-communicative behaviours (Bruinsma, Koegel, & Koegel, 2004). However, PRT is a behavioural intervention because learning in intervention is conceptualised as due to processes of operant conditioning, especially through the contingent use of reinforcement.

PRT represents a significant shift towards a developmental approach to autism intervention by incorporating naturalised instruction, following the child's lead, and the liberal shaping of behaviour, into behavioural programmes (Delprato, 2001a). The major strength of this approach to intervention lies in its considerable use of findings from

developmental psycholinguistics to target prerequisite behaviours that are most likely to positively affect language development. For example, Andersson et al (2007) have identified a nonverbal subgroup of children with autism who were severely language impaired and found that impaired joint attention was the single greatest risk factor for this group, “suggesting that mastery of preverbal social skills could be a high treatment priority for these children.” (Andersson et al, 2007, p. 603.). A PRT model of intervention incorporates findings such as these into language programmes and uses them to identify the most critical behaviours that need to be targeted in early autism intervention in order to improve the probability of effecting change in processes of language development. Similarly, incorporating child preferences into the choice of context and materials used in intervention, and flexibility in target behaviours taught, reflect non-behavioural principles of development (as outlined in chapter three).

However, PRT is a behavioural intervention and for autism intervention this conceptual framework affects the interventionist’s approach “to teaching speech, the theoretical concepts underlying them, therapist behaviour in the treatment, and the goals and objectives that are developed for the treatment” (Rogers, 2008, p. 159). We have seen that an operant conditioning theory of language learning undermines the role of cognitive, linguistic, and affective processes in language acquisition and that it is widely thought to be inadequate in accounting for language acquisition in typical children (Altman, 2001; Chomsky, 1959). Given that so little is known about the capacities of nonverbal children with autism it would be unwise to narrow the scope of potential learning mechanisms to operant learning. The developmental language trajectory for these children is particularly unpredictable and much remains to be understood about the processes involved in learning in these individuals:

Compared with children with other developmental disorders, the children with ASD showed greater heterogeneity and range of trajectories, which speaks to the necessity for intervention approaches that can address the diverse needs of this population. (Lord, 2007, p. 603.)

Rogers (2008) suggests that the lack of set guidelines for the interventionist/parent in PRT compared to the manualisation of intervention in DTT is a serious limitation. Rogers also proposes that a structured and demanding DTT intervention may be better for



different profiles of children with autism who may need more motivation and stricter controls to increase language development such as speech production (Rogers, 2008). However, we would suggest that the absence of a set protocol for the implementation of technologies, with an emphasis on the current context and natural environment, does not reflect an absence of critical and in-depth theory behind the approach, and that the approach is only difficult to effectively implement when the theory is poorly understood. Further, targets of immediate change in behaviour that are characteristic of DTT interventions and ABA in general, should not necessarily be appropriate aims for guiding the development of language programmes for nonverbal children with autism. Rather, several autism researchers have argued that we should be seeking to increase the child's understanding of language (Mesibov, Adams, & Klinger, 1997) and functional ways to communicate, and not necessarily to demonstrate control over a child's behaviour in a given situation (e.g., that a child will respond to a verbal command by following the command) (Hughes, 2000a).

### **5.2.3 Developmental Technologies**

A developmental approach to autism language intervention is based directly on findings from developmental psycholinguistics on the role of pre-linguistic socio-communicative behaviours in language acquisition (Mundy et al., 1990; Tager-Flusberg, 2000). In chapter three we outlined the conceptual approach of developmental models of intervention and highlighted the approach of one prominent model in particular, namely the Developmental Social-Pragmatic (DSP) model. In practice, DSP approaches are quite similar to PRT and normalized behavioural interventions. Teaching is child-directed, conducted in a natural environment, and control of the situation is shared between child and interventionist. However, conceptually, developmental interventionists do not adhere to the principles of an operant conditioning theory of language acquisition, and the child's cognitive, linguistic and affective capacities are considered to be as important as environmental contingencies in determining the outcome of language development. This approach emphasises change in understanding (Feinstein, 2001), not just behaviour, and rather than simplifying tasks to allow the child to learn them, the developmental

interventionist provides extra scaffolding to help the child gain meaning from complex skills such as social interaction (Rogers, 2008).

Developmental social pragmatic models are primarily concerned with increasing social-communicative interactions rather than with the form they take (e.g. language), and all communication attempts, no matter how unusual, are viewed as intentional (Ingersoll, Dvortcsak, Whalen, & Sikora, 2005). Sharing affect is also a key conceptual premise of the approach. Strengths of this approach include an emphasis on findings from language research, and an active link to autism research and investigation of the processes that affect future outcomes. As with PRT, DSP models of intervention typically do not show rapid increases in observable behaviour but focus rather on developing long-term differences in social interaction and sharing of affect between the child and those around them. In practice this means a de-emphasis on data collection during intervention programmes in comparison to behavioural models of intervention because of the type of processes that are targeted by developmental intervention. Hence, measurements used to gauge mediating variables in intervention outcome in developmental models of intervention include the length of time a child spends engaged in quality interaction with a care-giver and the number of times a child initiated joint attention with his or her care-giver. However, because developmental theories of autism and intervention posit several mediating variables as affecting outcome in autism intervention, the developmental interventionist must be careful to make explicit the processes and factors that are thought to underlie change throughout intervention as well as the internal processes that are thought to be affected in intervention.

Further, while this approach is based on language acquisition research, inferring atypical processes and impairment from theories of typical language acquisition may not be the best approach for autism. It seems likely that children with autism do not follow the same developmental pathway as typical children with regard to language acquisition. Indeed, even within the autism population it is more likely that there are multiple pathways to development given the variability in language functioning. However, given the child-directed and contextual nature of DSP models, it is less likely that the interventionist will miss alternative methods of communication and interaction attempts by the child. As discussed in chapter four, interventionists in this approach are



conceptually more prepared to investigate the processes involved in the behaviours they see in a creative and novel way.

### **5.3 Summary**

Research on autism has tended to focus on the defining social-communicative features of the disorder. Recently, significant attention has also been turned to the language development of individuals with autism, with many findings indicating a strong association between early language ability and positive long-term outcomes (McDuffie, Yoder, & Stone, 2005). Research on language development in autism is often conducted within a developmental psycholinguistic framework that is informed by typically developing language acquisition. A number of profile studies have been conducted that have identified potential subgroups of children with autism based on shared types of language impairment. Nonverbal children with autism represent one distinctive subgroup, and, despite the percentage of children with autism who do not acquire functional language, research on this particular group is rare. The language development of children with autism who have some functional language is much easier to contrast with that of typically developing children. Most nonverbal children with autism cannot be tested using standardized measures and therefore little is known about development and intellectual capacity in these individuals.

Given the present lack of understanding of this particular population, we sought to identify measures of intervention necessary for teaching language to nonverbal children with autism by exploring current findings on language impairment in the general autism population. Research would suggest that perceptual and phonological capacities are not impaired in children with autism. Oral- and manual- motor skills, including imitation, are thought to be particularly important for successful speech fluency and motor production. These behaviours precede joint attention behaviours and may thus represent the earliest types of pre-linguistic social-communicative behaviours that should and can be taught to children with autism. Teaching behaviours such as responding to and initiating joint

attention are clearly important given the strong evidence for the role of social-communicative behaviours in language acquisition and the particular type of social deficit found in autism. Further, reports of language development in children with autism now suggest that a smaller percentage of these children remain nonverbal than previously thought (Rogers, 2008). Thus it would seem that children with autism have spared capacities that would allow them to master speech production, and that therefore, it would be both appropriate and beneficial to teach spoken language to children at all levels of functioning that are on the spectrum.

Two approaches to language intervention were also examined, including three models representing a behavioural approach and one model representing a developmental approach. In terms of practice, traditional behavioural models, such as DTT, differ significantly in structure from normalised behavioural models, such as VB and PRT, and developmental models such as the DSP. On the other hand, traditional and normalised behavioural models of intervention differ from developmental models in their conceptualisation of language acquisition, and their theory of change and dysfunction in autism. Both approaches to intervention hold promise for teaching language to nonverbal children with autism, but only two models are based directly on scientific research into autism and language, namely: the DSP (developmental) model and PRT (behavioural) model. Rogers has suggested that a choice may be made between the two approaches and their corresponding models of intervention based on the profile of the child. Thus a child who has very few skills and does not communicate or interact with the interventionist at all may be better suited to intensive and structured interventions such as DTT, whereas a highly fluent child with significant pragmatic speech impairments might be better suited to a developmental social pragmatic approach. Given the problems which arise from theoretically eclectic approaches to intervention, however, this would not be good scientific practice, as it would mean eclectically applying methodologies that do not fit with the interventionist's particular conceptual framework of the processes underlying impairment and improvement in the disorder. Rather, the interventionist must be able to understand, and account for, particular choices of intervention technologies in order to be able to identify mediating variables, or to understand why change has not occurred. For example, one of the findings discussed earlier in the thesis suggests that adults



instinctively “shape” their child’s linguistic behaviour and social interaction by increasingly raising the standard of social exchange that the child must produce in order to get the desired response from the caregiver. This contingent responding by the caregiver is very similar to the shaping of behaviour in DTT and normalised behavioural interventions. If contingent responding is conceptualised as a developmental technology rather than as an exclusively behavioural one, then using contingent shaping in this way is not at odds with a developmental conceptual framework, but rather has an explicit theoretical basis which allows the interventionist to empirically test the role this technology may have in the intervention. On the other hand, an eclectic approach to intervention implies that the interventionist has given up looking for an adequate understanding of language development in children with autism and will settle for an “anything that works” approach, even if that means minimal improvement in language development.

As discussed in chapter four, there may be several mediators of outcome in autism intervention, and this is no less true in language intervention for nonverbal children with autism. Mediators and moderators of intervention outcomes need to be accurately identified during intervention so that the interventionist can explore potential explanations for lack of progress, and potentially develop methods of enhancing language development in this particularly vulnerable population.

## **Chapter 6**

### **An experimental investigation of optimal environments for increasing motor production in severely language-impaired children with autism**

#### **6.1 Introduction**

A central premise of this thesis is that autism intervention should be informed by contemporary developments in developmental psychopathology, psycholinguistic, and neuropsychological research on impairment and functioning in children with autism, as discussed in chapters three and five. Chapter two focused on an operant conditioning theory of children with autism and of language learning, and outlined the limited incorporation of autism research findings in the development of behavioural intervention technologies for children with autism, particularly with regard to programmes for language development. In this chapter, two empirical studies are reported which explore two empirical methods of comparing intervention technologies for increasing motor speech production in language-impaired children with autism. Specifically, we sought to: (1) highlight the role of theory in the development, implementation, and evaluation of treatment technologies; and (2) compare and contrast two maximally distinct approaches to language intervention for language-impaired children with autism. In the first empirical study, one theoretically eclectic treatment technology is compared and contrasted with two technologies from a behavioural conceptual framework, and the outcome of the study illustrates the negative impact of theoretical eclecticism on the evaluation of treatment technologies in intervention research. In contrast, the second empirical study compares treatment technologies developed directly from theoretically unified frameworks and which reflect two distinct approaches to autism and language acquisition. This study revealed comparable outcomes for both intervention approaches, and highlights the critical role of theorising in the development, implementation, and evaluation of these treatment technologies. The study also highlighted the significant issue of individual differences in treatment outcome and the need for greater theorising



with regard to identifying linguistic mediating variables in language intervention for this language-impaired group of children with autism.

## **6.2 Background to Increasing Motor Speech Production in Nonverbal Children with Autism**

### **6.2.1 Research Evidence**

As discussed in chapter five, language ability in individuals with autism is heterogeneous and can range from normal to severely impaired levels of functioning (Kjelgaard & Tager-Flusberg, 2000; Tager-Flusberg et al., 2001). However, research indicates that all individuals share a significant impairment in the pragmatic use of language, and that most children may have spared functioning in perceptual and speech articulation capacities (Paul, 2008). Spared perceptual and articulation capacities would suggest that children with autism are capable of producing motor speech yet roughly 36% of children with autism spectrum disorder over the age of two have no expressive language (Paul, Chawarska, Fowler, Cicchetti, & Volkmar, 2007). Further, language is a significant prognostic indicator of outcome in children with autism (Toth, Munson, Meltzoff, & Dawson, 2006) and expressive language in particular has been found to predict eventual outcome in children with autism (Kjelgaard & Tager-Flusberg, 2000; Thurm, Lord, Lee, & Newschaffer, 2007). Together, the potentially spared perceptual and articulation capacities of children with autism, and the importance of expressive language in predicting positive outcomes for these children, would indicate that increasing speech production in nonverbal children with autism is an appropriate and justifiable target for autism intervention. However, the extent to which speech production may be taught to older, severely language-impaired children with autism through direct instruction is unknown. Research on general functioning in nonverbal children with autism is also lacking (Tager-Flusberg, 1999) and many theories of how best to teach motor speech to nonverbal children with autism rely on evidence from research on the language development of typical children and verbal children with autism.

Several key findings from autism language research have been outlined in chapter five that may be particularly pertinent for the development of language programmes for increasing speech production in children with autism: (1) manual and motor skills are significantly inter-correlated and are strongly associated to levels of speech fluency in children with autism (Gernsbacher et al., 2008; Thurm et al., 2007); (2) children with autism do not have a deficit in the fine motor control of speech (Sheinkopf, Mundy, Oller, & Steffens, 2000); (3) sound imitation may predict expressive language later in development (e.g. Thurm et al. found that imitation of sounds at age two predicted expressive language at age five); (4) initiating joint-attention skills at age three have been found to predict expressive language at age 12 (Sigman & Ruskin, 1999, cited by Wetherby, 2008); and (5) the presence of useful speech at age five may be less associated with adult outcome than previously thought, with some evidence that children who had little or no language can develop useful speech as adults (Howlin, Goode, Hutton, & Rutter, 2004). These findings support directing intervention towards teaching functional language use to nonverbal children with autism, suggesting that it is both possible and beneficial for older nonverbal children with autism to acquire some functional expressive language.

### **6.2.2 Comparing Behavioural and Developmental Models of Language Intervention**

The first empirical study explores the impact of theoretical eclecticism on autism intervention research. To do this, one theoretically eclectic treatment technology for increasing motor speech production was compared with two that were grounded in a unified conceptual framework. Koegel et al.'s (1988) study on increasing motor production attempts in nonverbal children with autism was chosen for partial replication because it outlined and investigated two behavioural-based technologies for increasing speech sounds in severely language-impaired children with autism. One technology was based directly on a discrete-trial training (DTT) format and as such was developed exclusively from a behavioural conceptual framework and theory of operant conditioning. In this condition, only successive approximations of target words were rewarded by the experimenter. Koegel et al. compared this DTT treatment condition with a 'motivation' treatment condition in which all motor production attempts were rewarded



by the experimenter, and found that motor speech production attempts were higher in the N-ABA treatment condition than in the DTT-ABA treatment (Koegel, O' Dell, & Dunlap, 1988). We have termed this treatment condition a 'normalised-ABA (N-ABA)' treatment because it was one of the first technologies developed within a normalised model of ABA intervention and reflects a move towards theorising about processes other than those accounted for directly in the theory of operant conditioning. For example, Koegel et al. hypothesised that reinforcing all motor attempts would increase motivation to learn language and would generalise to increased motor production. They based this hypothesis partly on reports of "remarkable bursts of spontaneous speech" that some children with autism have shown in highly motivating circumstances, and hypothesised that increasing motivation to respond would increase speech acquisition (p. 526). However, Koegel et al.'s hypothesis that children can acquire complex verbal speech in a highly motivating environment and, as such, that direct shaping of complex language was not necessary for language acquisition to occur contradicts Skinner's hypothesis which states that successive approximations allow the interventionist to "build complicated operants that would never appear in the repertoire of the organism otherwise" (Skinner, 1953, p. 92, as cited by Cooper, Heron, & Heward, 2007, p. 422). The N-ABA treatment condition is therefore informed by a behavioural theory that moves beyond a strict theory of operant conditioning.

In our first empirical study, Koegel et al.'s research design was modified by including a third condition that reflected a truly theoretically eclectic approach to intervention. This treatment differed from Koegel et al.'s two treatment conditions only with regard to the behaviours which were rewarded by the experimenter. In this treatment, all motor productions and socio-communicative behaviours were reinforced, and these target behaviours were chosen because they have been identified by research on autism as predicting later language development. This condition was therefore named the developmental-ABA treatment condition or D-ABA treatment. As such, this treatment represents a truly theoretically eclectic approach to intervention: this treatment was developed directly from the principles of operant conditioning and the technology of this treatment is used to target behaviours that are conceptualised within a developmental approach to have a critical role in language acquisition.

It was hypothesised that performance in this study would replicate findings from Koegel et al.'s study. Therefore, it was hypothesised that performance would be significantly greater in both the N-ABA and D-ABA conditions. It was also hypothesised should differences occur between treatment conditions, it would be extremely difficult to identify the mediating variables affecting participant performance.

In contrast, the second empirical study was developed to compare and contrast technologies developed from competing but unified conceptual frameworks, and to illustrate the benefits of comparing conceptually distinct intervention technologies. We also sought to demonstrate that treatment technologies developed from a developmental conceptual approach to autism and language acquisition may not differ notably in implementation and structure from normalised behavioural technologies (i.e. at stage two of the intervention research process) but that they differ significantly in the theoretical framework from which they are developed (i.e. in stage one of the research process), and in the theoretical framework in which they are evaluated and interpreted (i.e. at stage three of the research process). To achieve these goals, two treatment conditions were developed and compared that reflected the theoretical principles guiding normalised-behavioural and developmental models of autism language intervention respectively. Both treatments were set in a natural environment, away from the desk and did not involve discrete-trial 'drills' and are described in full in the report of phase two. Both conditions were very similar in structure and behaviours targeted. It was hypothesised that there would be no significant difference in the quality of motor speech productions in each condition and that any difference would be in favour of the developmental condition because this condition was developed directly from research on autism and a more informed theory of child language acquisition.



## **6.3 Experiment One: Comparing DTT-ABA, N-ABA, and D-ABA**

### **6.3.1 Method**

#### **Participants**

Four male pre-verbal children with autism participated in the study. All four participants received full time Applied Behaviour Analysis (ABA) schooling at the time of the study. The children's real names are not used in this study. Rather, individual participants will be referred to as Jack, Frank, Harry, and Bill.

#### **Jack**

Jack was aged five years and seven months at the time of the study. He was diagnosed with Autism Spectrum Disorder at the age of three years and one month, and received part-time ABA intervention at home from the age of four. He began full-time ABA schooling at the age of five and he had therefore received seven months of full-time ABA schooling at the time of the study. His mother noticed a marked regression in Jack's language skills at two and half years of age when he stopped using most of the 40 words he had acquired and began to use the remainder in unusual and inappropriate contexts. Results from Jack's most recent speech pathology assessment (November 2007) indicated severe receptive and expressive language delays. Jack also had severe challenging behaviours including biting, pinching, and boxing his throat at the time of testing. A criterion was set for stopping the experimental study in the event of any challenging behaviours. Criterion for stopping the study was set at the average number of self injurious behaviours over the previous five school days or the average number of physical assault behaviours over the previous five school days. For Jack the criterion for the number of self-injurious behaviours allowed before the study was stopped was two and the criterion for physical assaults was one.

#### **Frank**

Frank was aged seven years and four months at the time of testing. He had been diagnosed with autism at the age of three years and three months and was placed in an

ABA intervention programme two months later. Frank began full-time ABA schooling aged five years and nine months and had therefore received one year and seven months of full-time ABA schooling at the time of the study. Frank's mother noticed a marked regression in language skills between one and a half and two years of age during which time Frank lost all his language with the exception of an occasional word. Frank's most recent speech and language assessment report (September 2007) indicated significant speech and language delay. Frank had no challenging behaviours but had difficulty attending and participating in each condition for extended periods of time (longer than five minutes) after which time he would flop in his chair or run around the room. These behaviours were only pertinent to experiment one and were addressed by instructing Frank to sit nicely or returning Frank to the table and praising him for his return.

#### Harry

Harry was aged nine years and two months at the time of testing. He was first diagnosed with autism at the age of three years and nine months and had received 20 hours of ABA tuition five months prior to diagnosis. He was placed in full-time ABA schooling (30 hours per week) six months after diagnosis, at the age of four years and three months. He had therefore been in full-time ABA schooling for four years and 11 months at the time of the study. Harry was severely delayed in both receptive and expressive language at the time of testing and had limited speech productions. Harry had some challenging behaviours including self-injurious behaviours, such as head banging, and physical assaults, such as hitting. Again, the average number of self-injurious behaviours and physical assaults over the previous five days was calculated and used as a criterion for stopping an intervention phase. For Harry the criterion for the number of self-injurious behaviours allowed before the study was stopped was two and the criterion for physical assaults was one.

