BEHAVIOUR PREDICTORS OF CHILD DEVELOPMENT AND PARENTING STRESS TRAJECTORIES OF CHILDREN WITH AUTISM

by

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Abstract

Little is known about the factors that predict change over time in children with autism and their parents. This research addressed the predictive relationship of six child behaviours – acting-out, sleep disturbances, eating difficulties, stereotypic behaviours, social unresponsiveness, and inattentiveness – on changes in child language, cognitive, and adaptive skills and on changes in parenting stress over 2 years. Participants were 70 young children with autism (mean age: 4;2) and their mothers. Child behaviour variables were constructed using a six step procedure. Structural equation modeling was used to explore the relationships between child behaviours and child and parenting stress trajectories from T1 to T4. Results indicated that (a) high scores for acting-out behaviour at T1 predicted a greater increase in the rate of change (ROC) of expressive vocabulary, expressive language, and social skills; (b) high scores for stereotypic behaviour at T1 and reduced eating difficulties over 6 months predicted a greater increase in the ROC of social skills; (c) reduced stereotypic behaviour over 6 months predicted a greater increase in the ROC of cognitive skills; (d) reduced stereotypic behaviour over 1 year predicted a greater increase in the ROC of expressive language and daily living skills; (e) high scores for inattentive behaviour at T1 predicted less increase in the ROC of receptive and expressive vocabulary, expressive language, and daily living skills; and (f) improvement in inattentive behaviours over 1 year predicted a greater increase in the ROC of expressive vocabulary. The results also revealed that: (a) reduced acting-out behaviour over 6 months predicted less increase in the ROC of maternal stress related to managing

children's behaviour; (b) reduced sleep disturbances and stereotypic behaviour over 6 months predicted a greater increase in the ROC of overall maternal stress and specific stress related to parent competence; (c) reduced eating difficulties over 1 year predicted a greater increase in the ROC of maternal stress related to managing children's behaviour; and (d) reduced inattentive behaviour over 6 months predicted less increase in the ROC of maternal stress related to both parent competence and parent-child interactions. Interpretations of the findings, implications for treatment efficiency, and considerations for future research are discussed.

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CHAPTER 1

Introduction

Our understanding of autism, how to treat individuals with it, and how to support their families has come a long way since Leo Kanner first described 11 children as having inborn autistic disturbances of affective contact (Kanner, 1943). Currently, autistic disorder is one of five autism spectrum disorders (ASDs) that also include Rett syndrome, Childhood Disintegrative Disorder, Asperger's syndrome (AS), and Pervasive Developmental Disorder–Not Otherwise Specified (PDD-NOS) (American Psychological Association, 2000). The symptoms of autism are evident within the first 3 years of life and include significant difficulties with social interaction; delayed or abnormal functioning in verbal and non-verbal communication; and unusual patterns of behaviour (e.g. restricted interests, repetitive activities, stereotyped movements, and/or unusual responses to sensory stimuli).

It appears that the prevalence rate of ASD is on the increase. When epidemiological studies were first conducted, the rate of autism was estimated at approximately 4 to 5 cases per 10,000 births (Lotter, 1966). However, a recent study found that the prevalence rate was 58.7 per 10,000 preschool children for all pervasive developmental disorders, with autism at 22 per 10,000 and all other variants of autism at 36.7 per 10,000 (Chakrabarti & Fombonne, 2005).

Today, many more children are diagnosed with autism than in the past and, as a result, more families are faced with the challenge of deciding how to best support their children's developmental progress. In both Canada and the United States, there has been much discussion, debate, and litigation regarding the effectiveness of various treatment

approaches, resulting in provinces such as British Columbia funding early intervention services for children with ASD. However, it is still premature to claim that one treatment approach is more effective than another (Prizant & Rubin, 1999). Instead, research must move forward to better understand the relationships among child and family characteristics, intervention approaches, and child change in order to aid families and governments to make informed decisions about how to maximize the effectiveness of scarce funding dollars.

The Effectiveness of Early Intervention for Children with Autism

Early intervention for children with autism has evolved substantially since the 1960s and 1970s, when researchers first demonstrated that these children are able to learn and develop through structured teaching using applied behaviour analysis (e.g. Ferster & Demyer, 1962; Jensen & Womack, 1967; Lovaas, 1974; Lovaas & Koegel, 1973; Lovaas, Koegel, Simmons, & Long, 1973). Today, there is mounting evidence that intensive early intervention that involves a range of behavioural and naturalistic approaches is effective for a substantial number of young children with autism (Woods & Wetherby, 2003). However, the outcomes for children receiving intervention continue to be variable. Some children display remarkable improvements, while others do not (Rogers, 1998). For example, Lovaas (1987) reported that, of 19 young children with autism who received up to 40 hours of intensive behavioural treatment over 2 years, 47% achieved normal intellectual and educational functioning, 40% were mildly retarded and assigned to special classes, and 10% were profoundly retarded and assigned to segregated settings at follow-up. A recent replication study in which 24 young children received an average of 38 hours per week of intensive behavioral intervention over 2 years reported similar

outcomes; 48% of the children achieved IQ scores in the normal range and were placed in regular, age-level classrooms, while the remaining children made less dramatic progress (Sallows & Graupner, 2005). Strain, Kohler, and Goldstien (1996) also reported that, of 51 children with autism who received 2 years of treatment in the LEAP preschool using incidental and naturalistic teaching techniques, 47% were placed in regular public school settings.

Despite these and other positive outcomes, Volkmar and Pauls (2003) estimated that, even with early identification and intervention, only approximately 15% of individuals with autism can be reasonably self-sufficient as adults and another 15% to 20% can function well with periodic support. In a review of treatments for young children with autism, Schriebman (2000) noted this wide heterogeneity in the outcomes of intervention and remarked that these findings suggest that there is no "one size fits all" treatment for this population. The lack of 100% effectiveness of early intervention leads one to conclude that there are other variables affecting outcomes that have not yet been identified (Ingersoll, Schreibman, & Stahmer, 2001). Identifying these variables and understanding the process of development in autism and the factors that influence the differential outcomes observed in the literature are critical in order to improve treatment efficiency.

One approach used to identify variables that affect the outcomes of early intervention is to examine the relative effectiveness of one treatment compared to another -- for example, traditional behavioural versus contemporary behaviour analytic interventions (e.g., "Lovaas therapy" versus incidental teaching). This approach, however, requires randomly assigned, matched-control samples, which is often difficult

to achieve because many parents wish to choose – rather than be assigned -- the method of intervention for their children (Prizant & Rubin, 1999). In addition, this approach focuses solely on treatment characteristics and ignores the individual differences among children with autism themselves. Kluth (2003) noted that autism is a complex spectrum disorder whereby no two individuals appear to have the same experiences. Thus, comparing one treatment approach to another without taking child differences into account can be overly simplistic. An alternative approach that can be used to better understand differential outcomes is to examine the individual differences among children and how these differences affect development over time.

Individual Child Differences and Links to Other Child Characteristics

Pre-treatment IQ scores (Gabriels, Hill, Pierce, & Rogers, 2001; Harris & Handleman, 2000; Liss et al., 2001; Lovaas & Smith, 1998; Sallows & Graupner, 2005; Smith, Eikeseth, Klevstrand, & Lovaas, 1997), age at the start of intervention (Fenske, Zalenski, Krantz, & McClannahan, 1985; Harris & Handleman, 2000; Lovaas, 1987), and autism severity (DeMyer, 1973; Eaves & Ho, 1997; Liss et al., 2001) have all been found to be good predictors of cognitive, language, and adaptive behaviour outcomes of early intervention. However, these broad child characteristics are "unchangeable" and tell us little about which skills to target in order to improve treatment efficacy. Recently, researchers have taken a new direction and have examined specific "treatable" child skills that are associated with differential changes in child development. These skills include early language behaviours such as verbal imitation (Sallows & Graupner, 2005; Smith, Zaidman-Zait, & Mirenda, 2005; Stone & Yoder, 2001), synchronized behaviour with caregivers (Rollins & Snow, 1998; Siller & Sigman, 2002), early language and nonverbal

skills (Szatmari, Bryson, Boyle, Streiner, & Duku, 2003), joint attention (Charman et al., 2003; Rollins & Snow, 1998; Travis, Sigman, & Ruskin, 2001; Sigman & McGovern, 2005; Smith et al., 2005), and early gestures (Brady, Marquis, Fleming, & McLean, 2004). A few longitudinal studies have examined the predictive effects of these skills on changes in child characteristics over time. For example, Rollins and Snow (1998) found that both joint attention and responsive parental interactions with children with autism at age 1;2 predicted the children's grammatical development at age 2;7. Stone and Yoder (2001) followed 35 children with autism and found that children who had stronger imitation skills at age 2 had better expressive language outcomes at age 4, over and above the effects of their initial language levels. Siller and Sigman (2002) examined 25 children with autism, 18 children with developmental disabilities, and 18 typically developing children from early childhood to the age of 16, over three time points. They found that children with autism who made significant gains in language and communication skills over 1-, 10-, and 16-year intervals had caregivers who showed higher levels of synchronized and undemanding utterances at baseline. Szatmari et al. (2003) found that early language and nonverbal skills measured at 4 to 6 years of age were important predictors of adaptive behaviour 2 years later in 47 children with autism and 21 children with Asperger's syndrome. Charman et al. (2003) found that children with autism and PDD-NOS who displayed increased responsiveness to joint attention and increased imitation at 20 months had increased levels of receptive (but not expressive) language at 42 months. Charman et al. (2005) found that the number of non-verbal communicative interactions observed at age 2 was a good predictor of language, communication, and social development at age 7 for 29 children with autism. Smith et al. (2005) found that

both gestures to initiate joint attention and verbal imitation skills predicted higher expressive vocabulary scores over 2 years in children with autism who received early intervention. Sallows and Graupner (2005) found that a combination of pre-treatment language age and verbal imitation, daily living, and socialization skills were highly predictive of early intervention outcomes. Sigman and McGovern (2005) found that functional play skills, responsiveness to others' bids for joint attention, and frequency of requesting behaviours in early childhood predicted language skills in adolescence for 48 children with autism followed over 16 years. Finally, in a study of children with developmental disabilities or PDD-NOS, Brady et al. (2004) found that children's communication rate, the extent to which they used proto-declarative pointing, and the amount of responsive parental interactions all predicted positive communicative development over 2 years.

Despite these interesting findings, our understanding of which specific child skills are related to child change is in its infancy. It appears from recent research that treatments focused on promoting parent-child responsivity and on increasing prelinguistic communication skills (e.g., responding to and initiating gestures for joint attention, verbal imitation skills, and the rate of communicative acts) may improve the outcomes of children with autism over time. However, these may not be the only child behaviours involved in the differential changes in child development observed in children receiving early intervention.

Child and Family Characteristics and Parenting Stress

Intervention must be viewed within the context of the family and family outcomes, not just child development, must be examined. One family measure that has

received the most attention is parenting stress. Holroyd and Lazurus (1982) defined stress as occurring when "environmental and/or internal demands tax or exceed the individual's resources for managing them" (p. 22). Although most families experience stress resulting from discrete events or natural life changes over time (e.g., a parent's job loss or a child entering puberty), research has demonstrated that families of children with autism or other developmental disabilities experience higher levels of stress than families of typically developing children (Boyce & Behl, 1991). In fact, it seems that parents of children with autism endure more stress than parents of children with other disabilities (Dunn, Burbaine, Bowers, & Tantleff-Dunn, 2001). These parents tend to experience not only typical family stressors, but also a pile-up of stressors that can result from ongoing childcare demands (McCubbin & Patterson, 1982). In turn, these ongoing special care demands, along with multiple demands on family resources, can lead to significantly higher stress levels for parents and disruption of family relationships (Floyd & Gallagher, 1997; Smith, Oliver, & Innocenti, 2001). On the other hand, not all families with children with autism or other developmental disabilities experience elevated levels of stress compared to families raising children who are typically developing. In fact, some families report that having a child with a developmental disorder such as autism enhances family functioning and that the presence of a child with a disability does not always lead to decreased family well-being (Dyson, 1996; Floyd & Gallagher, 1997; VanRiper, 2001).

The question then arises: Why do some families thrive while others become burdened by stress? In order to truly understand the impact that a child with autism has on parenting stress, one must examine the various processes that are related to stress within family systems. These include the impact of coping styles and negative life events

experienced and how both of these factors interact with specific characteristics observed in the child.

A Model of Family Stress

One model of stress and coping that examines the interactions within families systems is the Double ABCX model of family adaptation developed by McCubbin and Patterson (1983). In this model, "X," the stress of raising a child with a disability, is influenced by "A," the characteristics of the child and the pile-up of stressors and strains (e.g., life events); "B," the parental perceptions of the child's disability and the parental coping style; and "C," the family's external and internal resources and supports. These variables change over time in families, thus producing the "double" in the double ABCX model (Hodapp, Dykens, & Masino, 1997). This model is only one of many used to examine interactions within family systems and parenting stress; others include the Resiliency Model of Family Stress (McCubbin & McCubbin, 1991), the Family Caregiving Model (McDonald & Gregiore, 1997), and the parent-child interactive model of stress (Mash & Johnston, 1990). However, the Double ABCX model appears to provide a template upon which to describe the interplay of three key variables -- (1) child characteristics, (2) negative life events, and (3) parent coping styles -- that can influence parenting stress levels in families caring for children with autism.

Child characteristics and parenting stress. Child characteristics are one of the factors that must be addressed when examining parenting stress. It goes without saying that all children with autism do not present with identical skill levels. Thus, it is more useful to examine how specific within-child characteristics make the impact of a specific disability more or less stressful for parents (Richdale, Francis, Gavidia-Payne, & Cotton,

2000) than to examine whether specific disabilities themselves (e.g. autism versus Down syndrome) are related to parenting stress.

Several researchers have found that one of the primary sources of parenting stress is the presence of child behaviour problems (e.g., Cameron & Armstrong-Stassen, 1991; Floyd & Gallagher, 1997; McDonald & Gregoire, 1997; Richdale et al., 2000). For example, when comparing children with mental retardation to children with chronic illnesses, behaviour problems were found to be a better indicator of parenting stress than the type of disability (Floyd & Gallagher, 1997). Cameron and Armstrong-Stassen (1991) also found that child behaviour problems (e.g., harming oneself or others or interrupting the sleep of others) were significantly related to parenting stress, and that the more "extreme" the child's behaviour problem, the higher the level of stress. Other researchers have found that increased levels of behaviour problems also have indirect effects on parenting stress. Indirect effects occur when behavioural challenges limit family activities or school placements, are associated with sleep problems, or result in reduced extended family support -- all of which, in turn, result in decreased coping and increased stress (Floyd & Gallagher, 1997; McDonald & Gregoire, 1997; Richdale et al., 2000).

Coping style and parenting stress. Coping style is another factor that must be addressed when examining parenting stress. People cope with stress in different ways. Some people avoid or escape stressful situations entirely, while others use strategies such as emotional distancing; positive re-framing by redefining stressful events to make them more manageable; positive or passive appraisal; accepting problem situations by minimizing their reactions; or a combination of these. The type of coping style used by parents of children with developmental disabilities has been found to correspond to

family outcomes. For example, Dunn et al. (2001) found that a coping style based on escape and avoidance was related to increased depression, isolation, and spousal relationship problems for parents of children with autism. They also found that parents who presented with higher levels of stress used a smaller range of coping styles and/or failed to use emotional distancing at all. Cameron and Armstrong-Stassen (1991) found that the use of positive re-framing resulted in decreased stress levels in mothers of adults with developmental delays. Thus, parent coping styles appear to have a significant impact on the stress levels experienced by parents of individuals with disabilities across the age range.

In summary, the variables that are likely to affect the stress and coping process in families of children with autism appear to include child characteristics (e.g., behavioural difficulties), negative life events experienced, and internal family processes (e.g., coping style). It is these variables that practitioners who provide services to families of children with autism must take into consideration.

Summary

Past research has supported the effectiveness of early intervention for children with autism (Prizant & Rubin, 1999). However, little is known about the predictors of differential changes over time found for children and their parents. The present study was designed to expand our current understanding of the predictors of both child and family change by examining individual differences in the development of children with autism and their families over time. Specifically, the goal of this research was to determine the influences of six clusters of child problem behaviours – namely, acting-out behaviours, sleep disturbances, eating difficulties, stereotypic behaviours, social unresponsiveness,

and inattentiveness -- on both child change and parenting stress in children with autism who received intensive behavioural intervention over a 2-year period. Chapter 2 reviews the existing literature on the relationship between child behaviours and both other child characteristics for children with autism and parenting stress for the families of these children.

CHAPTER 2

Review of the Literature

The primary purpose of this investigation was to examine child behaviours as predictors of both changes in child characteristics and changes in parenting stress for children with autism receiving intensive behavioural intervention over 2 years. In this review, "child behaviours" refer to the following six behaviour clusters: acting-out behaviours, sleep disturbances, eating difficulties, stereotypic behaviours, social unresponsiveness, and inattentiveness. "Child characteristics" refer to children's language, cognitive, adaptive behaviour, and autism severity scores. Finally, the term "predict" refers to an influential, not a causal, relationship between two variables, in which the "predictor" variable (e.g., child behaviour) is measured prior to the outcome variable (e.g., child characteristic or parenting stress).

Despite findings that imply that child behaviours may be related to other child characteristics and/or can impact parenting stress over time, very few studies have specifically examined the sources of variability in child development and parental well-being longitudinally and within the context of early intervention (Hauser-Cram, Warfield, Erikson, Shonkoff, & Kraus, 2001). In addition, the majority of studies found in this area are descriptive or cross-sectional in nature; focus mainly on families and older children with developmental delays other than autism; and include children who did not receive early intervention services. This literature review will examine these issues in two sections. First, each of the six child behaviours used as predictors of child characteristics will be examined. Second, the same six child behaviours will be reviewed as predictor variables of parenting stress. These sections will then be followed by a cumulative

summary of the research and a statement of the current problem and overview of the study.

Child Behaviours as Predictors of Other Child Characteristics

Acting-Out Behaviour: Links to Child Characteristics

In this review, acting-out behaviour refers to behaviours that can cause harm or potential harm to a child and/or to the environment. Examples of acting-out behaviours include self-injury, tantrums, aggression towards others, and property destruction. Recent research findings have indicated that the presence of acting-out behaviours in children with developmental disabilities appears to influence their cognitive development (Hauser-Cram et al., 2001). This may be because the inability to regulate one's behaviour during cognitively demanding tasks or situations places these children at a disadvantage over children who are able to do so (Bronson, 2000; Hauser-Cram et al., 2001). In addition, children with acting-out behaviours may be rejected by their peers and as a result are deprived of opportunities to practice and develop prosocial skills such as sharing and cooperating (Kaiser & Rasminsky, 2003).

No studies have examined the impact of acting-out behaviours on the development of young children with autism receiving early intervention, and only one has examined this issue with children with other developmental disabilities. In this study, Hauser-Cram et al. (2001) examined acting-out behaviour as a predictor of child outcomes in a 10-year investigation of 183 young children with Down syndrome, motor impairments, or developmental delays of unknown etiology. They found that the children who were rated at 3 years of age by their teachers as having higher levels of acting-out behaviour demonstrated the least cognitive growth over the next 10 years. Thus, it

appears the acting-out behaviour was inversely related to cognitive growth over time. This research is the first to directly link acting-out behaviours to changes in other child characteristics in children with developmental disabilities. However, more research is needed to examine this issue for children with autism who display such behaviours.

Sleep Disturbances: Links to Child Characteristics

In this review, sleep disturbances refer to unusual sleep behaviours such as being often frightened by dreams; screaming during sleep and cannot be comforted; waking often and not falling back asleep; and not having a regular sleep schedule. Although the prevalence rate of sleep problems for children with autism has been estimated between 44-83% (Richdale, 1999), research examining the link between sleep disturbances and the development of other child characteristics in children with autism is in its infancy. In typically developing children, sleep problems appear to be associated with cognitive impairments; altered emotional states; inflexibility to change; reduced learning rates; and an increase in behaviours that interfere with learning, such as inattentiveness, aggression, hyperactivity, non-compliance, and irritability (Schreck, Mulick, & Smith, 2004). Wiggs and Stores (1996) assessed the sleep patterns, daytime behaviour, and challenging behaviour of 209 young children with severe learning disabilities (mean age: 10). They found that children who had severe sleep problems were more likely to be irritable, lethargic, hyperactive, and displayed more stereotypic behaviours and acting-out behaviours such as self-injury, aggression, screaming, temper tantrums, non-compliance, and impulsivity. Schreck, Mulick, et al. (2004) examined a database that included one-time parent reports of the sleep problems of 55 children with autism (mean age: 8;2) and found that sleep problems were related to various autistic symptoms and behaviours.

Children with autism who had increased sensitivity to stimuli in the sleeping environment, periods of screaming during the night, and/or fewer hours of sleep displayed difficulties in communication, increased stereotypic behaviour, and difficulties with social interactions. In addition, they found that the number of hours of sleep per night alone predicted the severity of autistic symptoms; children who had fewer hours of sleep had more severe symptoms, as measured by the Gilliam Autism Rating Scale (GARS: Gilliam, 1995). Hoffman et al., (2005) compared parent responses on the Children's Sleep Habits Questionnaire (CSHQ) from 80 parents of young children with autism (mean age: 8;2) with their children's GARS scores. They found that sleep disordered breathing was the best predictor of stereotypic behaviour, social interactions, and overall level of autism. In addition, they found that parasomnias such as sleep apnea, nightmares, and sleep walking were predictive of level of developmental disturbances and overall level of autism. These studies link sleep problems to child characteristics in the areas of communication, stereotypic behaviour, acting-out behaviour, social interactions, and autism symptomatology.

Eating Difficulties: Links to Child Characteristics

In this review, eating difficulties refer to unusual food intake behaviours such as eating a limited variety of foods, gagging, and/or having strong preferences for certain tastes and smells. It has long been noted that many children with autism present with unusual eating patterns and feeding difficulties (Archer & Szatmari, 1991; Cornish, 1998; Gray, 1994; Schreck, Williams, & Smith, 2004; Williams, Dalrymple, & Neal, 2000). Reports of the prevalence of eating difficulties in children with autism range from 42% (Archer & Szatmari, 1991) to 94% (De Meyer, 1979); in general, children with autism

exhibit more eating and mealtime problems than typically developing children (Schreck, Williams, et al., 2004). Such problems include eating a restricted range of foods, refusing foods, requiring specific presentations of foods, eating only specific textures, and using only specific utensils (Schreck, Williams, et al., 2004).

Archer and Szatmari (1991) are the only authors to date who have examined the relationship between eating difficulties and other child characteristics in children with autism. They investigated children between 5 and 6 years of age who were typically developing, had autism, or were identified with specific eating problems. They found that 42% of the children with autism presented with eating and mealtime problems. For these children, there was a significant correlation between their total eating problem score and their total autism severity score, as measured by the Autism Behavior Checklist (ABC; Krug, Arick, & Almond, 1980). In other words, the children who had greater eating problems had more severe autism. Further analyses also revealed significant correlations between children's eating problems and their ABC scores on the subscales for relating, language, socialization, and self-help skills. These findings suggest that the eating problems present in many children with autism may be linked to other child characteristics.

Stereotypic Behaviour: Links to Child Characteristics

Stereotypic behaviours refer to repetitive behaviours that involve abnormal movements of the body such as rocking back and forth, flapping the arms, spinning around, squinting the eyes, and/or inappropriately touching items or people. They also include strong reactions to change and/or becoming involved in complicated rituals such as lining things up. Considerable research has focused on the functions of and

interventions related to stereotypic behaviours exhibited by children with autism (e.g., Goldstein, 2002; Horner, Carr, Strain, Todd, & Reed, 2002; Polirstock, Rovert, Lawrence, & Serifino, 2003; Turner, 1999). However, only a few studies have examined the direct relationship between stereotypic behaviours and the development of other child characteristics. Epstein, Taubman, and Lovaas (1985) explored changes in stereotypic behaviours in six young children with autism who received intensive behavioural treatment over 2 years. They found that the children whose stereotypic behaviours changed most dramatically from "low-level" motor behaviours (e.g., rocking, spinning, or twirling) to "high-level" stereotypies (e.g., lining up objects or preoccupations) also had the best academic outcomes 2 years later, as measured by school placement. Dadds, Schwartz, Adams, and Rose (1988) examined stereotypic behaviours in 12 children with autism (mean age: 8;6) and found that those with the most stereotypic behaviours had lower levels of personal contact and lower language ages. Campbell et al. (1990) examined the stereotypic movements of 224 children with autism (mean age: 4;7) and found that children who had more stereotypic behaviours also had lower IQ scores and higher autism severity scores, as measured by the Clinical Global Impressions severity of illness item (CGI; National Institute of Mental Health, 1985). Venter, Lord, and Schopler (1992) followed 58 young children with high-functioning autism from preschool to school age over a period of 8 years. They found that, among other things, parental reports of restricted, repetitive behaviours in preschool predicted adaptive behavior and achievement scores 8 years later. Bodfish, Symons, Parker, and Lewis (2000) examined the rate of occurrence of repetitive behaviours in 32 adults with autism to see if rate predicted overall autism severity. In their correlational analyses, they found that severity

scores for stereotypy, self-injury, compulsions, dyskinesia (i.e., repetitive, involuntary movements), and akathisia (i.e., repetitive, restless movements such as pacing) significantly predicted autism severity scores, as measured by the Autism Behavior Checklist. In other words, adults with a higher number of stereotypic behaviours had more severe autism. Finally, Gabriels, Cuccaro, Hill, Ivers, and Goldson (2005) examined the relationship between repetitive behaviours and cognitive and adaptive functioning levels in 14 children with autism (mean age: 10;7). They found that children with lower cognitive and communicative abilities had significantly more stereotypic behaviours when non-verbal IQ was not used as a covariate.

Social Unresponsiveness: Links to Child Characteristics

Another set of child behaviours that may be linked to other child characteristics is social unresponsiveness, which is defined as a decreased "capacity to engage in social exchanges in ways that 'invite' others to reciprocate" (Dunst, Trivette, Hamby, & Pollock, 1990, p. 208). Socially unresponsive behaviours include, for example, lack of smiling in response to others and/or lack of responsiveness to verbal or physical overtures. By definition, children with autism exhibit such socially unresponsive behaviours. For example, Sigman, Kasari, and Kwon, and Yirmiya (1992) found that young children with autism failed to respond when an adult displayed fear or distress, either verbally or through body language. Only a few studies, however, have examined the link between social unresponsiveness and other child characteristics. Dunst et al. (1990) examined children with mental retardation, physical impairments, or developmental delays (mean age: 2;4) and found that social responsiveness accounted for 34% of the variance in child progress over 1 year, as measured by mental age.

Dissanayake, Sigman, and Kasari (1996) followed young children with autism (mean age: 3;6) over 5 years and assessed their responsiveness to an adult's display of distress (i.e., an adult "hurting" her ankle and crying in pain). They found that, at each assessment time point, children's ability to respond to the adult was positively associated with cognitive level – that is, children who were more responsive had higher cognitive skills. Sigman and Ruskin (1999) examined children with autism, Down syndrome, or developmental delays between the ages of 10 and 13 and found that prelinguistic communication skills such as joint attention behaviours, the ability to engage in social exchanges, and social responsiveness to others were all predictors of peer engagement in children with autism over time. Finally, Beadle-Brown, and Murphy (2005) followed 91 individuals with intellectual disabilities, including autism, over 3 time points expanding 25 years (T1 - mean age: 8;11; T2 – mean age: 20;11; T3 – mean age: 34). They found that there was little change in social impairments over time as measured by the Schedule of Handicaps, Behaviors, and Skills. In addition, low levels of social impairment at T3, especially participants who were described as "aloof" (i.e., indifferent or interacting only to obtain needs), more challenging behaviour at T3, and low IQ at T1 predicted 81% of the variance in participants with poor or very poor outcomes (note: "outcome" was calculated from mean scores on the Schedule of Handicaps, Behaviors, and Skills including communication and social skills, work situation, residential placement, and a quality of life measure). From these findings, it appears that a lack of social responsiveness may be a predictor of delayed development of cognitive, daily living, and social skills for children with autism.

