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The Effects of Daycare Participation for Children

by

Tyson R. Sawchuk

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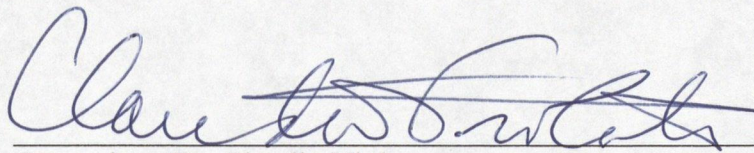
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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "The Effects of Daycare Participation for Children" submitted by Tyson R. Sawchuk in partial fulfilment of the requirements of the degree of Master of Science.



Supervisor, Dr. Claudio Violato

Department of Community Health Sciences

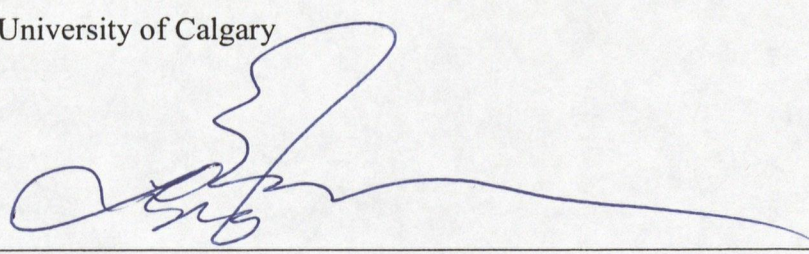
University of Calgary



Dr. Jac Andrews

Division of Applied Psychology

University of Calgary



Dr. Tyrone Donnon

Department of Community Health Sciences

University of Calgary

Sept. 8, 2004

Date



## ABSTRACT

Despite over a half century of research on the potential impact of nonmaternal care during a child's development, the impact of centre care during infancy and the early childhood years remains a highly debated area. Cross-sectional maternal questionnaire data from a representative sample of 10,286 Canadian children aged newborn to 11 years were used to compare developmental data on behavior, affect, social-motor and cognitive outcomes obtained from children who had participated in centre care compared with those who had received maternal care only. Using socioeconomic status (SES) as a covariate and sex as a blocking variable, measures of hyperactivity-inattention were found to be significantly higher in the centre care groups than in those children cared for only by their primary caregiver (Univariate F Hours (2,5002)=22.69,  $p<.001$ ; F Months (2,5020)=23.7,  $p<.001$ ). As well, a trend was observed for lower household income groups suggesting that children may attain higher receptive vocabulary scores as a result of being in centre care when their family's income is low (Univariate F Hours (2, 3256)=3.16,  $p<.05$ ; F Months (2, 3270)=5.1,  $p<.01$ ). Overall results for 2-3 year old children also showed a moderate advantage of being in full-time care (greater than 24 hours/week), which translated into higher levels of prosocial behavior reported by primary caregivers (F(2, 1404)=4.11,  $p<.01$ ). However, an increase was also found on measures of emotional disorder (F(2, 5002)=4,  $p<.05$ ) and aggression (F(2, 5002)=4.42,  $p<.01$ ) for older children in the part-time centre care groups. It is concluded that there appear to be positive and negative outcomes as a result of participation in centre care that are dependent on a number of factors including socioeconomic level.

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## CHAPTER I

### INTRODUCTION

Developmental researchers (Bowlby, 1951; McCartney & Phillips, 1988; Greenspan, 2003) have long emphasized that the interactions between children and their parents as well as with peers are among the most important external determinants of child social, emotional and cognitive development. Coinciding with the increases in our knowledge of the effects of care are dramatic changes in the approaches to child rearing over the past three decades. The growing participation of women in the work force has been accompanied by a steady increase in the use of nonmaternal care, most notably and increasingly during an infant's first year of life. In the U.S., for example, 58% of women with infants under age one were in the labour force between 1998 and 1999 (Bureau of Labour Statistics, 2000), and in recent representative studies of childcare the overall majority of working mothers had returned to the labour force before their child's sixth month of age (NICHD Early Child Care Research Network, 2003). Similar though less extensive care use is evident in Canada, with approximately 18% of children entering care by age one and up to 50% entering care by age five (Seifert, Canning & Lindemann, 2001). These proportions have continued to rise in representative studies of childcare, and based on these data, we now know that early nonmaternal care in childcare centers has become a routine experience for a large number of North American children.

Approximately half a century ago, concerns began to be raised regarding the developmental risks associated with nonmaternal and group daycare (Bowlby, 1951; WHO Expert Committee on Mental Health, 1951). Over the decades that followed,

several small-scale studies in the scholarly literature began to indicate a wide range of findings from negative to equivocal or even positive effects of care (For a review, see Lamb, 1996). Despite long standing debate regarding effects of nonmaternal care, reviews of relevant literature in the late 70's and early 80's revealed few negative associations between early childcare and psychosocial adjustment, suggesting that the risks of nonmaternal and centre care had been greatly over exaggerated (Belsky & Steinberg, 1978). However, as more evidence became available, several researchers argued that early and extensive nonmaternal care characterized by 20-30 hours care a week and commencing before age one was associated with increased aggression and non-compliance in children 3-8 years of age (Belsky, 1986, 1988, 1990, 1994, Belsky & Rovine, 1988). Considerable discussion followed on how this data should be interpreted (Clarke-Stewart, 1988, Phillips, McCartney, Scarr & Howes, 1987; Richters & Zahn-Waxler, 1990; Thompson, 1988) and together with additional studies led to the hypothesis that increased time in care was, in fact, associated with poorer psychosocial outcomes (Belsky, 1994, 2001). Nonetheless, as knowledge of childcare background factors increased, it appeared that these data were confounded in a number of ways. The primary criticism was a lack of control for pre-existing factors such as family background and economic factors, quality of care, and characteristics of caregivers, among others, leading to judgements of the samples used as highly biased. Coupled with the problem of how to incorporate the multiplicity of variables in daycare studies were continued questions regarding the meaning of attachment constructs and how they were being measured (Clarke-Stewart, 1992a; 1992b; Fein & Fox, 1990; Richters & Zahn-Waxler, 1990; Thompson, 1988). Other arguments (see, e.g., Rutter, 1981) concluded that the

quality of care in children's homes and childcare centres were more important factors for child development than any actual time spent in a daycare. Similarly, outcomes themselves came to be criticized with some reviewers positing that increased non-compliance effects were simply reflecting greater assertiveness and independence from adults as a result of a child's experiences in centre care (Clarke-Stewart, 1989). Hence, the history of daycare study has been hampered by a variety of methodological issues, many of which relate to the non-experimental designs required of childcare studies and problems in measuring early developmental constructs known to change dynamically over the course of infancy.

While arguments regarding use of childcare continue to be raised, more reliable and comprehensive data has begun to accrue through systematic large-scale studies such as that initiated by the US National Institute of Child Health and Human Development (NICHD) Early Child Care Research Network. This now well-known project is among the first to introduce a broad multivariate framework for studying the influence of infant nonmaternal care on the development of infant-mother attachment and various other developmental outcomes longitudinally. Employing a wide range of measures with a representative US population, the NICHD's prominent group of independent researchers initially failed to find negative effects of time in care for children measured at 24 and 36 months of age (NICHD Early Child Care Research Network, 1997, 1998, 2000b). Instead, what the studies appeared to show was that quality of care and maternal sensitivity were predictive of later outcomes, although hours in care did appear to be positively associated with less sensitive mothering (NICHD, 1999b). Another overriding finding was that economic factors appeared to play a stronger role in determining

outcomes far beyond that of childcare factors. However, when children were reassessed at age 4.5 years and into kindergarten enrolment, moderate though consistent risks were apparent independent of background factors including maternal sensitivity and childcare quality (NICHD Early Child Care Research Network, 2003). Specifically, these findings were that average hours/week spent in some form of childcare resulted in greater externalizing problems and teacher-child conflict at kindergarten age regardless of child socioeconomic characteristics. These results demonstrate that while a variety of factors appear to mediate developmental outcomes in childcare, quantity of time in care itself appears to present some behavioral risks, possibly delayed until school age. The major purpose of the present study was to further investigate daycare effects within a sample of Canadian children having participated in centre care. Based on several shortcomings identified in previous studies of childcare effects, it was also considered important to ensure adequate consideration of socioeconomic factors among care groups.

### **Statement of the Problem**

Based on the foregoing discussion, the main objective of the present study was to investigate various developmental outcomes in relation to level of participation in a daycare centre. Data were employed from the third cycle (cross-sectional) of the National Longitudinal Survey of Children and Youth (NLSCY), comprised of a randomly stratified sample of children living in a Canadian province between 1998 and 1999. Degree of daycare usage was defined in two ways by developing care variables for average weekly hours and total months. Specifically, it was proposed that intra-group differences among mean values for dependent variables would vary as a function of

participation in daycare. Child sex as well as family socioeconomic factors were employed in the analyses to account for any contributions of the same that might confound care effects.

Chapter II presents a review of research on childcare effects with particular attention being paid to quantity of care effects as a function of participation in centre care. Chapter III contains a description of the methods employed in the analyses including a description of the NLSCY database and the definition of variables employed. Results of the analyses are presented in Chapter IV. Finally, a discussion of the results is presented in Chapter V followed by a summary of the limitations for the present study.

## **CHAPTER II**

### **LITERATURE REVIEW**

Attempts to review the relevant scholarly literature with regards to childcare effects can be lengthy and daunting. The focus of this review will be to examine prior studies of “quantity-of-care” effects, for which a reliable body of evidence has accrued linking time children spend in childcare with later socioemotional adjustment. Following a discussion of theoretical issues in the study of childcare effects, evidence pertaining to early initiation of care as well as actual time spent in care will be reviewed. Beginning with investigations of preschool-aged children, the review will proceed to studies of early school-aged children and investigations conducted outside North America, followed by a review of research examining cumulative quantity of care experienced across multiple years, including results of a recent study by the NICHD that support grounds for making a priori associations between cumulative time in care and socioemotional development. The next section includes a discussion of alternative explanations for research linking time spent in childcare with socioemotional adjustment, including past arguments that quantity-of-care effects may be entirely accounted for by other variables such as parenting, quality or stability of care, and selection effects. This summary will show that while findings from reported studies are by no means perfectly consistent, there are reasonable data to show that time in care itself plays a role in outcomes beyond that of family, economic and care quality factors. This chapter will end with a delineation of the research questions and research problems.