#### Bill

Bill was aged five years and four months at the time of testing. He was diagnosed with Autism Spectrum Disorder at three years and six months of age, and one month later began a home ABA programme (eight-ten hours per week) for four months. He had been



in full-time ABA schooling for 19 months at the time the study was conducted. Bill had the most advanced expressive and receptive language skills of the four participants. He could repeat whole sentences, accurately reproducing prosodic features of the utterance and syllabic meter but without successfully articulating individual words. Throughout testing Bill also exhibited frequent echolalia and he had no challenging behaviours. Bill, however, was not considered by tutors in his school to be yet under the instructional control of all the tutors who worked with him.

### **Materials and Setting**

Testing was conducted in two ABA schools in Dublin and Louth. Jack and Frank attended the former school and Harry and Bill attended the latter. The study was carried out in an empty classroom in both schools by a single experimenter. All treatments were delivered by the presenting doctoral student who had 18 months experience of ABA tutoring in both school and home settings, and three years research experience in psycholinguistics and child language development at the time of testing.

A low desk and two chairs were placed in one area of the classroom which had been cleared of all non-essential items. Four participant-preferred items, e.g. toys, were placed on the desk. A camcorder and tripod were placed approximately one metre from the desk to record testing. A third chair was placed behind the video equipment for an observer who attended half of the testing sessions. Data was recorded by the experimenter on data collection forms throughout the session. Only correct or incorrect responses were recorded during testing. Subsequent linguistic analysis was conducted through video analysis at a later stage.

### **Procedure**

#### *Design*

A repeated-measures reversal design (ABCA) was used. All participants took part in three treatments which comprised four conditions: a Discrete-Trial Training ABA (DTT-ABA) condition, a normalised-ABA (N-ABA) condition, a developmental-ABA (D-ABA) condition, and a reversal condition (the first of the three previous conditions in which the participant had taken part). Each condition consisted of a minimum of two

sessions. Each session included at least 20 trials for each target behaviour which totalled a minimum of 80 trials per session and a minimum of 160 trials per condition.

**Table 1. Summary of Experimental Details regarding Treatments, Conditions, Sessions, and Trials**

| Experimental Details                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"><li>• 3 Treatments (DTT-ABA, N-ABA, D-ABA)</li><li>• 4 Conditions (1 condition for each treatment plus a repeat condition of the initial treatment)</li><li>• At least 2 sessions per condition</li><li>• At least 80 trials per session</li><li>• At least 20 trials per word</li><li>• Minimum of 160 trials per condition</li></ul> |

*Conditions*

(A) Discrete-Trial Training ABA (DTT-ABA)

In this condition the participant received praise and access to the item only if he successfully approximated the verbal model. The use of successive approximations, or behaviour shaping, is a procedure often used in discrete trial training to shape a target behaviour, such as a spoken word (S. Rogers et al., 2006). In this study, a target sound was identified and the participant was reinforced only if they produced the target sound correctly (e.g., /s/ for sand). If the participant correctly produced this sound eight out of ten times, a more sophisticated target sound was set as the new criterion (e.g., /sa/ for sand) and the participant was only reinforced if they correctly produced this target sound. If the child did not respond, or responded inaccurately, the verbal model was repeated as a correction and the trial began again with delivery of a new verbal model. Shaping of the target word proceeded accordingly. If, however, after ten trials the participant had not correctly approximated the new target sound eight times, the previous criterion was used for another ten trials or until the participant reached this criterion.



In conducting the experiment with the first participant, Jack, unforeseen consequences were encountered in the DTT-ABA condition. To conduct the successive approximations according to the procedure described by Koegel et al. the experimenter had to ignore sincere and enthusiastic attempts by the participant to communicate through speech production. In doing so, Jack became increasingly frustrated and he eventually reacted severely to the lack of response by the experimenter following his inaccurate communicative attempts. The condition was stopped when he exhibited challenging behaviours that were not typical of day-to-day functioning for Jack (as set out in the criterion for emergency stopping of the experiment). Koegel et al. had not highlighted that this treatment condition may negatively affect vulnerable children with autism, beyond the likelihood that the child would demonstrate neutral or negative affect, yet the procedure of successive approximations outlined above appeared to the experimenter to be extremely punishing for children with very little communication skills. Immediate measures were therefore taken to correct these consequences, as recommended by the Society for Research in Child Development (1996), and the procedure for the DTT-ABA condition was redesigned in order to include a DTT-ABA condition in the study with the other participants.

Thus, the new DTT-ABA condition also included shaping procedures but these were less demanding than those described in Koegel et al.'s original study: if the child did not correctly approximate the new sound five times, the previous criterion was used until the child had again correctly produced this sound for eight out of ten trials. It was decided that five inaccurate trials would be the new criterion for returning to the previously acquired sound, so as to reduce the amount of time (by half) before a child again received reward for positive communicative attempts in this condition. Due to the altered criterion for reinforcing communicative attempts, it was hypothesised that differences between the DTT-ABA treatment conditions and the N-ABA treatment conditions may not have been strong enough to produce a significant difference for the remaining three participants in this short term study. Comparable outcomes were therefore hypothesised for Bill, Harry and Frank, who participated in the altered DTT-ABA treatment. However, should a significant difference occur it would be in favour of the N-ABA and D-ABA treatments. The study was continued, therefore, using the altered

DTT-ABA condition, in order to illustrate the difficulties in comparing across intervention technologies where one or more technology is derived from a theoretically eclectic framework.

#### (B) Normalised-ABA (N-ABA) Condition

In this condition all motor production attempts were reinforced. All other behaviours were systematically ignored, including socio-communicative behaviours. If the child did not respond verbally the verbal model was repeated as a correction. The target item was then held up again to the child and a verbal model delivered until the child successfully attempted a motor production.

#### (C) Developmental-ABA (D-ABA) Condition

In this condition all attempts by the child to produce speech sounds and/or engage socially with the experimenter in relation to the table-top items and activities were reinforced. Target behaviours included initiating joint attention behaviours and responding to joint attention behaviours (as defined in the ECSC (P Mundy et al., 2003)), and motor production attempts.

Testing for all conditions was carried out by a single experimenter and was video-recorded. Testing was conducted over the course of three days for participants, and testing was always conducted at the same time of the day for each participant. Participants took part in three sessions on average per day. A break of at least ten minutes away from the desk was given between sessions.

During testing the participant sat beside the experimenter at the desk within reach of the preferred items. The participant was then presented with a verbal model of an item and received the item upon meeting a set criterion. The choice of which item (and its corresponding verbal model) was presented to the child was decided by: (a) the child, if he reached for a particular item (child-directed instruction); (b) the experimenter, if the child had repeatedly (more than four times) reached for the same item (adult-directed instruction); or (c) the experimenter, if the child had not reached for any item (adult-directed instruction).



The **independent variable** in phase one was the experimenter’s response to, or consequence given for, the participant’s motor production attempts (see table 3). In the DTT-ABA condition only correct successive approximations to the verbal model were rewarded with praise and access to the preferred item. In the N-ABA condition all motor production attempts were rewarded with praise and access to the preferred item. In the D-ABA condition all socio-communicative behaviours including motor production attempts were rewarded with praise and access to the preferred item.

The **dependent variable** was the quality of participant’s motor production attempts. The mean quality of motor production attempts per session and per condition was measured. To rate the quality of each motor production attempt a Distinctive Features Analysis (DFA) of target words and their sub-phonetic units was carried out. Phonetic units were assigned a value based on this analysis.

**Table 2: Independent Variable across Conditions**

| DTT ABA<br>(condition A)                  | Normalised ABA<br>(condition B)        | Developmental ABA<br>(condition C)                                       |
|-------------------------------------------|----------------------------------------|--------------------------------------------------------------------------|
| Antecedent                                | Antecedent                             | Antecedent                                                               |
| Behaviour                                 | Behaviour                              | Behaviour                                                                |
| Consequent (i): Successive Approximations | Consequent (ii): All Motor Productions | Consequent (iii): All Motor Productions & socio-communicative behaviours |

*Hypotheses*

It was hypothesised that Jack would perform significantly better in the N-ABA and D-ABA treatments than in the DTT-ABA treatment. Comparable outcomes were hypothesised for Bill, Harry and Frank, who participated in the altered DTT-ABA treatment. However, should a significant difference occur it was hypothesised that performance would be better in the N-ABA and D-ABA treatments than in the DTT-

ABA treatment. It was also hypothesised that if the quality of motor productions increased significantly in the D-ABA and N-ABA treatments it would be extremely difficult to identify the mediating variables in the treatment.

### *Distinctive Features Analysis*

In order to compare the quality of motor responses in each condition Koegel et al. conducted a distinctive features analysis of target motor productions. Distinctive features of speech sounds reflect acoustic cues, and are either present or absent in a speech sound (Clark, Yallop, & Fletcher, 2007) Details of the twelve distinctive features that Koegel et al. used in their analysis are not specified in the study (Ingram, 1976, and Shane, 1973 are cited as references for the analysis). To conduct a distinctive features analysis of the verbal models presented and the participant responses, we identified ten distinctive features of all the speech sounds produced by participants in the study (see Appendix II). Each target word was sub-divided into smaller phonetic units. The number of distinctive features attributable to each phonetic unit was calculated and this number was used as the value for that speech sound. For example, the phoneme /s/ has four of our ten distinctive features: it is a continuant, strident, and coronal, consonant. Thus if a participant produced a /s/ sound in response to the verbal model “sand” this response was assigned a value of four. To calculate the score for a full verbal model we added the individual scores for each sub-unit of the word. To continue our example, “sand” was assigned a value of 18 and, therefore, the maximum score for a response to the verbal model “sand” was 18. If a child produced a speech sound that was not part of the target response the speech sound was given a value of zero. However, the child may have been reinforced for the speech sound depending upon which condition they were in. The value of zero was, therefore, used for comparative analysis.

### *Target Words*

Four preferred items for each participant were identified through observation of the participant playing with the item. A **five-trial sampling** of the names of potential preferred items was carried out for each participant. Participants were presented with preferred items and given a vocal verbal model of the name of the item. If the child



attempted an accurate approximation of the word four out of five times but could not fully pronounce the word then the item was included in phase one of the study. To ensure that all items were of equal value to the participant preferred items were either all edible or all play items.

Preferred items for Jack: a toy truck, a car, a container filled with sand, and a ball.

Preferred items for Frank: sweets, crisps, popcorn, and fruit.

Preferred items for Harry: a singing Barney toy, a DVD case dust jacket, a singing Frog toy, and a book.

Preferred items for Bill: chocolate, ‘skip’ crisps, ‘tayto’ crisps, and popcorn.

*Reliability*

To ensure reliability of testing across conditions and participants and to ensure fidelity of the treatment measure (refers to confirmation that the manipulation of the independent variable occurred as planned), two observers, blind to the study, rated the accuracy of experimenter performance in establishing and delivering the antecedent-behaviour-consequent (A-B-C) contingency. The A-B-C contingency is central to ABA schooling and took the form of discrete trials in all three conditions in experiment one. The target behaviour (B) in each discrete-trial was defined as any motor production or socio-communicative behaviour. Therefore, both observers should record more incorrect discrete trials in the DTT-ABA and N-ABA condition, as the target behaviour in both conditions was motor speech production only.

Observers watched four randomly chosen video-clips each showing a different treatment condition of the experiment. Participants varied in the video-clips. Observers were asked to:

Please tick each column for accuracy (✓) or inaccuracy (X) in delivery by the experimenter. The **antecedent** in each trial is a vocal verbal model, the **target behaviour** is any attempted motor production or communicative behaviour, and the **consequent** is delivery of the desired item and praise (or repeating the verbal model while delivering the item).

Do not rate as trials those where an antecedent was delivered when the participant was not attending and that resulted in redelivery of the antecedent. Rather, rate the trial beginning from the redelivery of the antecedent. Ignore any escape behaviours/non-attending by the participant.

The results of the reliability measures are summarised in table three.

**Table 3. Inter-rater observations of the number of discrete trials in video-clip and the number of discrete trials delivered correctly for DTT-ABA, N-ABA, and D-ABA treatment conditions respectively**

|                                        | Observer 1 | Observer 2 |
|----------------------------------------|------------|------------|
| Number of Discrete-trials              | 46         | 46         |
| Correct delivery of 3-term Contingency | 40         | 40         |

|                                        | Observer 1 | Observer 2 |
|----------------------------------------|------------|------------|
| Number of Discrete-trials              | 40         | 40         |
| Correct delivery of 3-term Contingency | 33         | 33         |

|                                        | Observer 1 | Observer 2 |
|----------------------------------------|------------|------------|
| Number of Discrete-trials              | 22         | 22         |
| Correct delivery of 3-term Contingency | 22         | 22         |



6.3.2 Results

Performance across the three treatment conditions, DTT-ABA, N-ABA, and D-ABA was initially analysed. As such, data from the initial and reversal conditions of the repeat treatment were grouped together and analysed as one treatment. Data from the initial and reversal conditions of the repeat treatment were then separated and performance across all four conditions was compared. This was done as a control measure to ensure that there was no significant difference between performance in the initial and reversal conditions of the repeat treatment. There should be no significant difference if these conditions were part of the same treatment.

Table 4. A Brief Summary of the Treatment Details of Study One

| Experimental Details                                                                                                                                                                                                                         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"><li>• 3 Treatments (DTT-ABA, N-ABA, D-ABA)</li><li>• 4 Conditions (1 condition for each treatment plus 1 reversal condition of the repeat treatment)</li><li>• At least 2 sessions per condition</li></ul> |

## **(A) Comparison across Treatments**

### Hypotheses

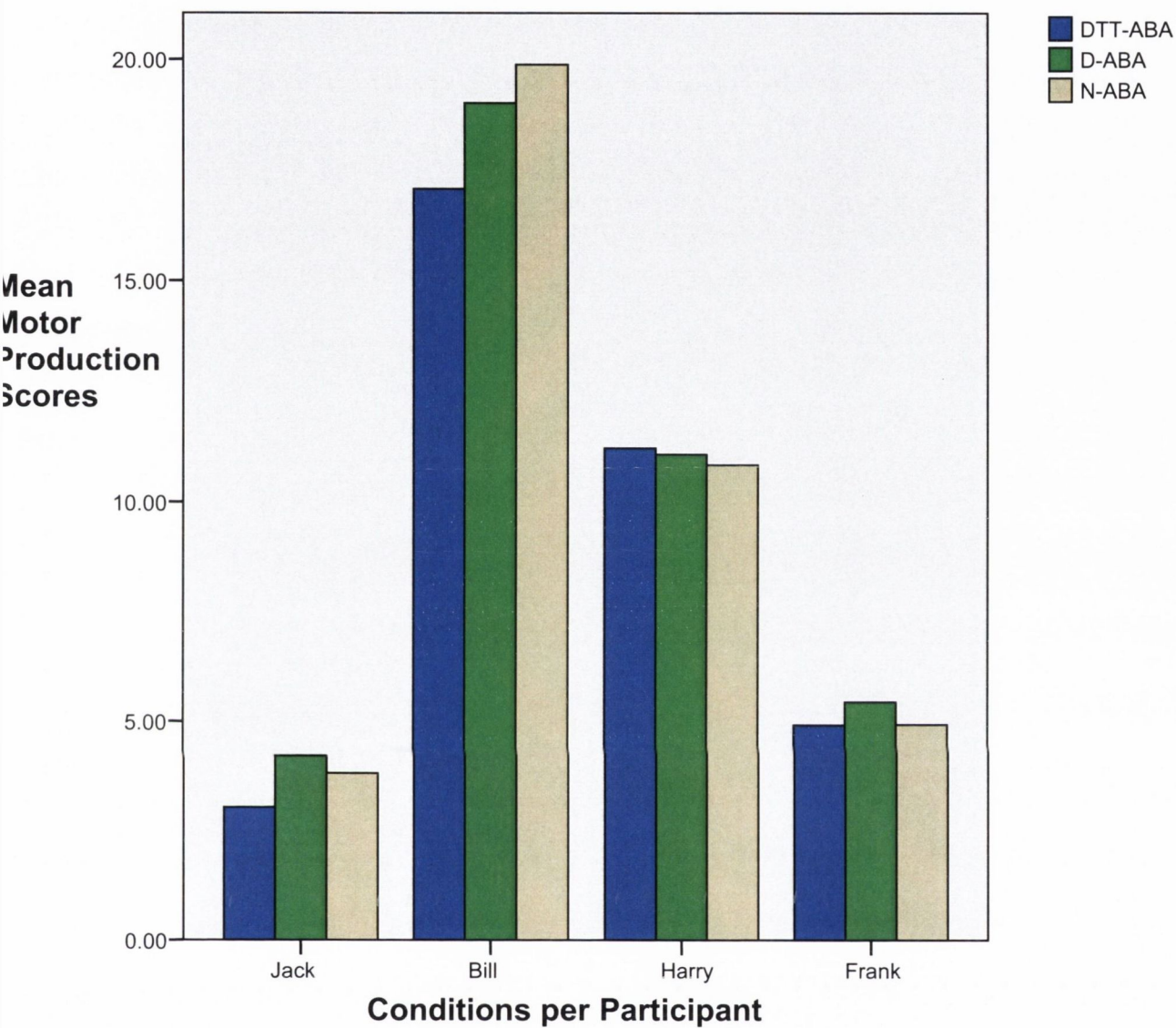
Jack would perform significantly better in the N-ABA and D-ABA treatments than in the DTT-ABA treatment. Comparable outcomes were hypothesised for Bill, Harry and Frank, who participated in the altered DTT-ABA treatment. However, should a significant difference occur it was hypothesised to be in favour of the N-ABA and D-ABA treatments.

Statistical analysis revealed a significant difference in performance across conditions for Jack, Frank, and Bill (significance was set at  $p < .05$ ) (see Appendix II). Three Mann-Whitney U tests were conducted for each participant to identify the conditions in which the participant performed significantly better. Significance was calculated by dividing the .05 significance level by the number of pair-wise comparisons for each participant, i.e. three, and was set at  $p < .016$ .

Jack's performance supported the hypothesis. Jack performed significantly better in both the N-ABA condition ( $U = 32947.500$ ,  $p < .001$ ) and D-ABA condition ( $U = 17625.000$ ,  $p < .001$ ) than in the DTT-ABA condition. There was no significant difference in performance between the D-ABA and N-ABA conditions ( $U = 16985.500$ ,  $p = .044$ ). Jack's performance therefore replicated the findings of Koegel et al. in that performance was significantly better in the N-ABA treatment than in the DTT-ABA treatment.

Frank, Harry and Bill's performance all supported the hypotheses. Frank produced better quality speech sounds in both the D-ABA and N-ABA than in the DTT-ABA but this difference was not significant. Harry produced better quality motor productions in the DTT-ABA treatment condition than in the N-ABA and D-ABA treatment conditions but this difference was not significant. Bill produced better quality speech sounds in the D-ABA and N-ABA conditions than in the DTT-ABA condition but this difference was not significant..





**Figure 1: Mean Motor Production Scores for Participants across Treatment Conditions:** Scores represent mean values of quality of motor productions based on a DFA of all speech sounds produced by participants

## **(B) Comparison across Conditions**

As a measure of internal validity, the repeat treatment was split into initial and reversal conditions. If the conditions are conducted correctly we should see no significant difference between initial and reversal conditions of the repeat treatment. Jack and Harry participated in conditions in the following order: DTT-ABA (I), N-ABA, D-ABA, and DTT-ABA (R). Frank participated in conditions in the following order: N-ABA (I), DTT-ABA, D-ABA, and N-ABA (R); and Bill participated in conditions in the following order: N-ABA (I), DTT-ABA, D-ABA, and N-ABA (R). Two of the reversal treatments were therefore DTT-ABA, and two were N-ABA.

### Hypothesis

There will be no significant difference in quality of motor production between the initial and reversal conditions of the repeat treatment.

Jack and Bill's performance supported the hypothesis. For Jack, there was no significant difference between performance in the DTT-ABA (I) and DTT-ABA (R) conditions and for Bill, there was no significant difference in performance between N-ABA (I) and N-ABA (R) conditions. Frank and Harry's performance did not support the hypothesis. Frank performed significantly better in the N-ABA (I) condition than in the reversal N-ABA (R) condition ( $U = 12,100.000$ ,  $p = .001$ ). Harry performed significantly better in the DTT-ABA (I) condition than in the DTT-ABA (R) condition ( $U = 5777.000$ ,  $p = .007$ ).