Inattentiveness: Links to Child Characteristics

A final child behaviour that may be linked to other characteristics in children with autism is inattentiveness. In this review, inattentiveness refers to children's inability to make eye contact; maintain attention to others or activities; or attend to sudden changes in their environments, such as persons entering the room or loud noises. A few studies have linked the occurrence of inattentive behaviours with other child characteristics. Yarrow et al. (1983) found that visual attention was significantly correlated with developmental competence as measured by the Bayley Scales of Infant Development (BSID; Bayley, 1969) and the Mental Development Index (MDI) for typically developing 6-month-old infants. Edelson, Schubert, and Edelson (1998) found that, among other things, the presence of attention problems in 393 individuals with autism ranging in age from 4 to 41 years was predictive of their scores on the Test of Nonverbal Intelligence-Second Edition (TONI-2; Brown, Sherbenou, & Johnsen, 1997). In particular, they found that the participants who had a greater number of attention problems as measured by the Conner's Rating Scales (CRS; Goyette, Conners, & Ulrich, 1978) were also more likely to be untestable on the TONI-2. Hauser-Cram et al. (2001) found that mastery motivation (i.e., the ability to focus and persist in order to master a problem, skill, or task that is moderately challenging) was a predictor of change in both cognitive and adaptive behaviour skills in children with Down syndrome, motor impairments, or general developmental delays. Children with motor impairments or developmental delays who demonstrated higher levels of mastery motivation at the age of 3 also displayed more cognitive growth and better daily living skills over 10 years.

Summary of Child Behaviours as Predictors of Child Characteristics

Table 2.1 summarizes the studies reviewed in this section regarding the relationship between child behaviours and other child characteristics. When reviewing this literature, three key issues emerge. First, the majority of studies found in this area are descriptive or correlational in nature (Archer & Szatmari, 1991; Bodfish et al., 2000; Campbell et al., 1990; Dadds et al., 1988; Dissanayake et al., 1996; Edelson et al., 1998; Schreck, Mulick, et al., 2004). Unfortunately, descriptive or correlational designs do not allow one to truly understand the sources of variability in child development over time. Thus, such designs do not help to identify which intervention strategies may be required early in treatment to promote positive changes in other child characteristics for young children with autism (Hauser-Cram et al., 2001). In addition, only half of the studies reviewed in Table 2.1 include children who were under the age of 6 (Archer & Szatmari, 1991; Campbell et al., 1990; Dissanayake et al., 1996; Dunst et al., 1990; Epstein et al., 1985; Hauser-Cram et al., 2001; Sigman & Ruskin, 1999). Finally, the authors of only six of the investigations in Table 2.1 specified that participants were receiving or had received some type of early intervention services (Archer & Szatmari, 1991; Campbell et al., 1990; Dadds et al., 1988; Dunst et al., 1990; Epstein et al., 1985; Hauser-Cram et al., 2001). It is crucial that we begin to investigate how early intervention affects changes in child behaviours and how these changes, in turn, affect developmental trajectories in cognitive, language/communication, adaptive skill, and other areas. Knowing which child behaviours best influence positive child change might enable professionals to focus their interventions more precisely and thus improve the overall effectiveness of early intervention services.

Table 2.1: Child behaviours linked to other child characteristics

Study	Child behaviours	Participants	Method used	Results	EI? Type?
Hauser-Cram et al. (2001)	Acting-out behaviour (e.g., apathy/withdrawal or angry/defiant) Inattentiveness/mastery motivation (i.e., ability to focus and persist when problem-solving)	183 children: 32.8% diagnosed with Down syndrome and < 12 months of age @T1 39.3% diagnosed with motor impairment and < 24 months of age @T1 27.9% diagnosed with developmental delay and < 24 months of age @T1	Longitudinal: Five time points: T1 = entry into early intervention T2 = 1 year later T3 = Age 3 T4 = Age 5 T5 = Age 10	Acting-out behaviour @ T3 predicted cognitive growth Inattentiveness/ mastery motivation @T3 predicted cognitive growth and daily living skills	Yes Community-based EI programs until age 3
Schreck, Mulick, et al. (2004)	Sleep problems (e.g., increased sensitivity to stimuli in the sleeping environment/fewer hours of sleep/periods of screaming during the night)	55 children with autism between 5 and 12 years of age (Mean age: 8;2)	Correlational One time point	Sleep problems were related to communication problems, stereotypic behaviour, and social interaction difficulties	Not specified School age children attending variety of programs

Table continues

Table 2.1 (Continued)

Study	Child behaviours	Participants	Method used	Results	EI? Type?
Archer & Szatmari (1991)	Eating difficulties (e.g., eating a restricted range of foods/refusing foods/ requiring specific presentation or textures/using specific utensils)	33 children with autism (Mean age = 5;3) 295 typically developing children (Mean age = 5;8) 11 children with identified eating problems (Mean age = 6;2)	Cross-sectional Correlational One time point	Eating difficulties were related to autism severity (specifically relating, language, socialization, and self-help skills)	Yes Preschool programs for children with autism
Epstein et al. (1985)	Stereotypic behaviours (e.g., rocking, spinning, twirling, feeling/licking textures, vocal repetition, lining-up objects, repetitive actions with objects, etc.)	6 children (5 males and 1 female) with autism ranging in age from 5 to 9	Longitudinal Stereotypy measured monthly over 2 years	Children who had the greatest improvement in their stereotypic behaviour also had the best achievement level scores	Yes All had received treatment for more than 2 years in the UCLA Young Autism Project

Table continues

Table 2.1 (Continued)

Study	Child behaviours	Participants	Method used	Results	EI? Type?
Dadds et al. (1988)	Stereotypic behaviour (e.g., rocking, hand flapping, head weaving, spinning, trapping objects, and twiddling small items/leaves/sand)	12 children with autism (Mean age = 8;6)	Correlational One time point	Children who had the most stereotypic behaviours also had lower levels of personal contact and lower language ages	Yes Attended a therapy centre
Campbell et al. (1990)	Stereotypic behaviour measured by the Children's Psychiatric Rating Scale, the Abnormal Voluntary Movement Scale, the Abbreviated Dsykinesia Rating Scale, and the Timed Stereotypies Rating Scale	224 children with autism with a mean age of 4;7	Correlational One time point	Children who had a greater number of stereotypic behaviours also had lower IQ scores and higher autism severity scores	Yes All children were inpatients at a hospital

Table continues

Table 2.1 (Continued)

Study	Child behaviours	Participants	Method used	Results	EI? Type?
Venter et al. (1992)	Repetitive stereotypic behaviours as measured by parental report on the Autism Diagnostic Interview (ADI)	58 children with high-functioning autism (Mean age = 14;7 at Time 1)	Longitudinal Two time points over 8 years	Children with more repetitive behaviours in preschool had poorer adaptive behaviour and academic achievement at school age	N/A: all children over 6 years at Time 1
Bodfish et al. (2000)	Stereotypic behaviours (e.g., compulsions, dyskinesia and akathisia)	32 adults with autism 34 adults with mental retardation	Correlational One time point	Stereotypic behaviour was related to autism severity	N/A: adults
Dunst et al. (1990)	Social responsiveness (i.e., engaging in social exchanges in a way that invites others to participate)	47 children with mental retardation, physical impairment, or developmental delay (Mean age = 2;4)	Retrospective Two time points for mental age: One at time of study and a second, 1 year earlier	Social responsiveness accounted for 34% of the variance in child progress over 1 year as measured by mental age	Yes Weekly/bi-weekly home-based early intervention

Table continues

Table 2.1 (Continued)

Study	Child behaviours	Participants	Method used	Results	EI? Type?
Dissanayake et al. (1996)	Social responsiveness (i.e., a child's responsiveness to an adult's display of distress)	30 children with autism (Mean age = 3;6 at Time 1)	Correlational at each of three time points over 5 years	The children who were more responsive had higher cognitive skills at each time point	Not Specified
Sigman & Ruskin (1999)	Social responsiveness (i.e., early nonverbal communication such as attention, social exchanges, and inviting others to reciprocate)	51 children with autism (Mean age @T1 = 3;11) 71 children with Down syndrome (Mean age @T1 = 2;7) 33 children with developmental delay(Mean age @T1 = 3;9) All children were between 10 and 13 years of age @ follow-up	Longitudinal T1 and follow-up	Social responsiveness predicted peer engagement over time	Not Specified At Time 1, half of the children with autism were inpatients for 3-6 months on a psychiatric ward

Table continues

Table 2.1 (Continued)

Study	Child behaviours	Participants	Method used	Results	EI? Type?
Edelson et al. (1998)	Inattentiveness as measured by Conner's Rating Scales	393 individuals with autism (Mean age = 12;0)	Correlational One time point	Participants who had a greater number of attention problems were also more likely to be untestable on the TONI-2	N/A: all children were over 6 years of age

N/A = Not applicable

Child Behaviours as Predictors of Parenting Stress

Research has demonstrated that, in order to maximize the developmental gains of an individual child, one must consider that child as a part of the family system in which he or she lives (e.g., Floyd & Gallagher, 1997). As noted in Chapter 1, one dimension of the family system that has received considerable research attention is parenting stress. Many authors have noted that professionals must have a better understanding of parenting stress and how it impacts the caregiving experience, in order to enhance child outcomes (Boyce & Behl, 1991; McDonald & Gregoire, 1997). Thus, it is important to examine factors that may be related to changes in parenting stress over time; these include, for example, the impact of children's problem behaviour, family coping style, and negative life events, especially in families raising a child with a developmental disability (Weiss & Diamond, 2005).

A variety of child behaviours have been linked to parenting stress in families with children with autism and other developmental disabilities. Stress can be defined as "the condition that results when person/environment transactions lead the individual to perceive a discrepancy between the demands of the situation and his/her resources or ability to cope" (Quine & Pahl, 1991, p. 57). Parenting stress is typically characterized by two components: Child-related stress, defined as "the parent's satisfaction with and adaptation to the child's temperament and behavioural characteristics;" and parent-related stress, defined as "the parent's own emotional resources and adjustment to the parental role" (Hauser-Cram et al., 2001, p. 16). In the following sections, research on the relationship between child behaviours and parenting stress will be reviewed, along with a summary of the impact of coping strategies and life events on parenting stress.

Acting-Out Behaviour: Links to Parenting Stress

It appears that acting-out behaviour is strongly related to parenting stress regardless of a child's disability. For example, in a comparison of families of children with mental retardation and those with chronic illnesses or emotional impairments, Floyd and Gallagher (1997) found that acting-out behaviours were more important than the nature of the child's disability in determining parenting stress. Baker et al. (2003) compared parents of children with developmental delays and parents of typically developing children (mean age: 3;0) and found that the children's acting-out behaviours predicted parenting stress levels but their developmental status did not. Quine and Pahl (1985) used a correlational design to examine the sources of stress in 200 families with children with mental handicaps. They found that the more acting-out behaviours (i.e., temper tantrums, destructiveness, spitting, biting, screaming, etc.) the children displayed, the more stress their mothers experienced. Similarly, Hodapp et al. (1997) found that children diagnosed with Prader-Willi syndrome (mean age: 10;3) who presented with high levels of acting-out behaviours also had parents who presented with higher levels of stress. Specifically, they found that children's behaviour problems accounted for 25% of the variance related to overall family stress.

Cameron and Orr (1989) examined 84 families caring for children with developmental delays (ages 5 to 21) and divided the families into low, moderate, and high stress groups. They found that families in the high stress group had children who displayed more "irritating" behaviours (e.g., crying, whining, hanging on to parents) and aggressive behaviours (e.g., harming others, harming oneself, destroying property) than those in the other two groups. Cameron and Armstrong-Stassen (1991) found that acting-out behaviours such as self-injurious behaviour and aggression were significantly related

to parenting stress in 147 mothers of adult children with developmental delays; again the more "extreme" the behaviour problems, the higher the level of parenting stress. Finally, Ross and Blanc (1998) explored parenting stress among mothers of 92 young children (mean age: 4;6) with Attention Deficit Hyperactive Disorder (ADHD), Oppositional Defiant Disorder (ODD) and/or Conduct Disorder (CD). Some children had ADHD or ODD, while others had multiple diagnoses such as ADHD and ODD or all three disorders. They found higher levels of parenting stress in the mothers of multiply-diagnosed children and in those whose children had more acting-out behaviours, regardless of diagnosis. Finally, Hassell and McDonald (2005) found that acting-out behaviours, parental locus of control, and parenting satisfaction accounted for 59% of the variance of parenting stress in a correlational study which included 46 mothers of children with intellectual disabilities (mean age: 9;3).

The majority of the research linking child behaviours and parenting stress has been descriptive or cross-sectional in nature. Hauser-Cram et al. (2001) were the first to examine the sources of variability in the stress experienced by parents of children with developmental disabilities in a longitudinal investigation. They found that children who displayed a higher number of acting-out behaviours upon exiting early intervention programs at age 3 had parents who experienced higher rates of child-related stress over 10 years. Their findings also revealed differential predictors of stress outcomes between mothers and fathers. For mothers, a child's disability (i.e., Down syndrome, motor impairment, or developmental delay) was a significant predictor of changes in stress; while for fathers, a child's gender and the quantity of maternal-child interactions as measured by the Nursing Child Assessment Teaching Scale (NCATS; Barnard, 1978) were significant predictors of changes in stress over time.

Other researchers have also noted that maternal versus paternal stress appears to be predicted by different child behaviours. Konstantareas and Homatidis (1989) found that, while children's self-injurious behaviour was the best predictor of stress for both parents, children's inability to speak was a secondary stressor for fathers while children's preoccupations (e.g., inappropriately smelling, licking, and rubbing objects) was a secondary stressor for mothers. Hastings (2003) found that mothers of young children with autism had stress levels that were associated mainly with acting-out behaviours, while fathers displayed no such association. Weiss, Sullivan, and Diamond (2003) found that, for mothers of mostly adult children with developmental disabilities, acting-out behaviours accounted for a significant proportion of the variance in child-related stress; while for fathers, personal and social responsibility (i.e., a child's ability to function independently in relationships) was a better predictor of stress. Finally, Saloviita, Italinna, and Leinonen (2003) found that how mothers and fathers of children with intellectual disabilities defined their situations differentially predicted parenting stress. Mothers who defined their children's disabilities in terms of acting-out behaviours were more stressed, while fathers who defined their children's disabilities in terms of decreased social acceptance had higher levels of stress.

Sleep Disturbances: Links to Parenting Stress

Four studies have specifically examined the relationship between child sleep problems and parenting stress. Quine and Pahl (1985) analyzed the relative importance of several different child behaviours on parenting stress in 200 families of children with severe handicaps. They found a significant positive relationship between the number of night-time disturbances and parenting stress levels. They also found that parents who

reported not getting enough sleep had significantly higher levels of stress than those who were not sleep deprived. Similarly, Quine and Pahl (1991) found that higher scores on an index of sleep problems related significantly to higher stress scores in mothers of 162 children with severe learning difficulties. Finally, Richdale et al. (2000) found that night-waking was associated with increased stress in families of children with intellectual disabilities (mean age: 7;7). They also found that children with sleep onset and maintenance difficulties displayed more acting-out behaviours during the day, which in turn led to increases in parenting stress.

Eating Difficulties: Links to Parenting Stress

Only two studies to date have examined the influence of eating difficulties on parenting stress. Archer and Szatmari (1991) compared young children with autism and typically developing children both with and without eating problems and found a significant positive correlation between parenting stress and eating difficulties. In a qualitative study of 33 parents of children with autism (ages 6 to 12), Gray (1994) found that unusual child eating behaviours such as insisting food be presented on a specific plate appeared to cause considerable stress for many parents.

Stereotypic Behaviour: Links to Parenting Stress

A few studies have examined the link between stereotypic behaviour and parenting stress. Beckman (1983) found that the frequency of repetitive behaviours (e.g., head banging, finger flicking, etc.) displayed by infants with developmental delays (mean age: 1;10) was significantly associated with increased maternal stress. Stores, Fellows, and Buckley (1998) found that the amount of stereotypic behaviour as measured on the stereotypies subscale of the Aberrant Behaviour Checklist (ABC; Aman, Singh, Stewart,

& Field, 1985) was correlated with higher levels of maternal stress in 91 mothers of children with intellectual disabilities (mean age: 10;0). Stoddart (2003) found that child stereotypic behaviours accounted for a significant proportion of the variance in stress levels for 110 mothers of children with PDD (ages 6 to 18). Finally, Gabriels, Cuccaro, Hill, Ivers, and Goldson (2005) found that parenting stress and child repetitive behaviours as measured by the Repetitive Behavior Scales-Revised (RBS-R; Bodfish, Symons, Parker, & Lewis, 2000) were highly positively correlated in 14 children with autism (mean age 10;7) and their parents. In general, these studies found that children who had higher levels of stereotypic behaviours had parents who were more stressed.

Social Unresponsiveness: Links to Parenting Stress

Researchers have also found a link between children's social responsiveness and parenting stress. Beckman (1983) found that how infants responded to various forms of social stimulation (e.g., via smiling, laughing, and responding to gestures from others) was significantly associated with maternal stress. Specifically, mothers who had infants who were less socially responsive were more stressed. Weiss et al. (2003) found that what they termed "personal and social responsibility" (i.e., children's ability to use interpersonal skills, socially respond to others, and function independently in relationships) accounted for the majority of variance (34%) in paternal child-related stress for fathers of children with developmental disabilities (ages 9 to 42).

Inattentiveness: Links to Parenting Stress

It appears that no studies have specifically examined inattentiveness and caregiver stress in families with children with autism. However, one study was found that linked inattentive behaviour to parenting stress in families of children with other developmental

disabilities. Podolski and Nigg (2001) found that, for 56 mothers of children with Attention Deficit Disorder (ADD) or ADHD (mean age: 10;2), child inattention (as assessed via the DSM-IV ADHD Inattention symptom list) was positively associated with stress related to the parenting role. In addition, they found that child inattentiveness had a unique association with maternal stress even when controlling for acting-out behaviours. Thus, inattentiveness alone may have a significant impact on parenting stress.

Summary of Child Behaviours as Predictors of Parenting Stress

Table 2.2 summarizes the studies linking child behaviours to parenting stress. The same three issues emerge in this body of work that were found in the research examining the links between child behaviours and other child characteristics. First, only two of the studies involved a longitudinal design (i.e., Baker et al., 2003: Hauser-Cram et al., 2001); thus, it is difficult to examine the sources of variability in parenting stress over time. Second, only six of the studies involved children on the autism spectrum (Archer & Szatmari, 1991; Gabriels et al., 2005; Gray, 1994; Hastings, 2003; Konstantareas & Homatidis, 1989; Stoddart, 2003) and only five included children with a mean age less than 6 years (Archer & Szatmari, 1991; Baker et al., 2003; Beckman, 1983; Hauser-Cram et al., 2001; Ross & Blanc, 1998). Finally, only four of the studies included children identified as receiving some type of early intervention. Thus, the relationship between changes in child behaviours in children receiving early intervention and changes in parent stress is unclear at the present time.

Table 2.2: Child behaviours linked to parenting stress (EI = early intervention)

Study	Child behaviour	Participants	Method used	Results	EI? Type?
Floyd & Gallagher (1997)	Acting-out behaviour (measured with the Child Behavior Checklist, CBCL)	112 families of children with mental retardation (ages 6 to 18) 119 families of children with chronic illness or emotional impairment (ages 6 to 18)	Correlational One time point	Acting-out behaviours were more predictive of increased parenting stress than the nature of the child's disability	Not specified School aged children enrolled in special education classes
Baker et al. (2003)	Acting-out behaviour (measured with the CBCL)	82 families of children with a developmental delay 123 families of typical children (Mean age = 3;0)	Longitudinal Time 1 @ 3 years Time 2 @ 4 years	Acting-out behaviours were associated with higher parenting stress but the presence of a developmental delay was not	Not specified
Quine & Pahl (1985)	Acting-out behaviour (temper tantrums/destructive-ness/spitting/biting/ screaming, etc.)	200 families of children with mental handicaps (no age provided)	Correlational One time point	Acting-out behaviours were related to increased parenting stress	Not specified

Table continues

Table 2.2 (Continued)

Study	Child behaviour	Participants	Method used	Results	EI? Type?
Cameron & Orr (1989)	Acting-out behaviour (irritating and aggressive behaviours)	84 families of children with developmental delays (ages 5 to 21)	Correlational One time point	Acting-out behaviours and the number of handicapping conditions accounted for 50% of child-related stress for the parents	Not specified; school-aged children in a range of educational settings
Cameron & Armstrong-Stassen (1991)	Acting-out behaviour (harming self/other, interrupting the sleep of others)	147 mothers of adult children with developmental delays	Correlational One time point	Acting-out behaviours were related to increased parenting stress Mothers who coped by reframing and redefining reported significantly less stress	N/A: Adults
Ross & Blanc (1998)	Acting-out behaviour (measured with the CBCL)	43 children with ADHD or ODD 39 children with ADHD and ODD 10 children with ADHD, ODD and CD (Mean age = 4;6)	Cross-sectional Correlational One time point	Acting-out behaviours were related to increased parenting stress regardless of child diagnosis	Not specified

Table continues

Table 2.2 (Continued)

Study	Child behaviour	Participants	Method used	Results	EI? Type?
Hodapp et al. (1997)	Acting-out behaviour (measured on the CBCL)	42 children with Prader-Willi syndrome (Mean age = 10;4)	Correlational One time point	Acting-out behaviours accounted for 25% of the variance in overall family stress	N/A: school aged children
Hauser-Cram et al. (2001)	Acting-out behaviour (measured with the CBCL and Classroom Problem Checklist)	60 children with Down syndrome (age: < 12 months @ T1) 72 with motor impairment (age < 24 months @ T1) 51 with developmental delay (age < 24 months @ T1)	Longitudinal: T1 = pre-EI T2 = 1 year later T3 = age 3 T4 = age 5 T5 = age 10	Acting-out behaviours at age 3 years predicted child-related stress for parents over time	Yes Enrolled in community-based EI programs until age 3

Table continues

Table 2.2 (Continued)

Study	Child behaviour	Participants	Method used	Results	EI? Type?
McDonald & Gregiore (1997)	Acting-out behaviour (measured with the CBCL	259 caregivers of children with atypical development or emotional disorder (ages 4 to12)	Correlational One time point	More acting-out behaviours, higher SES, and less use of positive coping strategies were all associated with increased caregiver stress Acting-out behaviours were associated with decreased family support which was associated with reduced coping strategies and an increase in caregiver stress	Not specified
Johnston et al. (2003)	Acting-out behaviour (as measured with the CBCL)	75 families of children with Fragile X syndrome (Mean age = 10;9)	Correlational One time point	More acting-out behaviours and less family support were associated with higher parental stress levels	Not specified
Hodapp et al. (1998)	Acting-out behaviour (as measured with the CBCL)	36 parents of children diagnosed with Smith-Magenis syndrome (Mean age = 8;4)	Correlational One time point	Acting-out behaviours were associated with increased parenting stress	N/A: children were school-aged

Table continues

Table 2.2 (Continued)

Study	Child behaviour	Participants	Method used	Results	EI? Type?
Konstantareas & Homatidis (1989)	Acting-out/self-injurious behaviour Stereotypic preoccupations (e.g., smelling, licking, and rubbing objects)	44 families of children with autism between ages 2 to 12 (Mean age = 6;10)	Correlational One time point	Self-injurious behaviour was the best predictor of stress for both parents Children's preoccupations was a secondary stressor for mothers Children's inability to speak was a secondary stressor for fathers	No
Hastings (2003)	Acting-out behaviour (as measured by the teacher report version of the Developmental Behavior Checklist)	18 couples who were parents of children with autism (Mean age = 11;8)	Correlational One time point	Acting-out behaviours were associated with higher maternal stress; no association between acting-out behaviours and paternal stress	N/A: school-aged
Soloviita, Italinna, & Leinonen (2003)	Acting-out behaviour	Mothers (n = 116) and fathers (n = 120) of 236 children with intellectual disability (ages 1 to 10)	Correlational One time point	Mothers' definition of the child's disability as a burden or catastrophe was associated with difficulties controlling acting-out behaviour Fathers' definition of the child's disability as a burden or catastrophe was associated with his perceptions regarding the child's social acceptance by others	Not specified

Table continues

Table 2.2 (Continued)

Study	Child behaviour	Participants	Method used	Results	EI? Type?
Quine & Pahl (1985)	Sleep disturbances (as measured by the number of night-time disturbances & parental report of "getting enough sleep")	200 families of children with mental handicaps	Correlational One time point	Sleep disturbances were associated with increased parenting stress	Not specified
Quine & Pahl (1991)	Sleep disturbances (as measured with an index of sleep problems)	166 mothers of children with severe learning difficulties	Correlational One time point	Sleep disturbances were related to increased maternal stress scores Mothers whose coping strategy included positive acceptance of their child had lower stress scores	Not specified
Richdale et al. (2000)	Sleep disturbances (i.e., sleep onset and maintenance and night-waking)	52 children with intellectual disabilities (Mean age = 7;7) 25 typically developing children (Mean age = 8;0)	Cross-sectional Correlational One time point	Sleep disturbances were related to day-time behaviour problems which were associated with increased parenting stress	N/A: school aged children

Table continues

Table 2.2 (Continued)

Study	Child behaviour	Participants	Method used	Results	EI? Type?
Archer & Szatmari (1991)	Eating difficulties (i.e., eating a restricted range of foods, refusing foods, requiring specific presentation or textures, and using specific utensils)	33 children with autism (Mean age = 5;3) 295 typically developing children (Mean age = 5;8) 11 typical children with eating problems (Mean age = 6;2)	Cross-sectional Correlational One time point	Eating difficulties were related to increased parenting stress	Yes Preschool programs for children with autism
Gray (1994)	Eating difficulties (i.e., obsessive behaviour associated with food such as insisting to use the same plate)	33 parents of children with autism (ages 6 to 12)	Qualitative	Eating difficulties appeared to cause much stress for parents	N/A: school aged children
Beckman (1983)	Stereotypic and repetitive behaviour (measured with the Carolina Record of Infant Behavior)	31 infants with developmental delays (Mean age = 1;10) and their mothers	Correlational One time point	Stereotypic repetitive behaviour was significantly associated with increased maternal stress	Yes Minimum of 3 months of EI pre-study

Table continues

Table 2.2 (Continued)

Study	Child behaviour	Participants	Method used	Results	EI? Type?
Stores, Fellows, & Buckley (1998)	Stereotypic behaviour (as measured with the Stereotypies subscale of the Aberrant Behaviour Checklist)	71 mothers of children with intellectual disabilities (Mean age = 10;0)	Correlational One time point	Stereotypic behaviour was correlated with an increase in maternal stress	N/A: school aged
Stoddart (2003)	Stereotypic behaviours	110 mothers of children with PDD (ages 6 to 18)	Correlational One time point	Stereotypic behaviour and social phobia accounted for a 38% of the variance in maternal stress	N/A: school aged
Gabriels, Cuccaro, Hill, Ivers, & Goldson (2005)	Stereotypic and repetitive behaviours (as measured by the Repetitive Behavior Scales-Revised)	14 children with autism (Mean age = 10;7) and their parents	Correlational One time point	Stereotypic repetitive behaviours and parenting stress and were positively correlated	N/A: school aged
Beckman (1983)	Social responsiveness (i.e., responses to social stimulation such as smiling, laughing, and gestures from others)	31 infants (Mean age = 1;10) with developmental delays and their mothers	Correlational One time point	Social responsiveness was significantly associated with increased maternal stress	Yes Minimum of 3 months of EI prior to the study

Table continues

Table 2.2 (Continued)

Study	Child behaviour	Participants	Method used	Results	EI? Type?
Weiss et al. (2003)	Social responsiveness (i.e., ability to use interpersonal skills, socially respond to others, and function independently in relationships)	97 children with developmental disabilities (ages 9 to 42) and their parents	Correlational One time point	Social responsiveness accounted for 34% of the variance in child-related stress for fathers	N/A: school aged and adults
Podolski & Nigg (2001)	Inattentiveness (as measured with the DSM-IV ADHD inattention symptom list)	56 mothers of children with Attention Deficit Disorder (ADD) or ADHD (Mean age = 10;2)	Correlational One time point	Inattentiveness was positively associated with stress relating to the parenting role	N/A: school aged

N/A = Not applicable

Negative Life Events and Coping Strategies: Influences on Parenting Stress

Based on past research, it is unlikely that child behaviours alone can account for 100% of the variance in parenting stress over time. Research suggests that the relationship between child behaviours and parenting stress may change in the context of other variables such as negative life events and parent coping strategies.