## **Studies of Childcare - Theoretical Considerations**

Before beginning a review of the studies examining quantity-of-care effects, it is important to consider how theory guides us to their interpretation. There are various bioecological and transactional models (e.g. see Belsky, 2003; Greenspan, 1999, 2003; Crockenberg, 2003) that describe child development as a result of reciprocal interactions between children and the multiple environments in which they are embedded. These theories state that it is the biological endowments, opportunities provided by environments and the interactions for children within those environments that combine to affect children's developmental trajectories. Effects of childcare must be considered within this array of multiple factors which lead to measured outcomes and the various trajectories laid down during childhood.

### Infant-Mother Attachment

The foremost studied outcome examined in earlier studies of childcare effects is the concept of attachment. Sparked by his interest in the emergence of separation protest occurring near the end of the first year, Bowlby (1969) first devised his theory of infant-mother attachments based on an extension of the early theories of Freud and Erickson which suggested that mother-child relationships set the stage for later psychological well-being. Attachment theory states that children's early experiences with caregiving adults are key to providing the first basis for children's internal working models of the self and that self in relation to others (Howes, 1990). Hence, children who experience sensitive and warm caregiving come to believe they are lovable and go on to initiate future relationships with others from this "secure base". Attachment theory continues to

predominate as an important framework for conceptualizing parent-child relationships, and in this way continues to receive strong consideration from researchers attempting to understand the mechanisms for negative effects of centre and other nonmaternal care.

The basic premise of this theory states that the quality of later relationships stems from the early interactions between infants and their caregivers, specifically with regards to the degree to which they can rely on attachment figures as sources of security and support. It is this secure base from which a child can explore that serves as both a biological survival mechanism and a way of ensuring bonding between child and others of their own species. While early versions of Bowlby's theory tended to stress the mother's role in care, it is now an accepted premise that infants can securely attach to multiple figures (Barnas & Cummings, 1994; Farran & Ramey, 1977). Caregivers who are sensitive and consistently responsive to their infant's needs are likely to foster secure attachment in their children. From successful attachment to their caregiver, a secure child is thought to develop a healthy working (cognitive) model of themselves as lovable and worthy individuals, while also perceiving others as generally being responsive to their needs (Bowlby, 1982). Alternatively, inconsistent or insensitive caregivers are thought to foster insecure attachment in their children, leading to a working model of themselves as unworthy of being loved and of others as rejecting or unresponsive to their needs. Bowlby (1979) viewed attachment as a life-long construct lasting throughout childhood and into adulthood, and it has been suggested that children continue to rely on attachment figures as a secure base from which to explore during their adolescent years, relying on parents as a source of comfort in times of stress, rather than maintaining the physical proximity observable in infants, due to more sophisticated coping mechanisms

(Kerns, 1996). It is in this way that disruption of attachment at an early age has been thought possible through extensive use of nonmaternal care or in care environments where additional responsive attachment figures are not available.

The effects of extreme maternal deprivation have been well documented from early work in the 1970's examining the short and long-term impact of institutionalization on children. Effects have been found to include apathy, social withdrawal, intellectual deficiency and in more severe cases, failure-to-thrive syndrome or even death. Reviews of this research (e.g. see Rutter, 1979) have suggested that interference of children's attachment behavior leads to four different types of observable syndromes including acute distress disorder, impairment of verbal intellect, conduct disorder and lack of affection related to disturbed interpersonal relationships.

Additionally, there is a large body of physiological data, primarily from animal studies, showing that maternal contact plays a far more important role than previously considered. For example, tactile maternal contact has been shown in animal studies to impact on later stress responses in offspring, such that higher mother to offspring contact results in lower stress/cortisol responses, leading to more stable individuals who do not panic under stressful environments (Liu, Diorio, Day, Francis & Meaney, 2000; Caldji, Diorio, & Meaney, 2003). Cortisol itself is related to stress responses including those long term and heightened that have been linked to diabetes, heart disease, mental illness and other serious ailments in both humans and lab animals (For a review, see Caldji, Diorio & Meaney, 2000). It is these same cortisol levels which have been found to elevate across the day in studies of children from lower socioeconomic families and with those of depressed mothers (Lupien, King, Meaney, & McEwen, 2000). In considering

the role of attachment already described, the results of a recent study (Ahnert, Gunnar, Lamb & Barthel, 2004) have demonstrated that insecurely attached infants have significantly higher cortisol responses and separation anxiety behaviors (fussing, crying) upon separation between mother and child in a centre care setting.

Also playing a large role in early development of infant nervous systems, cortisol levels influenced via maternal contact have been shown to impact on cognitive development (Liu et al., 2002) and performance on attentional tasks in animals (Lovic & Fleming, 2004). Specifically, these studies have found that artificially reared rat pups not receiving maternal-like licking stimulation do poorer on attentional tasks than do those who receive the stimulation (Lovic & Fleming, 2004). Similar variations of maternal care have been shown to impact on regions of the brain known to mediate experience-dependent neural development, with high maternal stimulation groups demonstrating increased neuronal enervation and receptor expression in the mammalian hippocampus (Lupien, de Leon, De Santi, Convit, Tarshish, Nair, Thakur, McEwen, Hauger & Meaney, 2002). Cross-fostering studies have provided evidence of a direct relationship between maternal behavior and neurological development in mammals, although not all newborns appear to be equally sensitive to these variations in maternal care (Liu et al., 2000). Another recent finding in this area has found that in animals, the physical act of tactile contact produces changes in the DNA which in turn activates a gene restricting the production of cortisol in offspring. This genetic influence has been found to transmit from mother to daughter in animal studies (Caldji, Diorio, & Meaney, 2000), suggesting that maternal warmth or lack of the same can be passed down to later generations. It is these studies that provide for a useful animal model of the neuro-physiological effects of

maternal care in humans. This work tells us that deprivation of maternal behavior appears to have significant consequences for the development of attentional, learning and stress response systems. At the same time however, recent work also suggests that environmental enrichment may compensate for maternal separation, at least in terms of the emergence of stress responses (Francis, Diorio, Plotsky, & Meaney, 2002). This addition to an animal model of maternal separation suggests that quality of nonmaternal care can also impact significantly on child outcomes, by minimizing or even reversing the impact of deleterious parenting through adequate stimulation via surrogate care.

### Attachment and Childcare

Studies of attachment effects specifically resulting from nonmaternal childcare have ranged from negative to equivocal. Between 1970 and 1980, for example, eight out of ten published research studies investigating whether daycare disrupts the mother-child bond reported no significant differences between daycare and maternal care groups (Doyle, 1975; Caldwell et. al., 1970; Cochran, 1977; Hock, 1980; Kagan et al., 1977; Moskowitz et al., 1977; Portnoy & Semmons, 1978; Rubenstein, 1979). Alternatively, the two remaining studies found significantly greater anxious-avoidant behavior in infants enrolled in nonmaternal care prior to age one (Blehar, 1974; Vaughn, Gove & Egeland, 1979). Similarly, an additional study of childcare effects found that 3-4 year olds with histories of childcare and from impoverished backgrounds were less cooperative with adults, more aggressive towards peers/adults and showed higher motor activity levels than controls, suggesting that there were behavioral implications of attachment disruption (Schwarz, Strickland & Krolick, 1974). Belsky in a later article

(1986) set the stage for a controversial model of increased anxious attachment in relationships for children enrolled in full time care during the early years of life, sparking great debate on the topic for years to come. In a later article reviewing previous studies, Belsky (1988), argued that available data results were consistent with a theory of daycare being associated with the development of anxious-avoidant attachment, aggression and noncompliance. However, among the valid arguments against this conclusion was the fact that the vast majority of previous study samples were highly disadvantaged in terms of socioeconomic and family risk and therefore not suitable for inferring direct effects of daycare on the study participants.

It was Rutter (1981) who additionally suggested that boys may be particularly susceptible to the negative effects of nonmaternal care in the first year, and Chase-Landsdale & Owens (1987) who thereafter found infant boys whose mothers worked fulltime to exhibit significantly higher rates of insecurity in relationships with their mothers and fathers compared with boys whose mothers provided full-time care. Belsky and Rovine (1988) found similar results in their study combining data from two previous longitudinal surveys (Pennsylvania Infant and Family Development Project). By analyzing measurements of attachment behavior at 12 and 13 months of age, the authors found that infants exposed to 20 hours/week or more of nonmaternal care displayed more avoidance of the mother upon reunion (following a brief separation in the presence of a stranger) and were more likely to be classified as insecurely attached on Ainsworth's Strange Situation Test (Ainsworth, Blehar, Waters & Wall, 1978) than those infants having experienced less than 20 hours/week of care. In the case of males, greater than 20



hours/week care was also associated with significantly higher rates of insecure attachment to fathers, an effect not observed for girls.

In support of the hypothesis that behavioral problems might result from care via attachment disruption Leiberman, Doyle and Markiewicz (1999) found self-reports of positive friendships and lack of conflict in the same to be significantly related to positively measured mother/father attachment security, supporting the hypothesis that quality of parent-child attachment generalizes to quality of other close relationships including peers relations.

In perhaps the most comprehensive analysis of previous studies examining nonmaternal effects, Violato and Russell (2000) analyzed effect size data for 101 studies published between 1957 and 1995 involving 32,271 children. Dependent variables were categorized into one of four domains, these being attachment, social-emotional, behavioral or cognitive outcomes. Results of unweighted effect sizes indicated small and negative effects for the cognitive and socio-emotional domains ( $d$  values of .14 & .26, respectively), and larger negative consequences for behavioral and attachment outcomes ( $d$  values of .38 & .39, respectively), as a result of nonmaternal care. Results suggested that males in nonmaternal care fared more poorly than females in all domains when participants were separated by sex. While mediating variables were not found to impact results when means were compared between socioeconomic categories, the impact of the same could not be ruled out in the original studies. However, barring a systematic bias among the data, these combined results from almost 40 years of studies suggest extensive nonmaternal care of infants and children has resulted in measurable negative outcomes, including attachment behavior.

On the other hand, more recent studies of childcare impact on attachment continue to show inconsistent results. In one of the most thorough investigations to date of childcare effects on infant-mother attachment, the NICHD Study of Early Child Care found a wide range of childcare features to be unrelated to security of attachments at 15 months of age (NICHD, 1997a). These features included amount, quality and stability of childcare in addition to age of entry, within a sample of 1,153 infants and their mothers obtained from 10 different US sites. Nonetheless, the strongest predictor of attachment security independent of childcare factors was found to be a mother's sensitivity in caring for her infant, measured via a composite index of positive regard, responsiveness and lack of hostility. When infants were found to have mothers possessing low maternal sensitivity (Defined as the bottom 25% range of scores) combined with specifically poor quality care, care exceeding 10 hours/week, or participation in more than one setting over a 15 month period, significant rates of insecure attachment were found.