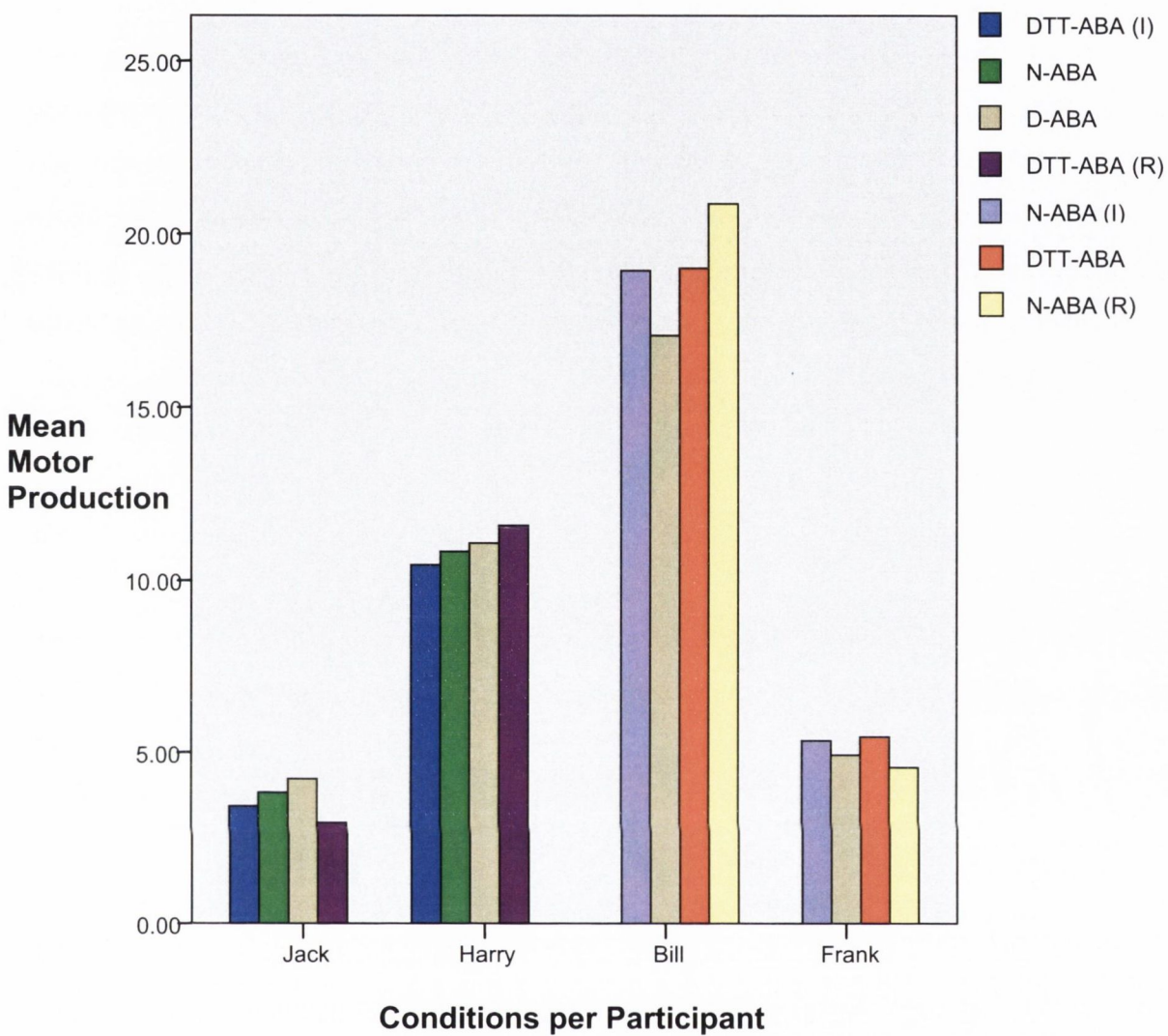


Figure 2. Mean Motor Production across Treatment Conditions for Jack, Harry, Bill, and Frank

### 6.3.3 Discussion

Phase one of the experimental study was conducted to replicate Koegel's findings that a strict Discrete Trial Training-ABA (DTT-ABA) approach to increasing motor production is less effective than a normalised-ABA (N-ABA) approach. A third treatment was designed and implemented, the developmental-ABA (D-ABA). This treatment was also a normalised-ABA treatment but one that was more informed by developmental research on autism, and it was hypothesised that both the D-ABA treatment and N-ABA treatment would lead to more motor production attempts than the DTT-ABA treatment.

The performance of one participant, Jack, supported both hypotheses. Jack performed significantly better in both the D-ABA and N-ABA treatments than in the DTT-ABA treatment and there was no significant difference in performance between the D-ABA and N-ABA treatments. The other three participants, who participated in an altered DTT-ABA treatment, did not perform significantly better in the D-ABA and N-ABA treatments than in the DTT-ABA treatment. However, both Frank and Bill did score higher in both of these treatments than in the DTT-ABA treatment even though this difference was not significant. Therefore, all of the participants performed as expected.

Jack was the only participant to take part in a close replication of the DTT-ABA treatment condition in Koegel et al.'s study. It was found to be unethical to continue to carry out the successive approximation training or 'shaping' procedures that were found in our study to be overly punishing and aversive to children with little language ability. This procedure involved ignoring speech attempts and social interaction by the child that did not meet a strict criterion for reinforcement. The negative behaviours only occurred in the DTT-ABA (R) treatment condition, when Jack was placed back in a condition that was negative and demanding, especially after experiencing two positive and highly motivating treatments. The experimenter implemented an augmented successive approximation procedure for the three subsequent participants as described in the *Procedure* section of the study. The altered successive approximation procedure which was subsequently used was informed by contemporary DTT-ABA programmes which emphasise motivation and enjoyment for the child, and recommend stopping an intervention programme that appears to be de-motivating for the child (Leaf & McEachin, 1999). Successive approximations, or 'shaping' procedures, are frequently



used in DTT-ABA to increase speech production and improve articulation. The use of successive approximations in this study was guided by Leaf and McEachin's text (1999) on developing and implementing DTT programmes, *A Work in Progress*. However, details of shaping procedures for motor production were quite vague: "slowly require better approximations" (p. 208); and "Eventually do not accept poorly articulated responses, but make it as playful as possible" (p. 208). Thus, contemporary DTT-ABA interventionists use shaping procedures only when the child is highly motivated to speak and can maintain his or her confidence (p. 207). However, constructs such as motivation and confidence are difficult to explain within a behavioural conceptual framework and may be another form of theoretical eclecticism.

#### **6.3.3.1 Theoretical Eclecticism in Empirical Research**

In both experiments we sought to clearly highlight the theory guiding the development and implementation of the technologies used in each treatment condition. In the treatment conditions of experiment one, a theory of operant conditioning guided the development of all the technologies used. The theory of operant conditioning underlying these conditions placed a significant emphasis on the behaviour of the experimenter as well as the child. The experimenter had to be highly consistent and deliver both the antecedent and response to a behaviour in a prompt and specific manner. As a result, much positive social-communicative behaviour, which was not pre-identified as target responses for reinforcement, was ignored in both the strict DTT-ABA and N-ABA treatment conditions. Further, in the DTT-ABA treatment condition, instruction could at times be very punishing and therefore extremely difficult to conduct if the interventionist does not place a theoretical value on the use of operant principles in teaching language acquisition.

Thus, language intervention which includes technologies derived from a behavioural conceptual framework may be difficult to carry out if one does not conceptualise language acquisition as shaped by the three-term contingency and the principles of operant conditioning. Instruction in the first experimental phase was also highly adult-directed even though the participants initially chose their preferred items, and the trials conducted in this phase were repetitive, restrictive, and required prolonged access to only four stimuli. Even though two of the treatment conditions (N-ABA and D-

ABA) were informed by developmental research (i.e., these treatments targeted behaviours identified in developmental research as prerequisites for language learning), learning in each condition was conceptualised as occurring in terms of the three-term contingency and all treatments were very much based on behavioural theory. Further, while some degree of repetition of instruction is integral to development interventions, repetition is conceptualised as necessary for enhancing expressive phonology. That is to say, that expressive phonology cannot be divorced from motor skill and thus practice is necessary for changing the underlying phonological representation. The theory underlying the use of drills in developmental language intervention therefore explicitly states the mechanisms by which repetition is thought to enhance motor speech production, or expressive language. The use of drills are not conceptualised in this way in an operant conditioning theory of language acquisition, but rather are thought to provide the child with multiple opportunities for earning positive feedback for performing a target behaviour. Similarly, although Koegel sought to integrate research on motivation as a key variable in increasing motor production attempts, motivation is conceptualised as a behaviour and as such is thought to be subject to the laws of operant conditioning. In contrast, motivation is conceptualised in a developmental approach as an internal process which is affect-driven. To integrate findings from developmental research in both of these treatment conditions therefore reflects a practice of theoretical eclecticism, and both the N-ABA and D-ABA treatment conditions are thus good examples of theoretical eclecticism in practice: the development of intervention technologies based on findings from developmental research on the critical role of joint attention behaviours in language acquisition in conjunction with an operant conditioning theory of learning. This practice is theoretically eclectic because in a developmental conceptual framework joint attention behaviours are thought to act on language acquisition processes in a very different way to that posited by a theory of operant conditioning.

Theoretical eclecticism in the N-ABA and D-ABA treatment conditions has significant implications for the evaluation of treatment technologies. The main implication of this practice of theoretical eclecticism for our study is that it places limitations on our ability to identify mediating variables in the treatment conditions. That is to say, that had we found a significant difference in the performance of all participants



across all treatment conditions, we would have been limited in drawing conclusions as to the mediating variables in the intervention. Developing and implementing treatment technologies from two incongruent theories of autism and language acquisition, namely an operant conditioning theory of language learning and a developmental approach to language acquisition, means that several competing mechanisms are posited as accounting for the outcomes in an intervention. In this study, we found that the D-ABA treatment condition exemplifies the practice of theoretical eclecticism in autism intervention research. That is to say, that it is difficult to identify whether the mediating variables in this study was the consistent and extensive use of operant behaviour principles or whether increased opportunities for shared affect and attention affected performance across treatment conditions. For example, where we did find a significant result for all treatment outcomes (i.e., for Jack), a developmental theorist might theorise improved performance in the developmental and N-ABA conditions as due to exposure to language in a motivating environment, and similarly that there were many shared instances of joint attention in the many interactions between interventionist and child which may also have affected the outcomes. On the other hand, a behavioural researcher would theorise that differences were due to the behaviours targeted using operant conditioning methods. A different method of investigating theory driven technologies was therefore required that would allow for comparison across theories and conceptual framework and not just comparison as to which treatment technology was most effective.

Further, from a developmental perspective, the DTT-ABA condition is particularly unnatural, and increasing speech sounds and accurate articulation is meaningless unless the child understands what speech sounds refer to and will use them spontaneously. DTT-ABA may therefore have greater success at shaping full words piece-by-piece but this process of language learning may be highly un-motivating for children with autism who are more active and who are more motivated to acquire the pragmatic aspects of language in a natural setting. This structured setting is also unlike how language is typically acquired. The table-top format and restricted choice of reinforcers provided little opportunity for the development of new developmentally appropriate behaviours.

### 6.3.3.2 Individual Differences in Empirical Research

As noted in the *Procedure* section, Jack was the first to participate in the study and at the time of the study was considered by the experimenter, and the senior tutors in the ABA school in which testing was carried out, to be the most under ‘instructional control’, i.e. he responded well and rapidly to direct instruction, and was a very fluent participant in discrete-trial training. It may be, therefore, that Jack was more sensitive to the subtle changes in target behaviours across treatments. Indeed, Jack performed as predicted by our hypotheses even when we analysed data from the initial and reversal conditions of the repeat treatment separately. That is to say, Jack performed at a similarly poorer level in both repeat conditions, producing significantly lower quality motor productions in the initial DTT-ABA condition and in the reversal DTT-ABA condition than in the D-ABA condition. Jack also scored better in the N-ABA condition than in either of the repeat DTT-ABA conditions but this difference was not significant.

Individual differences may also have played a significant role in the mixed performance of the other three participants. For example, when we split the repeat treatment into initial and reversal conditions and analyse differences in mean motor production for Harry, we see a trend for increase in performance across conditions over time. Of the four participants, Harry had spent the longest amount of time in ABA schooling and was quite compliant and was not de-motivated by decreased reinforcement in the DTT-ABA condition. Rather, Harry responded well to shaping procedures by providing improved quality of motor productions when demanded. In turn, Harry’s ability to meet demanding criteria may have meant that Harry received less negative responses from the experimenter and therefore met with fewer frustrating consequences than other participants. It would therefore not be surprising if he responded well to intervention approaches that are both structured and playful.

Frank was also very docile and enjoyed physical contact and playful interaction and performance may have been highly varied because he was easily bored with tasks and unaffected by negative consequences in the DTT-ABA condition. He performed better in the D-ABA and N-ABA treatments than in the DTT-ABA treatment, although this difference was not significant. Comparative analysis wherein the repeat N-ABA treatment was split into initial and reversal conditions, revealed that performance in the



N-ABA (R) condition was the lowest of the four conditions. We would predict that Frank would perform very well in the developmental condition because of his highly sociable nature and preference for play situations.

Bill was a highly active child and found it very difficult to stay seated during instruction. He also got bored with his reinforcers easily and was not under instructional control. This would suggest that Bill would engage more readily in non-structured free play settings where demands were less high but interaction with experimenter was encouraged.

Rogers (2008) has suggested that individual differences such as those described above are critical in deciding between best treatment models for teaching language. However, the empirical research reported in this thesis aims to illustrate the merit of adequate theorising in anticipating and accounting for individual differences in developing effective interventions for children with autism. Based on the conceptual analysis in section one, it is therefore hypothesised that appropriate intervention models which have an adequate unified conceptual framework can account for individual differences in performance, and may enable the development of technologies which will be able to address the mechanisms underlying learning in all children with autism. This hypothesis guides the next empirical study, reported in section 6.4.

## **6. 4 Experiment Two: Comparing Two Unified Conceptual Approaches to Autism Language Intervention**

### **6.4.1 Method**

#### **Participants**

The participants in phase two were the same as in phase one (see *Participants* section, phase one, for details).

#### **Materials and Setting**

In the first behavioural school, testing for phase two was conducted in a play room specifically designed to provide sensory stimulation for the students. It contained several play items, including, two bean bags, a lava lamp, and oversized animals. A low desk was placed in one corner of the room. Participants had access to any object in the room. A camcorder and tripod were set up in the opposite corner of the room so that the whole area could be monitored on camera.

In the second behavioural school, testing took place in the same classroom as in phase one. However, the desk and chairs were moved to one side and the main area of the room was filled with a wide variety of toys. A play mat was placed on the floor near the toys and the participants had access to any object in the room. A camcorder and tripod were set up in one corner of the room so that the whole room could be monitored on camera.

No data was recorded by the experimenter during testing. Motor production was analysed through video analysis at a later stage.

#### **Procedure**

##### *Design*

In phase two we used a repeated-measures reversal (ABA) design. Participants were placed in three conditions: a **normalised behavioural condition**, a **developmental condition**, and a reverse condition (a repeat of the first condition in which they had been



placed). In all conditions the child had access to a variety of items, including preferred toys and novelty items. Each condition consisted of two 15 minute sessions and testing was conducted over three days for each participant. Participants were given a minimum break of ten minutes between sessions during which they were taken to a play area away from the testing room. Testing was carried out by a single experimenter and was video-recorded.

The **independent variable** across conditions was the response of the experimenter to the communicative behaviours of the participant. In the normalised behavioural condition, the experimenter presented a clear verbal model of items to the participant and reinforced a motor production by giving him praise and the item. In the developmental condition, the experimenter presented a verbal model, often with an accompanying remark or expression, and reinforced both motor productions and socio-communicative behaviours by giving the child the item and further engaging him in social interaction. In this condition, laughing and playing were also rewarded by the experimenter through attention and praise. Further, spontaneous communication through motor production attempts or socio-communicative behaviours were rewarded and engaged with by the experimenter.

The **dependent variable** was the quality of motor production by participants during conditions. Speech sounds produced by each participant were given a value based on a distinctive features analysis of the speech sounds, as described in phase one.

**Table 7: Independent Variable in conditions, Phase two**

| Normalised ABA               | Developmental Intervention                                   |
|------------------------------|--------------------------------------------------------------|
| Antecedent: Vocal model      | Antecedent: Vocal model                                      |
| Behaviour: Motor productions | Behaviour: Motor productions & IJA, RJA, IBR, RBR, ISI, RSI* |

\* IJA = Initiating Joint Attention; RJA = Responding to Joint Attention; IBR = Initiating Behavioural Requests; RBR = Responding to Behavioural Requests; ISI = Initiating Social Interaction; RSI = Responding to Social Interaction (P Mundy et al., 2003)

|                                         |                                                                                  |
|-----------------------------------------|----------------------------------------------------------------------------------|
| Consequent: Reinforce motor productions | Consequent: Reinforce all socio-communicative behaviours incl. motor productions |
|-----------------------------------------|----------------------------------------------------------------------------------|

*Conditions*

(A) Normalised ABA (N-ABA)

In the N-ABA condition the experimenter followed the participant’s lead to determine items of interest to him (**child-directed approach**) and delivered a vocal verbal model of the item to him. If he attempted a motor production the participant received the item and praise. If he did not respond the verbal model was redelivered until the participant made an attempted motor production. If he was not interested in any of the items the experimenter would select items and deliver verbal models following the same procedure as before. If the child was overly stimulated by the environment and was not under instructional control, testing was conducted at the desk with a variety of items and access to play at the desk (**adult-directed approach**).

(B) Developmental

In the developmental condition the experimenter also followed the participant’s lead to determine items of interest to the child and delivered a verbal model of the item that he was playing with (**child-directed approach**). If he attempted to imitate the model the participant received the item and praise, and the experimenter would model another more complex use of the toy. The experimenter also interjected play with several comments and exclamations and sought participant responses that were social and communicative, such as laughing in response to tickles or funny faces, but that were not necessarily verbal. If the participant was not engaged with the experimenter or if he was not motivated to play with any of the items, the experimenter would attempt to engage his attention in a particular item. However, if he did not respond the experimenter followed the participant’s lead and delivered verbal models of the activity that he was engaged in (e.g. if Harry was lying on the mat the experimenter sat down beside him, made eye contact and said, “what is Harry doing?” - “lying down”, and waited for Harry to attempt a motor production or engage with the experimenter). If the participant did respond verbally or through socio-communicative behaviours the experimenter gave him the item and interacted with him in socially- and context-appropriate manner. This did not always



involve praise. The experimenter always engaged with any attempt to interact both verbally and behaviourally by the participant.

### Reliability

To ensure reliability of testing across conditions and participants and to ensure fidelity of the treatment measure, one observer, blind to the study, and the experimenter rated the number of discrete-trials (three-term contingencies) that were instigated by the experimenter in short video-clips of both treatments and the accuracy of experimenter performance in establishing and delivering the antecedent-behaviour-consequent (A-B-C) contingency. This was done to ensure that the experimenter was consistent in using the three-term contingency to increase motor production in the normalised behavioural condition and that the experimenter was not systematically implementing the contingency in social interactions in the developmental condition. We therefore expected ratings of the occurrence and or the accuracy of the delivery of the three-term contingency to be higher in the normalised condition than in the developmental condition. The video clips were randomly chosen and the target behaviour was any speech production by the child.

**Table 8. Number of discrete-trials that were identified in both conditions and number of discrete trials identified as delivered incorrectly: Developmental treatment**

|                                     | Observer 1 | Observer 2 |
|-------------------------------------|------------|------------|
| Number of discrete-trials           | 20         | 21         |
| Number of Incorrect Discrete Trials | 6          | 5          |

**Table 9. Number of discrete-trials that were identified in both conditions and number of discrete trials identified as delivered incorrectly: N-ABA treatment**

|                                     | Observer 1 | Observer 2 |
|-------------------------------------|------------|------------|
| Number of discrete-trials           | 36         | 36         |
| Number of Incorrect Discrete Trials | 8          | 8          |

### *Hypothesis*

It was hypothesised that there would be no significant difference between performance outcomes in the normalised ABA (N-ABA) condition and developmental (D) condition. It was further hypothesised that any difference in performance would be greater in the D condition than in the N-ABA condition.

### **6.4.2 Results**

As in phase one, two sets of comparative analysis were conducted on the quality of motor productions across treatment conditions. In the first analysis (comparison across treatments), data from the initial and reversal conditions of the repeat treatment were grouped together and comparative analysis was conducted on two treatment conditions (N-ABA, and developmental). In the second analysis (comparison across conditions), motor production data from the repeat treatment condition was analysed as two separate conditions (initial and reversal) and comparative analysis was therefore conducted on three treatment conditions.

#### **Comparison across Treatments**

##### Hypothesis:

There will be no significant difference between performance outcomes in the N-ABA condition and developmental treatment, and any significant difference will be found in a greater performance in the developmental treatment than in the N-ABA treatment.