Negative Life Events

Boyce and Behl (1991) found that families who experienced stressful life events (e.g., job loss, divorce, moving), reported more child-related stress but not more parent-related stress. They hypothesized that the increase in child-related stress was due to an interaction between child characteristics and life events. If Boyce and Behl (1991) are correct, one must account for life events that occur over a time period under investigation in order to truly understand the impact of child behaviours on parenting stress (Hauser-Cram et al., 2001).

Coping Strategies

Families' use of positive coping strategies (i.e., the actions they take to reduce stress) is another variable that must be taken into consideration when examining parenting stress. Hastings and Johnson (2001) found that lower parenting stress was related to, among other things, the use of reframing as a coping strategy (i.e., redefining events positively to make them more manageable) by 141 parents of young children with autism (mean age: 5;0). Cameron and Armstrong-Stassen (1991) found that mothers of adult children with developmental delays who used reframing reported significantly less stress than mothers who did not utilize this strategy. Quine and Pahl (1991) found that the

use of positive acceptance of the child as a coping strategy was related to reduced stress in mothers of children with learning difficulties. Finally, McDonald and Gregoire (1997) found an interaction between child external behaviour problems, family socio-economic status (SES), social support, and caregiver coping behaviours in 259 caregivers of children with atypical development or serious emotional disorders (ages 4 to 12). Specifically, they found that, when child external behaviour problems increased, relative and family support decreased, resulting in a reduction in parents' use of positive coping strategies and an increase in parenting stress.

Summary of the Research

The literature examining child behaviours as predictors of other child characteristics and parenting stress reveals four central themes that lead one to conclude that these areas of investigation are still in their infancy with regard to autism. First, very few studies have examined the influences of specific child behaviours such as acting-out behaviours, sleep disturbances, eating difficulties, stereotypic behaviour, social unresponsiveness, and inattentiveness on other child characteristics and parenting stress. Second, many investigations have focused on children with developmental disabilities other than autism, and only a few studies have examined the relationships between child behaviours and other child characteristics in children under the age of 6. Third, the majority of studies conducted in this area have been descriptive or correlational in nature; thus, they provide only a restricted view of the relationship between child behaviours on either other child characteristics or parenting stress. Finally, only a few studies have included children with autism receiving early intervention services. It is imperative that we begin to better understand the relationship between child behaviours and changes in

other child characteristics or parenting stress associated with early intervention. This information will enable professionals to focus their interventions more precisely to promote healthy outcomes.

Statement of the Problem and Overview of the Study

The research reviewed in this Chapter justifies a need to examine the influence of child behaviours such as acting-out behaviour, sleep disturbances, eating difficulties, stereotypic behaviour, social unresponsiveness, and inattentiveness on other child characteristics and parenting stress for young children with autism receiving early intervention over time. This investigation examined these issues in detail by identifying child behaviours at the start of early intervention and examining how changes in these behaviours over the first year of intervention affected changes in other child characteristics (i.e., language, adaptive skills, autism severity, and IQ) and in parenting stress over 2 years. Thus, this research was longitudinal in nature and addressed a number of specific questions, as detailed below.

Questions Related to Child Characteristics

1. Does one or more categories of child behaviour (acting-out behaviour, sleep disturbances, eating difficulties, stereotypic behaviour, social unresponsiveness, and inattentiveness) at the onset of intervention predict child characteristics over 2 years?
2. Does change in one or more categories of child behaviour (acting-out behaviour, sleep disturbances, eating difficulties, stereotypic behaviour, social

unresponsiveness, and inattentiveness) over the first 6 months of intervention predict child characteristics over 2 years?

3. Does change in one or more categories of child behaviour (acting-out behaviour, sleep disturbances, eating difficulties, stereotypic behaviour, social unresponsiveness, and inattentiveness) over the 12 months of intervention predict child characteristics over 2 years?

Based on the extant research literature, it is hypothesized that the predictive relationships between child behaviours at either T1, T1 to T2, and/or T1 to T3 and changes in other child characteristics from T1 to T4 will be as follows: Acting-out behaviours will predict changes in cognitive skills; sleep disturbances will predict changes in communicative skills, social skills, and autism severity; eating difficulties will predict changes in language skills, social skills, daily living skills, and autism severity; stereotypic behaviours will predict changes in cognitive skills, communication skills, adaptive skills, and autism severity; social unresponsiveness will predict changes in cognitive skills, daily living skills, and social skills; and inattentiveness will predict changes in cognitive and adaptive skills.

Questions Related to Parenting Stress

4. Is there a relationship between parent coping style, negative life events experienced at T4, and changes in parenting stress over 2 years?

Based on the extant research literature, it is hypothesized that parents who exhibit more positive coping styles and/or who experience fewer negative life events will show evidence of greater reductions in parenting stress from T1 to T4.

5. Does one or more categories of child behaviour (acting-out behaviour, sleep disturbances, eating difficulties, stereotypic behaviour, social unresponsiveness, and inattentiveness) at the onset of intervention predict a change in parenting stress scores over 2 years, when parent coping style and negative life events are taken into account?
6. Does change in one or more categories of child behaviour (acting-out behaviour, sleep disturbances, eating difficulties, stereotypic behaviour, social unresponsiveness, and inattentiveness) over the first 6 months of intervention predict a change in parenting stress scores over 2 years, when parent coping style and negative life events are taken into account?
7. Does change in one or more categories of child behaviour (acting-out behaviour, sleep disturbances, eating difficulties, stereotypic behaviour, social unresponsiveness, and inattentiveness) over the first 12 months of intervention predict a change in parenting stress scores over 2 years, when parent coping style and negative life events are taken into account?

Based on the extant research literature, it is hypothesized at either T1, T1 to T2, and/or T1 to T3, acting-out behaviours, sleep disturbances, and/or stereotypic behaviour will have a strong predictive influence on changes in parenting stress from T1 to T4. In addition, eating behaviours, social responsiveness, and inattentiveness at either T1, T1 to T2, and/or T1 to T3 will have a moderate predictive influence on changes in parenting stress from T1 to T4.

CHAPTER 3

Method

Participants

For this study, data were accessed from a database established between 2001-2004 for a project examining early intervention outcomes for 70 children with autism spectrum disorders and their parents in British Columbia (BC), Canada. Participants for that study were recruited from families receiving services from three Early Intensive Behavioural Intervention (EIBI) service providers (n = 39) and from families receiving direct early intervention funding (n = 31). Prior to entry into the study, 55 children had been diagnosed with autism and 15 had been diagnosed with pervasive developmental disorder-not otherwise specified (PDD-NOS). All diagnoses were done by experienced diagnosticians in the community not involved in the study. There were 58 males and 12 females (mean age: 4;2: range = 1;8 to 6;0). Ethnic backgrounds included European (n = 38), Asian (n = 21), Hispanic (n = 4), Caribbean/African (n = 2), Middle Eastern (n = 1), and multiple (n = 4). At the beginning of the investigation, mothers had, on average, completed some college or university courses and were coded as semiskilled workers (e.g., machine operator, grocery store clerk) (Hollingshead, 1962). Fathers had, on average, some university training and were coded as skilled workers (e.g., department manager, administrative assistant etc.) (Hollingshead, 1962). At the outset, the families included 55 two-parent (married) families, three separated families, four divorced families, seven other arrangements (e.g., common-law), and one single parent.

All of the children received approximately 15 to 20 hours per week of early intervention services year-round for 2 years. Thirty-nine of the children received clinic-

managed services and 31 received parent-managed services. Intervention for all children was based on the principles of applied behaviour analysis (ABA), but was, in general, considered eclectic. It consisted of individualized programming implemented by behavioural consultants and interventionists with input from speech-language pathologists, occupational therapists, and other professionals.

Measurement

Data were collected at baseline (i.e., prior to the initiation of early intervention, T1), and 6, 12, and 24 months later (T2-T4). Data collection occurred in each child's home or early intervention centre by registered psychologists, certified speech-language pathologists, and trained graduate students who acted as family interviewers. None of the assessors were involved in service provision to the children or their families. Two additional measures relating to parental coping style and life events experienced over 2 years were collected via mail-out, after each family was contacted by phone. A list of the measures collected at each time point can be found in Table 3.1.

Table 3.1

Measures collected at T1, T2, T3, and T4 for children and families

Assessment Instrument	Purpose	Administered by
Childhood Autism Rating Scale (CARS)	Confirm diagnosis of ASD and establish a level of "severity"	Psychologist
Mullen Scales of Early Learning	IQ measure that provides subscores in gross motor, visual perception, fine motor, receptive language, and expressive language	Psychologist

Table continues

Table 3.1 (Continued)

Assessment Instrument	Purpose	Administered by
Wechsler Preschool and Primary Scales of Intelligence-III	IQ measure for children who were above the upper age range of the Mullen (i.e., age 69 months or above)	Psychologist
Vineland Adaptive Behavior Scales (VABS)	Measurement of adaptive behaviour	Psychologist
Peabody Picture Vocabulary Scale–IIIA/B (PPVT)	Measurement of single word receptive vocabulary	Speech-language pathologist
Expressive One-Word Picture Vocabulary Test (EOWPVT)	Measurement of single word expressive vocabulary	Speech-language pathologist
Preschool Language Scale-3 (PLS-3)	Measurement of global receptive and expressive language skills	Speech-language pathologist
MacArthur Communicative Development Inventory (MCDI)	Measurement of parent report of single word vocabulary and pre-linguistic behaviours	Family interviewer
Autism Behavior Checklist (ABC)	Assessment of specific behaviours related to autism	Family interviewer
Temperament and Atypical Behavior Scale (TABS)	Measurement of temperament and a variety of atypical behaviours	Family interviewer

Table continues

Table 3.1 (Continued)

Assessment Instrument	Purpose	Administered by
Sensory Profile	Measurement of sensory abilities/deficits	Family interviewer
Parenting Stress Index-Short Form (PSI-SF)	Measurement of parenting stress	Family interviewer
Family Inventory of Life Events and Changes (FILE)	Measurement of life events and changes experienced by families over 2 years	Mail-out
Family Crisis-Oriented Personal Evaluation Scales (F-COPES)	Measurement of problem solving and behavioural strategies utilized by families	Mail-out

Dependent Variables: Child Measures

Child measures for the dependent variables were each child's raw scores[1] on measures of adaptive behaviour, cognitive development, autism severity rating, language, and vocabulary skills. Measures relating to each child dependent variable existed in the database for T1, T2, T3, and T4.

Adaptive behaviour. The Vineland Adaptive Behavior Scales (VABS; Sparrow, Balla, & Cicchetti, 1984) is a semi-structured interview administered by a psychologist that provides raw and standard scores for a total composite and four subscales:

[1] Raw scores were used for all variables except for cognitive development in which only standard scores were available.

communication, socialization, daily living, and motor skills. However, only the socialization, daily living, and communication subscale scores were used in this investigation because less than half of the participants (n = 33) obtained a raw score on the motor subscale at T4. The total composite score, which could not be calculated without the motor score, was also not used.

Cognitive development. Cognitive development/IQ was measured with one of three tests implemented by a psychologist, depending on the child's age. The Mullen Scales of Early Learning (Mullen, 1995) was used with children under 5 years 9 months of age. It provides a standard score for a total early learning composite and five subscale scores: gross motor, visual reception, fine motor, receptive language, expressive language. The Wechsler Preschool and Primary Scale of Intelligence-Revised (WPPSI-R; Wechsler, 1989) was used for children between 5 years 9 months and 6 years of age; and the Wechsler Intelligence Scale for Children–Third Edition (WISC-III; Wechsler, 1991) was used for children over 6 years of age. Both of these measures provide a standard score for full scale intelligence.

Autism severity rating. The autism severity rating was measured by the Childhood Autism Rating Scale (CARS; Schopler, Reichler, & Renner, 1988) and the Autism Behavior Checklist (Krug et al. 1980/1983). The CARS is a 15-item behaviour rating scale administered by a psychologist. It provides a total raw score and a raw score for each of 15 rating categories (i.e., relating to people; imitation; emotional response; body use; object use; adaptation to change; visual response; listening response; taste, smell, and touch response and use; fear or nervousness; verbal communication; nonverbal communication; activity level; level and consistency of intellectual response; and general

impressions). Children with total scores above 30 are categorized as having autism, with those scoring between 30 and 37 characterized as having "mild-moderate" autism and those scoring 38 to 60 characterized as having "severe" autism. Children with scores of 24-29 on the CARS were categorized as having pervasive developmental disorder-not-otherwise specified (PDD-NOS) (Perry et al., 2003). The ABC is a 57-item checklist of problem behaviours related to autism that is typically completed by the parent or primary caregiver. Each item is given a weighted score between 1 and 4, and children with total scores of over 68 are considered to have autism.

Language and vocabulary skills. Language skills were measured with the Preschool Language Scale–3 (PLS-3; Zimmerman, Steiner, & Pond, 1992), and vocabulary skills were measured with the Peabody Picture Vocabulary Test–IIIA/B (PPVT-III; Dunn & Dunn, 1997), the Expressive One-Word Picture Vocabulary Test (EOWPVT; Brownell, 2000), and the MacArthur Communicative Development Inventories (Words and Gestures or Words and Sentences) (MCDI; Fenson, Dale, Reznick, Thal, Bates, Hartung, Pethick, & Reilly, 1993). The PLS-3 was administered by a speech-language pathologist (S-LP) and measures both receptive and expressive language abilities. It provides a raw and standard score for total language and two subscales, auditory comprehension and expressive communication. The PPVT-III was also administered by an S-LP and measures children's understanding of single-word vocabulary. It provides raw and standard scores for total words understood. The EOWPVT was administered by an S-LP and measures children's single word expressive vocabulary. It provides raw and standard scores of total words expressed. Finally, the MCDIs are parent report forms used to measure language and communication skills in

infants and young children. They come in two formats, Words and Gestures and Words and Sentences. At each time point, parents completed the appropriate form, depending on their child's estimated vocabulary size. Parents of children with an estimated vocabulary size of 50 words or less completed the Words and Gestures form and parents of children with an estimated vocabulary size over 50 words completed the Words and Sentences form. Over the four time points, some children switched from one form to the other; however, both forms provide a "total words said" score that was used in this investigation.

Dependent Variables: Parent Measures

Parent measures for the dependent variables were each parent's raw scores on measures of parenting stress, coping skills, and life events experienced. Measures relating to parenting stress existed in the database for T1, T2, T3, and T4. Measures for coping skills and life events were available for T4 only.

Parenting stress. Parenting stress was measured with the Parenting Stress Index-Short Form (PSI-SF; Abidin, 1995). It was completed by parents and assessed their level of stress with regard to their relationship with their child with autism. Previous research has indicated that there are differential predictors of parenting stress for mothers versus fathers (see Chapter 2); therefore, only PSI-SFs completed by mothers were included in this study (n = 66). The PSI-SF consists of 36 key items derived from the PSI-Long Form. It provides a raw score for Total Stress which reflects overall stress experienced within the role of a parent; scores of 90 or above reflect clinically problematic levels of stress. The PSI-SF also provides three subscale scores. Parental Distress (PD) is a measure of how competent a parent feels about raising a specific child (i.e., the child with

autism). Parent-Child Dysfunctional Interaction (P-CDI) is a measure of the parent's perceptions that this child is not meeting her expectations and/or that her interactions with this child are not reinforcing. Difficult Child (DC) is a measure of child behavioural characteristics that make this child difficult to manage. The existing database included PSI-SF scores for Total Stress and all three subscales at all four time points.

Coping style. Parent coping was measured with the Family Crisis-Oriented Personal Evaluation Scales (F-COPES; McCubbin, Olson, & Larson, 1981). F-COPES measures problem-solving and behavioural strategies utilized by families in difficult or problematic situations. It features 30 coping behaviour items and provides a raw score for total coping and five subscales: acquiring social support; reframing; seeking spiritual support; mobilizing the family to acquire and accept help; and passive appraisal. Only the total coping score was used for this investigation. A high total coping score on the F-COPES indicates that the parent is using more positive coping strategies.

Life events. Life events were measured with the Family Inventory of Life Events and Changes (FILE; McCubbin, Patterson, & Wilson, 1983). FILE is a measure of life events and changes experienced by families. For the purposes of this investigation, families were asked to report on life events and changes that occurred over the past 24 months. This precedent was set in previous research by Gabriels et al. (2001) in an investigation that examined predictors of parenting stress outcomes over a 22-month period. In general, this measure assesses the accumulation of negative life events and changes experienced by a family over time. It provides a raw score on total life changes and nine subscales: intrafamily strains; marital strains; pregnancy and childbearing strains; finance and business strains; work-family transitions and strains; illness and

family "care" strains; losses; transitions "in and out;" and family legal violations. For the purposes of this study, only the raw score for total life changes was used. A high score on total life changes indicates that the parent has experienced more negative life events over the past 2 years.

Predictor Variables: Child Behaviour

The existing database did not include the six child behaviour variables that were utilized as independent variables/predictors in this study; thus, they were constructed in a six-step process.

Identify relevant predictor variables. The first step was to identify relevant predictor variables. This process was accomplished by examining the current research literature for potential predictors of (a) child language/communication abilities, adaptive behaviour, IQ, and autism severity; and (b) parenting stress in families of young children with autism and other developmental disabilities. Six predictor variables were identified in the literature review (see Chapters 1 and 2), including acting-out behaviour, sleep disturbances, eating difficulties, stereotypic behaviour, social unresponsiveness, and inattentiveness.

Select individual items. The second step was to choose individual item indicators from the existing assessment measures at Time 1 in the data set. This process was completed by examining every item in the ABC, PSI-SF, Mullen, and VABS, as well as in two additional measures: the Temperament and Aberrant Behavior Scale (TABS; Bagnato, Neisworth, Salvia, & Hunt, 1999) and the Sensory Profile (SP; Dunn, 1999). The TABS was completed by a parent/caregiver and consists of 55 yes/no response questions regarding each child's characteristic emotional style or disposition and

regulatory behaviour. The TABS is a reliable, valid, and norm-referenced assessment of dysfunctional behaviour used for children between 11 and 71 months of age (Bagnato et al., 1999). In general, it measures temperament, attention and activity, attachment and social behavior, neurobehavioral state, sleeping, play, vocal and oral behavior, senses and movement, and self-stimulatory behavior. The Sensory Profile was also completed by a parent/caregiver and consists of 125 judgment-based questions that report the frequency with which a child responds to various sensory experiences. It is used for children between the ages of 3 to 10 and provides a standardized method of reporting children's sensory and processing abilities.

The choice of individual items was made in light of how each of the child behaviours was described in the early intervention and developmental disabilities literature (see Chapter 2). To eliminate any correlation effects between predictor variables and parenting stress outcomes, items from the PSI-SF were included only in the construction of the child behaviour variables used as predictors of changes in child measures. PSI-SF items were omitted from child behaviour variables used as predictors of parenting stress outcomes. All items chosen for each child behaviour variable are summarized in Appendix A.

Convert items to dichotomous responses. The third step was to convert individual item indicators into dichotomous item responses (i.e., yes/no scores). As can be seen in Appendix A, some items were originally ordinal responses involving more than two scoring options. In cases where ordinal or Likert-type scales were used to score an individual item, "never," "no," strongly disagree," or "disagree" responses were coded as "no" (0) and all other responses were coded as "yes" (1). A second independent rater

coded a randomly selected 20% of the total items entered. Inter-rater reliability was 99.92%.

Enter items into database. The fourth step was to enter each item identified as 1 or 0 (i.e., 1 = "yes"/behaviour was present and 0 = "no"/behaviour was not present)[2] into an SPSS 13.0 database (Apache Software Foundation, 2000).

Eliminate item over-representation. The fifth step was to eliminate over-representation of any single behaviour within a predictor variable. For example, three separate items related to "temper tantrums" were taken from three separate measures (the TABS, the ABC, and Sensory Profile). The question for this step was "Which item is the best representative of the behaviour of concern?" Answering this question involved several phases. First, items related to the same behaviour were grouped into subdomains on the basis of their definitions (see Appendix B). For example, the item "severe temper tantrums and/or frequent minor tantrums" from the ABC, item #108 "has temper tantrums" from the Sensory Profile, and item #26 "has wild temper tantrums" from the TABS were grouped into one subdomain.

Second, a series of decision rules were applied to eliminate redundant items within each subdomain. Multiple items from the same measure were retained even when they referred to similar behaviors. For example, on the TABS, item #21, "upset by every little thing;" item #22, "often difficult to soothe when upset or crying," and item #52, "can't comfort self when upset" were all retained as separate items because they were considered separate items within the TABS. For items within a subdomain that originated from different measures, a Pearson correlation was calculated to determine whether or not the items were correlated. Cohen (1988) proposed that an r^2 value of ≥ 0.50, which

[2] All items from the VABS were reverse coded

indicates that at least 25% of the variance in one score can be accounted for by another, can be used to evaluate whether or not a correlation is of clinical significance when evaluating item over-representation. When r^2 was $\geq .50$, one item was eliminated, as follows: (a) items originally coded as dichotomous (e.g., those from the ABC and TABS) were chosen over items originally coded on a Likert-type scale (e.g. items from the PSI-SF, Sensory Profile, and VABS); (b) if both items were originally coded dichotomously, the item that was most consistent with other chosen items in the variable was selected. For example, if one subdomain in the acting-out variable had clinically correlated items from both the ABC and the Sensory Profile, according to the first rule of elimination, the ABC item was selected because it was originally coded dichotomously. Then, if another subdomain in the same acting-out variable had correlated items from two measures that were both originally dichotomous (e.g., the ABC and TABS), the ABC item was chosen over the TABS to ensure that items were chosen from a consistent measure (e.g., the ABC) within each predictor variable.

The third step for addressing item over-representation occurred only if more than two items within a subdomain were clinically correlated at $r^2 = \geq 0.50$. In this case, a Principal Components Analysis (PCA) was conducted to determine which item(s) to eliminate. PCA can be used to summarize the correlations among items to determine if there is a single underlying variable that a given number of items have in common. Grimm and Yarnold (1995) noted that, given a collection of related items, PCA can identify a smaller set of items, called eigenvectors or factors. These eigenvectors can then be used to explain the majority of variation among the original set of items. PCA also provides correlation coefficients for each item within a factor. In this analysis, the item

with the highest correlation coefficient (i.e., the item that accounted for the greatest amount of variation within a factor) was retained.

Calculate coefficient alphas and create composite scores. The final step in the process of creating each predictor variable was to examine the psychometric properties of the items within each predictor variable in order to compute a composite score (Zumbo, Gelin, & Hubley, 2002). First, however, missing data for individual item indicators needed to be addressed using the following rule: If the sum of the items at each time point was ≥ 0.5, a missing datum for that time point was entered as 1. If the sum was < 0.5, a missing item was coded as 0. Once missing data were accounted for, the psychometric properties of the items within each behaviour variable were examined by using total item correlation analysis and calculating the coefficient alpha. Coefficient alpha is used to gauge the reliability of measurements (Cronbach, 2004). In the current investigation, it estimated the accuracy of the interrelated items within a variable by examining the consistency of scores from one item to the next and determining the average correlation of items within a variable (Cronbach, 2004). A coefficient alpha score of $\geq .75$ indicates that the items used to calculate the composite score for each predictor variable are internally consistent with little measurement error (Streiner & Norman, 1989). If the items did not hold together with an alpha of $\geq .75$, items were eliminated one at a time and the coefficient alpha was recalculated after each removal. If the omission of a single item increased the alpha to $\geq .75$, this item was removed permanently from the variable. If removal of any one item was insufficient to obtain the target alpha, items that increased the alpha the most were removed in descending order until an alpha of $\geq .75$ was obtained. Once the final items were chosen, the sum of those

items was calculated (i.e., 1 = the behaviour was present and 0 = the behavior was not present) to create a composite score for each of the predictor variables at each time point (i.e., T1, T2, and T3).

Data Analysis

The data analysis procedures used to address each question in this research were similar. First, the predictor variables were constructed and then structural equation modeling (SEM) through the LISREL 8.72 Student Edition (LInear Structural RELations 8.7; Jöreskog & Sörbom, 2005) computer program was used to answer each of the seven questions.

Structural Equation Modeling (SEM). SEM was used to address each question in this investigation. SEM is a powerful method of data analysis that uses individual growth trajectories for building and testing models hypothesized by a researcher that are often predictive in nature. It is a technique that includes, among other things, path analysis and regression to explore relationships among changes in individual variables over time (Keith, 1993; Shumacker & Lomax, 2004). Individual growth trajectories offer a rich and flexible alternative to traditional methods for analyzing longitudinal data and take advantage of the multi-wave data present in this investigation. They also depict change as a continuous process, such that the amount of change between time periods for any given participant is a result of that participant's underlying growth trajectory (Francis, Fletcher, Stuebing, Davidson, & Thompson, 1991). By using SEM, this investigation was able to focus on describing the process of change in child behaviour predictors, child measures, and parenting stress over time using individual trajectories, instead of simply focusing on

the amount of change between two arbitrary points in time, such as T4 minus T1 (Francis et al., 1991). Thus, individual variability was not ignored (Willett & Sayer, 1994).

The software program LISREL 8.72 Student Edition (Jöreskog & Sörbom, 2005) was used to examine the relationships among the raw scores[3] of all child behaviour predictor variables, child measures, negative life events and parent coping style variables (when required), and the parenting stress variable. A model for each of the seven research questions was hypothesized and is presented below.

[3] Raw scores were used for all variables except for IQ in which only standard scores were available.

Figure 3.1: Time 1 child behaviours as predictors of the slope of a child characteristic variable over 2 years

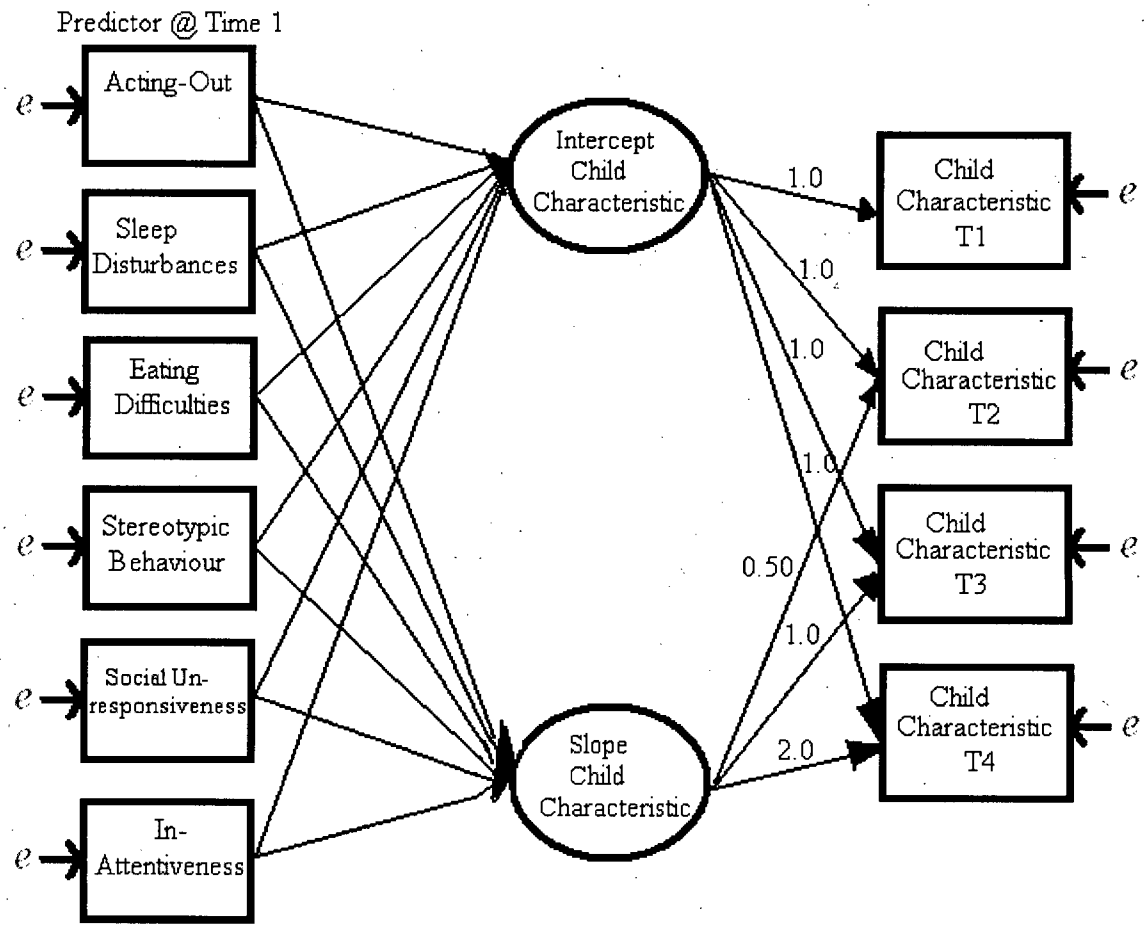


Figure 3.1 addresses Question #1 and examines whether predictor variables measured at baseline (T1) explain a percentage of the individual difference variance in the Rate of Change (ROC) of the raw scores for each child characteristic variable (e.g., IQ, adaptive behaviour, and language skills) measured over 2 years (i.e. T1, T2, T3, and T4).