It is important to consider that the above study did not replicate results of previous studies of attachment effects, in that a direct relationship between childcare and attachment was not observed. It is also important to consider that this study addressed a number of criticisms of previous studies by controlling for selection effects. However, there were some notable limitations in this study that impacted on generalizability of findings, including a 42% drop-out rate overall followed by an additional 15.5% drop-out rate among the remaining sample asked to undergo attachment testing using the Strange Situation test (Ainsworth et al., 1978). Nonetheless, the authors of this study could find no easily identifiable reason for the contrast of these results with that of previous studies showing negative effects (e.g. Belsky & Rovine, 1988; Clarke-Stewart, 1989). What

these findings do suggest is that quality of mother-child interactions rather than childcare experience or maternal separation per se impacts on later attachment, although when quality of parenting is low, childcare appears to exert some influence on negative attachment.

In a similar study conducted with a large and representative sample in Israel, Sagi, et al. (2002) found that infants in centre care were more likely to become insecurely attached to their mothers compared to all other forms of care (maternal, family or home daycare) while controlling for a variety of parent, infant and environmental characteristics. Most of these insecure infants were categorized as “ambivalent” according to Ainsworth’s Strange Situation Test (Ainsworth et al., 1978), meaning that their behaviors upon reunion with their mother (following a brief separation in the presence of a stranger) were characterized by observable approach and avoidance to their mother. Neither SES nor a number of other control variables were found to minimize the impact of centre care. Quality of care was found to add to the prediction model, and it was furthermore found that higher caregiver-child ratios (Sample ratios ranged from 12-27 children per adult) appeared to be responsible for the increased level of attachment insecurity among centre care infants. This lead the authors to conclude that quantity of care impacted on attachment through poor quality of care and high ratios. While the previous two studies appear to underline the importance of childcare quality for infant-mother attachments, questions have been raised about the differences in results. In contrast to the NICDH (1997a) findings described above, the Israeli (Sagi et al., 2002) study found direct effects of childcare on attachment. Like the NICHD study, the Israeli study employed a large sample within a multivariate controlled framework. Also, this

study largely corroborates previously published studies in Israel (Scher & Mayseless, 2000; van Ijzendoorn & Sagi, 1999). As such, it has been suggested that systematic differences between Israeli and US daycare quality may have played a role in the differences between these contrasting findings (Love et al., 2003).

Finally, while many early studies of child centre care focused on the possible risks of the nonmaternal care to secure attachment, more recent work has shifted to the effects on behavioral and developmental outcomes in a number of areas including externalizing and internalizing behaviors, cognitive and social outcomes (For a review see Belsky, 2001). This trend may reflect concerns for children in centre care beyond that of child-mother separation, including the fact that children may be forced to interact within a broader peer group while receiving less care and feedback from a caregiving adult. It is also possible that attachment disruption itself leads to later behavioral problems. Adding to these concerns is the growing awareness that various externalizing problems appear to peak during the pre-school years and lay the framework for later developmental risks (Tremblay, 2000). In the case of centre care, early exposure to these environments could be hypothesized to provide opportunities for such behaviors as hyperactivity and aggression to arise. However, it could alternatively mean that children also have more opportunities to learn how to behave and resolve interpersonal conflict without recourse to antisocial responses. Hence, theoretical debates regarding why centre care has positive or negative impacts on children depends on a variety of situational factors. One of these may include the stress level induced by daycare environments, a topic discussed in the next section.

### Stress in Daycare

Adding to the theoretical debate over childcare effects is that while mother-infant separation may be stressful to the child, so may the centre care setting itself be a source of anxiety for the child. This research question has been examined in a number of physiological studies with children over recent years (Dettling, Gunnar, & Donzella, 1999; Tout, de Haan, Campbell, & Gunnar, 1998). For example, after combining measures of cortisol concentration in the saliva of 20 infants and 35 toddlers with behavioral measures for teacher-reported fearfulness, Watamura, Donzella, Alwin & Gunnar (2003) reported that 71% of toddlers (Age 3-16 months) in centre care had rising cortisol levels while 64% of their peers in maternal care had decreasing levels based on measurements taken in the morning and again in the afternoon within the respective care settings. The effect also appeared, although to a much smaller degree, for infants (age 16-38 months) of which 35% in centre care demonstrated increased cortisol levels compared with decreasing levels in 71% of their peers in home care. Also of importance is that cortisol levels in centre care, regardless of age or time of day, were significantly higher than for those children in the home. The authors in this study also found a protective effect for toddlers in centre care who played more with their peers while in care. Overall cortisol levels for this group of children were found to be significantly lower than peers who engaged in less peer play, while social fear (rated by centre caregivers) predicted larger increases in cortisol for the centre care group. The authors concluded that cortisol levels were higher for children in centre care than at home but that those who played more with peers showed lower levels.

It is important to consider in the above study that 29% of infants and 65% of toddlers in centre care did not demonstrate rising cortisol levels. This suggests one possible mechanism for daycare effects: That childcare may be challenging to young children but less so for those who have the skills or ability to play complexly with their peers, who in turn are able to produce lower concentrations of cortisol. Therefore it may be that a certain subset of children who do not engage in positive peer interactions and/or who possess high social fear that experience centre care as stressful. Considered in the context of other studies, particularly studies of quantity effects to be reviewed in the following sections, this and other studies of cortisol levels in centre care children (Dettling et al., 1999; Tout et al., 1998; Ahnert, Gunnar et al., 2004) suggest that the stress of daycare itself might play a role in negative developmental outcomes independent of other factors including maternal sensitivity and attachment. This possibility is further supported by a recent investigation finding that quality in care (i.e. group sizes, adult-child ratio, caregiver interaction) combines with temperament to help maintain lower cortisol levels throughout the day (Dettling, Parker, Lane, Sebanc & Gunnar, 2000).

Although evidence is lacking at present to show that cortisol increases themselves constitute a risk to the developing child, the sensitivity of cortisol levels to physical and emotional stressors has been well-established (Kirschbaum & Hellhammer, 1989, 1994). At the same time, evidence already reviewed from studies of cortisol levels in children and animals shows early stressful experiences to shape the reactivity and regulation of neurobiological systems underlying fear, anxiety and stress reactions (For a review, see Sanchez, Ladd & Plotsky, 2001). It is therefore important to consider the above findings



within the context of stress-responses resulting from participation in centre care as a potential mechanism for later developmental problems.

### Summary of Theoretical Issues For Daycare Effects

In summary, new and more advanced research has added to the work of historical studies demonstrating multiple potential mechanisms for negative care effects resulting from childcare. These now appear to include the impact of daycare participation on maternal attachment which in turn may impact on later developmental outcomes, but also the impact of participation in daycare centres on cortisol levels in infants and toddlers who do not engage in positive peer interaction.

In many ways, studies of daycare effects can be likened to measures of the societies from which they derive, given the fact that researchers are not able to acquire a sample of children to which they can administer varying care environments, but rather only take various measurements across time spans as a function of where they have been cared for. Therefore, in order to clearly identify what is being measured in studies of centre and other forms of childcare, one can only make some broad generalizations. For the purposes of this review, let us consider first that we are measuring/comparing children who have spent time away from their mother in some form of nonmaternal care. Let us also consider that these children have been exposed to environments characterized by both a broader peer group and potentially less individual care/immediate feedback from a caregiver. Hence, when reviewing results of care studies, the following theoretical questions are relevant: How do we identify mechanisms underlying findings? Is the childcare environment itself causal? Is separation from the mother causal? Are

other correlated variables responsible such as the parental stress of working or the presence of large numbers of peers in the childcare setting? Is the peer-group interaction at an early age itself a factor responsible for quantity-of-care effects? It is these research questions that need be addressed before a comprehensive model of daycare effects can be established.

### **Quantity-of-Care Studies**

#### Pre-school Studies

Of the researchers who have reviewed the numerous studies on daycare effects throughout the years, many have suggested that there is little evidence of negative effects when children are older (Belsky, 1988, 1990; Hoffman, 1961, 1974, 1989). Debate about earlier effects however, has been less conclusive and it is here that the review of quantity effects will begin. Belsky (1988) was among the first of researchers to hypothesize that negative effects of maternal employment, and hence various forms of childcare including centre care, has negative effects when children were in care that was intensive (greater than 20 hours/week) and commenced prior to age one. Specifically, his findings (already discussed) were that children who had received such care were more insecurely attached as measured at age one, but also more disobedient and aggressive as measured between the ages of 3 and 8 years. Several other small-scale studies prior to that time had linked increased levels of aggression and non-compliance with experience in a variety of childcare settings including centre care (Rubenstein, Howes & Boyle, 1981; Schwarz et al., 1974). Later studies, such as that by Rubenstein and Howes (1983) reported children in infant day care to have more fears, be more active, have more temper tantrums, and be

less compliant than maternal care children. Also, a study by Haskins (1985) found that children who had been in full-time care before age 1 and were of low socioeconomic status were more likely to hit, kick, swear, push and argue at school and were also less likely to avoid situations that could result in aggression. They were also more likely to be rated as aggressive by their teacher. Other negative findings were reported by Altman and Mills (1990) who used the Vineland Adaptive Behavior Scale with 18-24 month old infants and found those in daycare to have lower scores, on average, than home cared children on measured communication, socialization, daily living skills and motor skills. However, in each of the previous studies it cannot be ruled out that negative effects resulted from the socioeconomic level of those children rather than childcare use per se. Like many of these earlier findings, results such as Belsky's (1988) were criticized for failing to take into account background factors, many of which appeared to have effects stronger than care even when it was found to predict negative outcomes (Clarke-Stewart, 1988, 1989). His and earlier studies were also criticized for using samples that did not adequately represent the general population.

Nonetheless, results from these earlier investigations have since been confirmed in two much larger scale survey studies. First, Baydar and Brooks-Gunn (1991) in a study of 572 caucasian children from a 1986 sample of the National Longitudinal Study of Youth (NLSY) controlled for maternal education and intelligence and found that maternal employment during the first year of a child's life was associated with increased behavior problems in 3-4 year olds. In a later study by Hofferth (1999), it was found in a sample of 519 children from a nationally representative US survey (Panel Study of Dynamics) that entering any type of childcare in the first year of a life was associated

with higher scores on an index of behavior problems at ages 3-4, most significant of which was an index for aggressive behavior. Entry into care during the second year of life for a child was also found to increase child behavior problems. The most compelling aspect of these findings was that Hofferth (1999) controlled for a number of mediating variables in his analyses, including child age, gender, head of household's age, family structure, parental employment, parental education, number of children in family, urban vs. rural residence and finally race. Also, the impact of childcare was stable across socioeconomic levels in both of these large-scale studies.