Statistical analysis of participant performance supported the hypothesis. There was no significant difference in mean quality motor production between performance in the N-ABA and developmental treatments for Jack and Harry (see Appendix II). Bill performed significantly better in the developmental treatment than in the N-ABA treatment ( $U = 28172.500$ ,  $p = .015$ ) and Frank performed significantly better in the developmental treatment than in the N-ABA treatment ( $U = 10018.000$ ,  $p = .046$ ).



### Comparison across Conditions

#### Hypothesis:

There will be no significant difference between performance outcome in the initial and reversal conditions of the repeat treatment.

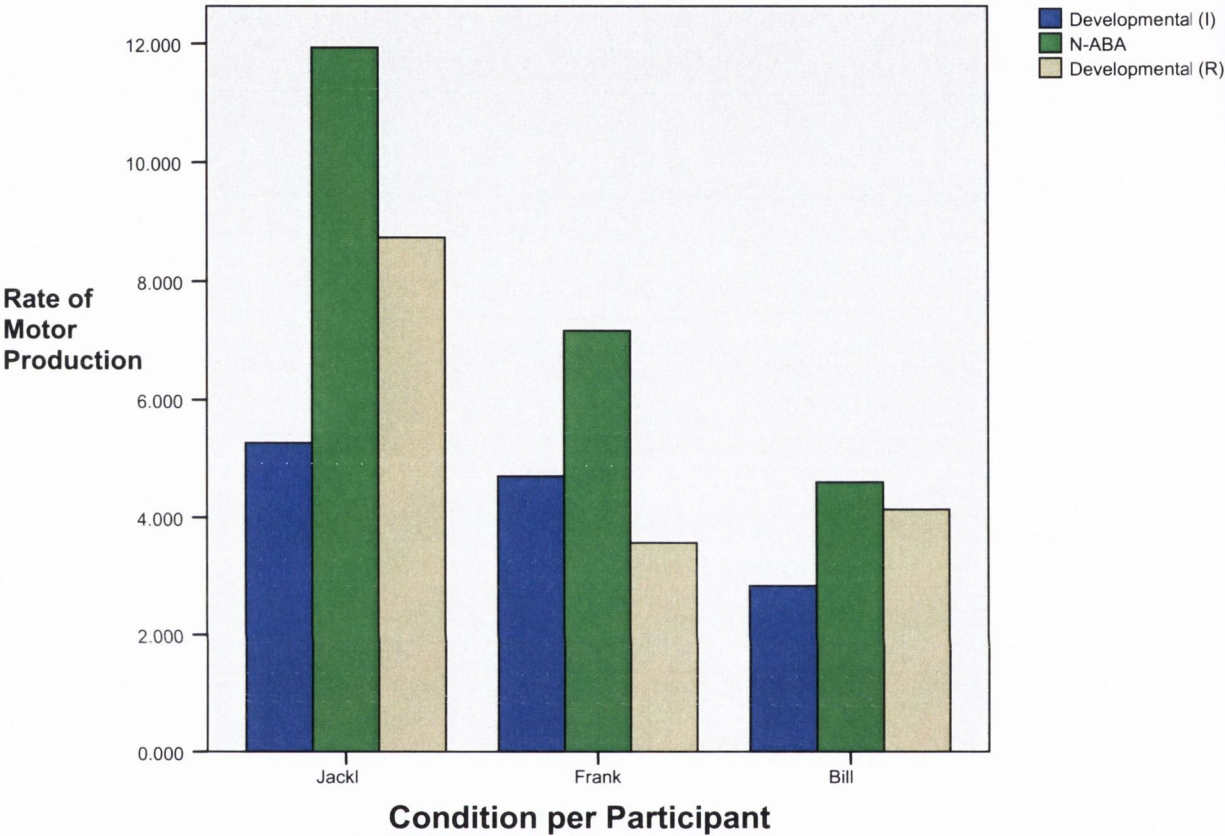
Statistical analysis revealed a significant difference in performance across the three treatment conditions for Jack, Frank, and Harry (see Appendix II). Pair-wise comparison tests were conducted on the data for Jack, Frank, and Harry to identify where the difference occurred and in which direction. Significance was set at  $p < .016$  (i.e.  $p < .05$  divided by the number of pair-wise comparisons, three).

Jack and Harry's performance did not support the hypothesis: Jack performed significantly better in the developmental (R) condition than in the developmental (I) condition ( $U = 5493.000$ ,  $p = .024$ ); Harry performed significantly better in the N-ABA (I) than in the N-ABA (R) condition ( $U = 10399.000$ ,  $p = .001$ ). Frank's performance supported the hypothesis: there was no significant difference in mean motor production between initial and reversal developmental conditions ( $U = 8622.500$ ,  $p = .011$ ). Bill's performance supported the hypothesis. There was no significant difference in performance between the three treatment conditions (see Appendix II).

#### 6.4.3 Rate

We were also interested in whether there was a difference in rate of motor production across conditions in phase two. That is, did children produce a greater number of motor production attempts in one condition above another, and if so, what was the relationship of rate of motor production to the quality of motor production in each condition? Harry was the only participant to take part in a reversed order of conditions and we have, therefore, graphically depicted the rate and quality of motor production for Harry separately.

Graph 2 illustrates the rate of motor production in each condition for participants for Jack, Frank, and Bill. There is a clear trend for a higher *rate* of motor production in the N-ABA condition than in the developmental (I) or developmental (R) condition.

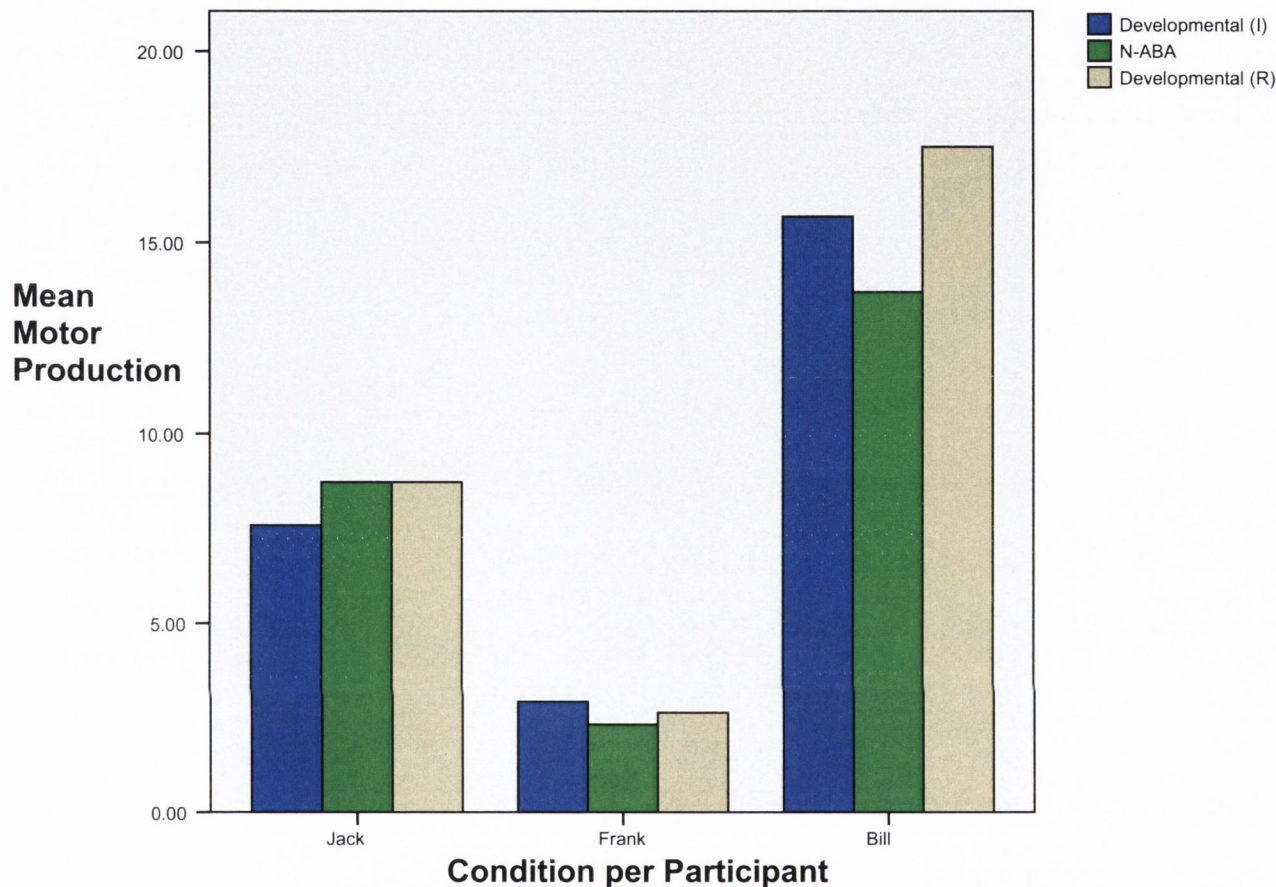


**Figure 3. Rate of Motor Production in each condition for each participant**

In contrast we see a trend for greater *quality* of motor production in the developmental (I) and developmental (R) conditions than in the N-ABA condition for Frank and Bill. Jack also produces a higher rate of motor production in the N-ABA condition than in developmental (I) and developmental (R) conditions (graph 3). However, Jack produces the same quality of motor production in both the N-ABA and developmental (R) conditions even though rate of production is much higher in the N-ABA than in the developmental (R) condition. This would suggest that *quality* of speech sounds can be as high in a condition that produces higher *rates* of motor production (N-ABA) as well as in conditions that produce lower rates (developmental) even though the data from Frank and



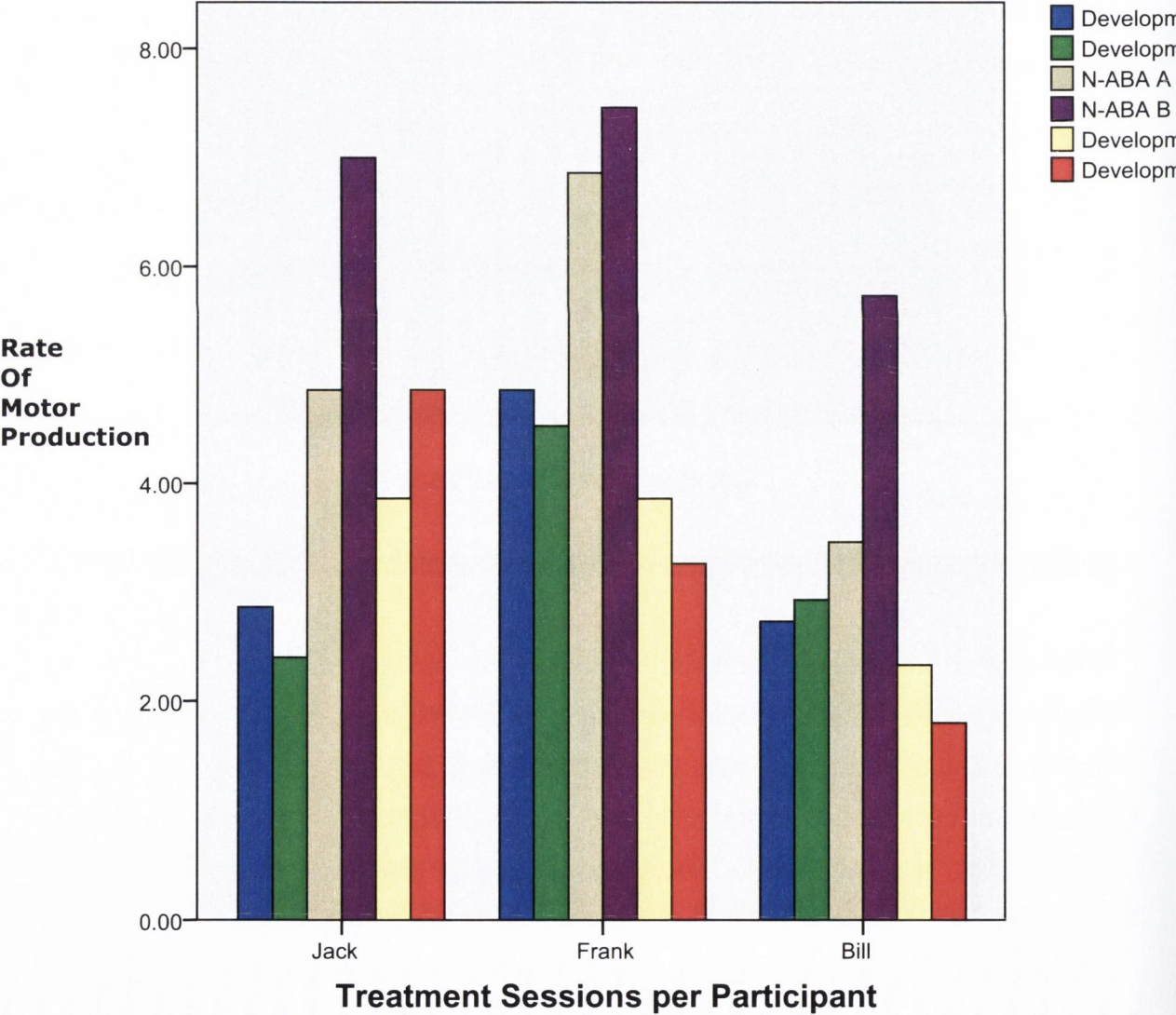
Bill indicate that it is more likely that the N-ABA condition would lead to higher rates but poorer quality of motor production.



**Graph 3. Quality of Motor Production in each condition for each participant**

If the rate of production is analysed in terms of the individual sessions that make up conditions we see that rate of motor production peaked at a significantly higher rate in the second session of the N-ABA condition for Jack, Frank, and Bill (see graph 4). Although significance tests cannot be run on these outcomes, rate of production in the second session of the N-ABA condition was at least double the rate of production in the initial developmental sessions for Jack, and double the rate of production in the reversal developmental sessions for Frank and Bill. This would indicate that participants are producing higher rates of motor production attempts in the N-ABA condition than in either the Developmental conditions. However, rate of production in the second session

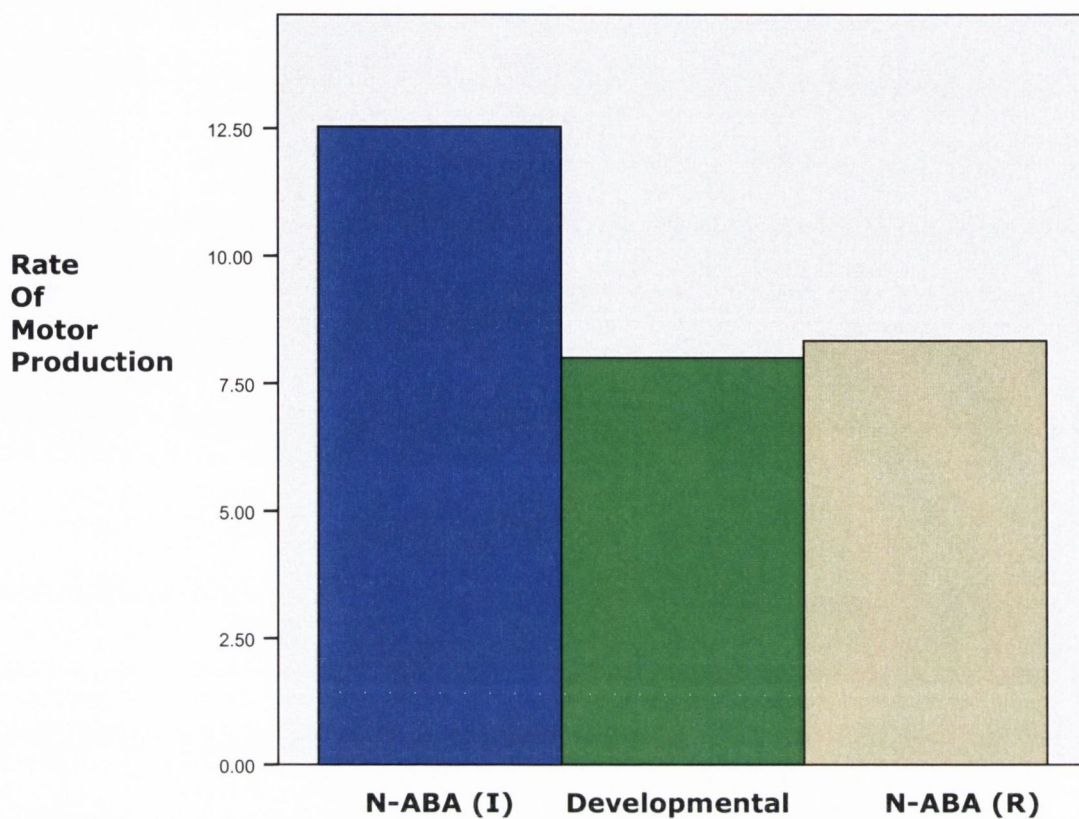
of the N-ABA condition was also much higher than the rate of production in the first N-ABA session for participants, Jack and Bill. This may indicate an increase in rate of production due to increased interest in, and proficiency with, the task and a decrease in rate of production due to boredom with the task over time. However, Harry participated in an initial and reversal N-ABA repeat condition (i.e., N-ABA (I) and N-ABA (R) conditions) and as we shall see he produced a higher rate of motor production in the N-ABA (I) condition (graph 5) which would suggest that an increase in rate in the N-ABA treatment is not related to increased interest over time.





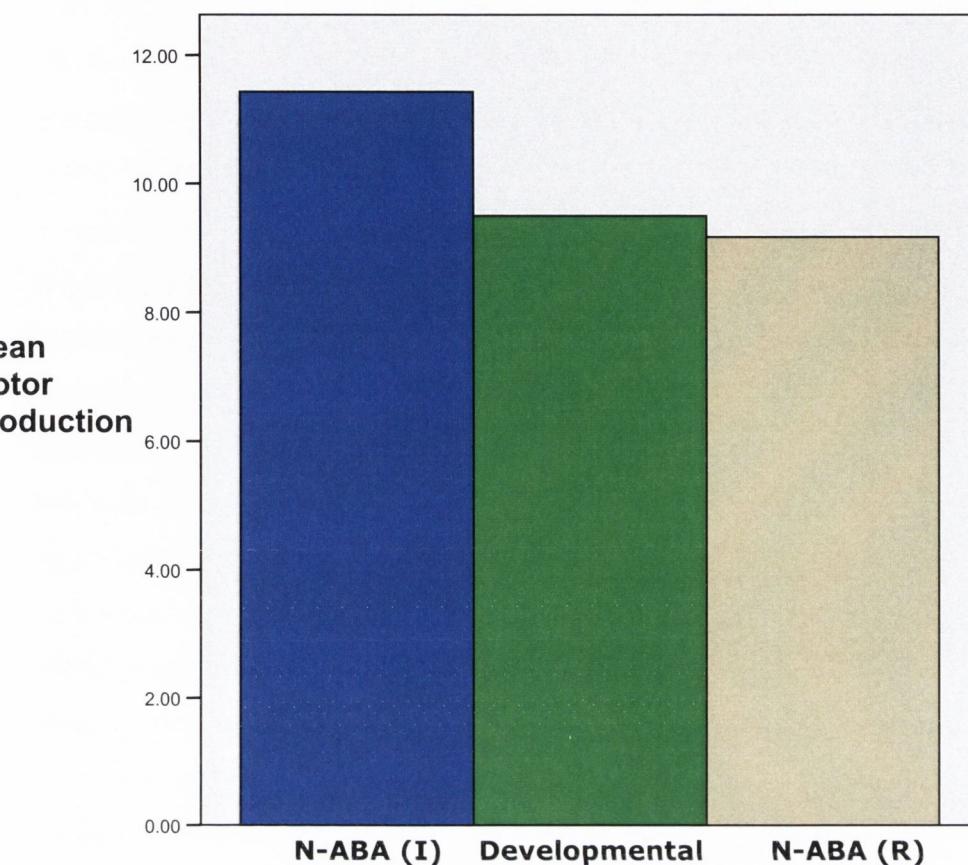
**Figure 4. Rate of Motor Production in each treatment session for participants Jack, Frank and Bill.**

Unlike the three participants who participated in a repeat developmental condition (developmental (I) and developmental (R)), Harry participated in a repeat N-ABA treatment (N-ABA (I) and N-ABA (R) conditions). Both the quality *and* rate of Harry's motor production was significantly greater in the initial N-ABA condition than in the developmental condition and the reversal N-ABA condition (see graph 6), and this was unlike the performance of the other participants where quality and rate of performance were inversely related in the N-ABA condition. However, like the other participants Harry's rate of motor production peaked in the N-ABA (I) condition (see graph 5) and rate was higher in both the N-ABA (I) and N-ABA(R) conditions than in the developmental condition. This could therefore be considered an example of an inverse of the trend found in the rate of the three other participants and would support the hypothesis that there is a dissociation between rate and quality of motor production in the N-ABA treatment, even though the increase in rate of motor production in the N-ABA (R) condition was very slight.