Figure 3.2: Change in child behaviour variable over first 6 months of intervention (T1-T2) as a predictor of the slope of a child characteristic variable over 2 years

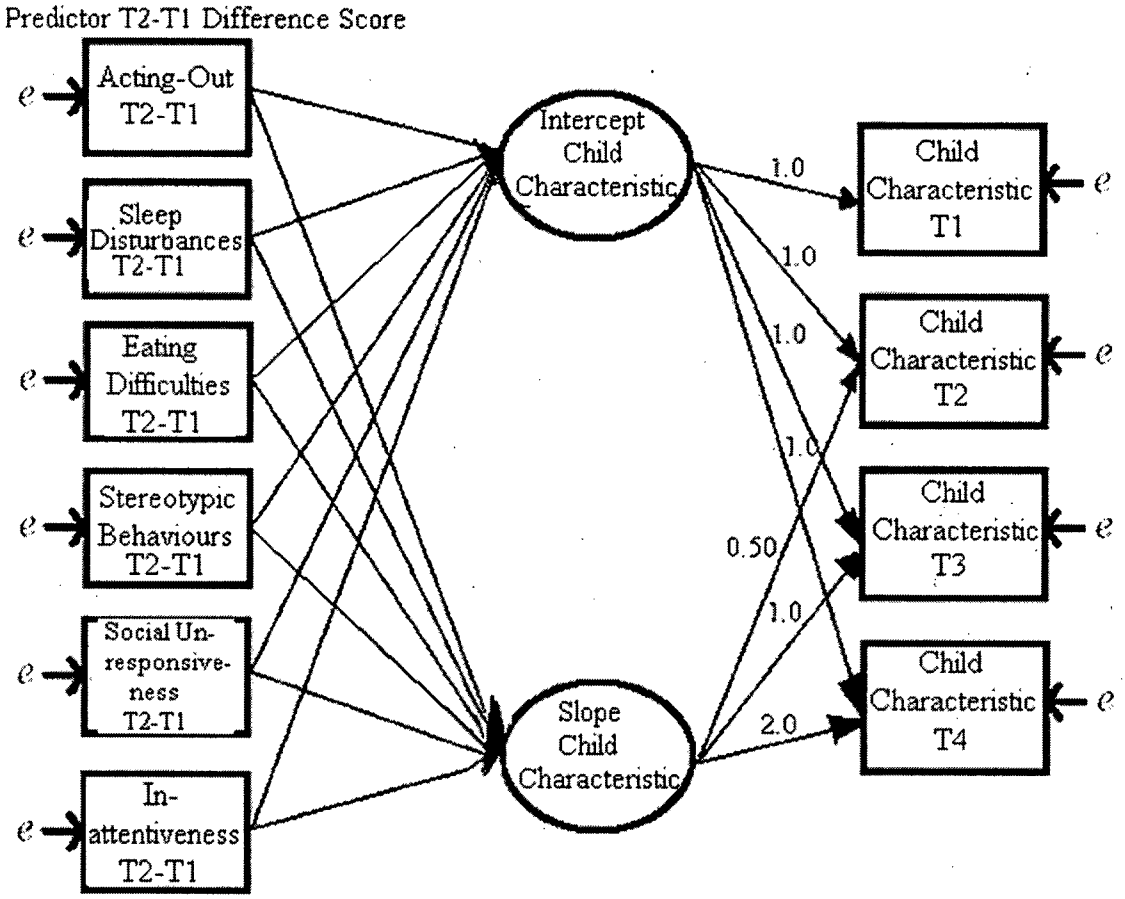


Figure 3.2 addresses Question #2 and examines whether changes in predictor variables over the first 6 months of intervention (as measured by a T2 minus T1 difference score) explain the individual difference variance in the ROC of the raw scores for each child characteristic variable measured over 2 years.

Figure 3.3: Change in a child behaviour variable over the first year of intervention (T1 to T3) as a predictor of the slope of a child characteristic variable over 2 years

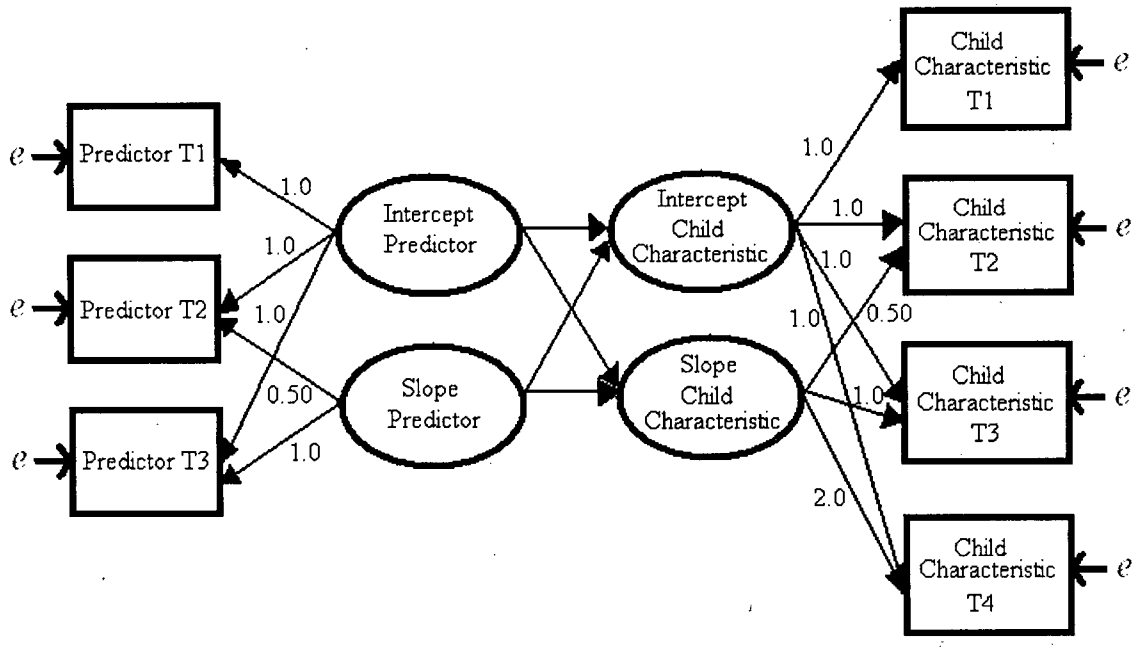


Figure 3.3 addresses Question #3 and examines whether the individual difference variance in ROC of the predictor variables over the first year of intervention (T1, T2, and T3) explains the individual difference variance in ROC in the raw scores of each child characteristic over 2 years.

Figure 3.4: Coping style (F-COPES) and negative life events (FILE) as predictors of the slope of parenting stress over 2 years

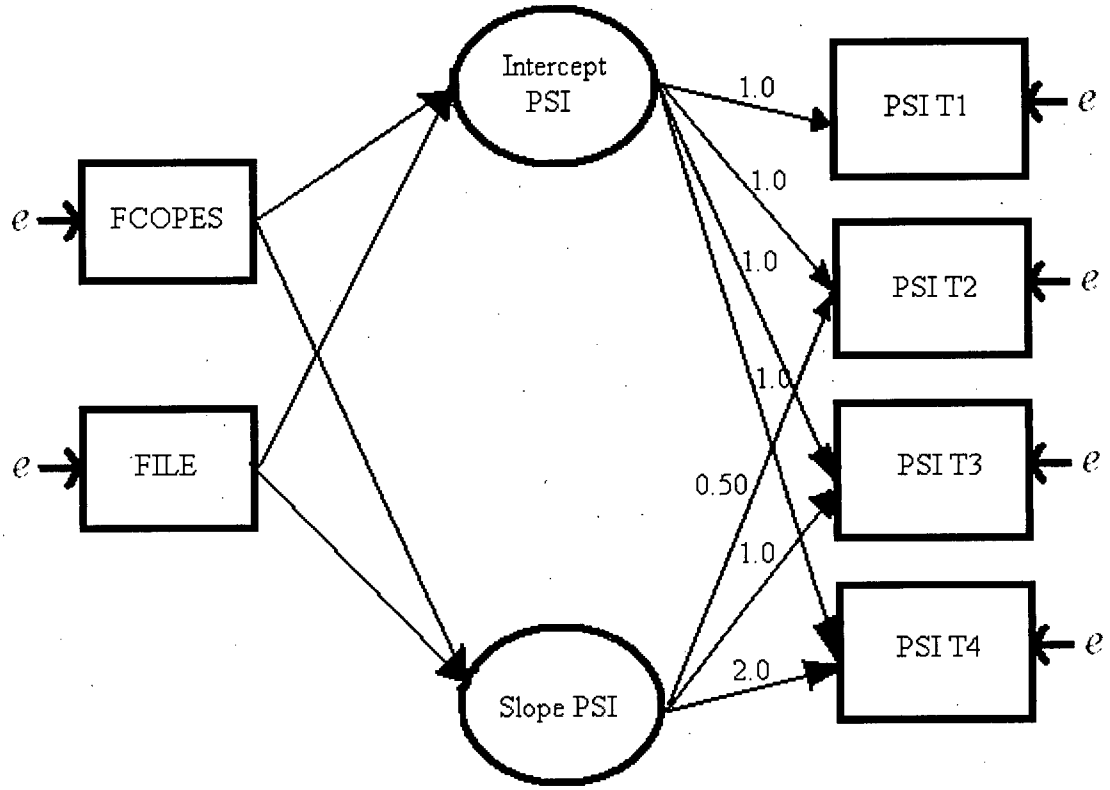


Figure 3.4 addresses Question #4 and examines the relationship between life events and parent coping style and the individual difference variance in the ROC of parenting stress over 2 years (i.e., T1, T2, T3, and T4).

Figure 3.5: Time 1 child behaviour variables as predictors of the slope of parenting stress over 2 years, taking into account parent coping style and negative life events experienced

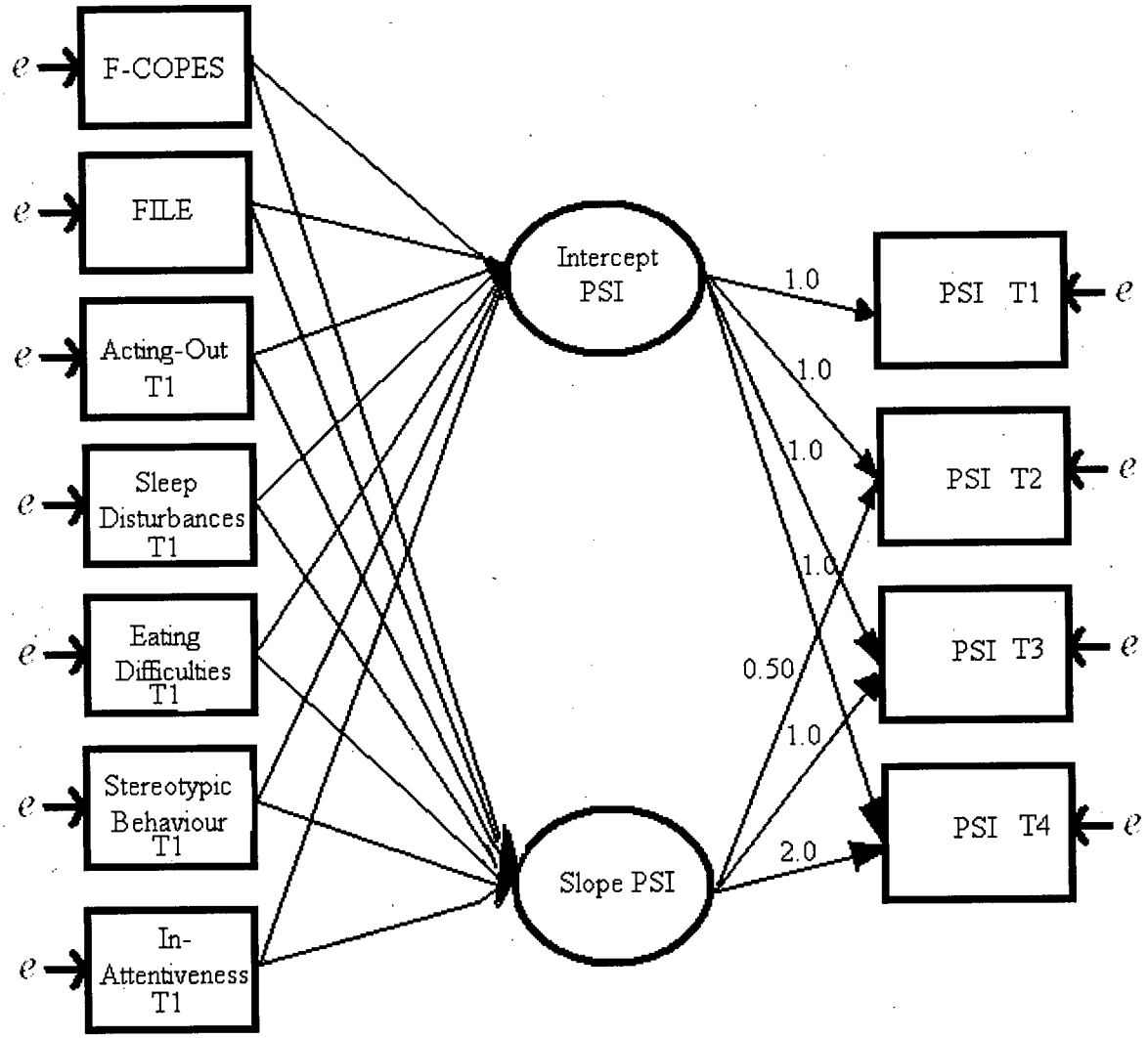


Figure 3.5 addresses Question #5 and examines whether predictor variables measured at baseline (T1) explain a percentage of the individual difference variance in the ROC of parenting stress over 2 years in the context of negative life events and parent coping style.

Figure 3.6: Change in child behaviour variables over the first 6 months of intervention (T1-T2) as predictors of the slope of parenting stress over 2 years, taking into account parent coping style and negative life events experienced

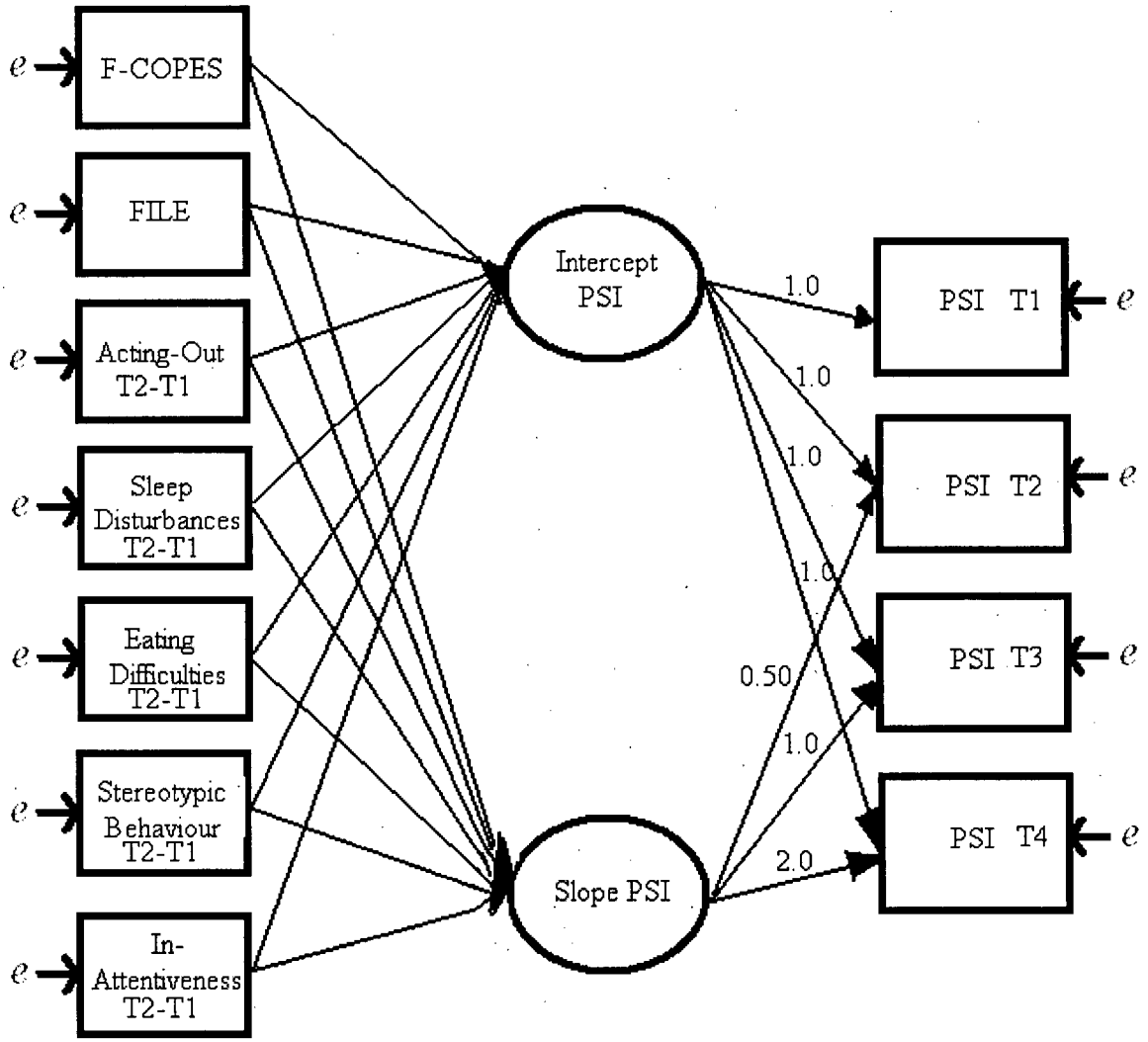
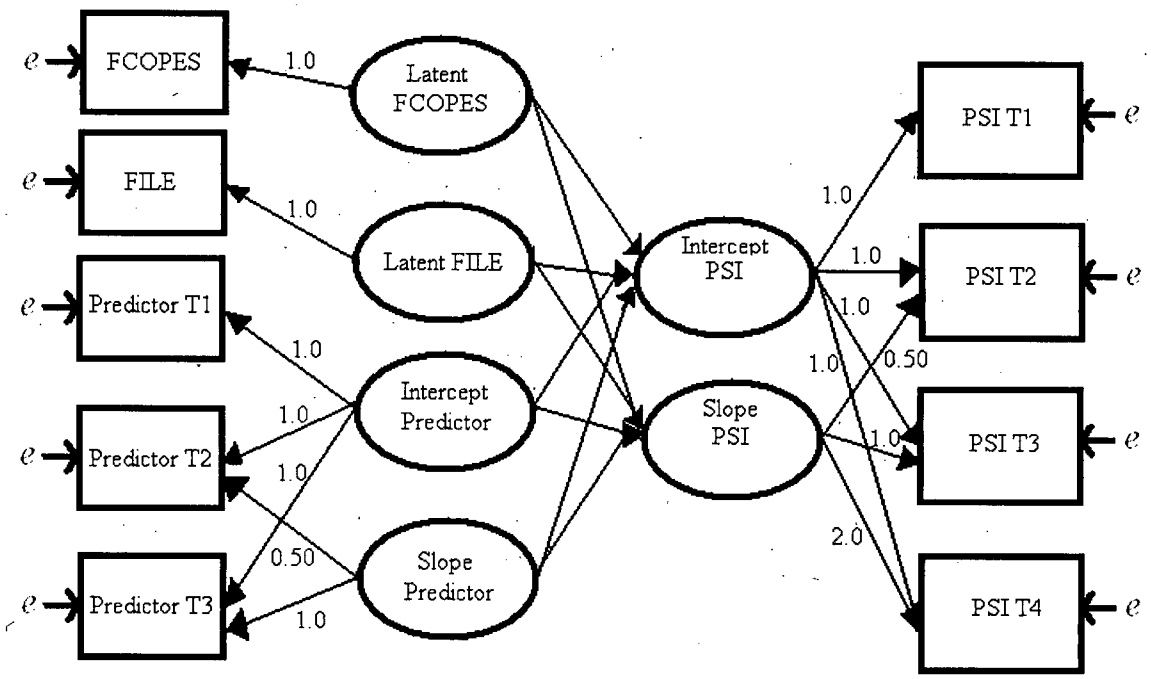


Figure 3.6 addresses Question #6 and examines whether changes in predictor variables over the first 6 months of intervention (i.e., measured by a T2 minus T1 difference score) explain the individual difference variance in the ROC of parenting

stress over 2 years in the context of parent coping style and negative life events experienced.

Figure 3.7: Change in a child behaviour variable over the first year of intervention (T1 to T3) as a predictor of the slope of parenting stress over 2 years, taking into account parent coping style and negative life events experienced



Finally, Figure 3.7 addresses Question #7 and examines whether the individual difference variance in ROC of the predictor variables over the first 12 months of intervention (T1, T2, and T3) explains the individual difference variance in the ROC of parenting stress over 2 years in the context of parent coping style and negative life events experienced.

SEM statistics reported. The guidelines for reporting SEM data dictate that one should examine goodness-of-fit indices (e.g. chi-square, GFI, CFI, NFI, RMSEA) for overall model fit before examining the individual path coefficients within the model (Keith, 1993; McDonald & Ho, 2002; Raykov, Tomer, & Nasselroade, 1991). If a model is found to be a "good fit," it accounts for the majority of the covariance (Chin, 1998). However, in this analysis, a decision was made *not* to examine or report fit indices for each structural model presented; rather, only individual path coefficients and their corresponding significance levels will be reported. This decision was based on three arguments found in the current literature with regard to the usefulness of fit statistics in general and the reliability of fit indices for small sample sizes in particular. First, fit indices have been found to be of little use when SEM is used to examine the individual structural paths between predictors and changes in outcome variables over time (Chin, 1998; Fan, Thompson, & Wang, 1999). The structural models presented in this research do not attempt to account for the majority of the covariance, as occurs in factor analysis. Instead, this investigation examined only a "piece" of the puzzle and attempted to identify some -- but certainly not all -- important variables that affect developmental changes over time in children with autism.

Second, the general rules for determining cut-off values used by many researchers to examine fit (e.g., incremental fit indexes > .90) have been called into question recently (Marsh, Hau, & Wen, 2004; Tomarken & Waller, 2005; Yuan, 2005). For example, Tomarken and Waller (2005) argued that fit indices are negatively affected by factors such as sample size and model complexity. Yuan (2005) also concluded that cut-off values are questionable with regard to model fit/misfit when he demonstrated that most

fit indices change their distributions substantially when conditions such as sample size change.

Finally, fit indices have been found to be unreliable for small sample sizes specifically (Curran, Bollen, Paxton, Kirby, & Chen, 2002; Yuan, 2005; Yuan, personal communication, September 27, 2005). Recent research has indicated that RMSEA (Root Mean Square Error of Approximation), one of the most commonly reported fit indices, is biased and unreliable when sample sizes are under 200 (Curren et al., 2002; Yuan, personal communication, September 27, 2005). Therefore, as the sample size in this investigation is considered small[4] according to SEM standards (i.e., 70 participants over four testing occasions), fit indices will not be reported. Instead, only path coefficients and their corresponding t-values were examined.

[4] It must be noted that in longitudinal research, small sample sizes are common, especially when examining special populations such as young children with autism.

CHAPTER 4

Results

In this chapter, the results are presented in five sections. First, the results of the total item correlation analysis used to construct each child behaviour variable are summarized. Second, the descriptive statistics for all child behaviour variables from T1 to T3, child measures from T1 to T4, and parent stress measures from T1 to T4 are provided. Third, the results of the unconditional model examining changes in each of the child measures and in the PSI-SF over 2 years are presented. Fourth, the results for Questions 1-3 that address the predictive effects of child behaviours on changes in other child characteristics over 2 years are summarized. Finally, the results for Questions 4-7 regarding the predictive effects of parent coping styles and negative life events and child behaviours on changes in parenting stress over 2 years are presented.

Predictor Variable Creation: Results of Total Item Correlation Analysis

Table 4.1 summarizes the total number of items chosen and the corresponding coefficient alpha found for each predictor variable. A coefficient alpha of $\geq .75$ indicated that the items used to calculate the composite score for each predictor variable were internally consistent with little measurement error (Streiner & Norman, 1989). Appendix C summarizes the complete list of items included in each child behaviour variable.

Of note is the fact that the item content of the predictor variables for acting-out behaviour, stereotypic behaviour, and social unresponsiveness differed when these variables were used as predictors of child measures versus predictors of parenting stress measures. This is because individual items from the PSI-SF were included in the child

behaviour variables when they were used to predict changes in child measures over 2 years. However, PSI-SF items were omitted from the child behaviour variables when they were used to predict changes in parenting stress over 2 years, in order to eliminate any correlation effects.

Table 4.1

Number of items per predictor variable and corresponding coefficient alpha

Child behaviour	Total number of items	Coefficient alpha
Acting-out (as a predictor of child measures)	28	.825*
Acting-out (as a predictor of parenting stress)	21	.833*
Sleeping disturbances	4	.769*
Eating difficulties	9	.817*
Stereotypic behaviour (as predictor of child measures)	38	.750*
Stereotypic behaviour (as a predictor of parenting stress)	37	.760*
Social unresponsiveness (as a predictor of child measures)	22	.744**
Social unresponsiveness (as a predictor of parenting stress)	0	Unable to obtain alpha of $\geq .75$
Inattentiveness	29	.755*

*alpha = $\geq .75$ indicates that items are internally consistent with little measurement error

**alpha accepted at given value[5]

[5] A coefficient alpha of .744 was felt to be sufficient because subsequent item omissions resulted in further reductions of alpha below the .75 target.

Overall, the acting-out behaviour variable, when used as a predictor of change in child measures, consisted of 28 items and had a coefficient alpha of .825. When this variable was used as a predictor of change in parenting stress, it consisted of 21 items and had a coefficient alpha of .833. The predictor variable sleeping disturbances consisted of only 4 items but had a coefficient alpha of .769. Eating difficulties consisted of nine items and had a coefficient alpha of .817. Stereotypic behaviour, when used as a predictor of change in child measures, consisted of 38 items and had a coefficient alpha of .75. When this variable was used as a predictor of change in parenting stress, it consisted of 37 items and had a coefficient alpha of .76. The social unresponsiveness variable, when used as a predictor of change in child measures, consisted of 22 items and had a coefficient alpha of .744[6]. However, when this variable was used as a predictor of change in parenting stress, it did not achieve a coefficient alpha greater than .75; thus, it was omitted as a child predictor variable from all parenting stress analyses. Finally, the inattentiveness variable consisted of 29 items and had a coefficient alpha of .755. In conclusion, all of the child behaviour variables with the exception of social unresponsiveness as a predictor of parenting stress, achieved the target alpha of $\geq .75$ and thus, were considered to be internally consistent with little measurement error.

Descriptive Statistics

Before providing descriptive statistics, it is important to address the issue of sample size. The sample size for all questions pertaining to predictors of change in child measures over 2 years consisted of the entire group of 70 children. However, the sample size for all questions pertaining to predictors of change in parenting stress measures over

[6] A coefficient alpha of .744 was felt to be sufficient because subsequent item omissions resulted in further reductions of alpha below the .75 target.

2 years was reduced to 63 children, for two reasons. First, previous research suggests that the predictors of parenting stress differ for mothers and fathers (see Chapter 2); thus, the data for four participants whose fathers completed the PSI-SF were omitted. Second, according to the PSI-SF manual, a raw score of less than 10 on the Defensive Responding (DR) subscale indicates that a parent's responses on the instrument may reflect an attempt to present herself and her relationship with her child with autism in an overly positive light. Three parents with DR subscale scores below 10 during at least 2 of the 4 data collection points (i.e., at least 50% of the time) were considered to be defensive responders and were thus omitted from all parenting stress analyses. In combination, these two exclusion rules resulted in a sample size of 63 for the parenting stress analyses.