However, despite support for the argument that early initiation of nonmaternal care is a predictor of problem behaviors, not all available research has replicated such results. In fact, some studies have found positive effects of early centre care experience (Field, Massey, Goldstein, Perry & Park, 1988; Howes, 1988; Macrae & Herbert-Jackson, 1975; Macartney & Rosenthal, 1991; Prodromidis, Lamb, Sternberg, Hwang & Broberg, 1995), including a small-sample (N=92) study by Crockenberg and Litman (1991) that found longer maternal work hours to be associated with greater child compliance both at home and in a laboratory setting with 2-year olds. Similarly, an earlier study by Schacter (1981) found toddlers of employed mothers to be more self-sufficient and initiate approach to peers more often. This study also found IQ scores and speech initiation with teachers to be higher as a result of maternal employment though only for females in their sample. Similarly, in a large-scale study of a Canadian sample from the National Longitudinal Survey of Children and Youth (NLSCY), Borge, Rutter, Cote & Tremblay (2004) sought to examine the role of social selection in aggression effects for centre care yet unexpectedly found that children reared at home evidenced

higher levels of aggressive behavior than those having participated in centre care. Furthermore, analyses accounting for an index of family risk showed that physically aggressive behavior was significantly higher for children cared for by their parents in high risk families, suggesting that if those children had received some degree of centre care their levels of physical aggression might have been attenuated. In considering these results, it may be the case that positive effects of childcare can result from the specific effects of care on low income or disadvantaged groups. However, this argument has also been used to account for many negative findings in the literature.

#### Studies of Early School Years

While not as well established, there is additional evidence for negative effects of early or extensive childcare impacting on problem behavior into the early school years. For example, Haskins (1985) in following a sample (N=59) of high-risk African American children who began centre care in infancy as part of an early intervention program, found them to be more physically aggressive (hitting, punching, kicking) than peers in kindergarten who initiated centre-based care sometime after the first year of life. However, these effects were observed to decline over time and were found to be manageable by teachers near the end of the measurement period. An important consideration in interpreting these results was that high-risk children were randomly assigned to either the intervention or later intervention group, hence the findings could not be linked to selection effects. The authors suggested that poor adaptation to school in going from the centre care to the kindergarten environment may have been a factor in the increased aggression during the later 2-3 years of primary schooling. Similar results were

found by Egeland and Heister (1995) who examined high risk, predominantly caucasian children in a variety of childcare arrangements. Those children that initiated childcare in their first year of life were found to be more aggressive and have more externalizing problems by kindergarten, even so after controlling for family background factors. Furthermore, the same group of children a year later were found to have higher behavior problem scores than peers lacking early childcare experiences and were found to be highly similar (on behavioral measures) to a group of home-reared children with histories of insecure attachment. As in similar studies, childcare care effects dissipated with time as children got older by the end of the measurement period.

Although Harvey (1999) found maternal employment not to relate to children's later social adjustment in a 1994 sample of the NLSY (in a study described in detail under 'Multiple Care Studies'), Han et al (2001), in a follow-up analysis with a subsample of the same dataset (N=138, white children) found that resumption of employment by the mother, specifically before the child's 1st birthday with reliance on nonmaternal care, predicted higher levels of mother-reported externalizing problems during the early school years. Youngblade, Kovacs & Hoffman (1999) similarly found in a sample of 171 eight and nine year olds from marital-intact caucasian families that maternal employment initiated during the first year of life while using any form of nonmaternal care resulted in children who demonstrated more acting out behaviors, lower frustration tolerance, less skill with peers and were judged to hit/bully others by peers more often than those whose mothers were not employed. These investigations of childcare effects on later adjustment suggest that both timing and amount of early



childcare are repeatedly, though not always, related to problem behavior during the early school years.

### International Studies

In considering quantity-of-care effects on developmental outcomes, there are also a number of studies that have been conducted outside of the North American context. Among these are several non-American studies (Bermuda, Italy & Sweden) that have documented associations consistent with those already reviewed between timing of early childcare and problem behaviors (e.g. McCartney, Scarr, Phillips, Grajik & Schwarz, 1982; Sternberg et al., 1991, Varin, Crugnola, Ripamonti & Molina, 1994). Probably the most compelling of these studies is Borge and Melhuish's (1995) investigation of 10-year olds in a Norwegian community, whereby controlling for child social class and cognitive ability, children were rated by teachers (but not parents) to show higher levels of problem behavior when a higher degree of maternal employment during the child's first 4 years had been reported. In contrast, several studies in Sweden have shown early daycare experiences to benefit young children (Andersson, 1989, 1992; Prodromidis et al., 1995). The same has lead one of Sweden's more prominent researchers on the topic to argue against many of Belsky's early claims that childcare posed developmental risks as he relied on biased, solely American studies and in turn only those with relatively short follow-up periods (Andersson, 2003). In support for his argument, Andersson cites many of his own studies, among others conducted in Sweden (e.g. Broberg, Hwang, Lamb & Wessels, 1997) which have demonstrated positive "sleeper effects" for social development that do not manifest until adolescence among Swedish youth. However, in

considering the studies of Andersson and other Swedish researchers, it must also be recognized that their samples derive from societies where childcare is blended within the public educational system to include nonmaternal care initiating at age three under the supervision of professional preschool teachers with several years training. Hence, if quality has a large impact on later outcomes, as suggested by empirical and theoretical findings, then Andersson's claims of no ill effects for care may be even more biased towards positive outcomes as a result of the society from which his samples are drawn.

The most common argument that results from an examination of international versus North American data is that a number of non-US studies show daycare to have no ill effects, suggesting that negative findings (most of which derive from US populations) result from samples biased towards low income and poor quality daycare. An important consideration to be taken from such arguments is that some component inherent in daycare itself may not be responsible for ill effects (such as infant-mother attachment disruption or early peer exposure) but rather that only specific environments commonly arising in certain daycare contexts (e.g. low income care) may be to blame. This issue is explored further under the section entitled 'Alternative Explanations of Quantity-of-Care Effects'.

### Multiple Year Studies

Often, the possible links between childcare variables and developmental risks do not manifest in children before they reach the increasingly demanding school years. Additionally, various measures of social and emotional adjustment are generally better developed and standardized for children who are older. It is these factors that add to the

greater validity and comprehensiveness of childcare findings from longitudinal designs that measure children across the development span. Such designs also provide for a higher degree of causal inference when outcomes are observed in specific temporal directions. Accordingly, more recent studies have attempted to examine the impact of multiple years of care as opposed to early care within a finite time period and at a single measurement interval. In an earlier such study, Vandell and Corasaniti (1990) examined 236 caucasian third graders over multiple years to find that children whose full-time care was initiated in their third year and continuously thereafter until school entry were rated by mothers and teachers as more noncompliant, as less likely to receive positive conduct evaluations on their report cards and as less competent with/less liked by peers. Children whose full-time care initiated continuously from their second year performed almost, although not as poorly as the later care-initiated group. This latter result may help to explain findings of a subsequent study by Belsky and Eggebeen (1991) who modeled the method described above in analyzing problem behaviors of more than 1,200 four to six year-olds included in the 1986 cycle of the NLSY. In their study, the authors found that among children whose mothers were employed full-time (defined as greater than 30 hours/week) prior to their second year of life and who continued to use childcare use by age three, no differences were observed on measures of problem behaviors between those who had entered care by age one versus those who entered by age two, despite the fact that nonmaternal care was significantly related to maladjustment and non-compliance. This study corroborates Vandell and Corasanti's (1990) findings by demonstrating that regardless of time of entry into care, children in centre care evidence more problem behaviors than those age mates whose mothers worked less extensively and experienced

less nonmaternal care. These significant group differences remained even after controlling for birth order, maternal education, family poverty, maternal intelligence and race in the above study.

Also consistent with the above studies are findings from an investigation of 589 kindergarten children sampled from three American public schools (Bates et al., 1994). These researchers observed that children who spent more time in any form of childcare during the first 5 years of life were more negatively adjusted than children with less experience in care, while controlling for background factors. Adjustment in this case was assessed through multiple variables including teacher reported behavior problems, lack of peer acceptance and observed as well as peer-rated aggression. Similarly, Park and Honig (1991) in a study of 105 preschoolers enrolled in centre-based childcare found that those who began full-time nonparental care during the first 9 months of life and continued full-time thereafter were observed and rated by teachers to be more physically aggressive (i.e. destructive, kicking, hitting, fights) and noncompliant than peers with less intensive (hours) and extensive (over time) care experiences. In yet another study Belsky (1999) found that more time in nonmaternal care across the first 3-5 years of life predicted higher mother-reported externalizing problems at ages three and five. Employing a working/middle class sample of 120 first-born sons from two-parent Caucasian families, greater time in care was also associated with more negative parenting during the toddler years, based on observational measures of the same. However, when controlling for measured parenting ability in the analyses, Belsky found childcare effects to be nonsignificant for externalizing problems, leading the author to conclude that parenting has a mediational effect on childcare outcomes. Performance on a lab-based

measure of cognitive ability and affect at age five was also found to be negatively predicted by greater time in nonmaternal care, yet was not attenuated when controlling for parenting effects. This measure was based on an index of such tasks as social problem solving and plot completion items for stories.

However, again negative results do not always appear to be the case for childcare effects, even among large-scale and multi-year studies. In an investigation of maternal employment effects on later cognitive, academic, behavioral and emotional functioning using the 1994 version of the NLSY dataset, Harvey (1999) found no main effects of early maternal employment status. While working greater hours on the mother's part was associated with slightly lower cognitive outcomes through age nine and academic achievement before age 7, no significant relationship was found for children's later problem behavior ratings, compliance or self-esteem. In her analyses, in fact, employment during first 3 years of life was associated with fewer behavioral problems at ages 7 and 9, for high-income families. A nonsignificant trend also was observed for low-income families in that care again decreased behavior problems. Also, The relation between maternal employment during the first 3 years and receptive vocabulary (PPVT-R) scores showed significantly positive outcomes for single-mother families than for those from married parents. These effects were not observed at any other age group, suggesting that in the case of conflicting findings among previous studies, age of measurement may have played a role as well as the interaction of income grouping and number of parents present in the children's life during care. However, returning to the main finding of Harvey's study, no significant effects of early maternal employment were observed. While returning to work later resulted in higher compliance in 3-4 year olds;

and working more hours was associated with lower PPVT-R scores measured at ages 9 and 12, these effects were minimal.