**Figure 5: Rate of Motor Production in each condition for Harry**





**Figure 6. Mean Motor Production Scores in each Condition for Harry. Scores represent mean quality values of motor productions based on a DFA of Harry’s speech sounds**

**6.4.4 Discussion**

**6.4.4.1 A Prominent Role for Theory in Comparative Research**

In this empirical study, two theory-derived and conceptually-unified treatments were developed and compared with regard to increasing motor speech production. These two distinct treatment conditions were derived from behavioural and developmental models of language intervention respectively: the N-ABA treatment was based on operant conditioning theory, as outlined in chapter two, and the developmental condition, was based on the principles of developmental psychopathology and social-pragmatic models of language acquisition, as outlined in chapter three. Comparable outcomes were found as

expected: There was no significant difference in quality of motor productions for Jack and Harry in the N-ABA or developmental treatments, and Bill and Frank produced significantly better quality motor productions in the developmental condition than in the N-ABA condition. Conversely, all participants produced a greater number of motor speech sounds in the N-ABA treatment than in the D-ABA treatment.

In the N-ABA treatment, the theory of operant conditioning prescribed that the experimenter delivered a clear antecedent prior to a behaviour and an immediate consequence following a behaviour. Normalised behavioural models of ABA intervention also theorise that natural reinforcers are the most motivating and effective in teaching children to learn language (Delprato, 2001), and that instruction should also be child-led in order to increase motivation to respond. The experimenter in this treatment had to be able to identify 3-term contingency in order to demonstrate that learning had occurred as a result of the direct application of the principles of operant behaviour. Some compliance was also theorised to be necessary in order to get the child's attention and ensure they are attending. The emphasis was primarily on speech sounds, rather than affective social interaction unless social interaction leads to increased motivation. In this model of intervention, language is conceptualised as acquired through direct instruction and therefore the child must be fully attending to the experimenter if he or she is to learn effectively in discrete-trials. Further, the experimenter should refrain from any comments or questions that are difficult to follow but, rather, all language should be broken down into easily understood units which the child can imitate.

In the developmental treatment, the technologies used to encourage speech production were not as pre-specified as those in the N-ABA treatment. That is to say, that implementation of a developmental treatment involved a good understanding of the principles of developmental psychopathology in order to respond effectively to the child's individual preferences and style of learning in each treatment condition. Based on developmental theories of language acquisition, it was posited that the many mediating processes (i.e., cognitive, motor, and perceptual) that affect language acquisition would be most supported in a positive, motivating, and highly affective environment. In particular, the pre-linguistic capacity for joint attention, and oral and manual motor skills were thought to be vulnerable to impairment in most children with autism, and to



negatively affect language development. Therefore, an emphasis was placed primarily on sharing affect, intention, and attention in order to enhance the child's capacity for intersubjective understanding. Motor skills and imitation were encouraged, including the production of speech sounds in a contextually appropriate way. Further, all speech production attempts and nonverbal behaviours were treated as intentional and incorporated into interactions with the experimenter. Treatment did not always involve directly eliciting speech sounds by the child but, rather, social-communicative responses were sought. As discussed in relation to Bill, a child did not have to earn items by producing target behaviours but rather interactions, such as chasing games, were set up to encourage shared attention and intention between child and experimenter, and these moments of nonverbal communication were considered as valuable for language development as observable speech sounds. Therefore, the experimenter did not focus on providing an identifiable antecedent or contingent reward because language was not theorised to be determined by operant conditioning mechanisms. Compliance was also considered to be less integral to a child's acquisition of language, and behaviours were conceptualised in terms of child's maturational age, and stage of development.

In phase two of the experiment, therefore, the theoretical framework guiding the development and implementation of treatment technologies was either developmental or behavioural, and there was a significant contrast in rationale for the development and implementation of technologies in each treatment. The clear exposition of theory underlying the development of the technologies, and their implementation, is most significant with regard to the finding of comparable outcomes. If two divergent approaches to autism and child language acquisition give equivalent outcomes during a dynamic assessment of motor speech production, then it is no longer a question of whether a behavioural or a developmental treatment may lead to differences in motor responsiveness (they will) but rather which one, if any, is best poised to lead to greater improvement in future treatment and which intervention's positive outcomes will generalise to other children with autism. Therefore, in the case of comparable outcomes, the theoretical framework of an intervention is particularly pertinent as the most research-informed and comprehensive framework will most likely be preferred by clinicians and interventionists. More comparative studies are needed which contrast theoretically

distinct approaches to autism and language acquisition. By comparing theoretically distinct approaches, common factors which effect treatment outcome become apparent and new hypotheses about the ways in which these factors mediate outcomes are generated. Such empirical research is particularly important for autism intervention given the variability in progress across children and interventions.

However, this study underlines the difficulty of ensuring a clean contrast between treatment conditions. In particular, several variables negatively affected comparisons made between treatments. The most significant factors were the therapeutic environment and individual differences (discussed in section 6.4.4.2). With regard to the therapeutic environment, testing took place in between longer behavioural intervention programmes in the child's typical schooling environment. Participants were therefore subject to many discrete trials between treatment conditions during normal school hours and it was particularly difficult to maintain a developmental treatment environment in this setting. By using the same experimenter for both treatments it was hoped to ensure that both treatments were carried out by someone who was equally informed about the theoretical framework of both approaches. However, this also made it difficult to avoid cross-over between both conditions. For example, as shown by the reliability data, there were several instances of the 3-term contingency in the developmental condition and it is likely that the experimenter's knowledge of child language acquisition research impacted on the delivery of the 3-term contingency in the N-ABA condition. For future comparative studies we would therefore recommend two experimenters, one for each treatment condition, both of whom are fully informed about the theoretical framework of their particular intervention approach to language intervention.

#### **6.4.4.2 Individual Differences in Empirical Research**

Of the four participants, Bill and Frank had the most difficulty in phase one in attending to work and remaining seated during testing. These children would be described as the most energetic, playful and socially interactive of the four participants, and thus individual differences may have played a role in their better performance in the developmental treatment. In this treatment, emphasis was on establishing a positive, highly affective and interactive relationship with the child. Language 'trials' were not



conceptualised as pivotal in language learning, but rather language acquisition was theorised to occur in a social- and language-rich environment wherein the child's perceptual, cognitive, and motor capacities would be best supported to acquire language. Thus while both the N-ABA treatment and developmental treatment involved a natural setting and access to any motivating item, the N-ABA condition included a much more systematic presentation of verbal models and an immediate response to the child's motor production attempts in terms of direct reinforcement or correction.

Some compliance procedures were also used in the N-ABA condition, particularly for Bill, who would be conceptualised in a behavioural model as not under the instructional control of the experimenter. Bill was highly active but often wanted to play on his own and was frequently unwilling to interact with the interventionist. To overcome this problem in both treatments, Bill was interrupted in his play, the item he was playing with was withheld in a playful manner, and he was presented with a verbal model of the item. The item was then given to Bill upon production of the speech sound. However, the interventionist in the developmental condition initiated games such as 'chase' or war games, neither of which involved the presentation of speech sounds but rather the use of speech by Bill in a natural context. Bill was praised, and encouraged to speak and use language to communicate in a conversational, playful manner. This was done as a natural response to Bill's preference for playing alone with items and for playing physical games with the interventionist. Bill clearly had little interest in interacting with the interventionist when demands were placed on him in an artificial, teacher-instructor format even where demand was low and the desired items were highly motivating. The developmental conceptual framework underlying this approach guided the experimenter to respond creatively to Bill's individual learning and social preferences in order to maximise opportunities for speech production and shared affect in interaction.

When the repeat treatment was split into initial and reversal conditions we found that Frank and Bill's performance supported both hypotheses: there was no significant difference in performance between the three treatment conditions for Bill; there was no significant difference in performance between the initial and reversal developmental conditions for Frank and he performed significantly better in the initial developmental treatment than in the N-ABA treatment. Jack performed significantly better in both the N-

ABA and developmental (R) treatment conditions (both with a mean score of 8.73) than in the developmental (I) treatment condition (mean score 7.59).

To provide a control for the study, Harry participated in a repeat N-ABA treatment instead of a repeat developmental treatment. Harry was randomly chosen to participate in treatments in this order. He demonstrated a decrease in performance across conditions (he performed significantly better in the N-ABA (I) condition than in both the developmental condition and the N-ABA (R) condition) whereas in phase one he had shown a steady increase in performance across conditions. Several variables, including individual differences could have played a role in Harry's performance across conditions in phase two. One possible reason for the initial peak in performance in the first treatment condition, N-ABA (I), may have been due to the novelty of the treatment setting and the early time of the day. In his usual school-day, Harry only was only given time to play freely for short periods of time and had an opportunity to play with a wide variety of items directly after lunch. As the day progressed Harry may have grown less interested and motivated to participate in the treatment conditions. In particular, Harry enjoyed rolling on a mat on the floor and in both conditions he was allowed to remain in this way as long as the experimenter could interact with him in some way. Harry had limited reinforcers, one of which the experimenter discovered was to tickle Harry with an oversized toy dinosaur. It may be that Harry was more motivated to respond and this resulted in a greater frequency and quality of speech productions in the initial N-ABA condition, which decreased in subsequent conditions because the novelty had worn off. Tickling Harry with a dinosaur appeared to be a novel experience for Harry in the initial N-ABA condition and therefore he may have found repeated instances of this game less motivating as time went on. One way to test this hypothesis would have been to conduct another developmental condition to see if performance would continue to decrease (in which case it is likely that boredom is playing a factor) or whether there would be an increase once again in quality of motor production (in which case other variables, including the treatment, may be affecting the outcomes).

Greater understanding of Harry's performance may be gained by comparing the quality of Harry's motor productions with the rate of his motor productions across treatments. Harry produced a much higher rate of speech sounds in the initial normalised



condition than in the developmental and reversal N-ABA condition and this appears to mirror performance in terms of quality of motor productions. However, performance in terms of rate of motor production began to increase (although very slightly) again in the reversal N-ABA condition whereas performance in terms of quality of motor production further decreased in this condition. Thus, Harry's performance also showed evidence that the N-ABA and developmental treatments were tapping different capacities in the participants. Specifically, N-ABA technologies in this treatment appeared to increase rate of motor production whereas developmental technologies were as effective in producing qualitative change in speech sounds.

This study highlights the significant issue of the role of individual differences in treatment outcome in comparative studies such as this one, and the way in which better theorising during the development, implementation, and evaluation of treatments may anticipate the impact of individual differences on treatment outcome. That is to say, treatments should be developed to anticipate personal variables and individual differences, and this requires extensive theorising about individual differences as mediating factors in treatment outcome. As discussed in chapter five, a developmental conceptual framework theorises directly about the mediating effects of individual differences, including developmental, maturational, and affective factors. However, while the developmental theory underlying the developmental treatment in this study incorporates such differences into its approach to language intervention, there still remains a significant issue of the degree to which it is possible to tailor theoretical analysis, and an analysis of the results of an intervention, to the unique characteristics of the child. Further, a developmental conceptual framework may be too general and all-encompassing in identifying mediating variables, including individual factors. Because a developmental conceptual framework posits the interaction of mediating variables at several levels (e.g. genetic, cognitive, affective, environmental) it may be impossible to predict and test for mediating variables within a developmental framework. Developmental interventions may also be very different in structure and implementation, given that an interventionist may focus on different aspects of language development (e.g. social interaction and shared affect rather than imitation and meaning).

A related problem with the empirical support for a developmental framework in this study is that a truly developmental framework requires a much more comprehensive approach to intervention than was possible to provide in this short study. In order, therefore, to provide support for a developmental approach to autism language intervention it would be necessary to examine the process of language acquisition over a longer period of time. Further, a developmental approach to language intervention would necessitate another level of analysis in evaluating treatment outcomes, one that is discourse-analytic in nature and which would incorporate an analysis of the pragmatic and meaningful use of communicative attempts in particular contexts throughout the intervention. However, in this study, only the rate and quality of the motor speech production of each child was analysed in order to enable comparison with a purely behavioural approach on one treatment outcome.

#### **6.4.5 Limitations of the Study and Recommendations for Future Research**

Experiment one was intended to be a partial replication of Koegel et al.'s study, but because of unforeseen consequences with the DTT-ABA condition we had to alter the successive approximation procedure of this treatment. That is to say, that we found insufficient detail in Koegel et al.'s study to carry out an exact replication of the experimental conditions, especially with regard to successive approximations and distinctive features analysis. However, the experiment was significantly guided by their experimental design and implementation. The problems involved in trying to replicate a study with insufficient details for doing so are likely to be common in intervention studies. Indeed, Michie and Abraham (2004) have pointed out that reports rarely have enough detail of intervention procedures to allow replication and, therefore, that identical interventions may vary in critical aspects. This not only makes inconsistencies in outcome difficult to explain but, where similar outcomes occur, comparable results could be due to another feature of the intervention (Michie & Abraham, 2004). This may be why we found that we had to redesign the successive approximations procedure in the DTT-ABA treatment for three of the participants, following unforeseen consequences of the treatment condition with Jack. Koegel et al. may have selected participants for their study using a particular behavioural or symptom criteria, whereby only children with



very mild behavioural difficulties were included in the study. We would suggest therefore that intervention research studies provide not only better details but also more theoretical explanations of how and why the techniques involved are purported to work. We found, for example, that ratings of affect as used in Koegel's study were not feasible in our study because several variables besides the treatment condition appeared to effect the child's enjoyment of the intervention, e.g. if the child had a cold, had a difficult morning in school, testing approached lunchtime or snack time, or the child had a negative encounter with other children previous to beginning the treatment condition.

Individual differences in intervention studies with children with autism are particularly significant, given the extent of behavioural heterogeneity in symptoms for these children. Pre- and post-tests of IQ and adaptive functioning are important in tests of intervention outcomes. In this study, individual differences were actively incorporated into the experimenter's approach to intervention with each child. However, formal tests of verbal and nonverbal ability were not included in the study which limits our ability to identify potential personal mediating variables. Rather, while we had detailed reports of the extent of language impairment for Jack and Frank, the participants in this study were chosen based on observational reports of expressive language impairment by the directors of both schools. Similarly, follow-up measures were not conducted with the participants. However, this step was not taken because of the brevity of the treatment conditions. That is, both experiments were developed in order to demonstrate immediate changes in motor speech production during treatment conditions. Outcome measures would be important in tests of more extensive participation in these treatment conditions. Therefore, both studies may be better described as a form of dynamic assessment, an interactive approach to assessing language learning that focuses on the ability of the learner to respond to intervention. In both studies, the ability of each child to produce motor speech sounds in response to a verbal model, or within an appropriate context, was assessed, and treatment conditions were then compared on the basis of this assessment. Both empirical studies also shared with a dynamic assessment procedure the goal of intentionally inducing changes in the learner's current level of independent functioning, and both shared a primary focus on the child's responsiveness to intervention. Future comparative studies,

with similar time and resource restrictions, may benefit from adopting a dynamic assessment procedure in order to compare two distinct intervention approaches.

Tager-Flusberg has suggested that laboratory-based experiments of language learning in children with autism will not provide an accurate portrait of the child's linguistic capacities because children with autism have been found to produce more advanced language in socially familiar contexts, such as at home with his or her mother (Tager-Flusberg, 1999). As such, intervention studies on theory-derived treatments which are implemented by parents in the home may reveal a very different performance by language-impaired children with autism. We would further suggest that single-case design studies may be extremely valuable in empirical and comparative research on autism intervention. Single-case designs, where each participant acts as his own control, allow for a greater account of individual differences and more detailed analysis of participant performance throughout intervention. An example of a simple single-case design is an A-B-A withdrawal design, whereby a baseline is first established (A), the child is then placed in a treatment (B) and then the treatment is withdrawn (A) (Hewitt, 2004). In order to be able to generalise findings to children with similar profiles, however, replication is necessary. A major advantage of using single-case designs is that individual differences in response to treatment are highlighted, thereby outlining for whom a particular intervention is most suited and aiding the identification of mechanisms by which change is effected in a particular treatment.



## **Chapter 7**

### **Conclusion**

Autism intervention is an important area in the field of autism research. Behavioural and developmental approaches to autism intervention currently dominate intervention services, and the majority of intervention research studies investigate the effectiveness of one or both of these approaches. Autism intervention research is also informed by developments in several disciplines, including neurobiology, developmental psychopathology, and psycholinguistics. There is, therefore, a significant need to integrate findings from the vast number of efficacy studies on intervention technologies with findings from research on the cause and form of dysfunction in autism. Several researchers have suggested that integrating the disparate streams of research on autism and autism intervention would be beneficial for the development and implementation of effective interventions for children with autism (Bodfish, 2004; Volkmar et al., 2004). However, a method for achieving this integration is rarely outlined. Further, proposals which detail a method for integrating different approaches to autism intervention and research seldom acknowledge the problem of theoretical incompatibility between diverse approaches to intervention and research. In chapter one, the pivotal role of theory in the development and implementation of treatment technologies was outlined and the role of theory was highlighted as equally important in understanding why and how these technologies are thought to effect change in intervention. In chapters two and three, the theoretical and philosophical principles upon which behavioural- and developmental-based intervention approaches are based were discussed in detail, and were found to be conceptually incongruent with one another (i.e. the conceptual framework of a behavioural-based approach was found to posit mechanisms of treatment change and a conceptualisation of autism which are incompatible with those of a developmental-based approach).

Several researchers have made proposals for integrating disparate approaches to, and findings on, autism that do not acknowledge these conceptual inconsistencies. Thus, one recommendation has been to identify the most effective technologies from different approaches to intervention and implement them according to what we know about

children with autism, and the particular sub-profiles of this population (Rogers, 2008; Wetherby & Woods, 2008). A second recommendation has been to separate the content of interventions from the processes and technologies used to address this content so that interventionists can combine effective practices with different treatment goals (Rogers & Vismara, 2008). A third recommendation for integrating independently-developed practices and paradigms included using effective technologies from one paradigm to investigate hypotheses about autism from another paradigm (Tager-Flusberg, 1999).

The above recommendations for methods of integrating the many strands of research on, and treatment technologies for, autism share a common emphasis on the mutual independence of empirically-supported technologies and theory-driven research. Such an emphasis significantly undermines the role of theory in the development, implementation, and appraisal of intervention technologies and advocates a practice of theoretical eclecticism. For example, the way in which empirically-supported technologies are thought to bring about change is necessarily understood within a theoretical framework. If technologies developed from one conceptual approach to autism are used by interventionists or researchers from another conceptual approach to autism, the interventionist is faced with two incongruent ways of explaining why change occurred. In chapter four, one potential way of dealing with this problem of theoretical eclecticism was put forward which involves reinterpreting the technologies of another conceptual framework in terms of one's own preferred theoretical framework. Indeed, the principle of the underdetermination of theory by data posits that this is always a viable option where treatment outcomes are concerned, in that data alone do not provide sufficient support for a theory. However, using this method, any treatment outcomes can be made to fit any theory and this does not allow the interventionist to identify which intervention can best effect change in autism and the ways in which change occurs. Rather, in chapter four it was proposed that theoretical and philosophical commitments should be made explicit in intervention studies, and that theories of autism should be used to generate new hypotheses which can be tested and understood by the interventionist or researcher in terms of a fully developed conceptual framework. This should be an ongoing and evolving process, and may not always lead to new knowledge about autism and mechanisms of change in intervention. However, by making theoretical and



philosophical principles explicit, the researcher and interventionist must justify the use of particular technologies and a particular view of the child in intervention. This would encourage open debate about what is actually occurring in autism intervention rather than the steadfast promotion of one view as the best, or most scientific, approach to autism intervention. Further, explicit theorising in reports on intervention efficacy studies highlights the research-based, but ultimately subjective, decisions of the interventionist in setting goals in intervention and in choosing to target certain behaviours above others. Explicit theorising also provides a platform for greater discussion of ethical concerns in autism intervention research. These concerns are not usually addressed as an integral part of the theoretical development of autism intervention research, but rather are raised as separate, albeit important, issues for consideration by researchers and interventionists. Further, ethical concerns may differ in scope and focus among conceptual approaches to intervention. For example, behavioural intervention researchers have routinely raised awareness of the individual's right to the best available and empirically supported treatments. Ethical issues raised in an ABA approach to autism often include identifying how best to implement behaviour modification practices in a way that ensures the individual's right to a safe, effective, and least aversive treatment possible, and which ensures that intervention benefits the individual and not the person conducting the intervention. In language intervention research, evidence-based practice is highlighted as integral to the provision of effective and ethical treatment (Brackenbury, Burroughs, & Hewitt, 2008). However, as we shall discuss later, ethical issues are also especially important in situations where there is insufficient evidence for claims made by interventionists about the nature of learning or the nature of impairment in a vulnerable population, such as children with autism. As such, ethical issues are intricately linked to conceptual framework and theory-development in intervention. In order to debate the issues fully, parents and practitioners must therefore have access to detailed information on the theoretical and philosophical principles that guide the development and implementation of proposed intervention approaches for children with autism.