Descriptive statistics: Child behaviours (T1 to T3) predicting child measures.

Composite scores were calculated for each child behaviour variable. Table 4.2 summarizes the mean, range, and standard deviation for each of the six child behaviours at baseline (T1), 6 months (T2), and one year (T3) for all 70 children.

Table 4.2

Scores for child behaviour variables used to predict changes in child measures over 2 years ($N = 70$)

	Time 1		Time 2		Time 3	
Child variable	Mean (range)	SD	Mean (range)	SD	Mean (range)	SD
Acting-out behaviours (maximum score = 28)	14.37 (4-27)	5.37	11.94 (1-29)	5.91	11.61 (0-24)	5.94
Eating difficulties (maximum score = 9)	5.74 (0-9)	2.73	5.70 (0-9)	2.87	5.77 (0-9)	2.91
Sleep disturbances (maximum score = 4)	0.66 (0-4)	1.14	0.74 (0-3)	1.07	0.80 (0-4)	1.07
Stereotypic behaviour maximum score = 38	20.17 (6-35)	5.46	17.51 (2-36)	6.93	16.86 (1-31)	6.94
Social unresponsiveness (maximum score = 22)	6.67 (0-14)	3.19	4.97 (0-12)	2.91	4.81 (0-15)	2.83
Inattentiveness (maximum score= 29)	16.49 (7-26)	4.40	13.81 (2-24)	5.13	13.36 (2-23)	5.16

SD = standard deviation

On average, the scores for acting-out behaviours, stereotypic behaviours, social unresponsiveness, and inattentive behaviours decreased over the first year of intervention (T1 to T3), whereas eating difficulties and sleeping disturbances displayed little average change over time. The relatively high mean scores for acting-out behaviours, stereotypic

behaviours, and inattentiveness appear to conform to the patterns that might be expected in children with autism (i.e., on average, the children displayed approximately 51% of all possible acting-out behaviours, 53% of stereotypic behaviours, and 57% of inattentive behaviours). However, the relatively low mean scores for social unresponsiveness were unexpected, given that this characteristic is typically associated with autism. On average, the children displayed only 29% of all possible socially unresponsive behaviours at T1, 23% at T2, and 22% at T3.

Descriptive statistics: Child behaviours (T1 to T3) predicting parenting stress.

Using the sample size of 63 and omitting all PSI-SF items, composite scores were re-calculated for each child behaviour variable, with the exception of social unresponsiveness which did not achieve an alpha of $\geq .75$. Table 4.3 summarizes the mean, range, and standard deviation for each of the five child behaviours at baseline (T1), 6 months (T2), and one year (T3) for all 63 children.

Table 4.3

Descriptive statistics for child behaviour variables used to predict changes in parenting stress over 2 years ($N = 63$)

	Time 1		Time 2		Time 3	
Child behaviour variable	Mean (range)	SD	Mean (range)	SD	Mean (range)	SD
Acting-out behaviour (maximum score = 21)	10.39 (1-20)	4.05	8.55 (0-24)	4.54	8.38 (0-18)	4.43
Eating difficulties (maximum score = 9)	5.59 (0-9)	2.76	5.68 (0-9)	2.88	5.75 (0-9)	2.90
Sleep disturbances (maximum score = 4)	0.73 (0-4)	1.18	0.74 (0-3)	1.05	0.84 (0-4)	1.11
Stereotypic behaviour (maximum score = 37)	19.65 (6-34)	5.21	17.16 (2-35)	6.84	16.59 (1-30)	6.81
Inattentiveness (maximum score = 29)	16.73 (7-26)	4.44	13.92 (2-24)	5.21	13.37 (2-23)	5.10

SD = standard deviation

On average, acting-out behaviours, stereotypic behaviours, and inattentive behaviours decreased over the first year of intervention (T1 to T3), whereas eating difficulties and sleeping disturbances showed little change over time.

Descriptive statistics: Child measures (T1 to T4).

Table 4.4 summarizes the raw score[7] mean, range, and standard deviation for each of the 11 child measures at baseline (T1), 6 months (T2), 1 year (T3), and 2 years (T4) for all 70 children.

Table 4.4

Raw scores[8] of child measures from T1 to T4

	Time 1		Time 2		Time 3		Time 4	
Child measure	Mean (range)	SD	Mean (range)	SD	Mean (range)	SD	Mean (range)	SD
ABC	67.90 (11-116)	23.68	49.68 (0-99)	23.93	47.47 (4-114)	26.40	47.80 (4-110)	24.85
CARS	36.14 (22-51)	5.95	35.43 (18-49)	6.81	34.74 (19-50)	7.18	34.34 (17-51)	7.90
IQ	52.39 (40-127)	12.12	54.83 (48-112)	12.90	58.51 (39-112)	15.45	61.76 (40-117)	18.91
VABS comm	35.43 (4-91)	17.93	44.36 (10-115)	21.27	52.14 (10-116)	26.44	61.88 (12-114)	26.99

Table continues

[7] Raw scores were used for all child measures with the exception of IQ, for which only standard scores were available.

[8] Raw scores were used for all child measures with the exception of IQ, for which only standard scores were available.

Table 4.4 (Continued)

Child measure	Time 1 Mean (range)	Time 1 SD	Time 2 Mean (range)	Time 2 SD	Time 3 Mean (range)	Time 3 SD	Time 4 Mean (range)	Time 4 SD
VABS dls	34.83 (6-70)	14.80	42.33 (8-117)	20.35	51.36 (14-114)	22.79	60.61 (17-136)	25.02
VABS soc	34.57 (13-72)	11.47	40.57 (17-76)	12.50	47.20 (17-84)	15.64	51.86 (5-104)	18.61
PPVT	10.64 (0-85)	18.71	20.80 (0-87)	23.05	28.80 (0-108)	27.67	39.20 (0-125)	30.04
EOWPVT	11.19 (0-65)	15.74	19.81 (0-75)	18.94	25.17 (0-86)	23.12	34.80 (0-96)	26.91
PLS AC	13.39 (3-48)	9.78	20.01 (3-47)	11.46	23.91 (5-48)	13.02	29.19 (8-48)	13.37
PLS EC	14.38 (4-47)	8.10	18.39 (6-44)	8.89	21.57 (5-48)	10.27	26.05 (7-48)	12.43
PLS Total	27.77 (8-95)	17.45	38.41 (11-91)	19.95	45.48 (10-96)	22.94	55.24 (15-96)	25.37

comm = communication; dls = daily living skills; soc = social skills

On average, the mean scores on the ABC and CARS decreased over 2 years and the mean standard scores for IQ increased over 2 years. In addition, the mean raw scores

for the VABS communication, social skills, and daily living skills subscales and for the PPVT, EOWPVT, PLS AC, PLS EC, and PLS Total all increased over 2 years.

Descriptive statistics: Parenting stress (T1 to T4).

Table 4.5 summarizes the mean, range, and standard deviation for each of the PSI-SF subscales and for the PSI-SF total score at baseline (T1), 6 months (T2), 1 year (T3), and 2 years (T4) for 63 children.

Table 4.5

Scores of parenting stress (T1 to T4)

	Time 1		Time 2		Time 3		Time 4	
PSI-SF scores	Mean (range)	SD	Mean (range)	SD	Mean (range)	SD	Mean (range)	SD
PD	33.13 (15-53)	8.87	30.19 (15-51)	8.38	29.52 (15-58)	10.08	26.46 (12-46)	8.73
PCDI	30.08 (18-50)	6.73	26.81 (17-42)	6.06	25.14 (15-46)	7.13	24.21 (12-49)	6.71
DC	38.17 (18-54)	7.39	34.23 (14-52)	8.39	34.00 (17-55)	8.27	32.90 (16-53)	9.19
Total	101.42 (59-147)	17.80	91.22 (52-136)	18.54	88.63 (53-149)	21.00	83.60 (42-136)	20.21

PD = Parental Distress subscale; PCDI = Parent-Child Dysfunctional Interaction subscale; DC = Difficult Child subscale

On average, there was a decrease in all three PSI-SF subscale scores and in the total score over 2 years. Overall, the mean PSI-SF total score at T1 (101.42) decreased from above the cut-off value of ≥ 90 that indicates a clinically significant level of parenting stress to below this cut-off value at T4 (83.60).

Unconditional Model: Changes in Child Measures and PSI-SF Over 2 Years

Before any analyses were conducted to examine the predictors of change in either child measures or parenting stress over 2 years, the unconditional model that examined change in each of these variables alone over 2 years was required. Table 4.6 presents the unconditional model for changes in child measures from T1 to T4. Table 4.7 presents the unconditional model for changes in parenting stress as measured on the PSI-SF from T1 to T4.

Table 4.6

Unconditional model of change in child measures from T1 to T4

Value	ABC	CARS	IQ	VABS comm	VABS dls	VABS soc	PPVT	EOW-PVT	MCDI total words	PLS AC	PLS EC	PLS total
Intercept	59.60	35.66	52.62	35.72	34.17	34.27	12.27	12.97	155.54	16.22	14.63	31.63
Slope	-6.91	-0.53	4.23	13.95	13.00	9.58	13.66	10.57	138.68	6.32	5.98	11.45
T-value	**-4.64***	-1.42	**5.23***	**12.03***	**14.42***	**11.81***	**11.63***	**10.61***	**11.39***	**12.29***	**12.04***	**12.54***

*t-value significant at $\geq \pm 1.96$ ($p \leq 0.05$)

comm.= communication; dls = daily living skills; soc = social skills

Table 4.7

Unconditional model of change in PSI-SF from T1 to T4

Value	PSI total	PSI PD	PSI PCDI	PSI DC
Intercept	96.12	31.05	27.74	36.88
Slope	-6.74	-2.53	-2.22	-2.01
T-value	**-6.14***	**-5.65***	**-6.87***	**-3.42***

*t-value significant at $\geq \pm 1.96$ ($p \leq 0.05$)

PD = parental distress; PCDI = parent-child dysfunctional interactions; DC = difficult child

Overall, the results indicate that the children changed significantly over 2 years on all child measures, except for the CARS. In addition, the results demonstrated that parents changed significantly on all three subscales and on the total score of the PSI-SF over 2 years. Therefore, all measures except the CARS were included in subsequent conditional model analyses that examined the predictors of change for child measures and parenting stress over 2 years.

Results: SEM Analyses

Structural equation modeling (SEM) was used to examine whether one or more categories of child behaviour either as measured at the onset of intervention (i.e., Questions 1 and 5), measured with a difference score between baseline and 6 months (i.e., Questions 2 and 6), or measured by the rate of change from baseline to 1 year (i.e., Questions 3 and 7) predicted the individual difference variance in the rate of change of any child or parenting stress measure over 2 years. In this section, all results are

presented in tables instead of in SEM path diagrams for ease of reading. Each table includes the path coefficient (β) and corresponding t-value for the path. A path is defined from one of the six categories of child behaviours to the rate of change of each child measure over 2 years. A path coefficient with a t-value of $\geq \pm 1.96$ was considered significant at $p \leq 0.05$. Please note that analyses were not conducted on paths between child behaviour variables and child measures when items from the child measure were used in the creation of the predictor variable(s). Cases in which this situation occurred are coded as N/A (Not Analyzed) in each table. In addition, some of the conditional models required the use of mathematical restrictions such as allowing the error of a predictor at a specific time point to be greater than 0. Please refer to Appendix D for the examples of LISREL syntax for each question and a list of all restrictions used for each conditional model presented.

Results for Question 1:

Does one or more categories of child behaviour (acting-out behaviour, sleep disturbances, eating difficulties, stereotypic behaviour, social unresponsiveness, and inattentiveness) at the onset of intervention predict child characteristics over 2 years?

Table 4.8 presents the results for this question. In this analysis the independent variable is the T1 score for each child behaviour.

Table 4.8

Path coefficients and (t-values) for T1 child behaviours predicting rate of change (T1 to T4) of child measures

Child measure	Acting-out behaviour	Sleep disturbances	Eating difficulties	Stereotypic behaviour	Social unresp.	Inatten-tiveness
ABC	N/A	-0.20	-1.03	N/A	N/A	N/A
		(-0.16)	(-1.87)			
IQ	0.12	-1.11	0.03	-0.11	-0.07	-0.01
	(0.72)	(-1.27)	(0.09)	(-0.56)	(-0.21)	(-0.03)
VABS comm	0.08	-0.43	-0.17	-0.10	-0.33	N/A
	(0.33)	(-0.41)	(-0.39)	(-0.37)	(-.75)	
VABS dls	0.15	0.003	0.50	-0.12	-0.33	-0.66
	(0.83)	(0.004)	(1.58)	(-0.61)	(-0.99)	**(-2.76)***
VABS soc	0.41	0.15	0.52	-0.40	N/A	N/A
	(2.64)*	(0.22)	(1.88)	**(-2.39)***		
PPVT	0.51	-1.00	0.41	-0.10	0.15	-0.72
	(2.14)*	(-0.92)	(0.94)	(-0.40)	(0.33)	**(-2.24)***
EOWPVT	0.62	-0.73	0.16	-0.14	0.15	-0.62
	(3.05)*	(-0.81)	(0.44)	(-0.64)	(0.39)	**(-2.28)***
MCDI	5.74	15.98	0.65	-0.23	-0.16	-5.27
	(2.37)*	(1.44)	(0.14)	(-0.09)	(-0.03)	(1.63)

Table continues

Table 4.8 (Continued):

Child measure	Acting-out behaviour	Sleep disturbances	Eating difficulties	Stereotypic behaviour	Social unresp.	Inatten-tiveness
PLS AC	0.03	0.30	0.07	-0.20	0.12	-0.14
	(0.29)	(0.61)	(0.38)	(-1.75)	(0.57)	(-0.95)
PLS EC	0.23	-0.22	0.05	-0.02	0.06	-0.37
	(2.18)*	(-0.46)	(0.27)	(-0.17)	(0.29)	**(-2.61)***
PLS Total	0.24	0.30	0.08	-0.20	0.07	-0.48
	(1.22)	(0.35)	(0.22)	(-1.00)	(0.19)	(-1.84)

* = t-value significant at $\geq \pm 1.96$ ($p \leq 0.05$)

N/A = Not analyzed because items in the child measure were used to construct the predictor variable

The results revealed that three child behaviours measured at T1 predicted changes in other child characteristics from T1 to T4 (i.e., over 2 years). First, a high score on acting-out behaviour at the onset of intervention was predictive of a greater increase in the rate of change in VABS social, EOWPVT, MCDI, and PLS EC scores over 2 years. Second, a high score on stereotypic behaviour at the onset of intervention was predictive of less of an increase in the rate of change of VABS social scores over 2 years. Finally, a high score on inattentive behaviour at the onset of intervention was predictive of less of an increase in the rate of change of VABS social, VABS daily living, PPVT, EOWPVT, and PLS EC scores over 2 years. The remaining child behaviours (i.e., sleep disturbances,

eating difficulties, and social unresponsiveness) did not significantly predict the rate of change of any child measure over 2 years.

The finding that children with more acting-out behaviours did *better* on social and language skills over time, and children with more inattentive behaviours did *worse* on these same skills required further investigation. The question was asked: "If these two behaviours predict opposing results on the same measures, what is the relationship between high acting-out children and high inattentive children?" To answer this question, children were coded as scoring either high on acting-out behavior at T1 (i.e., scores at or above 18/28) or low on this variable (i.e., scores less than 18). Similarly, with regard to inattentiveness, they were coded as scoring either high (i.e., scores at or above 19/29) or low (i.e., scores below 19). Then, a Pearson product-moment correlation was calculated to determine if children who scored high on acting-out behaviours also scored high on inattentiveness. The results revealed an insignificant correlation of $r^2 = 0.96$ ($p = .428$); thus, it appears that these were two separate groups of children.

Results for Question 2:

Does change in one or more categories of child behaviour (acting-out behaviour, sleep disturbances, eating difficulties, stereotypic behaviour, social unresponsiveness, and inattentiveness) over the first 6 months of intervention predict child characteristics over 2 years?

Table 4.9 presents the results for this question. In this analysis, change in each of the child behaviours over the first 6 months of intervention was represented by a difference score between the two time points of interest (i.e., T2 minus T1) for each predictor variable.

Table 4.9

Path coefficients and (t-values) related to difference scores (T1-T2) for child behaviours predicting the rate of change (T1 to T4) of child measures

Child measure	Acting-out behaviour	Sleep disturbances	Eating difficulties	Stereotypic behaviour	Social unresp.	Inatten-tiveness
ABC	N/A	1.61	0.17	N/A	N/A	N/A
		(1.25)	(0.25)			
IQ	-0.10	0.69	0.39	-0.55	0.06	0.17
	(-0.38)	(0.85)	(0.92)	**(-2.36)***	(0.19)	(0.56)
VABS comm	0.42	0.14	-0.19	-0.49	-0.01	N/A
	(1.17)	(0.12)	(-0.32)	(-1.63)	(-0.21)	
VABS dls	0.33	-0.20	-0.58	-0.26	-0.24	0.23
	(1.16)	(-0.22)	(-1.28)	(-1.11)	(-0.66)	(0.71)
VABS soc	-0.24	0.87	-1.14	-0.40	N/A	N/A
	(-0.97)	(1.12)	**(-2.89)***	(-1.93)		
PPVT	0.17	-0.11	-0.44	-0.05	-0.53	-0.09
	(0.46)	(-0.09)	(-0.75)	(-0.16)	(-1.15)	(-0.22)
EOWPVT	0.08	-0.54	-0.12	-0.25	-0.21	0.10
	(0.26)	(-0.05)	(-0.23)	(-0.94)	(-0.53)	(0.26)
MCDI	0.02	0.09	-0.001	-0.03	-0.07	0.05
	(0.40	(0.79)	(-0.01)	(-0.94)	(-1.42)	(1.08)

Table continues

Table 4.9 (Continued)

Child measure	Acting-out behaviour	Sleep disturbances	Eating difficulties	Stereotypic behaviour	Social unresp.	Inatten-tiveness
PLS AC	0.23	-0.50	-0.08	-0.07	-0.22	-0.22
	(1.39)	(-0.98)	(-0.31)	(-0.49)	(-1.08)	(-1.20)
PLS EC	-.07	-0.27	-0.36	-0.09	-0.11	0.05
	(0.42	(-0.52)	(-1.37)	(-0.63)	(-0.56)	(0.26)
PLS Total	0.32	-0.98	-0.50	-0.09	-0.12	-0.22
	(1.11)	(-1.06)	(-1.07)	(-0.35)	(-0.32)	(-0.66)

* = t-value significant at $\geq \pm 1.96$ ($p \leq 0.05$)

N/A = Not analyzed because items in the child measure were used to construct the predictor variable

The results revealed that changes in two child behaviours from T1 to T2 predicted changes in other child characteristics from T1 to T4 (i.e., over 2 years). First, a reduction in eating difficulties over the first 6 months of intervention was predictive of a greater increase in the rate of change in VABS social skills scores over 2 years. Second, a reduction in stereotypic behaviours over the first 6 months of intervention was predictive of a greater increase in the rate of change of IQ scores over 2 years. Change over the first 6 months in acting-out behaviours, sleep disturbances, social unresponsiveness, and inattentiveness did not predict the rate of change for any child measure over 2 years.

Results for Question 3:

Does change in one or more categories of child behaviour (acting-out behaviour, sleep disturbances, eating difficulties, stereotypic behaviour, social unresponsiveness; and inattentiveness) over the first year of intervention predict child characteristics over 2 years?

Table 4.10 presents the results for this question. In this analysis, change in each of the child behaviours over the first year of intervention was represented in the conditional SEM model through the creation of latent variables for each predictor variable. The latent predictor variable was the slope or rate of change of each predictor variable from T1-T3.

Table 4.10

Path coefficients and (t-values) for the rate of change (T1 to T3) of child behaviours predicting the rate of change (T1 to T4) in child measures

Child measure	Acting-out behaviour	Sleep disturbances	Eating difficulties	Stereotypic behaviour	Social unresp.	Inatten-tiveness
ABC	N/A	-0.75	1.20	N/A	N/A	N/A
		(-0.41)	(1.31)			
IQ	-0.69	11.63	-0.12	-0.25	-0.035	-0.97
	(-1.14)	(0.97)	(-0.30)	(-1.21)	(-0.03)	(-0.43)
VABS comm	0.005	-1.70	-0.15	-0.46	-0.26	N/A
	(0.006)	(-0.75)	(-0.27)	(-1.85)	(-0.19)	

Table continues

Table 4.10 (Continued)

Child measure	Acting-out behaviour	Sleep disturbances	Eating difficulties	Stereotypic behaviour	Social unresp.	Inatten-tiveness
VABS dls	-4.32	-21.82	0.16	-0.37	0.61	-0.34
	(-1.52)	(-0.96)	(0.38)	**(-1.98)***	(0.27)	(-1.51)
VABS soc	-1.74	-10.69	-0.27	-0.079	N/A	N/A
	(-1.34)	(-0.85)	(-0.70)	(-0.49)		
PPVT	-6.79	-41.69	-0.16	-0.38	-0.70	-0.40
	(-1.18)	(-0.69)	(-0.30)	(-1.53)	(-0.69)	(-1.33)
EOWPVT	-4.91	-0.22	-0.19	-0.38	-0.32	-0.54
	(-1.07)	(-0.12)	(-0.41)	(-1.72)	(-0.64)	**(-2.26)***
MCDI	5.56	-2.00	3.57	2.33	10.99	-0.28
	(0.81)	(-0.11)	(0.61)	(0.86)	(1.59)	(-0.09)
PLS AC	0.11	-1.78	0.15	-0.075	-0.63	-0.19
	(0.35)	(-1.14)	(0.62)	(-0.72)	(-1.05)	(-1.34)
PLS EC	-2.31	-28.62	-0.16	-0.24	-0.43	-0.21
	(-1.05)	(-0.29)	(-0.62)	**(-2.10)***	(-0.89)	(-1.57)
PLS Total	-0.05	-1.69	-0.15	-0.29	-0.57	-0.31
	(-0.07)	(-1.50)	(-0.35)	(-1.49)	(-0.70)	(-1.27)

* = t-value significant at $\geq \pm 1.96$ ($p \leq 0.05$)

N/A = Not analyzed because items in the child measure were used to construct the predictor

The results revealed that changes in two child behaviours from T1 to T3 predicted changes in other child characteristics from T1 to T4 (i.e., over 2 years). First, a reduction in stereotypic behaviour over the first year of intervention was predictive of a greater increase in the rate of change of VABS daily living skills and PLS EC scores over 2 years. Second, a reduction in inattentive behaviours over the first year of intervention was predictive of a greater increase in the rate of change of EOWPVT scores over 2 years. Change over the first year in acting-out behaviours, sleep disturbances, eating difficulties, and social unresponsiveness did not predict the rate of change for any child measure over 2 years.

Results for Question 4:

Is there a relationship between scores for parent coping style (FCOPES), negative life events (FILE) at T4, and changes in parenting stress (PSI-SF) over 2 years?

Table 4.11 presents the results for this question.

Table 4.11: Path coefficients and (t-values) for parent coping style and negative life events predicting the rate of change (T1 to T4) of parenting stress over 2 years

PSI-SF Scores	FCOPES	FILE
PSI-SF Total	-0.11	0.36
	(-2.20)*	**(2.50)***
PSI-SF: Parental distress	-0.01	0.10
	(-0.34)	(1.53)
PSI-SF: Parent-child dysfunctional interaction	-0.03	0.09
	(-1.37)	(1.76)

Table continues

Table 4.11 (Continued)

PSI-SF Scores	FCOPES	FILE
PSI-SF: Difficult child	-0.06	0.17
	(-1.76)	**(2.37)***

* = t-value significant at $\geq \pm 1.96$ ($p \leq 0.05$)

The results revealed that mothers with higher F-COPES scores (indicating that, in general, they utilized more positive problem-solving strategies in difficult situations) experienced greater reductions in total parenting stress from T1 to T4 (i.e., over 2 years). In addition, mothers with higher scores on the FILE (indicating that they experienced more negative life events) experienced less of a reduction in total PSI-SF scores and in PSI Difficult Child subscale scores over 2 years. The Difficult Child subscale measures the extent to which the parent perceives the child's behaviour as difficult to manage.

Results for Question 5:

Does one or more categories of child behaviour (acting-out behaviour, sleep disturbances, eating difficulties, stereotypic behaviour, social unresponsiveness, and inattentiveness) at the onset of intervention predict a change in parenting stress scores over 2 years, when parent coping style and negative life events are taken into account?

Table 4.12 presents the results for Question 5. In this analysis the independent variable is the T1 score for parenting stress.

Table 4.12

Path coefficients and (t-values) for child behaviour variables at T1 predicting the rate of change (T1 to T4) in PSI-SF scores

PSI-SF scores	Acting-out behaviour	Eating difficulties	Sleep disturbances	Stereotypic behaviour	Inattentive-ness
PSI Total	-0.28	-0.23	-1.15	0.06	0.23
	(-0.83)	(-0.56)	(-1.20)	(0.22)	(0.82)
PSI: Parental	0.05	-0.16	-1.03	-0.18	0.19
distress	(0.31)	(-0.84)	**(-2.35)***	(-1.43)	(1.46)
PSI: Parent-child	-0.20	-0.17	0.23	0.17	-0.05
dysf. interaction	(-1.69)	(-1.21)	(0.69)	(1.80)	(-0.48)
PSI: Difficult	-0.10	0.11	-0.38	0.07	0.12
child	(-0.54)	(0.55)	(-0.78)	(0.50)	(0.85)

* = t-value significant at $\geq \pm 1.96$ ($p \leq 0.05$)

Only one child behaviour variable at T1 was found to be predictive of changes in parenting stress from T1 to T4 (i.e., over 2 years). Children with higher scores on sleep disturbances at T1 had parents who demonstrated greater reductions in stress related to their feelings of competency (i.e., the Parental Distress subscale). This finding was not in the expected direction. The remaining child behaviour variables at T1 -- acting-out behaviour, eating difficulties, stereotypic behaviour, and inattentiveness -- did not significantly predict the rate of change of parenting stress over 2 years.

Results for Question 6:

Does change in one or more categories of child behaviour (acting-out behaviour, sleep disturbances, eating difficulties, stereotypic behaviour, social unresponsiveness, and inattentiveness) over the first 6 months of intervention predict a change in parenting stress scores over 2 years, when parent coping style and negative life events are taken into account?

Table 4.13 presents the results for this question. In these analyses, change in each of the child behaviours over the first 6 months of intervention was represented by difference scores between the two time points of interest (i.e., T2 minus T1) for each predictor variable.

Table 4.13

Path coefficients and (t-values) related to difference scores (T1-T2) for child behaviours predicting the rate of change (T1 to T4) of parenting stress

PSI-SF scores	Acting-out behaviour	Sleep disturbances	Eating difficulties	Stereotypic behaviour	Inatten-tiveness
PSI Total	-0.50	2.42	0.54	0.59	-0.59
	(-1.31)	**(2.42)***	(0.10)	**(2.05)***	(-1.78)
PSI: Parental distress	-0.17	1.37	-0.002	0.35	-0.40
	(-1.02)	**(3.14)***	(-0.008)	**(2.77)***	**(-2.71)***
PSI: Parent-child	0.09	0.12	-0.47	0.17	-0.27
dysf. interaction	(0.65)	(0.35)	(-0.25)	(1.62)	**(-2.30)***
PSI: Difficult child	-0.41	0.88	0.10	0.06	0.54
	(-2.03)*	(1.68)	(0.37)	(0.39)	(0.31)

* = t-value significant at $\geq \pm 1.96$ ($p \leq 0.05$)

The results revealed that changes in four child behaviours from T1 to T2 predicted changes in parenting stress from T1 to T4 (i.e., over 2 years). Improvement in two child behaviour variables, acting-out and inattentiveness, had the opposite predictive effects on parenting stress than was expected. Children whose acting-out behaviours improved over the first 6 months had parents who were more stressed over 2 years regarding their ability to manage their children's behaviour (i.e., the Difficult Child subscale). In addition, children whose inattentive behaviours improved over the first 6 months had parents who were more stressed over 2 years regarding their feelings of competency and their interactions with their children (i.e., the Parental Distress and Parent-Child Dysfunctional Interaction subscales). On the other hand, children who had reduced stereotypic behaviours or sleep disturbances over the first 6 months had parents who were less stressed over 2 years (i.e., PSI-SF Total scores) as well as less stressed about how competent they felt about raising their children (i.e., the Parental Distress subscale).