As in the above investigation, three studies already reviewed (Baydar & Brooks-Gunn, 1991; Belsky & Eggebeen, 1991; Han, Waldfogel & Brooks-Gunn, 2001) also employed data from the NLSY, yet found negative effects of care. Specifically, Belsky & Eggebeen (1991) found nonmaternal care before the age of three to relate to significant maladjustment and non-compliance, while Baydar & Brooks-Gunn (1991) found increased behavior problems measured at ages 3-4 in children whose mothers worked prior to age one. It was Han et al (2001) that followed up Harvey's (1999) study with a subsample of 138 Caucasian children to find nonmaternal care prior to age one to predict higher levels of externalizing problems by school age. Hence, despite the fact that similar data was being used, Harvey's study did not detect the negative outcomes reported in three other studies.

In accounting for her findings in comparison with a number of previous studies including six previous investigations also using the NLSY dataset, Harvey (1999) identified a number of methodological factors that may have contributed to the varied findings. The NLSY itself is a survey of women who have been interviewed annually since 1979 when they were selected between ages 14 and 22. Beginning in 1986, children of these women also started being assessed annually and continuously over time. As the study was not initially designed as a study of childcare effects, researchers have repeatedly needed to sample participants from among the existing datasets, one contributing factor among studies leading to inconsistent child ages, ethnicity and economic classes among those studied. In pointing out inconsistent sampling, Harvey

(1999) suggested that there are theoretical reasons why childcare effects might vary with age, as effects may dissipate over time as more salient and proximal factors begin to play a larger role in the development of children. Alternatively, she suggested there may be sleeper effects of childcare or maternal separation whereby early negative or undetected effects might spiral into much larger later problems, although based on her data she suggested that the former appeared to be the case. Another factor considered by Harvey is how the maternal employment/childcare variables were constructed in the previous studies, a concern deriving from the fact that in most studies, childcare variables were constructed from continuous variables and transformed into categorical variables that required arbitrary cut-offs to determine inclusion. The problem posed by such childcare variables, according to Harvey, is that categorical variables themselves can exclude various subjects if the categories do not include every employment pattern present in the sample. Also, subjects with similar employment or care patterns will often be placed in different categories as a result of being clustered around the cut-off values for categorical variables. Finally, Harvey suggested that the selection of control variables and how these variables were employed in analyses was not consistent among studies.

In summary, the study by Harvey (1999) provided little evidence of risk associated with early, extensive and continuous maternal employment through the first three years of life in the NLSY sample, despite previous studies demonstrating negative outcomes. However, the inconsistency in sampling subjects, selecting and creating variables among these and other studies employing the NLSY may have accounted for some of these differences. In the next section, the NICHD series of studies will be

reviewed in greater detail to show how this ongoing investigation has ensured a higher level of consistency between multiple analyses of a large, representative dataset.

### The NICHD Study of Early Child Care

The most extensive study to date of childcare impacts began in the early 1990s, when the National Institute for Child Health and Human Development (NICHD) initiated the NICHD Study of Early Child Care. A large-scale longitudinal study following over 1,200 children and their families from birth, the NICHD have and continue to examine over multiple years, the short and long-term effects of childcare at 10 different locations across the United States. This study has carefully examined the characteristics of the childcare contexts chosen by the children's families, the characteristics of the families, the children's experiences within the family, and multiple domains of child outcomes over time. As a result of random sampling from hospital delivery stations and a high response rate (62%), these children and families have provided for a representative US sample which includes the full range of socioeconomic strata, ethnicity and childcare use. Childcare in the sample has been monitored every 3 to 4 months via phone interviews and measurements for various outcomes have been obtained at selected intervals, including cognitive and social behavior measures at 15, 24, 36 and 54 months of age. Initially totalling 1,364 children and their families, early descriptive statistics revealed that the overwhelming majority of children in the sample were found to enter childcare early in their first year, and use of childcare was found to relate strongly to economic factors. Family sizes, maternal education, personality and beliefs were also associated with childcare use. Both high and low-income families were found to place their children



in relatively higher quality childcare during infancy. Childcare types included in the dataset were centre care, family childcare, relative care, home care and paternal (father) care (NICHD, 1997b).

Among the earlier studies of the dataset were findings that maternal attachment was not impacted by childcare unless maternal sensitivity was already low (See NICHD, 1997a, reviewed earlier in this article). The following year, the NICHD published their first (1998) study of quantity of care effects. This investigation found that early, extensive and continuous childcare was generally unrelated to behavior at ages 2 and 3 and that mothering as measured by maternal sensitivity proved the most consistent predictor of the same. Childcare variables included quantity, quality, stability, type and age of entry into care, and while either of these variables alone or in combination predicted some degree of variance among outcomes, quality proved the most significant. Later studies continued to find significant linear relationships between various developmental (behavioral, cognitive and language) outcomes and maternal sensitivity (NICHD, 1999a), while maternal sensitivity itself was found to be predicted by childcare variables (NICHD, 1999b). Specifically, this relationship was found between both quality and time in care, although an interesting delineation effect was reported by which greater time in childcare predicted lower maternal sensitivity yet quality of care predicted higher maternal sensitivity, suggesting that childcare may have differential impacts on mothering. While the impact of childcare time and quality on maternal sensitivity were found to be less important than family characteristics such as maternal education, the role that time and quality played appeared equal to that of maternal depression and child temperament. Hence, while childcare was not found to play any direct role in outcomes

at ages 2 and 3, the above studies suggest that an indirect role may have been present via childcare's impact on maternal sensitivity.

Further NICHD studies established the role of childcare impact on later cognitive and language outcomes in the sample, finding that among the quality indicators, language stimulation via caregivers was the strongest predictor of positive outcomes (NICHD, 2000b). Again, in the above study impact of time in care was found to be unrelated to outcomes, and comparison of maternal care versus childcare groupings revealed no significant differences among cognitive/language measures. The only exception was a post-hoc finding that when quality of childcare was controlled, time specifically spent in centre care related to more positive cognitive and verbal outcomes than did any other form of childcare use.

In a later study controlling for family and child characteristics, social competence among peers was assessed at ages 2 and 3 (NICHD, 2001). Caregiver behavior that was positive and responsive was the most consistent among childcare variables to associate with positive outcomes. Although greater hours in childcare overall resulted in more negative peer play ratings by caregivers, time spent specifically in a form of care involving other children resulted in higher ratings of observed peer play, although caregivers again rated these children as more negative than their peers who had not experienced the same degree of time in childcare. Overall, however, it was maternal sensitivity and child cognitive ability/language competence only that predicted positive peer interaction consistently on all measures, which included separate ratings by mother and caregivers, as well as observed peer interactions.

The following year the NICHD (2002) released yet another longitudinal study (N=943) of childcare effects based on childcare quality and quantity as well as the interaction with a number of family risk factors including psychosocial, ethnic and SES indicators. Results showed that family risk was the strongest predictor for all outcomes and that there was no impact of quantity or hours/week in care. Quality of care had some degree of impact on prosocial behavior and language ability at 3 years of age. There were no interactions between family risk and childcare quantity and only a minority of the analyses (1 out of 5 regression models) showed interactions between care quality and family risk. An intra-family risk interaction was observed for ethnic minority children in low quality care, who were found to be less prosocial than their peers in childcare. However, in another study released independently that same year, Brooks-Gunn, Han & Waldfogel (2002), employing a sample of 900 European American children from the NICHD reported the first negative findings of childcare quantity effects. Specifically, these were lower cognitive outcomes measured by the Bracken School Readiness scale which did not manifest until age 3. Furthermore, these effects were most pronounced when mothers worked 30 hours or more a week (initiated prior to the child's ninth month of life) and also when children were males, had married parents or had less sensitive mothers. Effects remained in the full-time employment groups even after controlling for maternal sensitivity and quality of childcare as well as home environments.

Examining outcomes at even later ages (4.5 years and kindergarten, N=1081), the most recent study reported by the NICHD (2003) examined whether cumulative amount of nonmaternal care over infancy, the toddler and preschool years was associated with positive or negative child socioemotional development after considering a wide range of

potentially confounding family background factors. Obtaining parent, teacher and caregiver reports of children's social behavior and social competence at 4.5 years and during enrolment in kindergarten, quantity of care was found to significantly predict three out of nine outcomes at 54 months and three out of five kindergarten outcomes. Specifically, this meant that children who averaged more time in nonmaternal care across the first 54 months of life scored lower on caregiver rated social competence and higher on care-giver rated externalizing problems and care-giver child conflict at 54 months, and also were observed to engage in more negative dyadic play. More time in care also predicted, at kindergarten age, higher levels of mother and teacher-reported externalizing problems and teacher-child conflict. An increase in hours over time, when compared with decreased care (in hours) over time resulted in less social competence and more externalizing problems in children at age 4.5 years, although they were observed to engage in more positive behavior during childcare observations. The same effect (changes in amount of care over time) was unrelated however, to kindergarten outcomes.

In carefully reviewing the literature and seeking to confirm or rule out various alternative explanations for care effects identified in previous studies, the authors of the NICHD (2003) study also examined, through a series of nested regression analyses, whether quantity of care continued to predict negative outcomes when four other features of care were added to the statistics model. These variables were average quality of care, proportion spent in centre care only, proportion of peer group exposure and finally, instability of care. These analyses showed that for pooled quantity of care effects (hours/week & linear change in use over time), the impact on outcomes remained, although impact of the same decreased slightly resulting in loss of prediction for one

outcome (mother-reported externalizing problems in kindergarten). However, this loss was compensated by the addition of two other outcomes (mother-reported social competence at both 54 months and kindergarten), which were added to the model and found to be negatively predicted by pooled quantity-of-care effects. Further analyses showed that when hours/week in care was considered separately (without linear change over time), care effects remained significant (on six out of nine outcomes) although to a smaller degree, and that mother-rated social competence was added to the list of negatively predicted outcomes. The summarized result provided by the authors was that while the inclusion of care features attenuated/lowered some of the original effects of time in care, the impact remained significant even with the indicators of care quality, type and instability being taken into consideration.

Given previous findings in their dataset suggesting that maternal sensitivity was predicted by quantity of care (NICHD, 1999b), the authors sought to examine whether parenting might diminish the impact of quantity effects. To do so, the authors incorporated two additional parenting variables into their prediction model: average maternal sensitivity and change in sensitivity over time. In this case small reductions in quantity prediction (variance) among the outcomes were noted, however, all but one outcome (mother-reported externalizing problems) remained significantly predicted by time in care. This finding demonstrated that previously detected effects for quantity of care remained significant even when an alternative predictor (maternal sensitivity) was added to the multiple regression model. The importance of this finding is that quantity effects care remained independently of maternal sensitivity, at least in the models used in these analyses.