Inadequate consideration of the impact of the interventionist's and researcher's conceptual framework on the development and implementation of intervention is perpetuated by a current emphasis on efficacy studies. Doll has highlighted that debate

about whether intervention technologies are effective or not is actually a debate about the theoretical underpinnings of the competing technologies (Doll, 2000). However, we would suggest that while this may be so, the problem is that this debate is not made explicit and is not conducted overtly in the research literature. Rather, a particular world-view, or philosophy of science, can mean that certain intervention approaches to autism can become insulated fields of research wherein the theoretical tenets of the approach are not tested but are taken for granted as fact. For example, in several behavioural research articles, the principles of the theory of operant conditioning are presented as scientific fact (Cooper et al., 2007; Leaf & McEachin, 1999), the ‘discovery’ of which is comparable to discoveries about atomic structure (Kimball, 2002). Consequently, the theoretical principles of operant conditioning, as the most adequate explanation of learning and impairment in children with autism, are not tested by proponents of this approach, but rather the application of technologies derived from these tenets is tested. Several researchers have highlighted the need for openness to scrutiny and criticism from outsiders (Hughes, 2000b; Jensen, 1999) and this can only occur when intervention researchers make explicit the theory of autism which underlies the development and evaluation of treatment outcomes. Reluctance to submit to such criticism may result in the “fossilization” of an intervention approach to autism (Evans, 1999; Hughes, 2000b). Applied Behaviour Analysis is particularly vulnerable to this process of “calcification” (Jensen, 1999), given the reluctance of contemporary researchers to address issues of observation and the theoretical nature of principles of operant conditioning. It is not that a theory of operant conditioning is a less scientific or appropriate theory but rather that it is not being openly tested as a feasible theory of the change underlying outcomes in autism intervention and is thus even further removed from prominent research streams on autism impairment. In autism intervention this is particularly detrimental given that much remains to be understood about the impairments and capacities of individuals with autism. Theory and empiricism are sometimes considered mutually exclusively and this view is usually found within a positivist view of the scientific enterprise. However, empiricism relies on theory for direction and novel investigations (Kazdin, 1999). Further, we have shown in our conceptual analysis (chapters one, two, and three) that theories are not simply heuristic devices for summing up research findings, but rather a



pivotal part in the development, implementation, and evaluation of treatment technologies. Philosophical assumptions about the nature of science and scientific investigation are, therefore, integral to the research process because they have a significant impact on how research is conducted, including the role theory is perceived to play in science. Philosophical beliefs may also significantly affect the targets of the scientific enterprise and the ways in which research variables can be talked about and manipulated. In this way the ability to generate novel hypotheses and creative solutions to limitations is also constrained by the philosophy or world-view of the researcher.

Although the role of theory in evaluating the effectiveness and appropriateness of treatment technologies is often minimised in efficacy studies, empirical studies on the effectiveness of treatments in changing outcomes are important in autism intervention for several reasons. Firstly, efficacy studies have provided insight into potential mediating variables and moderators of change in intervention. Thus, a degree of consensus has been reached regarding the importance of structured, early intervention, which is one-on-one, and that has individually-based goals. These have been referred to as non-specific factors of intervention which are shared by all effective treatments, and more research on these factors needs to be conducted in order to understand why these factors are important and in what way they support change in intervention. This can only be done by positing and investigating specific theories of change in autism intervention. Secondly, as consumers of intervention on behalf of their children, parents of children with autism need to be able to make informed decisions about which intervention approach is most likely to effect change in their child and in what way. However, the current neglect of theoretical and conceptual debate in efficacy studies and empirical research on autism interventions has meant that parents and educators are not being informed about a significant aspect of intervention, namely, the theoretical and philosophical assumptions of proponents of different approaches to autism intervention, including how the child with autism is conceptualised in treatment programmes.

Problems arising from a lack of consideration of conceptual issues in the effectiveness and appropriateness of autism intervention are particularly pertinent to current autism services in Ireland. Debate about the best available treatment technologies for children with autism is often heated and divisive. We would suggest that a lack of

conceptual and theoretical debate has negatively impacted on the development and implementation of an effective and appropriate system for service delivery in Ireland. For example, in chapters one, two, and four the highly effective aspects of an ABA intervention approach for some children with autism were outlined and the many merits of the conceptual framework of the approach for the consistent implementation, replication, and evaluation of effective technologies for changing behaviours in autism. However, in chapters one, three and five developments in developmental intervention approaches for children with autism were also outlined, for which there is much empirical and theoretical support. Thus, a major premise of this thesis is that empirical support alone is not sufficient for aiding the interventionist, researcher, or parent deciding between approaches to autism intervention. Rather, the entire conceptual framework of the intervention approach must be weighed and considered with regard to how effectively the intervention teaches essential skills to children with autism, the extent to which core features of autism are affected, the extent to which target goals are appropriate, the scientific support for the theory of change mechanisms upon which the intervention technologies are based, and the potential which the intervention approach provides for developing new and better technologies for intervention.

Perhaps the strongest support for the critical role of theory in autism intervention can be found in empirical findings of comparable outcomes between intervention approaches. For example, in chapter six, a comparison study of two prominent and conceptually incongruent intervention approaches for increasing motor speech production in autism intervention was outlined. The results showed no significant difference in outcome with regard to the quality of motor production in the behavioural- and developmental-based treatment technology. In this dynamic assessment study, the conceptual framework of both approaches was evident in developing, implementing, and evaluating treatment technologies. Rather than supporting theoretical eclecticism, therefore, a finding of equivalent outcomes highlights the necessity of considering the theoretical framework of both approaches, in order to identify which theory of autism and language acquisition most adequately explains the mechanisms underlying treatment outcome.



Throughout this thesis it has been argued that a developmental conceptual framework meets this criteria and that it is positioned to further inform autism-specific research on the cause, and type, of dysfunction in autism. The comparable outcomes of the dynamic assessment procedure in this empirical study do not provide clear empirical support for a developmental approach. In order to provide empirical support for a developmental framework, it would be necessary to conduct a longer and more comprehensive intervention which would allow for a more linguistic and pragmatic analysis of participant performance over time. Rather, the comparable outcomes in our study suggest that a developmental-based treatment, such as that implemented in our study, is as good as a behaviourally-based treatment in evoking quality, context-specific motor productions. As such, this study provides support for considering the theoretical framework of an approach in choosing between treatment interventions. These findings also support the critical role of theory in designing comparative intervention studies. In other words, efficacy studies of isolated interventions only show the extent to which a particular intervention is effective, and do not show whether another intervention may achieve similar results. Therefore, comparative studies of conceptually distinct interventions are necessary. Equivalent outcomes were also found by Magiati et al (2007) who compared autism-specific nursery provision with Early Intensive Behavioural Intervention (EIBI) for young children with autism (Magiati et al, 2007). These findings would suggest that factors common to both approaches are responsible for treatment outcome, and these factors may only be identified through extensive empirical and theory-driven research. In addition, Magiati et al did not find significant improvements for many of the children in the study. This would suggest limitations in the theory underlying both approaches and it is only by incorporating extensive theorising about the linguistic mechanisms underlying intervention performance into research studies that we may begin to clarify how development and amelioration of autism occurs during treatment.

A neglect of theoretical and philosophical debate in intervention research has also negatively impacted on the perception of an ABA approach to intervention. A common perception of ABA research is of a research field that is isolated from non-behavioural psychology and scientific research on language and development. By not acknowledging

the scientific support for other intervention approaches and appearing unwilling to submit to scientific investigation by non-behavioural researchers in autism intervention behavioural researchers risk further segregation in the field of intervention research. It would thus appear that a lack of awareness of the theoretical incongruity between an ABA approach to autism intervention and developmental and non-behavioural research on autism is detrimental for the development of research-informed and openly debated intervention services for children with autism.

Highlighting the pivotal role of theory in autism intervention also serves to emphasise that goal-setting in autism intervention is strongly influenced by the conceptual framework of the interventionist and that the types of behaviours targeted in intervention are not determined by empirical support alone. Awareness of theory and philosophy is critical in the development of appropriate and effective targets for intervention and identifying suitable treatment technologies for the child. How we theorise about processes of learning and how we conceptualise the individual with autism determines how, and the extent to which, we address ethical issues with regard to best practice with children with autism. Interventionists and intervention researchers make many, often unfounded assumptions about the nature of impairment in autism and the style of learning that defines individuals with autism (M. Dawson et al., 2007; Gernsbacher, 2006; Gernsbacher, Dawson, & Mottron, 2006). In bringing theory to the fore we believe that interventionists are more likely to ask themselves critical questions about children with autism and how they are conceptualised in the treatment process. For example, we can ask ourselves the important question as to whether we want to normalise children with autism or whether we want to help them to express themselves as individuals with a learning disability. Similarly, do we conceptualise autism as something that can be cured or as an integral part of individuals who have a significantly different “style of thinking”? Thus one prominent autistic academic<sup>9</sup> has strongly criticised the conceptual framework of an ABA approach to intervention because of its lack of acknowledgement of the rights of the individual with autism and the narrow target goals for intervention that drive ABA approaches (M. Dawson, 2004). Dawson has argued that

---

<sup>9</sup> Dawons prefers to be referred to as “an autistic” in recognition of the central role of autism in her individual identity.



the general public would be outraged if, for example, we sought to normalise individuals with Down's Syndrome and did not acknowledge the fundamental role of the disorder in the expression of the individual's personality. She has used her ability as an academic to challenge unsupported assumptions about the nature of autistic intelligence (M. Dawson, Mottron, Gernsbacher, & John, 2008). In contrast, another prominent academic with autism views behavioural intervention as critical for autistic children who are incapable of basic skills such as toilet-training and communication (Grandin, 2005) and highlights a difference between teaching essential skills and 'curing' autism. These two contrasting views on the appropriateness of an ABA approach to intervention for children with autism further highlight the importance of the individual's world-view, and personal conceptual approach to science and intervention.

Gernsbacher (2006) has emphasised that while many interventionists and researchers assume children with autism to be impaired in reciprocal social interaction, many of these interventionists and researchers do not behave in a reciprocal way with individuals with autism. Rather, interventionists and researchers view functioning in autism as a deviation from the norm, and neglect to consider that to individuals with autism the behaviour of the interventionist may be equally confusing and deviating (Gernsbacher, 2006). A particularly negative outcome of this conceptualisation of individuals with autism is that such individuals are often discouraged from participating in autism research beyond adopting a 'participant' role in intervention research studies. The language used to describe autism impairment can be emotive and negative and this reflects the personal world-view of the interventionist and researcher. For example, in the experimental investigation of treatment technologies (experiment two) presented in chapter six, the impact of personal and philosophical assumptions about the nature of social interaction and learning on the experimenter's decisions was a source of continuing surprise for the experimenter. Thus the experimenter had to continuously make informed decisions about the extent to which the child's lead was followed and when to intervene and insist on a verbal response to a verbal model. Even where research on autism suggested a particular approach to intervention, the experimenter had to make a subjective decision about the method of using this knowledge to effectively and appropriately effect change in the behaviour of the child with autism. For example, even

though imitation skills predict speech fluency, the experimenter had to decide upon how intrusive or demanding she should be in requesting the child to imitate her verbal speech. Clearly, conceptual and ethical discrepancies are common in intervention approaches to autism. However, by bringing to the fore implicit theoretical and philosophical assumptions of the researcher and interventionist, a greater awareness of issues such as these will be created and a greater degree of consensus may emerge on how individuals with autism are to be conceptualised and treated in intervention research.

This thesis has therefore highlighted the need for an active consideration of the role of theory in autism intervention and intervention research, and an awareness of the negative impact that the eclectic use of technologies from theoretically incongruent approaches to autism intervention has on the quality of that research. In chapters four and five, we outlined a method for actively addressing theoretical eclecticism in autism intervention research. Chapter four highlighted the tentative support that data provides for theory and we explored philosophical grounds for reinterpreting treatment outcomes in ABA models of intervention from a perspective that is directly informed by autism research. However, we noted that reinterpreting the outcomes of behavioural technologies in terms of a developmental theory of autism and development in order to use features of these technologies in non-behavioural research, does not fully address problems of theoretical eclecticism. Rather, the interventionist and researcher must make explicit their theoretical and philosophical assumptions about the nature of autism and of change in intervention and directly test these in intervention research. In chapter five, we discussed many findings from developmental psycholinguistics on language and communicative impairment in children with autism in order to develop a fully-informed conceptual framework for intervention research.

Chapter six outlined an experimental investigation of the applications of this approach to intervention research in which a treatment technology derived from this conceptual framework was implemented in a developmental treatment condition (experiment two). This developmentally-informed technology was directly compared to a treatment technology developed from, and understood in terms of, an operant conditioning theory of behaviour. Both treatment conditions in experiment two thus represented “maximally distinct approaches” (Hewitt, 2000, p. 192) even though the



treatment technologies that were developed from these distinct approaches were superficially very similar in structure and implementation. A central premise of this experimental investigation was that such an approach would allow the intervention researcher to test theories of autism and language impairment rather than simply test technologies as to whether or not behavioural changes were effected. We believe that this approach to autism intervention research is a good example of the kind of “qualitatively different research” that Ollendick and King (1998) have called for with regard to evaluating the effectiveness of treatment technologies.

The method proposed and implemented in the experimental section (section II) of this thesis has several implications for future autism intervention research. Firstly, by emphasising the subjective nature of the research process and the need for greater self-awareness and critical appraisal of the conceptual framework of approaches to autism intervention, this research suggests that a developmental framework for autism may in future be challenged by findings in autism research and may have to be significantly revised, or replaced by other more appropriate conceptualisations of autism. Indeed, if this framework for autism research and intervention is truly open to scientific testing and investigation, then the framework will necessarily evolve to address new insights into autism and the processes that affect development. Detailed conceptual frameworks that include theories of dysfunction and of mechanisms for change in intervention, such as Dawson’s (2008) developmental model, provide excellent examples of explicit theorising in this approach. In particular, the detailed theorising underlying this model of autism and intervention makes it possible to revise, reject, or further develop elements of the model. Secondly, emphasising the importance of detailed theorising and the development of an adequate conceptual framework for autism intervention research may highlight that some intervention researchers who ascribe to developmental approaches are really developmentally-oriented (Tronick, 2007) rather than truly developmental. That is to say, developmentally-oriented researchers do not theorise about the many inter-related processes that effect change in development and the mechanisms that underlie this change. In order to implement a truly unified developmental conceptual framework in autism language intervention as we have proposed, interventionists must provide such detailed theorising. As such, while the interventionist’s world-view or conceptual

approach to autism intervention is important to the form, content and direction of research, we must make clear hypotheses about methods of change and underlying processes in order to have a fully effective and dynamic model of intervention research. Thirdly, emphasising the conceptual framework of an intervention approach will help parents and practitioners to make informed decisions in choosing between treatment technologies that have comparable empirical support in terms of effectiveness. For example, Magiati et al. (2007) found comparable outcomes in a follow-up study of early intensive behavioural intervention and specialist nursery provision for children with autism spectrum disorders. However, details concerning differences in conceptual framework, including details of the theory of autism underlying the specialist nursery treatment group were not outlined in the study and therefore qualitative differences between these two comparably effective approaches are not available to intervention consumers.

This thesis has also highlighted the need for special consideration of the role of language theory in autism intervention. Communicative and language impairments are especially characteristic of impairment in autism and are strongly related to social deficits. Developmental theories of language focus on social-communicative skills and capacities and, therefore, fit well with what we know about impairment and language development in children with autism. In contrast, verbal behaviour is considered to be an inadequate theory of child language acquisition for typically developing children and we must therefore ask if it is appropriate to conceptualise language impairment in children with autism in terms of this theory. Rather than reject an operant conditioning theory of language impairment in children with autism, explicit theorising about the processes involved in language acquisition according to a behavioural conceptual framework would allow interventionists to test the theory of this approach to language impairment as well as the effectiveness and appropriateness of Verbal Behaviour technologies in teaching language to children with autism. For example, numerous questions may be asked about the processes and mechanisms that underlie the language learning process in a Verbal Behaviour theory: do children with autism acquire language through discrete-trial training or is motivation a pivotal behaviour, as proposed by Koegel?; is it, therefore, motivation, and the use of contingent reinforcement, or the repetitive imitation of verbal



models that leads to language learning under these conditions?; if motivation is a key variable, how is motivation conceptualised as a behaviour and in what way do individual differences affect this behaviour?; and what is the role of affect in motivation, and can emotional variables ever be understood in a theory of operant conditioning? Many further questions can be generated through explicit theorising about processes of change in autism intervention and directions for novel hypotheses and areas of investigation. For example, if it is understood why motivation may be a key variable in language learning then research on motivation in autism intervention technologies could be used to inform theories about the social deficit in autism and its relation to language impairment and communicative deficits. In this way, intervention research can inform and direct research on autism. Given the heterogeneity of language development in children with autism, better theorising is necessary to understand the linguistic mechanisms in the development and amelioration of autism in these children.

In particular, explicit theorising and more investigative research on nonverbal children with autism are needed. This particularly vulnerable sub-group of individuals with autism requires much more active research to understand the particular type of impairment and abilities which underlie language delay in these children. Active theorising and hypothesis development may at the very least stimulate new research directions for language impairment in these children. Future research with severely language-impaired children with autism must also go beyond using counts of behaviours and abstract measures of quality of speech sounds in order to evaluate progress in language development and to compare progress across treatment types. Rather, language development must be analysed in terms of the development of meaningful and appropriate communicative skills, and the pragmatic use of language or communicative attempts. Treatment efficacy for autism language interventions must include evidence of progress in the quality of social interaction and the development of meaningful communicative skills, verbal and otherwise. As such, the constructs of social context and meaningfulness should be important constructs in future comparative research designs. These constructs are already in place in several developmental models of autism language intervention and have been used in some empirical efficacy studies of developmental approaches to language intervention (Aldred et al, 2004; Ingersoll et al, 2005). However,

given the particular deficits in social-communicative functioning of children with autism, these constructs should be given greater prominence in comparative efficacy studies which seek to evaluate the progress and development of children with autism in two or more intervention approaches. Incorporating constructs such as meaningfulness and context ensures a more socially-sensitive analysis of the intervention process and gives developmental theories of child language acquisition a central role in empirical research on language development in autism and on autism language intervention.

This thesis supports the importance of empirical research on language development in autism intervention, particularly with severely language-impaired children with autism. However, it also supports the extensive incorporation of theorising and conceptual debate in the development, implementation, and evaluation of language interventions for autism, and therefore in empirical research as a whole. By highlighting the integral role of theory at these three stages of the intervention research process it is also argued that theoretical eclecticism, i.e. the use of theoretically incongruent technologies simultaneously, negatively affects the integrity of autism intervention research. While a developmental framework is currently proposed as the most appropriate framework for language intervention, it is also suggested that more comparative and longitudinal research is necessary which contrasts a comprehensively developmental approach with a behavioural approach. Several difficulties with a developmental approach to language intervention have also been raised, and it is suggested that only by explicit theorising will these problems be addressed in future research. However, the conceptual and empirical research in this thesis would suggest that developmental theories of language have much to offer autism language research and intervention, and should therefore be routinely incorporated into intervention research and in a theoretically coherent manner.