Results for Question 7:

Does change in one or more categories of child behaviour (acting-out behaviour, sleep disturbances, eating difficulties, stereotypic behaviour, social unresponsiveness, and inattentiveness) over the first year of intervention predict a change in parenting stress scores over 2 years, when parent coping style and negative life events are taken into account?

Table 4.14 presents the results for this question. In these analyses change in each of the child behaviours over the first year of intervention was represented in the SEM

model through the creation of latent variables for each predictor variable. The latent predictor variable was the slope or rate of change of each predictor variable from T1-T3.

Table 4.14

Path coefficients and (t-values) for the rate of change in child behaviours (T1 to T3) predicting the rate of change in parenting stress (T1 to T4)

PSI-SF scores	Acting-out behaviour	Sleep disturbances	Eating difficulties	Stereotypic behaviour	Inatten-tiveness
PSI Total	0.67	0.28	0.01	0.34	0.05
	(0.59)	(0.21)	(0.62)	(1.31)	(0.21)
PSI Parental distress	-0.35	0.09	0.12	0.11	-0.09
	(-1.13)	(0.15)	(0.49)	(0.92)	(-0.77)
PSI: Parent-child dysf.	-0.34	-0.87	-0.03	0.49	-0.06
interaction	(-1.52)	(-1.84)	(-0.17)	(0.57)	(-0.60)
PSI: Difficult child	0.59	0.96	0.56	0.16	0.19
	(1.20)	(1.23)	**(1.99)***	(1.30)	(1.37)

* = t-value significant at $\geq \pm 1.96$ ($p \leq 0.05$)

The results revealed that changes in only one child behaviour from T1 to T3 predicted changes in parenting stress from T1 to T4 (i.e., over 2 years). Children whose eating difficulties reduced over the first year of intervention were found to have parents who experienced a greater decrease on the Difficult Child subscale over 2 years.

Summary of Results

Table 4.15 presents a summary of the predictive effects of each child behaviour variable at T1, T1 to T2, and from T1 to T3 on both the rate of change (ROC) of child characteristics over 2 years and the ROC of parenting stress over 2 years.

Table 4.15

Summary of predictive effects of child behaviours at T1, T1 to T2, and T1 to T3 on ROC of child characteristics and parenting stress from T1 to T4.

Child behaviour variable	Child characteristic: ROC T1 to T4	Parenting stress measure: ROC T1 to T4
Higher score on acting-out behaviours at T1	Greater increase in ROC of - expressive vocabulary - expressive language - social skills	X
Acting-out: T1-T2 – behaviour reduced	X	Greater increase in ROC of - difficult child
Acting-out: T1 to T3 – behaviour reduced	X	X
Higher score on sleep disturbances at T1	X	Greater decrease in ROC of - parental distress
Sleep disturbances: T1-T2 – behaviour reduced	X	Greater decrease in ROC of -parental distress -total stress

Table continues

Table 4.15 (Continued)

Child behaviour variable	Child characteristic: ROC T1 to T4	Parenting stress measure: ROC T1 to T4
Sleep disturbances: T1 to T3 – behaviour reduced	X	X
Higher score on eating difficulties at T1	X	X
Eating difficulties: T1-T2 – behaviour reduced	Greater increase in ROC of - social skills	X
Eating difficulties: T1 to T3 – behaviour reduced	X	Greater decrease in ROC of - difficult child
Higher score on stereotypic behaviours at T1	Less of an increase in ROC of - social skills	X
Stereotypic behaviour: T1-T2 – behaviour reduced	Greater increase in ROC of - cognitive skills	Greater decrease in ROC of -parental distress -total stress
Stereotypic behaviour: T1 to T3 – behaviour reduced	Greater increase in ROC of - expressive language - daily living skills	X

Table continues

Table 4.15 (Continued)

Child behaviour variable	Child characteristic: ROC T1 to T4	Parenting stress measure: ROC T1 to T4
Higher score on social unresponsiveness at T1	X	N/A
Social unresponsiveness: T1-T2 – behaviour reduced	X	N/A
Social unresponsiveness: T1 to T3 – behaviour reduced	X	N/A
Higher score on inattentiveness at T1	Less of an increase in ROC of - receptive vocabulary - expressive vocabulary - expressive language - daily living skills	X
Inattentiveness: T1-T2 – behaviour reduced	X	Greater increase in ROC of - parental distress - parent-child dysfunctional interaction
Inattentiveness: T1 to T3 – behaviour reduced	Grater increase in ROC of - expressive vocabulary	X

ROC = rate of change; X = no predictive effect found; N/A = not analyzed

CHAPTER 5

Discussion

This study examined a number of relationships between specific child problem behaviors and (a) child characteristics in the cognitive, language, social, and daily living skills domains; and (b) parenting stress in the mothers of young children with autism. There were two primary objectives. The first was to assess the predictive effects of acting-out behaviors, sleep disturbances, eating difficulties, stereotypic behaviours, social unresponsiveness, and inattentiveness on changes in child characteristics over 2 years for 70 young children with autism who received early intervention. The second was to assess the predictive effects of these same child behaviours on changes in parenting stress over 2 years for the mothers of 63 of the children.

This chapter is presented in four sections. First, a discussion of the uniqueness of the statistical analysis used in this investigation is presented. Second, the findings for both objectives, organized according to each of the child problem behaviors investigated, are discussed. Third, the limitations of the study are described; and finally, directions for future research are proposed.

Examining Change Over Time Using Multi-Wave Data

The relationships between six child problem behaviors and changes in both child characteristics and parenting stress over 2 years were examined in two unique ways. First, child behaviours at the onset of intervention (i.e., at a single point in time, T1) were examined as predictors of the rate of change in the developmental trajectories of other child characteristics and parenting stress over four time points (T1, T2, T3, and T4). This

is unique in that, historically, the majority of longitudinal studies in autism have sought to examine the extent to which child behaviours at one time point (T1) predict child characteristics or parenting stress at a second time point (T2) alone. For example, Rollins and Snow (1998) found that joint attention and responsiveness to parental interactions in children with autism at age 1;2 (T1) predicted grammatical development at age 2;7 (T2). Charman et al. (2005) found that nonverbal communicative interactions at age 2 (T1) predicted language, communicative, and social skills at age 7 (T2). Baker et al. (2003) found that child acting-out behaviours at age 3 (T1) predicted parenting stress levels 1 year later (T2). Other authors have also examined various child behaviors as predictors of change over two points in time (e.g., Brady et al., 2004; Charman et al., 2003; Sallows & Graupner, 2005; Sigman & McGovern, 2005; Sigman & Ruskin, 1999; Siller & Sigman, 2002; Stone & Yoder, 2001; Szatmari, 2003; Venter et al., 1992).

This investigation moved beyond past research and used structural equation modeling (SEM) to explore the developmental trajectories over four time points rather than just two. The use of SEM allowed for the dependent variables, child characteristics and parenting stress, to be defined as the rate of change (ROC) of each child's continuous individual trajectory over 2 years (i.e., across T1, T2, T2, and T4) rather than simply as the mean T4 score. As a result, the variability for each child and parent over 2 years was not ignored (Willet & Sayer, 1994).

In addition, this study moved beyond an exploration of T1 predictors alone to examine the extent to which changes in each of six child behaviours over the first year (i.e., over the first six months, to T2; or over the first 12 months, to T3) predicted the differential developmental trajectories found in child characteristics and parenting stress over 2 years (i.e., from T1 to T4). Thus, this investigation used both the mean difference

scores over 6 months (T2 minus T1) and the individual rate of change over 1 year (i.e., T1-T3) to define the predictor variables. This examination of how changes in child behaviours over 1 year predicted differential developmental trajectories for children and their mothers over 2 years enables a deeper understanding of the inter-relationships between individual child behaviours and both child development and parenting stress over time.

Child Behaviours as Predictors of Changes in Child Characteristics Over 2 Years

Acting-Out Behaviour: Predictors of Child Characteristics

The results revealed that only the T1 measure of acting-out behaviours predicted differential developmental trajectories in other child characteristics over time. Specifically, young children with autism who displayed more acting-out behaviours at T1 made more progress in expressive vocabulary, expressive language, and social skills over 2 years. This finding was not expected, as past researchers have theorized that acting-out behaviours may interfere during cognitively demanding tasks and/or may deprive children of opportunities to practice and develop social skills (Bronson, 2000; Hauser-Cram, 2001; Kaiser & Raminsky, 2003).

One possible explanation for the result is that acting-out behaviours in young children with autism may indicate their motivation to interact, albeit negatively, with their environment. In the past, acting-out behaviours were viewed as maladaptive and nonfunctional, requiring simple elimination from a child's behavioral repertoire (Carr, Langdon, & Yarbrough, 1999). However, acting-out behaviors are now understood as serving one or more functions, at least some of which can be viewed as communicative (Durand & Merges, 2001). For example, acting-out behaviours may be used to gain

desired items such as drinks or toys (i.e., "I want X") (Sigafoos & Mirenda, 2002); to escape or avoid undesired activities, people, or situations (i.e., "I don't want X"); and/or to gain attention or social interaction (Bopp, Brown, & Mirenda, 2004; Carr et al., 1999). Therefore, it may be that some (if not most) acting-out behaviours in young children with autism are an indication of underlying communicative and social skills, rather than simply being behaviours that can interfere with development. This may explain why children with more acting-out behaviors at T1 made more progress in communication and social areas over time.

Sleep Disturbances: Predictors of Child Characteristics

Neither the number of behaviors related to sleep disturbances in young children with autism at T1 nor the changes in these behaviors between either T1-T2 or T1-T3 predicted the developmental trajectories of other child characteristics over 2 years. However, this result may reflect problems with the items that comprised the predictor variable itself rather than a true lack of association between sleep disturbances and other child characteristics. This variable included only four items, the smallest number in all six predictor variables. Although the items in this variable achieved a coefficient alpha of 0.77 (indicating internal consistency and little measurement error), the variance between the four items may have been insufficient to predict the rate of change of other child measures over 2 years. In addition, recent studies suggest that two of the four items that constituted this variable, "crying or screaming during sleep" and "often frightened by dreams or having nightmares," are among the least frequently reported sleep problems in young children with autism (Wiggs & Stores, 2004; Williams, Sears, & Allard, 2003). Indeed, "crying or screaming during the night" was reported in only 11% of the children

in this study at T1, in 9% at T2, and in 6% at T3; and "often frightened by dreams..." was reported in only 16% at T1, in 14% at T2, and in 13% at T3. Future research is needed to examine how specific sleep disturbances (e.g., getting fewer hours of sleep, as per Schreck, Mulick et al., 2004) are predictive of changes in child characteristics over time.

Eating Difficulties: Predictors of Child Characteristics

Scores for eating difficulties at T1 did not predict the rate of change in any child measures over 2 years; however, children whose eating behaviours improved between T1-T2 made more progress in social skills over this period of time. This finding is consistent with the work of Archer and Szatmari (1991), who found a significant correlation between eating behaviour and social skills at a single time point. The present study adds to the limited research on eating behaviors in autism by demonstrating that reductions in the frequency of these behaviours appears to be related to long-term gains in another area of child development.

It is interesting to note that 7 of the 9 items (77.8%) that comprised the eating difficulties variable were behaviours related to narrow food preferences, such as "limits self to particular food textures/temperatures," "avoids certain tastes or food smells that are typically part of children's diets," and "seeks out certain tastes or smells." These behaviours can be considered stereotypic behaviours related to food, in that they reflect a child's insistence on sameness and restricted pattern of interest (Turner, 1999). Hence, the relationship between changes in eating behaviours and changes in other child characteristics will be discussed in more depth in the next section on stereotypic behaviour.

Stereotypic Behaviour: Predictors of Child Characteristics

Both the level of stereotypic behaviour at T1 and changes in stereotypic behaviour sometime between T1-T3 predicted differential developmental trajectories in other child characteristics over 2 years. Specifically, children who had more stereotypic behaviours at T1 made less progress in social skills over 2 years (i.e., T1-T4). In addition, a decrease in stereotypic behaviours between T1 and T2 predicted improvement in cognitive skills over 2 years, and a decrease in stereotypic behaviours from T1 to T3 predicted improvement in expressive language and daily living skills over 2 years. Finally, as noted previously, reductions in primarily stereotypic eating behaviours between T1-T2 predicted improvement in social skills over 2 years.

These findings are consistent with past correlational studies that have identified relationships between stereotypic behaviors and other child characteristics (e.g., autism severity, cognitive and/or language ability) at a single time point (e.g., Campbell et al., 1990; Dadds et al., 1988; Venter et al., 1992). The findings are also consistent with intervention studies that have identified an inverse relationship between stereotypic behaviour and the acquisition of communication and/or social skills (e.g., Koegel, Koegel, Hurley, & Frea, 1992; Lee & Odom, 1996). Stereotypic behaviors have also been found to compete against the acquisition of language and social skills (Lee & Odom, 1996; Polirstok et al., 2003); for example, children who demonstrate stereotypic behaviours often have fewer social learning opportunities (McConnell, 2002). Finally, the present research echoes the results reported by Epstein et al. (1985), who found that children with autism whose stereotypic behaviours improved the most also had the best academic achievement scores over 2 years.

In addition, this study was the first to demonstrate a predictive relationship between the three defining domains of autism (i.e., social interaction deficits; communication/language deficits; and repetitive, stereotypic behaviors). This is important because it provides us with potentially useful information about how to maximize the effectiveness of early intervention efforts. Past research suggests that, while interventions that focus on prelinguistic socio-communication skills such as joint attention appear to promote language and social development over time, these same interventions have little effect on changes in stereotypic behaviour (Charman & Swettenham, 2001; Charman et al., 2005; Eaves & Ho, 1996). However, the results of this study suggest that the opposite may be true -- changes in stereotypic behaviour (including those related to restricted food preferences) appear to be related to changes in the developmental trajectories of social, language, daily living, and cognitive skills over time. This suggests that early intervention programs should include specific interventions designed to affect changes in the frequency of stereotypic behaviors, since such changes appear to be related to changes in other domains as well. For example, interventions designed to increase play skills, teach alternative replacement behaviors, and use activity schedules or pictorial cues have all been found to reduce stereotypic behaviours over time (see Turner, 1999 for a review).

Social Unresponsiveness: Predictors of Child Characteristics

Neither scores reflecting the number of behaviors related to social unresponsiveness in young children with autism at T1 nor changes in these scores from either T1-T2 or T1 to T3 predicted the developmental trajectories of other child characteristics over 2 years. However, it is important to note that the 22 items in the

constructed social unresponsiveness variable obtained a coefficient alpha of 0.744, which was slightly less than the minimum level of significance (0.75) used to ensure internal consistency (Streiner & Norman, 1989). Efforts to strengthen the construct by removing one or more items were insufficient to achieve the target level, suggesting that there may have been an unacceptable degree of measurement error in the variable itself. In addition, the mean scores for social unresponsiveness at each time point were relatively low (e.g., the children displayed only 29% of all possible socially unresponsive behaviors at T1, 23% at T2, and 22% at T3). Given the fact that social unresponsiveness is a defining characteristic of autism, these scores suggest that the items used to construct the variable did not accurately reflect the social deficits that are typically seen in young children with autism. Taken together, these two concerns suggest that this predictor variable may have been insufficient to characterize the construct of social unresponsiveness accurately.

On the other hand, it is possible that the predictor variable was reasonably accurate and valid despite the somewhat low coefficient alpha, and that children's low social unresponsiveness scores reflect a diagnostic problem rather than a measurement error. When the children in this study were diagnosed (i.e., prior to 2001), neither of the current "gold standard" diagnostic instruments for autism -- the Autism Diagnostic Interview-Revised (ADI-R; Le Couteur, Lord, &, Rutter, 2003) and the Autism Diagnostic Observation Schedule (ADOS: Lord, Rutter, DiLavore, & Risi, 2002) -- were commonly used in British Columbia, primarily because of a lack of trained diagnosticians. Rather, all of the children in this study were diagnosed by individual professionals or professional teams using the Childhood Autism Rating Scale (CARS; Schopler et al., 1988). In addition, an independent psychologist re-administered the CARS at each time point used in the study.

Recently, Saemundsen, Magnússon, Smári, and Sigurdardóttir (2003) examined both the CARS and the ADI-R with 54 children (ages 22 to 114 months) who were referred for possible autism. They found a significant correlation ($r = 0.81$; $p < .001$) between the ADI-R total score and the total score on the CARS. In addition, the observed agreement between the two instruments was 66.7% (i.e., moderate agreement) when all three domain scores on the ADI-R reached the threshold for autism and the cut-off score on the CARS was over 30 (i.e., defining autism). However, this agreement increased significantly to 94.4% when at least one domain score on the ADI-R reached the threshold for autism and the cut-off value on the CARS was over 30. Together, these results provide at least moderate support for the concurrent validity of the two measures. Similarly, Pilowsky, Yirmiya, Shulman, and Dover (1998) also examined the agreement between these two instruments in 70 participants who were suspected of having autism. They found an 85.7% agreement between the CARS and ADI-R diagnoses. From these findings, it appears that the diagnostic criteria used in the CARS are consistent with those in at least the ADI-R, suggesting that the children in this study who were diagnosed with the CARS did indeed have autism and that their low scores were reflective of problems with the constructed variable for social unresponsiveness rather than diagnostic inaccuracy.

Inattentiveness: Predictors of Child Characteristics

It is important to note at the outset that inattentive behaviours as defined in this research were not related to difficulties with either joint attention or gaze shifting. Rather, inattentiveness referred to the children's inability to make eye contact, maintain focused attention, and/or attend to sudden changes in their environments. Therefore, the

discussion of results related to this variable will focus only on inattentive behaviours as defined, without comparing those results to the large body of previous research on joint attention.

Both the level of inattentiveness at T1 and changes in inattentiveness between T1-T3 predicted differential developmental trajectories in other child characteristics over 2 years. First, children with more inattentive behaviours at T1 made significantly less progress over 2 years in receptive and expressive vocabulary, expressive language, and daily living skills. This is consistent with past research demonstrating a predictive relationship between the ability of children with developmental disabilities to focus and persist when trying to master a problem, task, or skill at T1 (i.e., age 3) and increased cognitive and daily living skills at T2 (i.e., 10 years later) (Hauser-Cram et al., 2001). However, this is the first study to demonstrate this predictive relationship for young children with autism.

Second, children whose in inattentive behaviors decreased from T1 toT3 made significantly more progress in expressive vocabulary from T1 to T4. This finding is intriguing. Given the previous finding that children with low levels of inattentiveness at T1 improved in four areas of development over 2 years (i.e., expressive and receptive vocabulary, expressive communication, and daily living skills), one might anticipate that a reduction in inattentiveness from T1 to T3 would predict improvements in all four of these areas. However, a positive rate of change in inattentiveness from T1 to T3 predicted improvement in only one area, expressive vocabulary. In this regard, it is important to note that, on average, inattentive behaviours decreased by only 3.13 points from T1-T3; thus, it appears that the majority of children were still relatively inattentive at T3. Perhaps

larger reductions in inattentiveness were needed in order for changes in this behavior to have predictive value. Future research is needed in order to examine this issue.

Child Behaviours as Predictors of Maternal Parenting Stress Over 2 Years

The second objective of this study was to examine the same six child behaviours as predictors of differential changes in parenting stress for 63 mothers of children with autism over 2 years. However, the predictor variable social unresponsiveness was eliminated because the items used to define this variable for the parenting stress analyses did not hold together with a coefficient alpha of $\geq .75$, indicating a lack of internal consistency with an unacceptable amount of measurement error. Thus, only the remaining five behavior variables were examined as predictors.

The purpose of these analyses was to better understand the inter-relationships between child problem behaviors and parenting stress over time. However, as described in Chapter 1, the Double ABCX model of family adaptation (McCubbin & Patterson, 1983) theorizes that the stress of raising a child with a disability (X) is influenced by child characteristics (A), parental coping style (B), and by external family supports and/or negative life events experienced (C). In addition, Hodapp et al. (1997) argued that relationships between A, B, C, and X change over time, as indicated by the "double" in the Double ABCX model. Thus, in order to better understand how specific child behaviours affected parenting stress over time, the influence of two other variables -- parental coping style and negative life events experienced over 2 years -- were first examined. The findings revealed that mothers of young children with autism who had more positive coping strategies and/or who experienced fewer negative life events had greater reductions in overall parenting stress over 2 years. These findings are consistent

with previous research with parents of children with other developmental disabilities (e.g., Cameron & Armstrong, 1991; Dunn et al., 2001; Hauser-Cram et al., 2001) and confirm the need for the inclusion of parental coping style and negative life events in any model examining the impact of specific child behaviors on parenting stress over time. Consequently, both parental coping style and negative life events were included in each of the structural equation models for all five child behaviours analyzed in this study.

Acting-Out Behaviour: Predictors of Maternal Parenting Stress

The level of child acting-out behaviours at T1 did not predict the rate of change in maternal parenting stress over 2 years. This finding is not consistent with past research, which has demonstrated that acting-out behaviours are typically associated with higher levels of parenting stress for children with autism. However, the majority of past research has been correlational in nature (e.g., Hastings, 2003); has examined children with a variety of developmental disabilities other than autism (e.g., Ross & Blanc, 1998); and/or has examined the simple effects of mean levels of acting-out behaviours at one time point (T1) on mean levels of parenting stress at another time point (T2) (e.g., Baker et. al., 2003). This study was unique in that SEM was used for the analysis, enabling an examination of the individual rate of change of each parent's stress scores over four time points spanning 2 years, rather than a simple examination of mean differences over two time points. Thus, the individual variability for these parents was not ignored -- that is, change as reflected in their individual growth trajectories rather than in a simple group mean change score was examined (Francis, et al., 1991; Willet & Sayer, 1994). This finer-grained analysis may more accurately reflect the predictive influence of acting-out

behaviours at T1 on the rate of change in parenting stress over time for mothers of young children with autism than the findings from previous research.

In contrast, children whose acting-out behaviours decreased between T1-T2 had mothers who experienced more stress with regard to their ability to manage their children's behaviour over 2 years. This finding was also unexpected. One possible explanation is that the mothers of children with higher rates of acting-out behavior experienced increased stress related to implementing intervention programs aimed at ameliorating those behaviours. For example, many types of interventions that are used to replace acting-out behaviours with functional alternatives are typically implemented by parents in the home (see Lucyshyn, Dunlap, & Albin, 2002). The demands of implementing behavior intervention programs may have placed more stress on the mothers at the same time that they effectively reduced the children's acting-out behavior over time. This explanation is supported by anecdotal reports implying that home-based early intervention programs may increase parenting stress (e.g., Cattell-Gordon & Cattell-Gordon, 1998), although it is also challenged by research to the contrary (e.g., Hastings & Johnson, 2001). Additional research is required to examine the interactive relationships between child acting-out behaviours and the demands of parent-implemented behavioral interventions.

An alternative explanation for this finding is that the positive changes observed in children's acting-out behaviours between T1-T2 (a 6-month period) were insufficient to have a significant impact on long-term (i.e., 2-year) reductions in maternal parenting stress. Acting-out behaviours in these children were not eliminated over this time period; they were simply reduced (from a mean of 10.4 to a mean of 8.4). As noted previously, the majority of research has demonstrated that acting-out behaviours are a strong and

consistent predictor of parenting stress, even when parental coping styles (e.g., McDonald & Gregoire, 1997) and negative life events experienced (e.g., Hauser-Cram et al., 2001) are taken into account. Thus, it is perhaps not surprising that, in this study, short-term, relatively minor reductions in acting-out behaviors were insufficient to affect decreases in parenting stress over 2 years.

Finally, we know very little about the influences of *specific* acting-out behaviours in young children with autism on parenting stress over time. Perhaps, the "quality" of acting-out behavior has more influence on parenting stress than does the quantity of such behaviors. For example, relatively minor acting-out behaviours such as cries easily, is stubborn or uncooperative, or non-compliant (i.e., refusing to do what one is told to do) may have much less impact on parenting stress than more disruptive behaviours such as severe temper tantrums or hurting others by biting, kicking, and/or hitting. Both types of behaviors were included in the acting-out variable constructed for this study, which may have diluted the predictive value of the variable as a whole. Future investigations should examine the impact of specific acting-out behaviours on parenting stress over time, to clarify this issue.

Sleep Disturbances: Predictors of Maternal Parenting Stress

Both the level of sleep disturbances at T1 and changes in sleep disturbances from T1 to T2 predicted differential developmental trajectories in measures of maternal stress over 2 years. First, children who had more sleep disturbances at T1 had mothers who were less stressed in terms of their feelings of competency as a parent (as reflected in scores on the PSI-SF subscale Parental Distress) from T1 to T4. This finding was not expected. However, examining the impact of children's behaviour at a single time point

(T1) on changes in parenting stress over 2 years may not reveal the whole the story between these two variables. This result may have been spurious - in that, the decrease observed in the subscale Parental Distress from T1 to T4 was caused by a missing critical variable (Burns, 1997). In this case, it may not have been the high T1 value, but perhaps was the decrease in this value over 6 months or 1 year (i.e., the difference score from T1-T2 or the rate of change from T1-T3) that predicted the decrease in maternal stress over time. Therefore, the next step in the analysis examined how actual changes in child behaviours sometime over one year predicted differential parenting stress measures over 2 years. In fact, this analysis did find that children whose sleep disturbances decreased from T1 to T2 (i.e., in the first 6 months) had mothers who demonstrated less overall stress and were less stressed on the same subscale, Parental Distress, over 2 years. This finding is more revealing and indicates that it was most likely the decrease in stereotypic behaviours that predicted the reductions in maternal parental distress over time rather than the T1 level alone.

Recent research on sleep interventions appears to support the finding that decreases in child sleep disturbances can promote reductions in maternal stress. Although there is no way of knowing if the children in this study received any intervention targeting sleep disturbances, the work of Wiggs and Stores (2001) supports the idea that sleep interventions can reduce parenting stress. They implemented a behavioural treatment program for sleep problems to the parents of 15 children (mean age: 8;2) with severe intellectual disabilities and severe sleep problems and compared them to 15 controls who received no treatment. The mothers of children in the sleep treatment group reported significantly less stress after 2 months than the mothers of children in the control

group. Therefore, it appears that helping mothers of children with autism to reduce their children's sleep disturbances can have a positively impact on parenting stress over time.

A plausible explanation for the relationship between decreased sleep disturbances and reductions in maternal stress can be found by examining the individual items within this variable. All four items (i.e., "often frightened by dreams in the nighttime," "screams in sleep and can't be comforted," "wakes up often and doesn't fall back asleep," and "doesn't have a regular sleep pattern") describe behaviours that disrupt both children's sleep and that of their mothers and other family members. Sleep deprivation has been found to be related to increased stress over time; for example, Kemp (2003) reported that sleep deprivation was one of the main contributors to parenting stress for parents caring for young children with severe eczema. Thus, when children sleep better, their mothers sleep better and may experience less stress as a result.

Eating Difficulties: Predictors of Maternal Parenting Stress

Neither scores reflecting the number of problem eating behaviors in young children with autism at T1 nor changes in these scores from T1-T2 predicted differential maternal stress trajectories over 2 years. However, a decrease in eating difficulties from T1-T3 predicted a reduction in maternal stress related to the mothers' ability to manage their children's behaviour over 2 years (i.e., the PSI-SF Difficult Child subscale). This finding is consistent with past correlational research indicating that parents of children who have problems with eating also experience more stress (Archer & Szatmari, 1991; Gray, 1994). Gray (1994) noted that specific types of rigid eating behaviours such as "insisting that food be presented on a certain plate" appeared to cause the most stress for many parents of young children with autism. This type of behavior, which was prevalent

among the eating behaviors included in this study, can be considered to be stereotypic because of its repetitive, inflexible nature. Thus, the relationship between changes in eating behaviours and changes in maternal parenting stress will be discussed further in the next section on stereotypic behaviour.