Additional analyses showed that among negatively predicted 4.5 year outcomes, adjusted for all other variables except maternal sensitivity and categorized according to time in care, small but consistent increases were observed for negative outcomes (i.e. externalizing problems, low social competence) as time progressed from limited to moderate to high and very high quantities of nonmaternal care. At the same time however, outcomes for all children including those having experienced the highest degree of time in care, were found to be well below the “at-risk” range (defined as t-scores of less than 60).

In comparing effect sizes among variables in the prediction model, the NICHD authors found that quantity of care was a stronger predictor of outcomes than any of the other childcare features (quality, stability, proportion of centre and peer group exposure). Confirming previous findings for earlier outcomes (NICHD, 2000, 2001), quality itself was found to significantly predict higher mother and caregiver rated social competence and lower caregiver reported behavior problems and conflict. When more liberal effect size estimates were used, greater peer group exposure was found to predict less social competence and greater caregiver conflict. Instability of care was generally unrelated to outcomes. Also confirming previous findings was that background factors used as covariates in the analyses proved to be the strongest predictors of most outcomes beyond that of childcare variables, including maternal education, family income/needs and to some degree also, maternal depression. Despite previous suggestions by Norberg (1998) that child temperament may lead to higher childcare enrolment, difficult temperament generally proved an insignificant predictor among outcomes, ruling out the possibility that selection effects had resulted in more difficult children being placed into care.

However, perhaps the most notable finding of this study was that maternal sensitivity proved the most powerful and consistent predictor for all outcomes, with higher sensitivity resulting in greater social competence (at home and daycare) as well as lower caregiver reported problems and conflict.

While kindergarten outcomes were similar to the 4.5-year outcomes in terms of effect sizes, they were slightly less strong. The authors interpreted this finding as not surprising given the fact that developmental variables appear to lose predictive power over time as peripheral factors come into play (i.e. broadened experiences). In this case, hours in care was again the strongest predictor among childcare variables, meaning that more time spent in childcare centres predicted more teacher-reported problems and conflict. Lower quality of care predicted more teacher-reported problems and conflict, but only stronger than quantity in the former case. At kindergarten, neither instability of care or peer group exposure were significant predictors. Maternal education, depression and income ratio again predicted outcomes consistently however sometimes less so than the care variables. Maternal sensitivity remained the strongest of all predictors. While increased sensitivity between children predicted less negative socioemotional adjustment in kindergarten, an increase in sensitivity over time also predicted lower levels of mother and teacher behavior problems and less teacher child conflict.

In the above study, no threshold effects were found for hours/week in care and no evidence was found for a critical period by which childcare had substantially more negative impact. However, greater overall time in childcare was more predictive of negative outcomes and in this way more time spent in nonmaternal care during the first year did result in significantly more externalizing problems and conflict with

caregivers/teachers at both 4.5 years and kindergarten. In summary however, care during the first year provided no unique contribution to the prediction model nor did a specific range of hours/week spent in a form of childcare. Among the conclusions made by the authors of this study were that quantity predicts negative adjustment even after controlling for all factors, that these effects were modest yet generally found in multiple domains (among three different reliable raters) and at two different measurement periods. The authors also concluded that when children spent anytime in nonmaternal care and in centre care specifically, they were rated highly on externalizing problems and teacher-child conflict in kindergarten, suggesting that these effects continue to manifest upon entry into school. However, the authors again qualified their conclusion with the fact that low levels of at-risk or clinical behaviors were reported. Finally, the authors stressed the importance of the family (parental sensitivity, economics) as the most important predictor of individual outcomes.

### **Alternative Explanations of Quantity-of-Care Effects**

Based on the present review, it is clear that associations between timing and amount of care with socioemotional adjustment are varied in the literature, and also that type of care arrangements (centre care vs. other forms of care) do not readily account for the inconsistencies among findings. As mentioned previously, much of the past work showing negative effects of time in nonmaternal and centre care has been challenged because the studies have failed to take into account other factors (family background and quality of care, among others) known to influence developmental outcomes. Of the numerous arguments that have been raised in attempting to explain quantity-of-care



effects, it has additionally been suggested that quantity itself may be confounded by other characteristics of childcare.

In considering the studies reviewed thus far, arguments against their interpretation must also be considered. Although several of the studies already reviewed found negative effects of care even after controlling for various family background factors, it might be possible that other characteristics of childcare are the cause. In this way, the most common arguments against quantity-of-care effects are that features of childcare themselves other than actual time spent away from the mother are responsible. For example, it might be quality, type of care, or even stability of care that is responsible for the negative effects found in studies of time in care. Additionally, it is also possible that socioemotional effects might themselves derive from the effects of childcare on parenting, meaning that the direct effects on child development result from the parent rather than care itself, but as a function of the impact on parenting ability due to less time spent with the child. While this hypothesized mechanism maintains the importance of time in childcare as a factor in child development, the importance of the same is diminished in relation to peripheral factors such as parenting ability.

### Parenting

One such theory is that more time working away from the child might make mothers less sensitive to their child's needs. Belsky and Rovine (1988) have considered heightened family stress and attributes of mothers as factors in child development. Accordingly, they found mothers of insecure infants to demonstrate less interpersonal sensitivity and empathy, and to report less marital satisfaction. Stated this way, it is clear

that maternal parenting impacts on child attachments and in this way infant development. Stated another way, quality of parenting practice may also account for why time in care is associated with non-compliance, aggression and problem behaviors.

Empirical evidence suggests that the sensitivity of mothers when interacting with their children contributes to the care-adjustment association. For example, a recent study (Ahnert et al, 2004) found that security of infant-mother attachment predicted how well infants adjusted to initial centre care participation. This same study also found that greater number of days spent in adjusting their infants to the care setting (i.e. mother present with child in daycare centre) strengthened attachments between mother and child. Additionally, a number of theorists (Brazelton, 1986; Sroufe, 1988; and Belsky 1999, 2001) have suggested that routine nonmaternal care, especially when initiated very early in life (before the first year), undermines the mother's sensitivity toward her child by reducing the amount of time available for the mother to learn the baby's signalling patterns and behavioral rhythms. Evidence for this theory comes from the NICHD studies already discussed indicating that childcare bears some relation to the mother's abilities to respond with sensitivity to her child and the child's positive engagement with mother during interactions (NICHD, 1997a, 1999b). In the 1999b study, children of mothers who were less sensitive with their infants were consequently less positively engaged in interactions with their mothers when they experienced more childcare. However, when mothers were more sensitive, children were also found to be placed in higher-quality care. While these subtle effects have not been found consistently across studies, other studies have not conducted their investigations with such a diverse and representative sample of infants and children with such careful controls as the NICHD,

and have not measured mother-child interactions as extensively throughout the preschool years.

Also consistent with the above findings are evidence from Belsky's (1999) study that found more time in care to predict more negative mothering during children's second and third years of life. However, after controlling for these effects, he found previously significant linkages between time in care and elevated levels of externalizing problems reported by mothers at 3 and 5 years of age to disappear, suggesting maternal sensitivity alone was able to account for effects thought to result from the time in care. Nonetheless, other studies have in fact failed to find the same effect care time on parenting (Braungart-Reiker, Courtney, & Garwood, 1999; Burchinal, Bryant, Lee, & Ramey, 1992; Goldberg & Easterbrooks, 1988; Zaslow, Pedersen, Suwalsky, & Rabinovich, 1989), raising serious questions about the generalizability of Belsky's findings and the true role of parenting in negative socioemotional outcomes for time in care. Also, while earlier NICHD studies (1999b, 2001) found a significant effect of parenting on various outcomes in the absence of quantity-of-care effects, the most recent and comprehensive NICHD investigation (2003) found time in care to impact on outcomes independently of two variables measuring mother-child interaction. Hence, while maternal sensitivity appears to play a mediational role in the outcomes measured in childcare studies, the impact of the same appears to have some independence from quantity effects.

### Quality

There is a large body of research suggesting better care is associated with better socio-emotional outcomes including compliance, sociability, attention regulation, peer

relations and lower rates of behavior problems (NICHD 1998, 2000b, 2001; Peisner-Feinberg & Burchinal, 1997). High quality care has also been associated with enhanced language, reading, math skills and long-term academic achievement (Peisner-Feinberg & Burchinal, 1997; NICHD, 2000, 2003; Peisner-Feinberg et al., 2001; Brooks-Gunn et al., 2002). Support for this assertion comes from the Cost, Quality and Outcomes Study that tracked centre care children from various communities across four US states. In this longitudinal study of 733 children examining cognitive and social developmental outcomes, quality of preschool participation was found to predict cognitive and social developmental gains into kindergarten and beyond for children 4-8 years of age (Peisner-Feinberg et al., 2001). Specifically, classroom practices in the preschools were found to predict language and academic skills whereas teacher-child closeness was related to cognitive and social skills, highlighting the importance of quality for childcare environments in influencing later cognitive and social functioning in children through the elementary years. Although effect sizes in the above study were generally quite small for these positive effects of quality, they were stronger for lower income children (Peisner-Feinberg & Burchinal, 1997).

In a similar longitudinal study of center-based care and outcomes for cognitive/language development Burchinal, Roberts, Nabors, & Bryant (1996) found that quality of childcare was related to higher measures of cognitive development (Bayley Scales of Infant Development), language development (Sequenced Inventory of Communication Development) as well as communication skills (Communication & Symbolic Behavior Scales) across 6 to 36 months of age in a sample of 89 African American children. The above findings remained adjusting for a number of child and

family characteristics. In this study, caregiver education was only found to relate to improved cognitive and receptive language skills in girls but not boys. This study appears to corroborate findings showing quality of childcare to impact on early development, and with a vulnerable population.

Additional support for positive effects of childcare in the case of low-income children is provided by Votruba-Drzal, Coley, & Chase-Lansdale (2004), who studied the influence of specifically community centre care (quantity and quality) on cognitive and social outcomes in a sample of children aged 2-4 (N=204) who came from low-income families. They found modest benefits for social development as a result of quality, as well as improved quantitative skills and decreased behavior problems as a result of being in extensive hours of community centre care, demonstrating the importance of childcare quality and even time in care as salient factors for particular subgroups of children in lower-income families.