## References

- Aldred, C., Green, J., & Adams, C. (2004). A new social communication intervention for children with autism: pilot randomised controlled treatment study suggesting effectiveness. *Journal of Child Psychology and Psychiatry*, 48(8), 1420-1430.
- Altman, G. T. M. (2001). The language machine: psycholinguistics in review. *British Journal of Psychology*, 92, 129-170.
- Apel, K. (1999). Checks and balances: keeping the science in our profession. *Language, Speech and Hearing Services in Schools*, 30(1), 98.
- Bailey, A., Philips, W., & Rutter, M. (1996). Autism: towards an integration of clinical, genetic, neuropsychological and neurobiological perspectives. *Journal of Child Psychology and Psychiatry*, 37(1), 89-126.
- Baron-Cohen, S. (2001). Theory of mind and autism: a review. *Special Issue of the International Review of Mental Retardation*, 23, 169.
- Bishop, D. V. (2008). Forty years on: Uta Frith's contribution to research on autism and dyslexia, 1966-2006. *Quarterly Journal of Experimental Psychology*, 61(1), 16-26.
- Bodfish, J. W. (2004). Treating core features of autism: are we there yet? *Mental Retardation and Developmental Disabilities Research Reviews*, 10, 318-326.
- Brackenbury, T., Burroughs, E., & Hewitt, L. E. (2008). A Qualitative Examination of Current Guidelines for Evidence-Based Practice in Child Language Intervention. *Lang Speech Hear Serv Sch*, 39(1), 78-88.
- Chomsky, N. (2006). *Language and mind* (3rd ed.). Cambridge: Cambridge University Press
- Cicchetti, D., & Sroufe, L. A. (2000). The past as prologue to the future: the times, they've been a-changin'. *Developmental and Psychopathology*, 12, 255-264.
- Clark, J., Yallop, C., & Fletcher, J. (Eds.). (2007). *An Introduction to Phonetics and Phonology*: Blackwell Publishing.
- Cooper, J. O., Heron, T. E., & Heward, W. L. (2007). *Applied Behavior Analysis* (2nd ed.). New Jersey: Pearson Merrill Prentice Hall.
- Dawson, G. (2008). Early behavioral intervention, brain plasticity, and the prevention of autism spectrum disorder. *Development and Psychopathology*, 20, 775-803.
- Dawson, G., & Faja, S. (2008). Autism Spectrum Disorders: A Developmental Perspective. In T. P. Beauchaine & S. P. Hinshaw (Eds.), *Child and Adolescent Psychopathology* (pp. 575-613): John Wiley & Sons.
- Dawson, M. (2004). The misbehaviour of behaviourists: ethical challenges to the autism-ABA industry. from  
file:///D:/My%20Documents/autism%20articles/Articles%20on%20Behavior%20Theory/The%20Misbehaviour%20of%20Behaviourists%20-%20Michelle%20Dawson.htm
- Dawson, M., Mottron, L., Gernsbacher, M. A., & John, H. B. (2008). Learning in autism. In *Learning and Memory: A Comprehensive Reference* (pp. 759-772). Oxford: Academic Press.

- Dawson, M., Soulieres, I., Gernsbacher, M., & Mottron, L. (2007). The level and nature of autistic intelligence. *Psychological Science*, 18(8), 657-662.
- Delprato, D. J. (2001). Comparisons of discrete-trial and normalized behavioral language intervention for young children with autism. *Journal of Autism and Developmental Disorders*, 31(3), 315-325.
- Doll, B. (2000). A commentary on Hughes: the tension between pragmatics and rigor. *Journal of School Psychology*, 38(4), 331-335.
- Evans, I. M. (1999). Child-focused behavioral assessment and modification. *Journal of Clinical Child Psychology*, 28(4), 493.
- Garrison, J. W. (1986). Some principles of postpositivistic philosophy of science. *Educational Researcher*, 15(9), 12-18.
- Gerber, S. (2003). A developmental perspective on language assessment and intervention for children on the autistic spectrum. *Topics in Language Disorders*, 23(2), 74-94.
- Gernsbacher, M. (2006). Toward a behavior of reciprocity. *Journal of Developmental Processes*, 1, 139-152.
- Gernsbacher, M., Dawson, M., & Mottron, L. (2006). Autism: common, heritable, but not harmful. *Behavioral and Brain Sciences*, 29(4), 413-414.
- Gernsbacher, M., Sauer, E. A., Geye, H. M., Schweigert, E. K., & Goldsmith, H. H. (2008). Infant and toddler oral-and manual-motor skills predict later speech fluency in autism. *Journal of Child Psychology & Psychiatry*, 49(1), 43-50.
- Grandin, T. (2005). Autism first-hand: An expert interview with Temple Grandin, PhD [Electronic Version]. *Medscape Psychiatry & Mental Health*, 10. Retrieved January, 18th, 2009, from <http://www.medscape.com/viewarticle/498153>
- Greenspan, S. I. (2003). Research support for a comprehensive developmental approach to autistic spectrum disorders and other developmental and learning disorders: the developmental, individual difference, relationship-based (DIR) Model [Electronic Version], 1-11, from <http://icdl.com/Research%20support%20for%20the%20Developmental.pdf>
- Hewitt, L. E. (2000). Does it matter what your client thinks? The role of theory in intervention: response to Kamhi. *Language, Speech and Hearing Services in Schools*, 31, 186-193.
- Hewitt, L. E. (2004). *Evaluating treatment efficacy for language facilitation in autism*. Paper presented at the Conference Name|. Retrieved Access Date|. from URL|.
- Hewitt, L. E. (2004). *Naturalistic, focused stimulation interventions for communicative impairments in autism*. Paper presented at the OSSPEAC.
- Hewitt, L. E. (2005). *Intervention for developmental language disorders: Evidence-based practice*. Paper presented at the Conference Name|. Retrieved Access Date|. from URL|.
- Hinshaw, S. P. (2008). Developmental psychopathology as a scientific discipline: Relevance to behavioral and emotional disorders of childhood and adolescence. In T. P. Beauchaine & S. P. Hinshaw (Eds.), *Child and Adolescent Psychopathology* (Vol. ). New Jersey: John Wiley & Sons, Inc.
- Howlin, P., Goode, S., Hutton, J., & Rutter, M. (2004). Adult outcome for children with autism. *Journal of Child Psychology and Psychiatry*, 45(2), 212-229.



- Hughes, J. N. (2000a). The essential role of theory in the science of treating children: beyond empirically supported treatments. *Journal of School Psychology, 38*(4), 301-330.
- Hughes, J. N. (2000b). Reconsideration of the role of theory in psychosocial intervention. *Journal of School Psychology, 38*(4), 389-401.
- Ingersoll, B., Dvortcsak, A., Whalen, C., & Sikora, D. (2005). The effects of a developmental, social-pragmatic language intervention on rate of expressive language production in young children with autistic spectrum disorders. *Focus on Autism and Other Developmental Disabilities, 20*(4), 213-222.
- Jensen, P. S. (1999). Links among theory, research, and practice: Cornerstones of clinical scientific progress. *Journal of Clinical Child Psychology, 28*(4), 553.
- Juszyk, P. W., & Aslin, R. N. (1995). Infants' Detection of the Sound Patterns of Words in Fluent Speech. *Cognitive Psychology, 29*(1), 1-23.
- Kamhi, A. G. (2000). Practice makes perfect: the incompatibility of practicing speech and meaningful communication. *Language, Speech, and Hearing Services in Schools, 31*, 182-186.
- Karmiloff, K., & Karmiloff-Smith, A. (2001). *Pathways to Language: From Fetus to Adolescent*. Harvard University Press.
- Kazdin, A. E. (1999). Current (lack of) status of theory in child and adolescent psychotherapy research. *Journal of Clinical Child Psychology, 28*(4), 533.
- Kimball, J. W. (2002). Behavior-analytic instruction for children with autism: philosophy matters. *Focus on Autism and Other Developmental Disabilities, 17*(2), 66-75.
- Kjelgaard, M. M., & Tager-Flusberg, H. (2000). An investigation of language impairment in autism: implications for genetic subgroups. *Language and Cognitive Processes, 16*(2-3), 287-308.
- Koegel, R. L., Koegel, L. K., & McNeerney, E. K. (2001). Pivotal areas in intervention for autism. *Journal of Clinical Child Psychology, 30*(1), 19-32.
- Koegel, R. L., O' Dell, M., & Dunlap, G. (1988). Producing speech use in nonverbal autistic children by reinforcing attempts. *Journal of Autism and Developmental Disorders, 18*(4).
- Kuhl, P. K. (2007). Is speech learning 'gated' by the social brain? *Developmental Science, 10*(1), 110-120.
- Kuhl, P. K., Coffey-Corina, S., Padden, D., & Dawson, G. (2005). Links between social and linguistic processing of speech in preschool children with autism: behavioral and electrophysiological measures. *Developmental Science, 8*(1), F1-F12.
- Laudan, L. (1996). *Beyond Positivism and Relativism: Theory, Method, and Evidence*. Westview Press.
- Leaf, R., & McEachin, J. (1999). *A Work in Progress*. New York: DRL Books, L.L.C.
- Lewis, V. (2002). *Development and disability* (2nd ed.). Oxford: Blackwell.
- Lovaas, O. I., & Smith, T. (1989). A comprehensive behavioral theory of autistic children: paradigm for research and treatment. *Journal of Behavior Therapy and Experimental Psychiatry, 20*(1), 17-29.
- Magiati, I., Charman, T., & Howlin, P. (2007). A two-year prospective follow-up study of community-based early intensive behavioural intervention and specialist nursery provision for children with autism spectrum disorders. *Journal of Child Psychology and Psychiatry, 48*(8), 803-812.



- Matson, J. L., Benavidez, D. A., Compton, L. S., Paclawskyj, T., & Baglio, C. (1996). Behavioral treatment of autistic persons: a review of the research from 1980 to the present. *Research in Developmental Disabilities, 17*(6), 433-465.
- McDuffie, A., Yoder, P. J., & Stone, W. (2005). Prelinguistic predictors of vocabulary in young children with autism spectrum disorders. *Journal of Speech, Language, and Hearing Research, 48*(5), 1080-1097.
- Michie, S., & Abraham, C. (2004). Interventions to change health behaviours: evidence-based or evidence-inspired? *Psychology and Health, 19*(1), 29-49.
- Miller, A., & Eller-Miller, E. (2000). The Miller method: a cognitive-developmental systems approach for children with body organization, social, and communication issues. In S. I. Greenspan, & Wieder, S. W. (Eds.), *ICDL Clinical Practice Guidelines: revising the standards of practice for infants, toddlers and children with developmental challenges* (pp. 489-516).
- Mundy, P., Delgado, C., Block, J., Venezia, M., Hogan, A., & Seibert, J. (2003). A Manual for the Abridged Early Social Communications Scales (ESCS). Unpublished Manual. University of Miami.
- Mundy, P., Sigman, M., & Kasari, C. (1990). A longitudinal study of joint attention and language development in autistic children. *Journal of Autism and Developmental Disorders, 20*, 115-128.
- Paul, R. (2008). Communication development and assessment. In K. Chawarska, A. Klin & F. R. Volkmar (Eds.), *Autism Spectrum Disorders in Infants and Toddlers*. NY: Guildford Press.
- Paul, R., Chawarska, K., Fowler, C., Cicchetti, D., & Volkmar, F. (2007). "Listen My Children and You Shall Hear": Auditory Preferences in Toddlers With Autism Spectrum Disorders. *J Speech Lang Hear Res, 50*(5), 1350-1364.
- Prizant, B. M., & Rubin, E. (1999). Contemporary issues in interventions for autism spectrum disorders: a commentary. *The Journal of The Association for Persons with Severe Handicaps, 24*(3), 199-208.
- Prizant, B. M., & Wetherby, A. M. (1998). Understanding the continuum of discrete-trial traditional behavioral to social-pragmatic developmental approaches in communication enhancement for young children with autism/PDD. *Seminars in Speech and Language, 19*(4), 329-352.
- Rogers, S., Hayden, D., Hepburn, S., Charlifue-Smith, R., Hall, T., & Hayes, A. (2006). Teaching Young Nonverbal Children with Autism Useful Speech: A Pilot Study of the Denver Model and PROMPT Interventions. *Journal of Autism and Developmental Disorders, 36*(8), 1007-1024.
- Rogers, S. J. (2008). Evidence-based interventions for language development in young children with autism. In T. Charman & W. Stone (Eds.), *Social and Communication Development in Autism Spectrum Disorders*: Guildford Press.
- Rogers, S. J., Hayden, D., Hepburn, S., Charlifue-Smith, R., Hall, T., & Hayes, A. (2006). Teaching young nonverbal children with autism useful speech: A pilot study of the Denver model and PROMPT interventions. *Journal of Autism and Developmental Disorders, 36*(8), 1007-1024.
- Rogers, S. J., & Vismara, L. A. (2008). Evidence-based comprehensive treatments for early autism. *Journal of Clinical Child & Adolescent Psychology, 37*(1), 8-38.



- Sheinkopf, S. J., Mundy, P., Oller, D. K., & Steffens, M. (2000). Vocal Atypicalities of Preverbal Autistic Children. *Journal of Autism and Developmental Disorders*, 30(4), 345-354.
- Siller, M., & Sigman, M. (2002). The behaviors of parents of children with autism predict the subsequent development of their children's communication *Journal of Autism and Developmental Disorders*, 32(2), 77-89.
- Tager-Flusberg, H. (1999). The challenge of studying language development in children with autism. In L. Menn & N. Bernstein (Eds.), *Methods for Studying Language Production* (pp. 313-332). Mahwah NJ: Lawrence Erlbaum Associates.
- Tager-Flusberg, H., Joseph, R. M., & Folstein, S. (2001). Current directions in research on autism. *Mental Retardation and Developmental Disabilities Research Reviews*, 7, 21-29.
- Thurm, A., Lord, C., Lee, L.-C., & Newschaffer, C. (2007). Predictors of Language Acquisition in Preschool Children with Autism Spectrum Disorders. *Journal of Autism and Developmental Disorders*, 37(9), 1721-1734.
- Tomasello, M. (2003). *Constructing a language: a usage-based theory of language acquisition*. Cambridge, Mass. ; London: Harvard University Press.
- Tomasello, M., & Bates, E. (2001). *Language development: the essential readings*. Malden, Mass., Oxford: Blackwell.
- Toth, K., Munson, J., Meltzoff, A., & Dawson, G. (2006). Early predictors of communication development in young children with Autism Spectrum Disorder: joint attention, imitation, and toy play. *Journal of Autism and Developmental Disorders*, 36, 993-1005.
- Trochim, W. M. K. (2006). Positivism and Post-Positivism. Retrieved December 5th, 2008, from <http://www.socialresearchmethods.net/kb/positvsm.php>
- Tronick, E. (2007). *The Neurobehavioral and Social-Emotional Development of Infants and Children*: W. W. Norton & Company, Inc.
- Volkmar, F. R., Lord, C., Bailey, A., Schultz, R. T., & Klin, A. (2004). Autism and pervasive developmental disorders. *Journal of Child Psychology and Psychiatry*, 45(1), 135-170.
- Walden, T. A., & Hurley, J. J. (2008). A developmental approach to understanding atypical development. In T. Charman & W. Stone (Eds.), *Social and Communication Development in autism Spectrum Disorders* (pp. 269-295). New York: The Guildford Press.
- Wetherby, A. M. (2008). Understanding and measuring social communication in children with autism spectrum disorders. In T. Charman & W. Stone (Eds.), *Social and Communication Development in Autism Spectrum Disorders* (pp. 3-34). NY: The Guildford Press.
- Wetherby, A. M., & Woods, J. (2008). Developmental approaches to treatment. In K. Chawarska, A. Klin & F. R. Volkmar (Eds.), *Autism Spectrum Disorders in Infants and Toddlers: Diagnosis, Assessment, and Treatment*: Guildford Press.
- Whitman, T. L. (2004). *The Development of Autism: A Self-Regulatory Perspective*. London: Jessica Kingsley.

**Appendix I**  
**Parental Consent Form**

Dear Parent/Guardian,

My name is Sinéad McNally and I am conducting a study on language learning in children with autism. I am a final-year Ph.D. research student and my current study investigates the best methods of teaching language to children with autism. Given the key role of language learning in the outcome of intervention for children with autism my research focuses on developing the optimal teaching environment and methods for acquiring this critical skill.

To participate in this study your child will receive ABA instruction specifically targeting speech production and the social use of language. Instruction will comprise several sessions over three or four days during which your child will receive positive reinforcement for producing motor language and engaging in the social aspects of language use with the instructor. The ABA instruction will be delivered by me and I will be in frequent contact with the director of ABACAS Kilbarrack regarding each child's progress. I expect the outcome of the study for each participant to be an improvement in the use of motor speech. I have worked in ABACAS Kilnamanagh as a tutor under Ms. Jenny McMullen's supervision before beginning my research studies in Trinity College Dublin, and I also have one year's experience tutoring children with autism using ABA in home programmes.

All personal information regarding your child will be completely confidential and you are free at any time to withdraw your child from the study. All data involving your child will be collected and stored in accordance with the Freedom of Information Act.

Please feel free to contact me at any time should you have any further questions about the study. All contact details are attached to this form.

Your child's participation in this study is greatly appreciated.

Yours sincerely,  
Sinéad McNally

*I consent to my child's participation in the study.*

Signature of Parent/Guardian .....



#### Contact Details:

Sinéad McNally,  
School of Psychology,  
Áras an Phiarsaigh,  
Trinity College Dublin,  
College Green,  
Dublin 2.  
Email: [smpkelan@tcd.ie](mailto:smpkelan@tcd.ie)  
Tel: 353-1-896-3912  
FAX: 353-1-671-2006

Dr. Jean Quigley (Supervisor)  
Address as above  
Email: [quigleyj@tcd.ie](mailto:quigleyj@tcd.ie)  
Tel: 353-1-896-2697  
FAX: 353-1-671-2006

#### Background of the Study:

This study experimentally investigates the best environment and teaching methods for teaching speech and the social use of language to children with autism. Language, especially the functional and social use of language, is seen to be one of the core deficits of autism. Improving language and communication is an important task for autism intervention and in this study we hope to contribute further to the scientific understanding of language impairment in, and its treatment for, children with autism.

Each child in the study will receive intensive ABA instruction targeting speech production and social-communicative behaviours. Instruction will be carried out through several short sessions over three or four days and sessions are constructed in such a way as to be optimally reinforcing for the child. In addition each child will receive breaks between teaching sessions and instruction will not occur if the child is distressed or upset in any way.

Appendix II  
Experimental Data

Experiment One: Data in Table form

**Table 1. Mean motor production scores across all four treatment conditions for each participant. Scores represent mean quality of motor productions based on a DFA of all motor productions per participant**

| <i>Participant</i> | <u><i>Mean Motor Production</i></u> |              |              |
|--------------------|-------------------------------------|--------------|--------------|
|                    | <i>DTT-ABA</i>                      | <i>N-ABA</i> | <i>D-ABA</i> |
| <i>Jack</i>        | 3.04                                | 3.82         | 4.22         |
| <i>Harry</i>       | 11.22                               | 10.84        | 11.08        |
| <i>Frank</i>       | 4.92                                | 4.93         | 5.45         |
| <i>Bill</i>        | 17.14                               | 19.87        | 19.01        |

| <i>Participant</i> | <b>Difference In Mean Motor Production</b> |           |          |
|--------------------|--------------------------------------------|-----------|----------|
|                    | <i>H</i>                                   | <i>df</i> | <i>p</i> |
| <i>Jack</i>        | 31.233                                     | 2         | .001*    |
| <i>Harry</i>       | .545                                       | 2         | .761     |
| <i>Frank</i>       | 7.855                                      | 2         | .02*     |
| <i>Bill</i>        | 6.257                                      | 2         | .044*    |

**Table 2. Test scores of difference in performance in quality of motor production across the DTT-ABA, N-ABA, and D-ABA treatment conditions**



**Table 3. Mean motor production scores across all four treatment conditions for each participant. Scores represent mean of quality of motor productions based on a DFA of all motor productions per participant**

| <i>Mean Motor Production</i> |                    |                |              |                    |
|------------------------------|--------------------|----------------|--------------|--------------------|
| <i>Participant</i>           | <i>DTT-ABA (I)</i> | <i>N-ABA</i>   | <i>D-ABA</i> | <i>DTT-ABA (R)</i> |
| <i>Jack</i>                  | 3.42               | 3.82           | 4.22         | 2.94               |
| <i>Harry</i>                 | 10.45              | 10.84          | 11.08        | 11.59              |
| <i>Participant</i>           | <i>N-ABA (I)</i>   | <i>DTT-ABA</i> | <i>D-ABA</i> | <i>N-ABA (R)</i>   |
| <i>Frank</i>                 | 5.34               | 4.92           | 5.45         | 4.56               |
| <i>Bill</i>                  | 18.95              | 17.07          | 19.01        | 20.87              |

**Table 4. Test scores of difference in performance in quality of motor production across four treatment conditions**

| <i>Participant</i> | Difference In Mean Motor Production |           |          |
|--------------------|-------------------------------------|-----------|----------|
|                    | <i>H</i>                            | <i>df</i> | <i>p</i> |
| <i>Jack</i>        | 34.629                              | 3         | .001*    |
| <i>Frank</i>       | 19.126                              | 3         | .000*    |
| <i>Harry</i>       | 6.860                               | 3         | .076     |
| <i>Bill</i>        | 10.221                              | 3         | .017*    |

**Pairwise Comparisons for across Treatments**

**Pairwise Comparison between Three Treatments: Jack**

| <i>Pairwise Comparison</i> | <b>Difference In Mean Motor Production</b> |          |                            |
|----------------------------|--------------------------------------------|----------|----------------------------|
|                            | <i>U</i>                                   | <i>p</i> | <i>Direction of Effect</i> |
| <i>DTT-ABA* N-ABA</i>      | 32947.500                                  | .001     | DTT-ABA < N-ABA            |
| <i>DTT-ABA*D-ABA</i>       | 17625.000                                  | .000     | DTT-ABA < D-ABA            |
| <i>N-ABA*D-ABA</i>         | 16985.500                                  | .044     | N-ABA=D-ABA                |