Stereotypic Behaviours: Predictors of Maternal Parenting Stress

The level of stereotypic behaviours at T1 did not predict differential maternal stress trajectories over 2 years. However, children whose stereotypic behaviours decreased from T1–T2 had mothers who experienced less overall stress over 2 years as well as less stress related to their feelings of competency in raising their children (as reflected in scores on the PSI-SF subscale Parental Distress). In addition, as previously noted, children whose stereotypic eating behaviours decreased between T1–T3 had mothers who reported less stress in terms of their ability to manage their children's behaviour over 2 years. These findings are consistent with past correlational research that has identified relationships between child stereotypic behaviours and parenting stress at one time point (e.g., Beckman, 1983; Gabriels et al., 2005; Stoddart, 2003; Stores et al., 1998). The results are the first to suggest that decreasing stereotypic behaviours in young children with autism over a short period of time (i.e., 6 months or 1 year) can result in reduced maternal stress over a longer period of time (i.e., 2 years).

One interpretation for this finding is that stereotypic behaviours act as a barrier to the development of children's adaptive communication, daily living, and socialization skills, which in turn results in increased parenting stress. The findings of this study provide some evidence to support the suggestion that stereotypic behaviours do indeed limit the development of adaptive skills (see the previous section entitled *Stereotypic*

Behaviours: Predictors of Child Characteristics). Other authors have reported results to support his contention. For example, Szatmari, Archer, Fisman, and Streiner (1994) provided additional evidence that fewer adaptive skills in children are related to increased parenting stress. They found that parents of 83 children with pervasive developmental disorder (mean age: 5;4) who reported fewer adaptive skills on the VABS also experienced high levels of stress. Recently, Chadwick, Cuddy, Kusel, and Taylor (2005) conducted a 5-year follow-up study of 82 children with intellectual disability (mean age at T1: 8;0 and mean age at T2: 13;0). They, too, found a relationship between child adaptive behaviour and parenting stress. Specifically, they found that improvements in adaptive communication skills (as measured with the Vineland screener, a shortened version of the VABS) over 5 years were associated with reductions in parenting stress over the same period of time ($r = 0.36$: $p = 0.02$). In terms of the present study, these studies support the interpretation that as children's stereotypic behaviours improve, their adaptive skills improve and, as a result, their parents experience reduced stress over time.

A second interpretation as to why reductions in stereotypic behaviours are related to reduced parenting stress concerns parents' level of comfort with their children in social situations. Many stereotypic behaviours – such as such as "repeatedly touching people or objects to the point of irritating others," "having strong reactions to changes in routine/environment," or "getting involved in complicated rituals such as lining things up" -- can appear odd or disruptive to members of the general public. In an older study, O'Moore (1978) found that social contact activities such as going shopping or taking trips with the family produced higher levels of stress in mothers of children with autism. Related to this is a report that parents of children with autism spend relatively little time engaging in recreational and leisure activities outside of the home (Koegel, Schreibman,

Johnson, O'Neill, & Dunlap, 1984). Perhaps, social outings with children who display unusual stereotypic behaviours are more stressful for their parents (and are thus avoided) because these behaviours are not easily explained to or accepted by others.

On the other hand, a recent study that specifically examined the relationship between stereotypic behaviours and parenting stress appears to provide evidence to the contrary. Tomanik, Harris, and Hawkins (2004) found that stereotypic behaviours had no correlational relationship with maternal stress for the mothers of 60 children with PDD (mean age: 5;0). However, the stereotypic behavior variable in this study was based on the stereotypy subscale of the Aberrant Behavior Checklist (Aman & Singh, 1986), which included only 7 stereotypic behaviours. Some of these were non-specific items such as "odd, bizarre behavior," while others were non-disruptive behaviors such as "meaningless, recurring body movements," "moves or rolls head back and forth repeatedly," or "repetitive hand, body, or head movements." Overall, many of these behaviours were less disruptive than the 38 stereotypic behaviours included in the present investigation. Perhaps, the different results reported by Tomanik et al. (2004) and the present study reflect differences between the specific stereotypic behaviors that were examined in each. Future research examining how reductions in specific types of stereotypic behaviours influence changes in parenting stress over time are needed, to clarify this issue.

Inattentiveness: Predictors of Maternal Parenting Stress

The level of inattentive behaviour at T1 did not predict differential maternal stress trajectories over 2 years. However, children whose inattentive behaviours decreased from T1-T2 (i.e., over 6 months) had mothers who experienced more stress with regard to their

feelings of competency as a parent (i.e., scores on the PSI-SF Parental Distress subscale) and their feelings about interactions with their children (i.e., scores on the Parent-Child Dysfunctional Interaction subscale) over 2 years. This finding was not expected. One possible explanation is that, as the children became less inattentive, they may have sought more attention from their parents and placed more caretaking demands on their mothers which, in turn, resulted in increased maternal stress. In support of this suggestion, Keller (1999) examined the variances of stress in 62 mothers of elementary school age children with disabilities and found that caretaking demands were a significant predictor of parenting stress. However, this interpretation is only preliminary. Since this study is the first to examine the relationship between inattentiveness and changes in stress over time in mothers of children with autism, additional research is needed to clarify this result.

Limitations

This is the first autism study that has attempted to examine behavioural predictors of differential trajectories of changes in other child characteristics and maternal stress over time and, as is often case with "first" studies in particular, it has several limitations. First, relatively small sample sizes ($N = 70$ for child characteristics and $N = 63$ for maternal stress) were used. Although small sample sizes are not uncommon in the field of developmental disabilities (e.g., Charman et al., 2005; Siller & Sigman, 2002; Sigman & McGovern, 2005; Stone & Yoder, 2001; Szatmari, 2003), future research is needed to examine the predictive relationships found here for a larger group of participants. Second, the timeline of 2 years for this investigation was relatively short for a longitudinal design.

Follow-up at 5 years and beyond for this group of children would be optimal, in order to ascertain the stability of the findings.

Third, the data used in this investigation were originally collected for another purpose (i.e., an evaluation of the impact of early intervention over 2 years). This raises two issues. First, items included within each child behaviour variable were limited to only those items available in the existing measures in the data set. Thus, none of the predictor variables incorporated all possible individual manifestations of the behaviour constructs used as predictors. For example, the variable "sleep disturbances" was constructed from only four items and did not include behaviours such as getting fewer hours of sleep, which Schreck, Mulick et al. (2004) found to be related to other child characteristics. Second, even though considerable care was taken in the construction of the predictor variables to ensure psychometric validity, none of the variables were taken directly from existing valid and reliable standardized measures of child behavior. Thus, it may be that at least some of the unexpected (and difficult-to-interpret) results reflected problems with the constructed predictor variables themselves. In addition, as noted previously, the social unresponsiveness variable only obtained a coefficient alpha of 0.744 when used as a predictor of change in child measures and fell significantly short of the $\geq .75$ level of significance used to ensure internal consistency as a predictor of change in parenting stress. Even though social unresponsiveness was the only predictor variable that failed to achieve an adequate level of internal consistency, future research is needed to examine the predictive effects of all six of the child behaviours presented in this study using standardized, valid, and reliable measures.

Fourth, it would be ideal to be able to interpret the predictive relationships between child behaviours and changes in other child characteristics and maternal stress in

the context of the early intervention these children received. Unfortunately, although the intervention was based on the principles of applied behavior analysis, it was quite eclectic in nature and varied considerably from child to child in terms of both focus and intensity. In addition, information about the extent to which interventions targeting the specific child behaviours examined in this research was not available. Thus, it was not possible to determine or speculate about the impact of specific interventions on changes in the child behaviour variables.

Finally, one needs to be cautious when generalizing these findings beyond this group of 70 children. As with all "first studies," replication is needed to ascertain if these findings persist with other young children with autism. That said, however, the 70 children in this study were reasonably representative of young children with autism in general, as evidenced by their overall developmental profiles and their autism rating scores at each of the four time points. Thus, while generalizability may be limited and must be approached with caution, it is likely that these findings are at least somewhat applicable to young children with autism other than those who participated.

Future Directions

The findings of this research provide a better understanding of some of the specific child behaviours that may predict the development of skills in young children with autism and/or the reduction of stress in their mothers. Identifying such predictive relationships may provide guidance for developing treatments that will result in better outcomes for young children with autism and their families (Koegel et al., 1992). For example, these data suggest that reductions in stereotypic behavior are related to improvements in several child development domains (i.e., cognitive development,

expressive language, social skills, and daily living skills) as well as in maternal stress. If future research supports this finding, empirically-supported early intervention approaches aimed at reducing or ameliorating children's stereotypic behaviour would appear to be in order. Similarly, the results also suggest that interventions designed to improve children's inattentive behaviours may result in improved expressive vocabulary skills; and interventions designed to improve children's sleep disturbances may result in reduced maternal stress. However, the data also suggest that treatments that improve inattentiveness and acting-out behaviours may result in *more* stress for mothers over time. This is a puzzling finding that requires additional research as it may indicate that these types of interventions need to include additional supports for parents. Nonetheless, future studies should consider the impact of specific child behaviours and the interventions related to them on differential trajectories of child development and parenting stress over time. In addition, more research is needed to explore if the predictive relationships found in this investigation persist among other young children with autism receiving various types of early interventions. Only then will we be able to understand the influence of these child behaviours on the widely heterogeneous outcomes observed in young children with autism and their families (Schriebman, 2000).

Future studies are also needed to explore the influence of changes in the *specific* manifestations of behaviours observed within each of the six child behaviour categories proposed in this investigation on changes in child characteristics and parenting stress over time. For example, stereotypic behaviours are manifested in a variety of ways, including motor stereotypies, rituals, compulsions, obsessions, sameness behaviours, echolalia, and self-injury (Bodfish et al., 2000; Militerni, et al., 2002). In fact, Bodfish et al. (2000) demonstrated that very few investigations examining the relationships between

stereotypic behaviours and either child or parent characteristics have operationally defined the specific behaviours involved. Indeed, even in this investigation, there was no way to determine whether changes in specific manifestations of stereotypic behaviours had a differential impact on changes in child characteristics and parenting stress over time. A standardized measure such as the Repetitive Behaviour Scale (Bodfish et al., 1999), which categorizes stereotypic behaviours into six distinct subgroups, may be better able to examine these relationships in the future.

A similar argument can be made for the other child behaviours as well. For example, destructive acting-out behaviours such as "hurts others by kicking, biting, and hitting" may affect changes in child characteristics and parenting stress differently than minor behaviours such as "frequently irritable, touchy or fussy." Or, non-disruptive sleeping behaviours that such as "getting fewer hours of sleep per night" may differentially affect changes in child characteristics and parenting stress than behaviours that affect the entire family, such as "crying or screaming during sleep." Therefore, future investigations should seek to define and examine subgroups of these six behaviours in order to determine their specific influences on the differential developmental trajectories observed in both young children with autism and their parents.

Finally, it would be ideal for future studies to examine the predictive impact of changes in child behaviours on changes in other child characteristics and parenting stress using structural equation modeling (SEM) with a larger sample size and over a longer period of time. Implementing this type of SEM analysis with a larger population of young children with autism would allow for more variance within each measure. As a result, the covariance matrices that are produced may be better able to detect potential predictive relationships among the variables. In addition, more time may be needed for changes in

child behaviours to predict changes in other child characteristics and parenting stress. For example, a reduction in acting-out behaviours over 1 year may be insufficient to affect parenting stress over 2 years.

In conclusion, the findings of this investigation open the door for future research examining the predictive relationships between specific child behaviours on changes in child characteristic and parenting stress over time. This type of research may assist service providers, families, and policy makers to make more informed decisions about how to maximize the effectiveness of their early intervention efforts.

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Appendix A: All Items Located for the Six Child Behaviour Variables

A1: Acting-out items

Measure	Item	Coding
ABC	Severe temper tantrums and/or frequent minor tantrums	yes/no
	Hurts self by banging head, biting hand etc.	yes/no
	Hurts others by biting, kicking, hitting	yes/no
	Is very destructive (toys and household items are soon broken)	yes/no
PSI-SF	#25: My child seem to cry or fuss more often than most children	strongly agree/ agree/ not sure/ disagree/ strongly disagree
	#26: My child generally wakes up in a bad mood	strongly agree/ agree/ not sure/ disagree/ strongly disagree
	#27: I feel that my child is moody and easily upset	strongly agree/ agree/ not sure/ disagree/ strongly disagree
	#28: my child does a few things which bother me a great deal	strongly agree/ agree/ not sure/ disagree/ strongly disagree

A1 continues

A1 (Continued)

Measure	Item	Coding
PSI-SF	#29: my child reacts very strongly when something happens that my child doesn't like.	strongly agree/ agree/ not sure/ disagree/ strongly disagree
	#30: my child gets upset over the smallest things	strongly agree/ agree/ not sure/ disagree/ strongly disagree
	#34: there are some things that my child does that really bother me a lot	strongly agree/ agree/ not sure/ disagree/ strongly disagree
	#35 my child turned out to be more of a problem than I had expected	strongly agree/ agree/ not sure/ disagree/ strongly disagree
	#36: My child makes more demands on me then most children	strongly agree/ agree/ not sure/ disagree/ strongly disagree
Sensory Profile	#105: displays excessive emotional outbursts when unsuccessful at a task	always/ frequently/ occasionally/ seldom/ never
	#107: is stubborn or uncooperative	always/ frequently/ occasionally/ seldom/ never
	#108: has temper tantrums	always/ frequently/ occasionally/ seldom/ never
	#109: poor frustration tolerance	always/ frequently/ occasionally/ seldom/ never

A1 continues

A1 (Continued).

Measure	Item	Coding
Sensory Profile	#110: cries easily	always/ frequently/ occasionally/ seldom/ never
TABS	#21: upset by every little thing	yes/ no
	#22: often difficult to soothe when upset or crying	yes/ no
	#23: has wide swings in mood	yes/ no
	#24: gets angry too easily	yes/ no
	#25: too easily frustrated	yes/ no
	#26: has wild temper tantrums	yes/ no
	#27: frequently irritable, "touchy" or fussy	yes/ no
	#30: controls adult's behavior. "is the boss"	yes/ no
	#31: jealous too often	yes/ no
	#35: almost always refuses to do what is told	yes/ no
	#36: throws breaks things on purpose	yes/ no
	#37: bites, hits, kicks others	yes/ no
	#49: often cries too long	yes/ no
	#52: can't comfort self when upset	yes/ no

A2: Sleep disturbances

Measure	Item	Coding
Sensory Profile	#113: Has nightmares	always/ frequently/ occasionally/ seldom/ never
TABS	#50: often frightened by dreams or the nighttime	yes/ no
	#51: screams in sleep and can't be comforted	yes/ no
	#53: wakes up often and doesn't fall back asleep	yes/ no
	#54: doesn't have a regular sleep schedule	yes/ no
	#55: too often needs help to fall asleep	yes/ no

A3: Eating difficulties

Measure	Item	Coding
Sensory Profile	#54: gags easily with food textures or food utensils in mouth	always/ frequently/ occasionally/ seldom/ never
	#55: avoids certain tastes or food smells that are typically part of children's diet	always/ frequently/ occasionally/ seldom/ never

A3 continues

A3 (Continued)

Measure	Item	Coding
Sensory Profile	#56: will only eat certain tastes	always/ frequently/ occasionally/ seldom/ never
	#57: limits self to particular food textures/temperatures	always/ frequently/ occasionally/ seldom/ never
	#58: picky eater, especially regarding food textures	always/ frequently/ occasionally/ seldom/ never
	#60: shows strong preference for certain smells	always/ frequently/ occasionally/ seldom/ never
	#61: shows strong preference for certain tastes	always/ frequently/ occasionally/ seldom/ never
	#62: craves certain foods	always/ frequently/ occasionally/ seldom/ never
	#63: seeks out certain tastes or smells	always/ frequently/ occasionally/ seldom/ never

A4: Stereotypic behaviour

Measure	Item	Coding
ABC	Whirls self for long periods of time	yes/ no
	Does not use toys appropriately (spins tires)	yes/ no
	Insists on keeping certain objects with him/her	yes/ no
	Rocks self for long periods of time	yes/ no
	Strong reactions to changes in routine/environment	yes/ no
	Does a lot of lunging and darting about, interrupting with spinning, toe walking, flapping, etc.	yes/ no
	Flaps hands	yes/ no
	Walks on toes	yes/ no
	Repeats phrases over and over	yes/ no
	Twirls, spins and bangs objects a lot	yes/ no
	Squints, frowns, or covers eyes when in the presence of natural light	yes/ no
	Repeats sounds or words over and over	yes/ no

A4 continues

A4 (Continued)

Measure	Item	Coding
ABC	Echoes questions or statements made by others	yes/ no
	Prefers to manipulate and be occupied with inanimate things	yes/ no
	Will feel, smell, and/or taste objects in the environment	yes/ no
	Gets involved in complicated rituals such as lining things up, etc.	yes/ no
	Stares into space for long periods of time	yes/ no
PSI	#21: It takes a long time and it is very hard for my child to get used to new things	strongly agree/ agree/ not sure/ disagree/ strongly disagree
Sensory Profile	#8: enjoys strange noises/seeks to make noise for noises sake	always/ frequently/ occasionally/ seldom/ never
	#15: Covers eyes or squints to protect eyes from light	always/ frequently/ occasionally/ seldom/ never
	#16: looks intensely at objects/people (for example stares)	always/ frequently/ occasionally/ seldom/ never

A4 continues

A4 (Continued)

Measure	Item	Coding
Sensory Profile	#24: seeks all kinds of movement activities and this interferes with daily routines (for example can't sit still, fidgets)	always/ frequently/ occasionally/ seldom/ never
	#25: seeks out all kinds of movement activities (for example being whirled by adult, merry-go-rounds, playground equipment, moving toys)	always/ frequently/ occasionally/ seldom/ never
	#26: Twirls/spins self frequently throughout the day (for example likes feeling dizzy)	always/ frequently/ occasionally/ seldom/ never
	#27: rocks unconsciously (for example, while watching TV)	always/ frequently/ occasionally/ seldom/ never
	#28: rocks in desk/chair/on floor	always/ frequently/ occasionally/ seldom/ never
	#40: touches people or objects to the point of irritating others	always/ frequently/ occasionally/ seldom/ never

A4 continues

A4 (Continued)

Measure	Item	Coding
Sensory Profile	#41: displays unusual need for touching certain toys, surfaces, or textures (for example, constantly touching objects)	always/ frequently/ occasionally/ seldom/ never
	#52: Walks on toes	always/ frequently/ occasionally/ seldom/ never
	#59: Routinely smells nonfood objects	always/ frequently/ occasionally/ seldom/ never
	#64: Chews or licks on nonfood objects	always/ frequently/ occasionally/ seldom/ never
	#90: "on the go"	always/ frequently/ occasionally/ seldom/ never
	#97: stares intensively at objects or people	always/ frequently/ occasionally/ seldom/ never
	#121: Has difficulty tolerating changes in plans and expectations	always/ frequently/ occasionally/ seldom/ never
	#122: Has difficulty tolerating changes in routines	always/ frequently/ occasionally/ seldom/ never
	#124: Deliberately smells objects	always/ frequently/ occasionally/ seldom/ never

A4 continues

A4 (Continued)

Measure	Item	Coding
TABS	#1: Consistently upset by changes in schedule	yes/ no
	#9: often stares into space	yes/ no
	#13: makes strange throat noises	yes/ no
	#16: stares at lights	yes/ no
	#17: overly interested in toy/object	yes/ no
	#18: Flaps hands over and over	yes/ no
	#19: shakes head over and over	yes/ no

A5: Social unresponsiveness

Measure	Item	Coding
ABC	Has no social smile	yes/ no
	Does not (or did not as a baby) reach out when reached for	yes/ no
	Does not respond to own name when called out among two others	yes/ no
	Not responsive to other peoples' facial expressions feelings	yes/ no
	Is (or was as a baby) stiff and hard to hold	yes/ no

A5 continues

A5 (Continued)

Measure	Item	Coding
ABC	Is flaccid (doesn't cling) when held in arms	yes/ no
	Frequently has no visual reaction to a "new" person	yes/ no
PSI	#15: My child smiles at me much less than I expected	strongly agree/ agree/ not sure/ disagree/ strongly disagree
	#17: When playing, my child does not often giggle or laugh	strongly agree/ agree/ not sure/ disagree/ strongly disagree
	#19: My child doesn't seem to smile as much as most children	strongly agree/ agree/ not sure/ disagree/ strongly disagree
Sensory Profile	#6: Appears to not hear what you say (for example, does not "tune-in" to what you say, appears to ignore you)	always/ frequently/ occasionally/ seldom/ never
	#7: Does not respond when name is called but you know child is hearing OK	always/ frequently/ occasionally/ seldom/ never
	#94: Is overly affectionate with others	always/ frequently/ occasionally/ seldom/ never

A5 continues

A5 (Continued)

Measure	Item	Coding
Sensory Profile	#95: Doesn't perceive body language or facial expressions (for example, unable to interpret)	always/ frequently/ occasionally/ seldom/ never
	#116: Doesn't express emotions	always/ frequently/ occasionally/ seldom/ never
TABS	#2: Emotions don't match what is going on	yes/ no
	#5: Acts like others are not there	yes/ no
	#8: Seems to be in "own world"	yes/ no
	#38: Rarely smiles, giggles, or laughs at funny things	yes/ no
	#42: Doesn't react to own name	yes/ no
	#43: Doesn't care when others are hurt	yes/ no
VABS Communication	#3: Smiles in response to presence of caregiver	yes/ sometimes/ no
	#4: Smiles in response to presence of familiar person other than caregiver	yes/ sometimes/ no

A5 continues

A5 (Continued)

Measure	Item	Coding
VABS Communication	#5: Raises arms when caregiver says, "Come here" or "up"	yes/ sometimes/ no
VABS Socialization	#2: Responds to voice of caregiver or another person	yes/ sometimes/ no
	#5: expresses two or more recognizable emotions such as, pleasure, sadness, fear, or distress	yes/ sometimes/ no
	#6: shows anticipation of being picked up by caregiver	yes/ sometimes/ no
	#7: shows affection towards familiar people	yes/ sometimes/ no
	#9: reaches for familiar person	yes/ sometimes/ no
	#15: laughs or smiles appropriately in response to positive statements	yes/ sometimes/ no

A5 continues

A5 (Continued)

Measure	Item	Coding
CARS III Emotional Response	4: Severely abnormal emotional response: responses are seldom appropriate to situation; once the child gets in a certain mood, it is very difficult to change the mood. Conversely, the child may show wildly different emotions when nothing has changed.	yes/ no

A6: Inattentiveness

Measure	Item	Coding
ABC	Frequently does not attend to social/environmental stimuli	yes/ no
	Seems not to hear so hearing loss is suspected	yes/ no
	Sometimes shows no startle response to a load noise (may have thought child was deaf)	yes/ no
	Actively avoids eye contact	yes/ no
	"Looks through" people	yes/ no

A6 continues

A6 (Continued)

Measure	Item	Coding
ABC	Frequently unaware of surroundings and may be oblivious to dangerous situations	yes/ no
Sensory Profile	#3: Has trouble completing tasks when the radio is on	always/ frequently/ occasionally/ seldom/ never
	#4: Is distracted or has trouble functioning if there is a lot of noise around	always/ frequently/ occasionally/ seldom/ never
	#5: Can't work with background noise (for example, fan refrigerator)	always/ frequently/ occasionally/ seldom/ never
	#43: Doesn't seem to notice when someone touches arm or back (for example, unaware)	always/ frequently/ occasionally/ seldom/ never
	#48: Has difficulty paying attention	always/ frequently/ occasionally/ seldom/ never
	#49: Looks away from tasks to notice all actions in the room	always/ frequently/ occasionally/ seldom/ never

A6 continues

A6 (Continued)

Measure	Item	Coding
Sensory Profile	#50: Seems oblivious within an active environment (for example, unaware of activity)	always/ frequently/ occasionally/ seldom/ never
	#96: Avoids eye contact	always/ frequently/ occasionally/ seldom/ never
	#99: Doesn't notice when people come into the room	always/ frequently/ occasionally/ seldom/ never
	#123: jumps from one activity to another so that it interferes with play	always/ frequently/ occasionally/ seldom/ never
TABS	#3: Seems to look through or past people	yes/ no
	#4: Resists looking you in the eye	yes/ no
	#10: "Tunes out," loses contact with what is going on	yes/ no
	#28: can't wait at all for food or toy	yes/ no
	#32: mostly on the go, "in high gear"	yes/ no
	#33: doesn't sit still	yes/ no

A6 continues

A6 (Continued)

Measure	Item	Coding
TABS	#34: too "grabby," impulsive	yes/ no
	#39: Doesn't pay attention to sights and sounds	yes/ no
	#40: Doesn't seem to watch moving objects	yes/ no
VABS Communication	#10: Listens attentively to instructions	yes/ sometimes/ no
	#17: Listens to a story for at least five minutes	yes/ sometimes/ no
VABS Socialization	#1: Looks at face of caregiver	yes/ sometimes/ no
PLS AC	#9: Maintains attention for two minutes	yes/ no
Mullen: Scale 4 Receptive Language	#8: attends to words and movements	yes/ no

Appendix B: Item Overrepresentation in Child Behaviour Variables

B1: Acting-out

Measure	Item description	Correlation	PCA	Item chosen to be included in variable?
ABC	Severe temper tantrums and/or frequent minor tantrums	Only the ABC item and TABS #26 correlate at $r^2 \geq 0.50$ where $r^2 = .574$* $p = .000$	N/A	Yes
TABS	#26: has wild temper tantrums			No
Sensory Profile	#108: has temper tantrums			Yes

B1 continues

B1 (Continued)

Measure	Item description	Correlation	PCA	Item chosen to be included in variable?
ABC	Hurts others by biting, kicking, hitting	$r^2 = .642$*	N/A	Yes
TABS	#37: bites, hits, kicks others	$p = .000$		No
ABC	Is very destructive (toys and household items are soon broken)	$r^2 = .484$* $p = .000$	N/A	Yes
TABS	#36: throws breaks things on purpose			No

B1 continues

B1 (Continued)

Measure	Item description	Correlation	PCA	Item chosen to be included in variable?
PSI-SF	#25: My child seems to cry or fuss more often than most children	Only PSI #25 and TABS #49 correlate at $r^2 \geq 0.50$ where $r^2 = .473$* $p = .000$	N/A	No
Sensory Profile	#110: cries easily			Yes
TABS	#21: upset by every little thing			Yes
	#22: often difficult to soothe when upset or crying			Yes
	#49: often cries too long			Yes
	#52: can't comfort self when upset			Yes

B1 continues

B1 (Continued)

Measure	Item description	Correlation	PCA	Item chosen to be included in variable?
PSI-SF	#27: I feel that my child is moody and easily upset	Only PSI #27 and TABS #24 correlate at $r^2 \geq 0.50$ where $r^2 = .523$* $p = .000$	N/A	No
	#29: my child reacts very strongly when something happens that my child doesn't like.			Yes
	#30: my child gets upset over the smallest things			Yes
Sensory Profile	#105: displays excessive emotional outbursts when unsuccessful at a task			Yes
	#109: poor frustration tolerance			Yes

B1 continues

B1 (Continued)

Measure	Item description	Correlation	PCA	Item chosen to be included in variable?
TABS	#24: gets angry too easily	see above	see above	Yes
	#25: too easily frustrated			Yes
PSI-SF	#36: My child makes more demands on me then most children	None of the items across measures correlate at $r^2 \geq 0.50$	N/A	Yes
TABS	#30:controls adult's behavior. "is the boss"			Yes
	#29: Demands attention continually			Yes

B1 continues

B1 (Continued)

Measure	Item description	Correlation	PCA	Item chosen to be included in variable?
PSI-SF	#26: My child generally wakes up in a bad mood	None of the items across measures correlate at $r^2 \geq 0.50$	N/A	Yes
Sensory Profile	#107: is stubborn or uncooperative			Yes
TABS	#23: has wide swings in mood			Yes
	#27: frequently irritable, "touchy" or fussy			Yes
	#31: jealous too often			Yes
	#35: almost always refuses to do what is told			Yes

N/A = not applicable

B2: Sleep disturbances

Measure	Item description	Correlation	PCA	Item Chosen to be included in variable?
Sensory Profile	#113: Has nightmares	None of the	N/A	Yes
TABS	#50: often frightened by dreams or the nighttime	items across measures		Yes
	#51: screams in sleep and can't be comforted	correlate at $r^2 \geq 0.50$		Yes