Loeb, Fuller, Kagan and Carrol (2004) in a recent longitudinal study of cognitive and social outcomes for low income children in centre care found strong significant positive effects of care on a number of cognitive measures for a group of 4 year olds who had entered care between 12 and 42 months of age. Cognitive outcomes were also found to improve if caregivers were measured as more sensitive and responsive with the child and if they had more education, highlighting the importance of children's interactions with caregivers even if that is not the mother. The above was found even while controlling for a large number of family and maternal characteristics. The study found that behavioral problems were most evident in family childcare homes that were largely unregulated, and in this case there were no cognitive gains suggesting that centre care

specifically was responsible for these effects. Stability of care played a role in that the longer a child remained in care, the more positive were the effects, however, this may be better understood as a quantity effect rather than stability per se. The largest question raised by this study is whether or not cognitive benefits of care for children in the low-income range remain beyond the early childhood years. Additional support for the idea that centre care can have a protective effect in the case of low-income families comes from the NICHD (1997b) study which found positive cognitive developmental effects from quality and quantity factors.

In a review of their data relating to quality of childcare centres, the NICHD Study of early Child Care (1999b) examined quality variables and their longitudinal relationships with various outcomes. Based on four recommended standards (child-staff ratio, group size, general caregiver education & specific education in child development) the authors found that only 10% of centres complied with all standards for 6 month-old children or 34% compliance in the case of 36 month-old infants. As subjects had been sampled randomly from multiple birthing sites, these percentages would appear to represent quality estimates for the continental United States. Linear associations (no thresholds) were found between quality indicators and outcomes, resulting in better school readiness, language comprehension scores and lower behavior problems when quality increased, with child-staff ratios and caregiver training being the strongest predictors of later outcomes.

With all of the above evidence pointing to the importance of quality in childcare, some critics have argued that it is only quality that matters in care regardless of time spent in the same. In other words, if care quality is good, then childcare can only result

in more positive outcomes, especially in the case of infants who are already disadvantaged. If care quality is bad, then degree of time in care could have a negative impact that increases with a greater proportion of time spent in that care. However, while such an argument may present as appealing, investigations of the same have not been borne out.

Although much of the scholarly literature with regards to quantity of care effects on child's development has controlled for family background factors, only recently have similar studies began to examine the simultaneous impact of childcare quality. In fact, very few have attempted to control for quality of care while also examining quantity of care effects, which has given rise to the role of quality as a confounding factor in such studies. Hence, it is possible that earlier studies showing negative impact of care could reflect low quality care rather than care itself as independently impacting on child development through nonmaternal or other care mechanisms. However, specific studies do refute this claim. First, there are a number of experimental investigations of aggression within high-quality daycare centre programs that suggest it is specifically time spent in large-group settings that leads to the associations between problem behaviors and time in care (Haskins, 1985; Schwarz et al., 1974). Secondly, there are a number of recent studies that have simultaneously employed quality and quantity in regression analyses to find negative effects of time in care for cognitive (Brooks-Gunn et al., 2002) and behavioral (NICHD, 2003) outcomes regardless of measured quality.

Nonetheless, the debate over care quality impact continues to play an important role in debates over childcare effects. A review of three recent large-scale studies (Love et al, 2003) has suggested that conclusions regarding childcare impact tend to vary with

quality context. The first of the reviewed studies, the Sydney (Australia) Family development Project, examined impact of childcare that was quite high when compared with US standards. In their 6-year longitudinal study of 147 mothers, these researchers found no significant relationships between quantity and behavioral problems, attachment, school social adjustment or teacher-child conflict. Quality however was related to positive outcomes in this study. Additionally, the Haifa study of Early Child Care, developed partly in conjunction with the NICHD (1997a) study found that quality of care and not quantity was related to their only outcome variable, infant-mother attachment. The quality of care observed in the Israeli centres was generally poorer than that typically observed in the NICHD Study in the US, thereby suggesting systematic differences in care quality between the three studies. Taken together with the large number of positive findings (previously reviewed) found in the non-North American literature and with higher care quality populations, it would appear that quality will continue to persist as an argument against conclusions supporting negative effects of time in childcare.

### Stability

Also important to consider in quantity-of-care effects is instability of care, as it is possible that frequent changes in care arrangements might impact on development as a function of continued unavailability of a stable caregiver and which also conceivably might impact on a child's emotional regulation through this or other mechanisms. For example, there is evidence that stable and familiar caregivers reduce stress experienced by infants (Cummings, 1980, 1986) and also lower the risk of a child developing insecure attachment to his or her mother (Suwalsky, Zaslow, Klein, & Rabinovitch, 1986; see also



NICHD Early Child Care Research Network, 1997a). It is therefore also important to consider this as a mediating variable possibly accounting for previous findings.

However, empirical evidence to date does not support that stability of care confounds quantity-of-care effects, given that in the most recent and largest examination by the NICHD (2003) instability was found to have no impact on outcomes or on the prediction model which included other features of childcare.

### Selection Effects

Also among the arguments that time in care itself does not pose any risk to the developing child is that of selection effects, or biased samples. Although early biases in the literature with regards to family economics and other “at-risk” samples are now almost entirely controlled among the available results, questions regarding pre-selection factors for type and extensiveness of nonmaternal care continue. For example, Borge et al (2004) examined potential selection effects among a sample from the Canadian NLSCY based on family risk and corresponding patterns of nonmaternal care usage. These authors reported significant and striking differences in family risk between home and centre-care groups, based on the finding that 44% of the homecare group showed high family risk versus 28% high risk in the centre care group. Norberg (1998) in an analysis of the 1994 wave of the American NLSY (N=6603) over a five-year longitudinal period also found a number of pre-existing differences among maternal employment and care usage. She found that mothers of children with longer hospitalizations at birth returned to work significantly later (19% less likely to work over the child’s first 5 years) while mothers of infants with higher developmental scores returned to work much sooner after

birth. This effect was found to impact primarily on low-income children. Based on two subscales measuring positive affect and friendliness in infants, Norberg also concluded that mothers of “difficult” infants were 23% more likely to work over the five-year period, an effect most pronounced among the male children in her sample. Based on her findings, Norberg (1998) argued that as a result of selection effects in care usage, cognitive benefits of maternal employment may be overstated in childcare samples as high risk infants, located most often in the low-income groups, are less likely to enter care. She also concluded that behavioral problems may be overstated as “more difficult” infants are placed in care sooner, and that gender differences may be overstated as “difficult” boys are more likely to be in care than “difficult” girls. Based on her results, Norberg her hypothesis that higher temperament in infants heightens maternal stress, thereby increasing the benefits of daycare use. She suggested that for this group of mothers, childcare in this way potentially heightens the value of social supports and the mental health benefits of being employed. In other words, childcare for mothers of difficult infants may serve as a protective factor for the mother-child relationship. Norberg suggested her findings may also help to explain previous studies that have paradoxically found part-time care rather than full-time care to predict more negative outcomes (Lamb, Sternberg and Prodromidis, 1992; Bayden & Brooks-Gunn, 1991). Based within the context of her theory, she accordingly suggests that children in part-time care may be comprised primarily of those whose mothers are seeking respite from the care relationship.

The above studies suggest the need for strong controls among childcare studies. However, in large-scale multivariate investigations such as the NICHD it appears that

quantity-effects remain even after controlling for the factors already mentioned. For example, the NICHD (2003) study did control for infant temperament and not only found care effects to remain but also found no significant differences in temperament among care groups, apparently disconfirming Norberg's previous hypothesis regarding the NLSY dataset. Also, there remains no further evidence for Norberg's claims of specific selection effects among childcare samples, indicating further inquiry will be necessary to establish that temperament and development selection effects are indeed predictive of later childcare use.

### **Design of the Present Study**

The present study was conducted to examine whether negative outcomes could be observed in a large Canadian sample of children having experienced various degrees of total time in centre care and average hours/week in the same. Ideally, hypotheses of environmental risk such as that posed by centre care are best tested through experimental designs involving longitudinal data, so that causation can be inferred from within-individual change. However, such experimental designs are infrequent during early childhood for practical reasons including the inability to assign developing children to care groups. Also, it can be impossible to control for effects of family care that are present at birth or even beforehand during neonatal periods. Adding to the problem is the difficulty of measuring behaviors at early ages, as it is difficult to measure physical aggression or hyperactivity at six months of age that will have the same meaning or even predictive value for these constructs at later ages. It is for this reason that reliance needs to be placed on quasi-experimental designs examining between-group comparisons,

therefore making a cross-sectional study a reasonable design choice. In order to detect care effects among a large number of potentially mediating variables, at least two criteria are identified by Borge et al (2004) as necessary. First, a large sample is required that is also reasonably representative of the general population. Second, there must be adequate measures of developmental outcomes and confounding factors, most importantly of which include socioeconomic variables.

The National Longitudinal Survey of Children and Youth (NLSCY) meets these requirements and in this investigation, developmental outcomes are reported for children aged 0-11 who were involved in centre or maternal care. Based on previous studies, the present investigation was specifically designed to determine whether amount of time spent in daycare (as a function of either average hours/week or total months in care while also taking family SES into account) is related to: 1) behavior problems, 2) problems in affect, 3) social-motor behavior, or 4) cognitive ability. Specific research questions are detailed below.

### Research Questions

On the basis of the foregoing review, a number of research questions are proposed when socioeconomic status is taken into account.

1. Do children who experience either full-time or part-time daycare, or alternatively short-term or long-term daycare, exhibit increased levels of behavioral problems compared with children in maternal care?

2. Do children who experience either full-time or part-time daycare, or alternatively short-term or long-term daycare, exhibit lower levels of cognitive performance compared with children in maternal care?
3. Do children who experience either full-time or part-time daycare, or alternatively short-term or long-term daycare, exhibit increased levels of affect problems compared with children in maternal care?
4. Do children who experience either full-time or part-time daycare, or alternatively short-term or long-term daycare, exhibit lower levels of motor-social behavior compared with children in maternal care?

## **CHAPTER III**

### **METHOD**

#### **Sample**

Data from the National Longitudinal Survey of Children and Youth (NLSCY) collected in cycle three (Statistics Canada, 2002) were used in this study. The NLSCY was designed to follow a representative sample of Canadian children, aged newborn to 11 years, into adulthood, with data collection occurring at two-year intervals study (See Appendix A for a complete description of the NLSCY Data). The third cycle represents a randomly stratified national sample covering the population of Canadian children aged 0 to 15 living in one of ten provinces in 1999. Excluded from sampling were aboriginal children living on Indian Reservations, those living in institutions and residents of the Yukon and Northwest Territories. The cross-sectional dataset used for the present investigation comprises of subjects derived from a representative random sample of Canadian households (Labour Force Survey) and identified from three sources: 1) Those initially sampled in cycle one from the Labour Force Survey, 2) newborn subjects (0-11 months) added to the sample during cycles two and three (also sampled from Labour Force Survey) and 3) one and five-year-olds added to the sample in cycle three and sampled from the Canadian birth registry (See Appendix A for a complete description).