**Pairwise Comparison between Three Treatments: Bill**

| <i>Pairwise Comparison</i> | <b>Difference In Mean Motor Production</b> |          |                            |
|----------------------------|--------------------------------------------|----------|----------------------------|
|                            | <i>U</i>                                   | <i>p</i> | <i>Direction of Effect</i> |
| <i>DTT-ABA* N-ABA</i>      | 20676.000                                  | .026     | DTT-ABA = N-ABA            |
| <i>DTT-ABA*D-ABA</i>       | 9313.500                                   | .035     | DTT-ABA = D-ABA            |
| <i>N-ABA*D-ABA</i>         | 29225.500                                  | .303     | N-ABA = D-ABA              |



**Significant Pairwise Comparisons for Participants**

**Pairwise Comparison between Four Conditions: Frank**

| <i>Pairwise Comparison</i> | Difference In Mean Motor Production |          |
|----------------------------|-------------------------------------|----------|
|                            | <i>U</i>                            | <i>p</i> |
| <i>N-ABA I* DTT-ABA</i>    | 26088.000                           | .125     |
| <i>N-ABA I*D-ABA</i>       | 16537.000                           | .561     |
| <i>N-ABA R*N-ABA I</i>     | 12,100.000                          | .001*    |
| <i>DTT-ABA*D-ABA</i>       | 31430.000                           | .028     |
| <i>N-ABA R*D-ABA</i>       | 14979.000                           | .001*    |
| <i>DTT-ABA*N-ABA B</i>     | 27762.000                           | .013     |

**Pairwise Comparison between Four Conditions: Harry**

| <i>Pairwise Comparison</i> | Difference In Mean Motor Production |          |
|----------------------------|-------------------------------------|----------|
|                            | <i>U</i>                            | <i>p</i> |
| <b>DTT-ABA I*N-ABA</b>     | 6160.000                            | .276     |
| <b>DTT-ABA I*D-ABA</b>     | 6114.500                            | .135     |
| <b>DTT-ABA I*DTT-ABA R</b> | 5777.000                            | .007*    |
| <b>N-ABA-DTT-ABA R</b>     | 12381.500                           | .099     |
| <b>N-ABA*D-ABA</b>         | 12657.000                           | .566     |
| <b>D*ABA-DTT-ABA R</b>     | 13344.500                           | .365     |

**Pairwise Comparison between Four Conditions: Jack**

| <i>Pairwise Comparison</i> | Difference In Mean Motor Production |          |
|----------------------------|-------------------------------------|----------|
|                            | <i>U</i>                            | <i>p</i> |
| <i>DTT-ABA I* N-ABA</i>    | 18003.000                           | .103     |
| <i>DTT-ABA I*D-ABA</i>     | 9885.000                            | .001*    |
| <i>N-ABA *D-ABA</i>        | 16985.500                           | .001     |
| <i>DTT-ABA R*D-ABA</i>     | 7740.000                            | .001     |
| <i>DTT-ABA R*N-ABA</i>     | 7740.000                            | .001*    |
| <i>DTT-ABA I*DTT-ABA R</i> | 11442.000                           | .120     |

**Pairwise Comparison between Four Conditions: Bill**

| <i>Pairwise Comparison</i> | Difference In Mean Motor Production |          |
|----------------------------|-------------------------------------|----------|
|                            | <i>U</i>                            | <i>p</i> |
| <i>N-ABA I* DTT-ABA</i>    | 10644.000                           | .099     |
| <i>N-ABA I*D-ABA</i>       | 15472.000                           | .942     |
| <i>N-ABA I*N-ABA R</i>     | 14478.500                           | .014     |
| <i>DTT-ABA*D-ABA</i>       | 9313.500                            | .035     |
| <i>N-ABA R*D-ABA</i>       | 13617.500                           | .060     |
| <i>DTT-ABA*N-ABA R</i>     | 10032.000                           | .017     |



Experiment Two: Data in Table Form

**Table 6: Mean Scores for Quality of Motor Production in each Condition for each Participant: Scores represent quality values for speech sounds based on a DFA of participants speech sounds**

| <i>Participant</i> | <u><i>Mean Motor Production</i></u> |                                |
|--------------------|-------------------------------------|--------------------------------|
|                    | <i>N-ABA</i>                        | <i>Developmental Condition</i> |
| <i>Jack</i>        | 8.73                                | 8.29                           |
| <i>Frank</i>       | 2.33                                | 2.79                           |
| <i>Bill</i>        | 13.71                               | 16.45                          |
| <i>Harry</i>       | 10.53                               | 9.50                           |

**Table 7: Results of statistical tests of Difference in Mean Quality Motor Production in N-ABA and Developmental conditions for each participant. An \* indicates significance.**

| <i>Participant</i> | <i>Difference In Mean Motor Production</i> |          |
|--------------------|--------------------------------------------|----------|
|                    | <i>U</i>                                   | <i>p</i> |
| <i>Jack</i>        | 21623.500                                  | .476     |
| <i>Frank</i>       | 28172.500                                  | .015*    |
| <i>Bill</i>        | 10018.000                                  | .046 *   |
| <i>Harry</i>       | 20454.000                                  | .194     |

**Table 8. Mean Scores for Quality of Motor Production in each Treatment Condition for each Participant: Scores represent values for speech sounds based on a DFA of participants' speech sounds**

| Participant  | <u>Mean Motor Production</u> |              |                  |
|--------------|------------------------------|--------------|------------------|
|              | <i>D ( A)</i>                | <i>N-ABA</i> | <i>D (B)</i>     |
| <i>Jack</i>  | 7.59                         | 8.73         | 8.73             |
| <i>Frank</i> | 2.93                         | 2.33         | 2.64             |
| <i>Bill</i>  | 15.68                        | 13.71        | 17.50            |
| Participant  | <i>N-ABA (A)</i>             | <i>D</i>     | <i>N-ABA (B)</i> |
| <i>Harry</i> | 11.43                        | 9.50         | 9.17             |

**Table 9. Results of statistical tests of Difference in Mean Quality Motor Production across three treatment conditions for each participant. An \* indicates significance**

| Participant  | Difference In Mean Motor Production |           |          |
|--------------|-------------------------------------|-----------|----------|
|              | <i>H</i>                            | <i>df</i> | <i>p</i> |
| <i>Jack</i>  | 6.548                               | 2         | .038*    |
| <i>Frank</i> | 16.666                              | 2         | .000*    |
| <i>Bill</i>  | 4.712                               | 2         | .095     |
| <i>Harry</i> | 13.384                              | 2         | .001*    |



Appendix III  
Distinctive Features Analysis

Table 1. Distinctive Features Analysis Grid of Common Speech Sounds made by

|         | /s/ | /p/ | /l/ | /t/ | /k/ | /d/ | /r/ | /b/ | /g/ | /f/ | /n/ | /ɪ/ | /ɑ/ | /ʌ/ |
|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| onantal | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | +   | -   | -   | -   |
| orant   | -   | -   | +   | -   | -   | -   | +   | -   | -   | -   | +   | +   | +   | +   |
| llabic  | -   | -   | +   | -   | -   | -   | +   | -   | -   | -   | +   | +   | +   | +   |
| pirated | -   | +   | -   | +/- | +/- | -   | -   | -   | -   | -   | -   | -   | -   | -   |
| oiced   | -   | -   | +   | -   | -   | +   | +   | +   | +   | -   | +   | +   | +   | +   |
| tinuant | +   | -   | +   | -   | -   | -   | +   | -   | -   | +   | +   | +   | +   | +   |
| ident   | +   | -   | -   | -   | -   | -   | -   | -   | -   | +   | -   | -   | -   | -   |
| labial  | -   | +   | -   | -   | -   | -   | -   | +   | -   | +   | -   | -   | -   | -   |
| orsal   | -   | -   | -   | -   | +   | -   | -   | -   | +   | -   | -   | +   | +   | +   |
| ronal   | +   | -   | +   | +   | -   | +   | +   | -   | -   | -   | +   | -   | -   | -   |

Participants

**Example of Distinctive Features Analysis of Target Word Book for Harry**

|                    | /b/ | /ʌ/ | /k/ |
|--------------------|-----|-----|-----|
| <b>Consonantal</b> | +   | -   | +   |
| <b>Sonorant</b>    | -   | +   | -   |
| <b>Syllabic</b>    | -   | +   | -   |
| <b>Voiced</b>      | +   | +   | +   |
| <b>Aspirated</b>   | -   | -   | +   |
| <b>Coronal</b>     | -   | -   | -   |
| <b>Continuant</b>  | -   | +   | -   |
| <b>Nasal</b>       | -   | -   | -   |
| <b>Dorsal</b>      | -   | +   | +   |
| <b>Labial</b>      | +   | -   | -   |

**1. /bʌk/**

**Potential Responses:**

- 0. no response – score of 0
- 1. /b/ - score of 3
- 2. /bʌ/ - score of 8
- 3. /bʌk/ - score of 11
- 4. /bʌʃ/ - score of 8
- 5. /bʌx/ (“buch”) - score of score of 10 (no aspiration)
- 6. /bʌx/ - score of 8 (/x/ is very softly pronounced)



**Appendix IV**  
**Full Transcript of Session One of Developmental Treatment: Harry**

- **Experimenter (E), Child (C), Tutor (T)**
- **Italics indicate a description of what the Child was doing**
- **Numbers beside the Child's responses indicate the quality value that was attributed to the response based on a DFA of sounds**

E: What are you listening to?

E: Frog

C: Froy 15

E: Frog

E: Yeah, ok you get the frog

*C plays with the frog*

*E takes the frog away and holds it up*

E: He's singing

C: s 4

E: Singing

C: b 0

*E gives the frog back to C*

E: Are you singing Harry?

E: Harry?

C: Froy 15

E: (laugh) frog, ok

C: Froy (laughs) 15

*E presents two toys, a frog and a Barney dinosaur*

E: Which, which one?

C: no response 0

E: Which one?

E: Barney?

E: Barney

C: Barrey 15

E: Barney? Ok (gives Barney to C)

*C plays with toy, E sets up game*

*E approaches Harry*

E: What are you doing Harry?

E: What are you doing? (E picks up Barney toy)

E: Want to play with Barney?

E: Come here Harry (indicates mat)

E: Let's play

E: Harry?  
C: Ha 9  
E: Barney  
C: Barrey (C doesn't move towards mat) 15  
E: Barney  
E: Come on let's play with Barney  
E: Do you wanna sit down and play with Barney?  
*C moves towards mat*  
E: Good boy  
E holds Barney toy up to C  
E: Play with Barney  
*C presses Barney toy to make music*

*C plays with Barney*

E: What do you want Harry?  
E: What do you want Harry?  
E: Harry  
*C presses Barney's foot (for music)*  
E: Barney  
C: Barrey 15  
E: Barney, there you go  
C: laughs  
E: laughs  
*C plays with Barney*

*C lies on the mat listening to Barney toy, E picks up Barney and leans over C to get attention*

E: What are you doing Harry?  
E: What are you doing? [playful voice]  
E: What?  
E: You're singing  
E: Harry... singing  
C: Si 9  
E: Singing  
E: Do you want Barney?  
C: Boya, boya 8  
E: Barney  
C: Barrey 15  
E: There you go, you get Barney  
*C plays with Barney*

*E holds up Barney*  
C: Barrey 15  
E: Barney (laugh) ok, Barney  
*C plays*



E: Harry (holds up Dinosaur)  
 E: Dinosaur  
*E plays with Harry and dinosaur*  
 C: laugh  
 E: What's this?  
 E: Dinosaur  
 C: Dino 18  
 E: Dino, yeah!  
*E plays with Harry*  
 E: He's eating Harry (E pretends dinosaur is trying to eat C)  
 E: Dinosaur  
 C: Dino 18 (stressed)  
 E: Dinosaur, well done! Dinosaur  
 C: &sound (high pitched sounds) 0  
 E: Harry  
 E: Raaaar, dinosaur  
 E plays with C  
 E: Dinosaur  
 Pause  
 C: no response 0  
 E: Harry, dinosaur  
 C: Dino 18  
 E: Dinosaur, good  
*C plays with dinosaur*  
 E: You're playing  
 E: What did the dinosaur say?  
 C: Fa 5  
 E: Raaar (E holds dinosaur close to C)  
 E: Raaar  
 C: Ra 11  
 E: Raaar, that's it, Raaar  
*C takes dinosaur and lies on the ground playing*  
  
 C: Pallilalia while playing with dinosaur  
*C chews on Dinosaur toy*  
 E: Don't eat the dinosaur  
*E removes dinosaur*  
 E: ok  
 E: Sit up Harry  
 E: Sit up  
*C attempts to sit up*  
 E: Oh, good listening  
 E: Sit up nicely  
 C: bo bo (echolalia) 0  
*C sits up*  
 E: Oh lovely listening Sam well done

E: Do you want the dinosaur?  
*E holds up dinosaur*  
C: Fa dee dee dee (excited speech sounds while Harry is looking at dinosaur)  
E: Dino  
C: Da 3  
E: Dino  
C: Dino 18  
E: Dino (laugh) well done good boy  
*C takes dinosaur and plays while babbling (fa& dee& dee& sounds)*

*E takes dinosaur back*  
E: Harry, mine!  
C: Moy 11  
E: Mine  
C: Fa 0  
E: What do you want?  
C: Da 3  
E: Dinosaur?  
C: Do 3  
E: Dinosaur, oh!  
E: Sam gets the dinosaur  
*E gives C the dinosaur*  
*C plays with dinosaur*  
C: doh& doh&  
E takes dinosaur  
E: Harry, sit up  
E: Sit up  
*C moves*  
E: Good boy  
*E points to Dinosaur's tail*  
E: Tail  
C: Tai(1) 8  
E: Tail, yeah!  
*E gives C the dinosaur and gets a second one*  
E: Tail  
C: no response 0  
E: Sam, tail  
C: Tai(1) 8  
E: Tail, yeah it's tickly  
*E tickles Harry*  
E: woops!  
*C babbles while playing*

E talks to T in an aside  
C is lying on the floor  
E: Harry, sit up



Harry moves  
 E: Oh, lovely listening  
*C rolls around on the mat*  
 E: You're just enjoying this aren't you?!  
*E rolls a car towards C*  
 E: What's this?  
 E: Car  
 C: Ka 8  
 E: Car, well done  
*E gives car to C*  
 E: Will I get another car?  
*E pushes one car towards C and moves another one back and forth*  
 E: There's your car  
 E: What are they doing?  
 C: no response 0  
*C lies on one side happily talking (short motor productions) to himself*  
 E: Car  
 C: Ka 8  
 E: Well done you get the car  
*C plays with cars*  
 E: Excellent Harry, you've got two cars!  
*C makes several low motor productions*  
 E takes a car and drives one truck over the car  
 E: Will you drive over?  
*C does not attend, lies on one side*  
 E: Harry, Harry  
 E: Playing nicely  
 E: Sit up  
*C does not respond*  
 E: Sit up (pause)  
 E: Sit up  
*C rolls over on the floor*  
 E: Harry  
*C looks at E*  
 E: Sit up  
 E: Sit up (demonstrates how to sit up)  
*Experimenter realises Harry is more familiar with "sit down" for sitting*  
  
 E: Sit down  
 C: Dow(n) 8  
  
*E and T talk briefly about C's typical behaviours in class*  
*E picks up dinosaur*  
 E: Dino  
 C: Dino 18  
 E: Oh!

*E taps mat*

E: Come here and play nicely

E: Let's get the dinosaur

*C rolls on the mat and speaks in high pitched tones, does not engage with E*

E: Come here and play nicely

C: laugh (rolls around)

*E and T talk briefly about C's typical behaviours in class*

*E approaches to child*

E: Tickles

*E tickles child*

C: Tickle 16

E tickles C

C laughs

E: Harry, tickles

C: tickle 20

*E laughs and tickles C*

E: Tickles, great!

C: wo& wo& (excited) 0

E: What do you want?

E: What do you want?

C: Ti 8

E: Tickles

C: Tick 10

E: Tickles!

*E tickles Harry*

*Harry rolls around on the mat*

E: Harry, come here, let's get the tickles

E: Sit down

*C stays lying on the mat*

E: Harry, come here

E: Harry, come here

*E tried to help C to sit up*

*C's clothes get caught on the mat*

E: You're stuck to the mat (laugh)

E: Show me sitting nicely Harry

*C tries to sit up*

E: Oh that's better

E: Sit nicely, come on

E: Do you want to play?

*C makes a move towards E*

E: Yes play, oh!

E: Sit up

*Pause*

E: Sit up



*C stays lying down and hands E a PECS picture with "open" written on it*

E: Open?

C: Ope(n) 13

E: Open

*E places PECS picture back*

E: We're going to play Harry

*E holds up dinosaur*

E: Do you want to play with the dinosaur?

*C looks at dinosaur*

E: Ok, up!

E: Come on, sit up Harry

E: Harry, sit up

T: Tell him to "sit nicely"

E: Ok, sit nicely

E: Sit nicely

*C moves to sit up*

E: Ok lovely sitting nicely Harry!

E: Dino

C: Dino 18

E: Dino, well done Harry

*C plays with dinosaur*

*E holds up second dinosaur*

E: Harry (pause) Harry

*C lies on the mat not attending*

E: Sit nicely

E: Dino

C: Dino 18

E: Dino, well done

*E plays with C, tickling him with dinosaur*

E: Oh tickling Harry!

E: Tickles

C: Ti 8

E: Tickles

C: Tick 10

E: Tickles for Harry (laugh)

*C rolls away laughing*

E: Harry (pause) Harry

*E holds dinosaur up*

E: Sit nicely

*Harry sits up*

E: Good listening Harry

E: Good listening, you ready?

*E holds up dinosaur*

E: Dino

C: Dino 18

E: Dino well done  
*E tickles C with dinosaur*

C: (laugh)

E: Dino

C: Dino 18

*E gives dinosaur to C*

E: Dino, excellent

E: Very good Harry

*C plays with dinosaur*

*E and T chat with each other briefly*

*C rolls on mat and laughs*

E: Harry

*E asks T a question*

E: Ok Harry, sit nicely

E: (Pause) sit nicely

C tries to sit up

E: Oh, great sitting nicely

*E shows C a car*

E: Car

C: Ka 8

E: Car

C: Ka 8

E: Car, well done

E: You get that car

*E gives C a car and points to another car*

E: Get me that car

E: Get me car

*C picks up dinosaur*

E: That's a dinosaur

E: Dino

E: You want the dino?

E: Dino

C: Dino 18

*E plays with C using dinosaur toy*

E: Dino (laugh)

C: Dino 18

*Both play with dinosaur*

E: Tickles

C: Ticka 10

E: Tickles for Harry

E tickles C

E: Dino

C: Dino 18

E: Dino, raaar, it's eating Harry!

*E pretends to make dinosaur eat Harry*



*C lies on mat repeating sounds*

*E picks up toy frog*

E: Frog

E: Sam, frog

C: Froy 15

E: Frog

E: Sentence

*E gives C the frog*

*E picks up frog and dinosaur*

E: Which do you want Harry?

C: Froy (points to dinosaur) 15

E: Dinosaur

*Harry reaches for the dinosaur but stays lying on the mat*

E: Sit up Harry

E: Sit nicely

*C sits up*

E: Good boy, well done

E: Turn around

*Pause*

E: Turn around

E: Oh, that's fine

E: Dino

C: Dino 18

E: Dino

*E plays with C*

E: Dino

C: Dino 18

E: Dino

*E plays with C and gives him two dinosaurs*

E: Both dinosaurs for Harry!

*C rolls on mat with dinosaurs*

E: Harry

*E takes dinosaurs and holds them up to C*

E: Raaar

C: R 6

E: Raaar

C: &sound 0

E: Raaar

C: Laugh 0

E: Raaar

C: laugh 0

E: Dino

C: Dino 18

E: Dino

C: laugh 0  
E: Dino  
C: laugh dino 18  
E: Dino  
C: Dino 18  
E: Dino (deep voice) very good!  
C: laugh  
E: Dino  
C: laugh 0  
E: laugh, you're laughing too much (playful voice)!  
C: Dino 18  
E: Dino (deep voice)  
*E gives C two dinosaur toys together*  
E: Both together, look at that!  
*C plays with dinosaurs*

*C lies down away from E*  
E: Harry, are you sleeping?  
C: Pa 3  
E: Sleeping  
E: Sleeping  
E: Harry (pause) sleeping  
E: Give me dinosaurs  
C: laugh 0  
E: Aw, they're...  
*E makes the dinosaurs run*  
E: What are they doing?  
C: bo 0  
E: Running  
C: no response 0  
E: Dino  
C: Dine 13  
E: Dino (deep voice) back for Harry!  
E: Long tail

*Timer goes off*

*E: Ok finished!*