N/A = not applicable

B3: Stereotypic behaviour

Measure	Item Description – Possible Overrepresentation	Correlation	PCA	Item chosen to be included in variable?
ABC	Rocks self for long periods of time	None of the	N/A	Yes
Sensory Profile	#27: rocks unconsciously (for example, while watching TV)	items across measures correlate at $r^2 \geq 0.50$		Yes
ABC	Flaps hands	$r^2 = .680$*	N/A	Yes
TABS	#18: Flaps hands over and over	$p = .000$		No

B3 continues

B3 (Continued)

Measure	Item Description – Possible Overrepresentation	Correlation	PCA	Item chosen to be included in variable?
ABC	Whirls self for long periods of time	None of the items across measures correlate at $r^2 \geq 0.50$	N/A	Yes
Sensory Profile	#26: Twirls/spins self frequently throughout the day (for example likes feeling dizzy)			Yes
ABC	Squints, frowns, or covers eyes when in the presence of natural light	None of the items across measures correlate at $r^2 \geq 0.50$	N/A	Yes
Sensory Profile	#15: Covers eyes or squints to protect eyes from light			Yes

B3 continues

B3 (Continued)

Measure	Item Description – Possible Overrepresentation	Correlation	PCA	Item chosen to be included in variable?
ABC	Stares into space for long periods of time	$r^2 = .528$* $p = .000$	N/A	Yes
TABS	#9: often stares into space			No
Sensory Profile	#8: enjoys strange noises/seeks to make noise for noises sake	None of the items across measures correlate at $r^2 \geq 0.50$	N/A	Yes
TABS	#13: makes strange throat noises			Yes

B3 continues

B3 (Continued)

Measure	Item Description – Possible Overrepresentation	Correlation	PCA	Item chosen to be included in variable?
ABC	Walks on toes	$r^2 = .480$*	N/A	Yes
Sensory Profile	#52: Walks on toes	$p = .000$		No
ABC	Will feel, smell, and/or taste objects in the environment	None of the items across measures correlate at $r^2 \geq 0.50$	N/A	Yes
Sensory Profile	#40: touches people or objects to the point of irritating others			Yes
Sensory Profile	#41: displays unusual need for touching certain toys, surfaces, or textures (for example, constantly touching objects)			Yes

B3 continues

B3 (Continued)

Measure	Item Description – Possible Overrepresentation	Correlation	PCA	Item chosen to be included in variable?
Sensory Profile	#59: Routinely smells nonfood objects	see above	see above	Yes
Sensory Profile	#64: Chews or licks on nonfood objects			Yes
Sensory Profile	#124: Deliberately smells objects			Yes
Sensory Profile	#90: "on the go"	None of the items across measures correlate at $r^2 \geq 0.50$	N/A	Yes
TABS	#32: mostly on the go, "in high gear"			Yes

B3 continues

B3 (Continued)

Measure	Item Description – Possible Overrepresentation	Correlation	PCA	Item chosen to be included in variable?
ABC	Strong reactions to changes in routine/environment	ABC and sensory profile #121 correlate at $r^2 = .552$* $p = .000$ and ABC and TABS #1 correlate at $r^2 = .498$* $p = .000$	ABC = .854 SP #121 = .803 TABS #1 = .766	Yes
Sensory Profile	#121: Has difficulty tolerating changes in plans and expectations			No
TABS	#1: Consistently upset by changes in schedule			No

N/A = not applicable

B4: Social unresponsiveness

Measure	Item Description – Possible Overrepresentation	Correlation	PCA	Item chosen to be included in variable?
ABC	Has no social smile	Only PSI # 17	N/A	Yes
PSI-SF	#15: My child smiles at me much less than I expected	and TABS #38		Yes
	#17: When playing, my child does not often giggle or laugh	correlate at $r^2 = .456$		No
	#19: My child doesn't seem to smile as much as most children	$p = .000$		Yes
TABS	#38: Rarely smiles, giggles, or laughs at funny things			Yes

B4 continues

B4 (Continued)

Measure	Item Description – Possible Overrepresentation	Correlation	PCA	Item chosen to be included in variable?
VABS - Comm	#3: Smiles in response to presence of caregiver	see above	see above	Yes
	#4: Smiles in response to presence of familiar person other than caregiver			Yes
VABS - Soc	#15: laughs or smiles appropriately in response to positive statements			Yes
ABC	Does not respond to own name when called out among two others	None of the items across measures correlate at $r^2 \geq 0.50$	N/A	Yes

B4 continues

B4 (Continued)

Measure	Item Description – Possible Overrepresentation	Correlation	PCA	Item chosen to be included in variable?
Sensory Profile	#6: Appears to not hear what you say (for example, does not "tune-in" to what you say, appears to ignore you)	see above	see above	Yes
	#7: Does not respond when name is called but you know child is hearing OK			Yes
TABS	#42: Doesn't react to own name			Yes
VABS - Comm	#5: Raises arms when caregiver says, "Come here" or "up"			Yes

N/A = not applicable

B5: Inattentiveness

Measure	Item Description – Possible Overrepresentation	Correlation	PCA	Item Chosen to be included in variable?
ABC	Actively avoids eye contact	None of the items across measures correlate at $r^2 \geq 0.50$	N/A	Yes
TABS	#4: Resists looking you in the eye			Yes
Sensory Profile	#96: Avoids eye contact			Yes
ABC	"Looks through" people	$r^2 = .522$* $p = .000$	N/A	Yes
TABS	#3: Seems to look through or past people			No

B5 continues

B5 (Continued)

Measure	Item Description – Possible Overrepresentation	Correlation	PCA	Item Chosen to be included in variable?
ABC	Frequently does not attend to social/environmental stimuli	None of the items across measures correlate at $r^2 \geq 0.50$	N/A	Yes
	Seems not to hear so hearing loss is suspected			Yes
	Sometimes shows no startle response to a load noise (may have thought child was deaf)			Yes
	Frequently unaware of surroundings and may be oblivious to dangerous situations			Yes

B5 continues

B5 (Continued)

Measure	Item Description – Possible Overrepresentation	Correlation	PCA	Item chosen to be included in variable?
Sensory profile	#43: Doesn't seem to notice when someone touches arm or back (for example, unaware)			Yes
Sensory profile continued	#50: Seems oblivious within an active environment (for example, unaware of activity)	see above	see above	Yes
	#99: Doesn't notice when people come into the room			Yes

B5 continues

B5 (Continued)

Measure	Item Description – Possible Overrepresentation	Correlation	PCA	Item chosen to be included in variable?
TABS	#5: Acts like others are not there			Yes
	#8: Seems to be in "own world"			Yes
	#10: "Tunes out," loses contact with what is going on			Yes
Sensory profile	#123: jumps from one activity to another so that it interferes with play	None of the items across measures correlate at $r^2 \geq 0.50$	N/A	Yes
TABS	#28: can't wait at all for food or toy			Yes
	#33: doesn't sit still			Yes
	#34: too "grabby," impulsive			Yes

N/A = not applicable

Appendix C: Items Selected for the Six Child Behaviour Variables

C1: Acting-out

Measure	Item description	Number
ABC	Hurts self by banging head, biting hand etc	1
	Severe temper tantrums and/or frequent minor tantrums	2
	Hurts others by biting, kicking, hitting	3
	Is very destructive (toys and household items are soon broken)	4
*PSI-SF	#29: my child reacts very strongly when something happens that my child doesn't like.	5
	#30: my child gets upset over the smallest things	6
	#36: My child makes more demands on me than most children	7
	#26: My child generally wakes up in a bad mood	8
	#28: my child does a few things which bother me a great deal	9
	#34: there are some things that my child does that really bother me a lot	10
	#35 my child turned out to be more of a problem than I had expected	11

C1 continues

C1 (Continued).

Measure	Item description	Number
Sensory profile	#108: has temper tantrums	12
	#110: cries easily	13
	#105: displays excessive emotional outbursts when unsuccessful at a task	14
	#109: poor frustration tolerance	15
	#107: is stubborn or uncooperative	16
TABS	#21: upset by every little thing	17
	#22: often difficult to soothe when upset or crying	18
	#49: often cries too long	19
	#52: can't comfort self when upset	20
	#24: gets angry too easily	21
	#25: too easily frustrated	22
	#30:controls adult's behavior. "is the boss"	23
	#29: Demands attention continually	24
	#35: almost always refuses to do what is told	25
	#23: has wide swings in mood	26
	#27: frequently irritable, "touchy" or fussy	27
	#31: jealous too often	28

*PSI-SF items were omitted when used as predictors of parenting stress

C2: Sleep disturbances

Measure	Item description	Number
TABS	#50: often frightened by dreams or the nighttime	1
	#51: screams in sleep and can't be comforted	2
	#53: wakes up often and doesn't fall back asleep	3
	#54: doesn't have a regular sleep schedule	4

C3: Eating difficulties

Measure	Item description	Number
Sensory profile	#54: gags easily with food textures or food utensils in mouth	1
	#57: limits self to particular food textures/temperatures	2
	#58: picky eater, especially regarding food textures	3
	#55: avoids certain tastes or food smells that are typically part of children's diet	4
	#56: will only eat certain tastes	5
	#60: shows strong preference for certain smells	6

C3 continues

C3 (Continued)

Measure	Item description	Number
Sensory profile continued	#61: shows strong preference for certain tastes	7
	#62: craves certain foods	8
	#63: seeks out certain tastes or smells	9

C4: Stereotypic behaviour

Measure	Item description	Number
ABC	Rocks self for long periods of time	1
	Flaps hands	2
	Whirls self for long periods of time	3
	Twirls, spins and bangs objects a lot	4
	Squints, frowns, or covers eyes when in the presence of natural light	5
	Stares into space for long periods of time	6
	Walks on toes	7
	Will feel, smell, and/or taste objects in the environment	8
	Echoes questions or statements made by others	9
	Repeats sounds or words over and over	10

C4 continues

C4 (Continued)

Measure	Item description	Number
ABC continued	Does a lot of lunging and darting about, interrupting with spinning, toe walking, flapping, etc.	11
	Prefers to manipulate and be occupied with inanimate things	12
	Does not use toys appropriately (spins tires)	13
	Insists on keeping certain objects with him/her	14
	Gets involved in complicated rituals such as lining things up, etc.	15
	Strong reactions to changes in routine/environment	16
*PSI-SF	#21: It takes a long time and it is very hard for my child to get used to new things	17
Sensory profile	#27: rocks unconsciously (for example, while watching TV)	18
	#28: rocks in desk/chair/on floor	19
	#26: Twirls/spins self frequently throughout the day (for example likes feeling dizzy)	20
	#15: Covers eyes or squints to protect eyes from light	21

C4 continues

C4 (Continued)

Measure	Item description	Number
Sensory profile continued	#16: looks intensely at objects/people (for example stares)	22
	#97: stares intensively at objects or people	23
	#8: enjoys strange noises/seeks to make noise for noises sake	24
	#40: touches people or objects to the point of irritating others	25
	#41: displays unusual need for touching certain toys, surfaces, or textures (for example, constantly touching objects)	26
	#59: Routinely smells nonfood objects	27
	#64: Chews or licks on nonfood objects	28
	#124: Deliberately smells objects	29
	#24: seeks all kinds of movement activities and this interferes with daily routines (for example can't sit still, fidgets)	30
	#25: seeks out all kinds of movement activities (for example being whirled by adult, merry-go-rounds, playground equipment, moving toys)	31
	#90: "on the go"	32

C4 continues

C4 (Continued)

Measure	Item description	Number
Sensory profile continued	#122: Has difficulty tolerating changes in routines	33
TABS	#16: stares at lights	34
	#13: makes strange throat noises	35
	#19: shakes head over and over	36
	#32: mostly on the go, "in high gear"	37
	#17: overly interested in toy/object	38

*PSI-SF items were omitted when used as predictors of parenting stress

C5: Social unresponsiveness

Measure	Item description	Number
ABC	Has no social smile	1
	Does not (or did not as a baby) reach out when reached for	2
	Does not respond to own name when called out among two others	3
	Not responsive to other peoples' facial expressions feelings	4
	Is (or was as a baby) stiff and hard to hold	5

C5 continues

C5 (Continued)

Measure	Item description	Number
ABC	Is flaccid (doesn't cling) when held in arms	6
continued	Frequently has no visual reaction to a "new" person	7
PSI-SF	#15: My child smiles at me much less than I expected	8
	#19: My child doesn't seem to smile as much as most children	9
Sensory profile	#6: Appears to not hear what you say (for example, does not "tune-in" to what you say, appears to ignore you)	10
Sensory profile	#7: Does not respond when name is called but you know child is hearing OK	11
continued	#116: Doesn't express emotions	12
TABS	#2: Emotions don't match what is going on	13
	#38: Rarely smiles, giggles, or laughs at funny things	14
	#42: Doesn't react to own name	15
	#43: Doesn't care when others are hurt	16
VABS -soc	#5: expresses two or more recognizable emotions such as, pleasure, sadness, fear, or distress	17

C5 continues

C5 (Continued)

Measure	Item description	Number
VABS -soc continued	#6: shows anticipation of being picked up by caregiver	18
	#7: shows affection towards familiar people	19
	#9: reaches for familiar person	20
	#15: laughs or smiles appropriately in response to positive statements	21
	#2: Responds to voice of caregiver or another person	22

soc = socialization

C6: Inattentiveness

Measure	Item Description	Number
ABC	Actively avoids eye contact	1
	"Looks through" people	2
	Frequently does not attend to social/environmental stimuli	3
	Seems not to hear so hearing loss is suspected	4
	Sometimes shows no startle response to a load noise (may have thought child was deaf)	5

C6 continues

C6 (Continued)

Measure	Item Description	Number
ABC continued	Frequently unaware of surroundings and may be oblivious to dangerous situations	6
Mullen	#8: attends to words and movements	7
Sensory	#96: Avoids eye contact	8
profile	#43: Doesn't seem to notice when someone touches arm or back (for example, unaware)	9
	#50: Seems oblivious within an active environment (for example, unaware of activity)	10
	#99: Doesn't notice when people come into the room	11
	#3: Has trouble completing tasks when the radio is on	12
Sensory profile continued	#4: Is distracted or has trouble functioning if there is a lot of noise around	13
	#5: Can't work with background noise (for example, fan refrigerator)	14
	#48: Has difficulty paying attention	15
	#49: Looks away from tasks to notice all actions in the room	16

C6 continues

C6 (Continued)

Measure	Item Description	Number
	#123: jumps from one activity to another so that it interferes with play	17
TABS	#4: Resists looking you in the eye	18
	#10: "Tunes out," loses contact with what is going on	19
	#5: Acts like others are not there	20
	#8: Seems to be in "own world"	21
	#39: Doesn't pay attention to sights and sounds	22
	#40: Doesn't seem to watch moving objects	23
	#28: can't wait at all for food or toy	24
	#33: doesn't sit still	25
	#34: too "grabby," impulsive	26
VABS-soc	#1: Looks at face of caregiver	27
VABS-comm	#10: Listens attentively to instructions	28
	#17: Listens to a story for at least five minutes	29

soc = socialization; comm. = communication

Appendix D: Examples of LISREL Syntax and List of Restrictions

Example of LISREL syntax for time one predictors of child measures from T1 to T4

Conditional model

spss-Data from file IQ_Regardless.sav

Observed variables: outc1 outc2 outc3 outc4 st ia su ao e s

sample size = 70

Latent variables: int_cept slope

Relationships:

outc1 = 1*int_cept

outc2 = 1*int_cept

outc3 = 1*int_cept

outc4 = 1*int_cept

outc1 = 0*slope

outc2 = 0.5*slope

outc3 = 1.0*slope

outc4 = 2.0*slope

int_cept=const

slope=const

slope = st ia su ao e s

int_cept = st ia su ao e s

Method = maximum likelihood

path diagram

D1: Syntax restrictions for T1 predictors of child measures (T1 –T4)

Child measure	Restriction
ABC	None required
IQ	None required
VABS communication	None required
VABS daily living skills	Let error of outc4 be greater than 0
VABS socialization	None required
PPVT	None required
EOWPVT	Let error of outc4 be greater than 0
MCDI total words said	None required
PLSAC	None required
PLSEC	None required
PLS total	Let error of outc4 be greater than 0

Example of LISREL syntax for time one predictors of parenting stress from T1 to T4

Conditional model

spss-Data from file PSI_med_pred_T1_no_dads_no_DR.sav

Observed variables: outc1 outc2 outc3 outc4 fcopes life st ia ao e s

sample size = 63

Latent variables: int_cept slope

Relationships:

outc1 = 1*int_cept

outc2 = 1*int_cept

outc3 = 1*int_cept

outc4 = 1*int_cept

outc1 = 0*slope

outc2 = 0.5*slope

outc3 = 1.0*slope

outc4 = 2.0*slope

int_cept=const

slope=const

slope = fcopes life st ia ao e s

int_cept = fcopes life st ia ao e s

Method = maximum likelihood

path diagram

D2: Syntax restrictions for T1 predictors of parenting stress (T1 –T4)

Parenting stress measure	Restriction
PSI-SF total	None required
PSI-SF parental distress	Let error of slope greater than 0
PSI-SF parent-child dysfunctional	Let the Error of slope be greater than 0
interaction	Let the errors correlate
PSI-SF difficult child	None required

Example of LISREL syntax for difference score (T2 minus T1) predictors of child measures from T1 to T4

Conditional model

spss-Data from file IQ_Diff_T2_T1.sav

Observed variables: outc1 outc2 outc3 outc4 st ia su ao e s

sample size = 70

Latent variables: int_cept slope

Relationships:

outc1 = 1*int_cept

outc2 = 1*int_cept

outc3 = 1*int_cept

outc4 = 1*int_cept

outc1 = 0*slope

outc2 = 0.5*slope

outc3 = 1.0*slope

outc4 = 2.0*slope

int_cept=const

slope=const

slope = st ia su ao e s

int_cept = st ia su ao e s

Method = maximum likelihood

path diagram

D3: Syntax restrictions for difference score (T2 minus T1) predictors of child measures (T1 –T4)

Child measure	Restriction
ABC	None required
IQ	None required
VABS communication	None required
VABS daily living skills	Let the Errors of the int_pred and slope_pred correlate Let the Errors of the int_cept and slope correlate
VABS socialization	None required
PPVT	None required
EOWPVT	Let error of outc4 be greater than 0
MCDI total words said	None required
PLSAC	Let the error of outc4 greater than 0
PLSEC	None required
PLS total	Let the error of outc4 be greater than 0

Example of syntax for difference score (T2 minus T1) predictors of parenting stress from T1 to T4

Conditional model

spss-Data from file PSI_T2_diff_med_nodadsDR.sav

Observed variables: outc1 outc2 outc3 outc4 fcopes life st ia ao e s

sample size = 63

Latent variables: int_cept slope

Relationships:

outc1 = 1*int_cept

outc2 = 1*int_cept

outc3 = 1*int_cept

outc4 = 1*int_cept

outc1 = 0*slope

outc2 = 0.5*slope

outc3 = 1.0*slope

outc4 = 2.0*slope

int_cept=const

slope=const

slope = fcopes life st ia ao e s

int_cept = fcopes life st ia ao e s

Method = maximum likelihood

path diagram

D4: Syntax restrictions for difference score (T2 minus T1) predictors of parenting stress (T1 –T4)

Parenting stress measure	Restriction
PSI-SF total	None required
PSI-SF parental distress	Let error of slope greater than 0
PSI-SF parent-child dysfunctional interaction	Let error of slope greater than 0
PSI-SF difficult child	None required

Example of LISREL syntax for rate of change (T1 – T3) predictors of child measures from T1 to T4

Conditional model

spss-Data from file VABS_dls_T3_AO.sav

Observed variables: outc1 outc2 outc3 outc4 pred1 pred2 pred3

sample size = 70

Latent variables: int_cept slope int_pred slope_pred

Relationships:

outc1 = 1*int_cept

outc2 = 1*int_cept

outc3 = 1*int_cept

outc4 = 1*int_cept

outc1 = 0*slope

outc2 = 0.5*slope

outc3 = 1.0*slope

outc4 = 2.0*slope

pred1 = 1*int_pred

pred2 = 1*int_pred

pred3 = 1*int_pred

pred1 = 0*slope_pred

pred2 = 0.5*slope_pred

pred3 = 1.0*slope_pred

int_cept=const

slope=const

int_pred=const

slope_pred=const

slope = int_pred slope_pred

int_cept = int_pred slope_pred

Method = maximum likelihood

path diagram

D5: Syntax restrictions for rate of change (T1 – T3) of acting-out predicting child measures (T1 –T4)

Child measure	Restriction
ABC	Not applicable
IQ	Let error of int_cept be greater than 0
VABS communication	Let the Errors of the int_pred and slope_pred correlate Let the Errors of the int_cept and slope correlate
VABS daily living skills	None required
VABS socialization	None required
PPVT	None required
EOWPVT	Let the error of outc4 be greater than 0
MCDI total words said	Let the Error of outc4 greater than 0
PLSAC	None required
PLSEC	None required
PLS total	Let the Errors of the int_pred and slope_pred correlate Let the Errors of the int_cept and slope correlate Let the Error of outc4 greater than 0

D6: Syntax restrictions for rate of change (T1 – T3) of sleep disturbances predicting child measures (T1 –T4)

Child measure	Restriction
ABC	None required
IQ	Let the Errors of the int_pred and slope_pred correlate
	Let the Errors of the int_cept and slope correlate
VABS communication	None required
VABS daily living skills	None required
VABS socialization	None required
PPVT	None required
EOWPVT	Let the Errors of the int_pred and slope_pred correlate
	Let the Errors of the int_cept and slope correlate
MCDI total words said	None required
PLSAC	Let the Error of outc4 greater than zero
PLSEC	None required
PLS total	Let the Error of pred3 be greater than 0
	Let the Error of outc4 be greater than 0

D7: Syntax restrictions for rate of change (T1 – T3) of eating difficulties predicting child measures (T1 –T4)

Child measure	Restriction
ABC	None required
IQ	None required
VABS communication	Let the error of pred3 be greater than 0
VABS daily living skills	Let the Error of the pred1 greater than zero
	Let the error of the pred3 greater than zero
	Let the Error of outc4 be greater than 0
VABS socialization	Let the Error of the pred3 greater than 0
PPVT	Let the Error of pred3 greater than 0
EOWPVT	Let the error of pred3 be greater than 0
	Let the Error of outc4 be greater than 0
MCDI total words said	Let the Error of pred3 greater than zero
PLSAC	Let the Errors pred3 greater than 0
	Let the Errors of outc4 greater than 0
PLSEC	None required
PLS total	Let the Errors of pred3 greater than 0
	Let the Errors of outc4 greater than 0

D8: Syntax restrictions for rate of change (T1 – T3) of stereotypic behaviour predicting child measures (T1 –T4)

Child measure	Restriction
ABC	Not applicable
IQ	Let the Errors of the int_pred and slope_pred correlate
	Let the Errors of the int_cept and slope correlate
VABS communication	Let the Error of the pred1 greater than 0
VABS daily living skills	Let the Error of pred1 greater than 0
	Let the Error of outc4 be greater than 0
VABS socialization	Let the Error of the pred1 greater than 0
PPVT	Let the Error of the pred1 greater than 0
EOWPVT	Let the Error of outc4 be greater than 0
	Let the Error of the pred1 greater than 0
MCDI total words said	Let the Error of the pred1 greater than 0
PLSAC	Let the Error of the pred1 greater than 0
PLSEC	Let the Error of the pred1 greater than 0
PLS total	Let Error of outc4 be greater than 0
	Let the Error of the pred1 greater than 0

D9: Syntax restrictions for rate of change (T1 – T3) of social unresponsiveness predicting child measures (T1 –T4)

Child measure	Restriction
ABC	N/A
IQ	None required
VABS communication	Let the Errors of the int_pred and slope_pred correlate Let the Errors of the int_cept and slope correlate
VABS daily living skills	Let the Errors of the int_pred and slope_pred correlate Let the Errors of the int_cept and slope correlate
VABS socialization	None required
PPVT	None required
EOWPVT	Let error of pred3 be greater than 0 Let the Error of outc4 be greater than 0
MCDI total words said	Let the Error of the pred3 greater than 0
PLSAC	Let the error of outc4 be greater than 0
PLSEC	None required
PLS total	Let the Error of the outc4 greater than 0

D10: Syntax restrictions for rate of change (T1 – T3) of inattentiveness predicting child measures (T1 –T4)

Child measure	Restriction
ABC	Not applicable
IQ	None required
VABS communication	None required
VABS daily living skills	Let the Error of the pred1 greater than 0
	Let the Error of the outc4 greater than 0
VABS socialization	None required
PPVT	None required
EOWPVT	Let the Error of the pred1 greater than 0
	Let the error of outc4 be greater than 0
MCDI total words said	Let the Error of the pred1 greater than 0
PLSAC	None required
PLSEC	None required
PLS total	Let the Error of the outc4 greater than 0

Example of syntax for rate of change (T1 – T3) predictors of parenting stress from T1 to T4

Conditional model

spss-Data from file PSI_T3_E_no_dadsDR.sav

Observed variables: outc1 outc2 outc3 outc4 pred1 pred2 pred3 fcopes life

sample size = 70

Latent variables: int_cept slope int_pred slope_pred lfcopes llife

Relationships:

outc1 = 1*int_cept

outc2 = 1*int_cept

outc3 = 1*int_cept

outc4 = 1*int_cept

outc1 = 0*slope

outc2 = 0.5*slope

outc3 = 1.0*slope

outc4 = 2.0*slope

pred1 = 1*int_pred

pred2 = 1*int_pred

pred3 = 1*int_pred

pred1 = 0*slope_pred

pred2 = 0.5*slope_pred

pred3 = 1.0*slope_pred

fcopes = 1*lfcopes

life = 1*llife

int_cept=const

slope=const

int_pred=const

slope_pred=const

slope = lfcopes llife int_pred slope_pred

int_cept = lfcopes llife int_pred slope_pred

Set the Error variance of fcopes to 0

Set the Error variance of life to 0

Method = maximum likelihood

path diagram

options: AD=OFF IT=500

end of problem

D11: Syntax restrictions for rate of change (T1 – T3) of acting-out predicting of parenting stress (T1 –T4)

Parenting stress measure	Restriction
PSI-SF total	Set the Error variance of fcopes to 0
	Set the Error variance of life to 0
	Let the error of pred1 be greater than 0
	Let error of slope be greater than 0
PSI-SF parental distress	Let the error of pred1 be greater than 0
	Let error of slope be greater than 0
PSI-SF parent-child dysfunctional	Let the error of pred1 be greater than 0
interaction	Let error of slope be greater than 0
PSI-SF difficult child	None required

D12: Syntax restrictions for rate of change (T1 – T3) of sleep disturbances predicting of parenting stress (T1 –T4)

Parenting stress measure	Restriction
PSI-SF total	Let the error of pred3 be greater than 0
	Let error of slope be greater than 0
PSI-SF parental distress	None required
PSI-SF parent-child dysfunctional	Let error of pred3 be greater than 0
interaction	Let error of slope be greater than 0
PSI-SF difficult child	Let error of slope be greater than 0

D13: Syntax restrictions for rate of change (T1 – T3) of sleep disturbances predicting of parenting stress (T1 –T4)

Parenting stress measure	Restriction
PSI-SF total	Set the Error variance of fcopes to 0
	Set the Error variance of life to 0
PSI-SF parental distress	Let the error of pred3 be greater than 0
	Let error of slope be greater than 0
PSI-SF parent-child dysfunctional	Let the error of pred1 be greater than 0
interaction	Let error of slope be greater than 0
PSI-SF difficult child	Let error of pred1 be greater than 0

D14: Syntax restrictions for rate of change (T1 – T3) of stereotypic behaviour predicting of parenting stress (T1 –T4)

Parenting stress measure	Restriction
PSI-SF total	Let error of pred1 be greater than 0
PSI-SF parental distress	Let the error of pred1 be greater than 0
	Let error of slope be greater than 0
PSI-SF parent-child dysfunctional	Let the error of pred1 be greater than 0
interaction	Let error of slope be greater than 0
PSI-SF difficult child	Let the error or pred1 be greater than 0

D15: Syntax restrictions for rate of change (T1 – T3) of inattentiveness predicting of parenting stress (T1 –T4)

Parenting stress measure	Restriction
PSI-SF total	Let error of pred1 be greater than 0
PSI-SF parental distress	Let the error of pred1 be greater than 0 Let error of slope be greater than 0
PSI-SF parent-child dysfunctional interaction	Let error of slope be greater than 0
PSI-SF difficult child	None required