As a percentage of all eligible children, an overall response rate of 88% was attained with full data obtained from 87% of eligible children and 1% of cases being partially completed. Of the non-responders, 3% occurred because the respondent no longer resided at the address or phone number on file and attempts to trace their current location were unsuccessful. In 6% of cases, households refused to participate and in 3%

of cases other non-responses occurred. Examples of other non-responses included being unable to do an interview due to unusual circumstances (i.e. death in the family, illness), absence of family members during the collection period, and being unable to do an interview due to language problems. In total 31,194 children were retained on the final data file which was used for the present study. Data collection for the survey involved a series of questions and tests individually administered to children and their PMK (Person Most Knowledgeable), who in 99.4% of cases was the child's parent, usually the mother.

Two groups were drawn from the total NLSCY sample in order to address the research questions posed by the present study. The first group of children were identified from the total NLSCY sample who had not experienced any form of childcare; that is, their PMK responded "No" to the interview question: "Have you ever used childcare while working or studying?". These children (n=8,696) served as the comparison group in the analyses. Children were also drawn from the total sample that had received care in a daycare centre. Due to the design of the survey questionnaire, this group was identified first by selecting those whose PMK responded "Yes" to the question: "Do you currently use childcare while working or studying?". This group numbered 12,693 children for whom 1,673 PMKs later identified daycare as their main type of care arrangement. An additional 290 PMKs identified their child as attending daycare, however, as this was not their main type of care arrangement, these children were excluded from the analyses. Approximately 30% (n=475) of those retained in the final daycare group were children who had also participated in other forms of care in addition to daycare as their primary care arrangement. However, only rarely (in 4.4% of cases) was more than one alternative

arrangement reported. Accordingly, these children were not excluded from the daycare group as they met the criteria for center care as their main type of care arrangement. As the above method was the only way to isolate children who had experienced center care as their main type of care arrangement, a limitation of sampling was that data for children not receiving childcare at the time of data collection could not be captured due to design of the survey. Based on responses to “Have you ever used childcare?”, these children were estimated to account for 12.7% of the total NLSCY survey (n=4066). As this group had not been interviewed further as to type, time or intensity of care, their data could not be captured. Hence, while the available sample represents an accurate cross-section of children in center care at the time of the NLSCY survey, a limitation of the same was that older children were less prominent among the care groups.

### **Independent Variables**

Two sets of care variables were employed within analysis of variance designs for the present study, these being daycare time (in months) followed by daycare hours (average per week). Data for these variables were determined based on interviews with the PMK as to when their main care arrangement began and for approximate hours per week in the main type of care arrangement. In the case of daycare months, data were recoded into a three level variable comprising maternal care only, short-term (less than 14 months) and long-term (14 months or greater) care. A categorical cut-off of 14 months was chosen based on the mean value for reported months in care. Given the various groupings of hours per week of care found in the literature, average hours/week in this



study were grouped based on a theoretical decision to reflect part-time and full-time levels of care, based on a cut-off of 25 hours/week. In this way, a three level variable was recoded for daycare hours comprising of maternal care only, less than 25 average hours/week, followed by 25 average hours/week or greater. The resulting variables and sample sizes are listed in Table 1 below.

**Table 1. Independent Variable Sample Sizes**

Daycare Months	N	Daycare Hours/Week	N
Maternal Care	8696		8696
Less than 14 Months	766	Less than 25 hours/Week	743
14 Months or Greater	824	25 Hours/Week or Greater	835
TOTAL	10,286		10,274

\* *Maternal Care Group derived from "No" response to question: "Have you ever used child care?"*

### **Outcome Measures**

The set of outcome measures derived from the NLSCY for the present study included: 1) a measure of motor and social development from ages 0 to 3; 2) a measure of receptive vocabulary from ages 4 up to pre-Grade 2; and 3) four measures of behavior problems and a measure of pro-social behavior at two developmental phases (2-3 years and 4-11 years). All measures were based on several items, yielding a continuous score for each subject. Table 2 summarizes the ages of administration for survey measures.

The Motor and Social Development Scale was administered to children newborn to 3 years of age at the time of the survey and measures different dimensions of motor, social and cognitive development in young children. Standard scores ranged from 15 to 205 in the total daycare sample with a mean of 100.6 (n=4651). Verbal ability was

**Table 2. Outcome Measures by Age of Administration**

Variable	Ages 0-1	Ages 2-3	Ages 4-7	Ages 8-11
Motor & Social Development	✓	✓		
Receptive Vocabulary (PPVT-R)			✓	
Hyperactivity		✓	✓	✓
Prosocial Behavior		✓	✓	✓
Emotional Disorder		✓	✓	✓
Physical Aggression – Opposition		✓		
Separation Anxiety		✓		
Aggression Score – Conduct Disorder			✓	✓
Indirect Aggression			✓	✓

estimated in 4 to 6-year olds through administration of the Peabody Picture Vocabulary Test –Revised, also known as the PPVT-R (Dunn & Dunn, 1981). Standard scores for this scale ranged from 40 to 160 in the total daycare sample with a mean score of 97.7 (n=3299). The PPVT-R measures verbal ability and represents probably the most important predictor of school success among this set of measures (Willms, 2000). Both the Motor and social Development and PPVT-R scales are described in greater detail in Appendix B.

Children’s behavior was assessed based on PMK-reported ratings. These were administered verbally during data collection interviews and included several items preceded by a standardized format: “How often would you say that {child’s name}... (e.g. can’t sit still, is restless or hyperactive, etc.),” with three possible likert-type responses—“never or not true”; “sometimes or somewhat true”; and “often or very true.” The scales used in this study pertain to prosocial behavior and four different behavior problems for 2

to 3 year-olds as well prosocial behavior and five different behavior problems for 4 to 11 year-olds (see Table 2).

Hyperactivity was characterized by inattention, impulsivity and restless motor activity for both 2 to 3-year-olds (range 0-14) and 4 to 11-year-olds (range 0-16). The Prosocial Behavior scale assessed whether children were empathetic (e.g., the child will try to help someone who is hurt), helpful (e.g., the child volunteers to clear up a mess someone else has made), and inclusive of other children (e.g., the child will invite bystanders to join in a game). Prosocial scores ranged from 0-10 in the 2 to 3 year-olds and 0-20 in the 4 to 11-year-olds. Emotional Disorder was characterized primarily by feelings of anxiety and depression (0-12 in 2 to 3-year-olds; 0-16 in 4 to 11-year-olds). Aggression comprised one factor for 2 to 3-year-olds representing physically aggressive and oppositional defiant behaviors, scores ranging from 0-16. Aggression was divided into two factors for 4 to 11-year-olds (based on factor analyses described in Appendix B) and comprised of physically aggressive behaviors relating to conduct disorder (range 0-12) and those related to indirect aggression behaviors (range 0-10). Finally, Separation Anxiety was measured for 2 to 3-year-olds and based on items related to anxiety symptoms caused by separation from primary caregiver (range 0-10). For a complete description of the behavior scales, individual items, derived factors and corresponding Cronbach Alpha values, see Appendix B.

### **Socioeconomic Status**

In order to account for socio-economic status of families (SES) in the analyses, a 9-point ordinal index developed by Statistics Canada (2001) and included in the NLSCY

was used. This index is calculated for the household of each child in the sample and is derived from five sources including PMK-education, education level of spouse/partner, prestige of PMK's occupation, prestige of spouse/partner's occupation and household income. The ordinal nature of this scale makes it a suitable covariate for controlling any effects of family education and income in the analyses. At the highest ranking (9), criteria are that both parents possess university degrees and are employed professionals earning a combined total income of \$80,000 annually or more. Criteria for the lowest ranking (1) require that the responder is an unemployed single parent with less than high school education and an income of less than \$10,000 annually. The method of construction for each component of the SES index as well as the overall cross-sectional scale criteria are described in greater detail in Appendix B.

### **Analysis Design**

For motor/social development and PPVT-R outcomes, two-way analysis of covariance statistics (ANCOVA) were computed separately for center care hours and center care months variables with child gender as a blocking variable and SES (family education and income) as a covariate. For behavioral, affect and prosocial behavior outcomes, separate (by age) two-way multiple analysis of covariance statistics (MANCOVA) were computed for both center care hours and months blocking for child gender and controlling for SES as a covariate. This design was chosen in order to control for both socioeconomic effects and sex differences on the behavioral measures, given well-established relationships between family income and positive child development (Willms, 2000). Sex was controlled for in order to avoid confounding on behavioral

measures due to gender effects hypothesized to occur in the case of hyperactivity and aggression in male children as well as increased prosocial behavior in females. The MANCOVA design was chosen as it allows for testing of each factor while controlling for others, leading to greater statistical power for between-group samples (Fisher, 1926). Another advantage of using the MANCOVA design was to detect any interactions that might occur between daycare and gender variables.

## **CHAPTER IV**

### **RESULTS**

This chapter is organized under six headings: 1) descriptive analyses, 2) main comparisons, 3) behavior outcomes, 4) cognitive outcomes, 5) affect outcomes and 6) motor-social outcomes.

#### **Descriptive Analyses**

Table 3 presents descriptive statistics for background and demographic variables by care grouping. While age was relatively constant at 4 years across the maternal, part-time and long-term ( $\geq 14$  month) groups; mean age for full-time and short-term ( $< 14$  month) care groups was considerably younger at 2 years, 8 months. Gender was generally equal across groups. While maternal education increased gradually (total range of less than one point) with degree of centre care use, average education across all groups fell primarily in the range of high school graduation (between the categories of “graduation from high school” and “less than graduation from a college”).

Maternal depression, family functioning and social support means were also calculated in order to compare for potentially confounding effects of the same. Maternal depression, for example, has been previously found to vary as a function of SES in the NLSCY, wherein 17% of low income-children have been found to live with at least one parent showing symptoms of depression versus only 5% incidence in higher income groups (Willms, 2000). The Depression Scale measured the PMK’s tendency to exhibit symptoms of depression, such as frequency of feeling “blue” in the preceding week of the survey interview. Scores ranged from 0-36 with higher scores representing higher reports

of depressive symptoms. Average depression score for PMK was highest in short-term and full-time center care groups at 4.9, compared with other means ranging between 4.3-4.6 and still well below threshold for depressive symptoms (range 0-36). Mean scores on

**Table 3. Demographic Characteristics (Means) of Care Groups**

Variable	Maternal Care (sd) or %	Part-time (sd) or %	Full-time (sd) or %	<14 Months (sd) or %	≥14 Months (sd) or %
<i>Child &amp; Family Characteristics</i>					
Child Age	4.1 (2.9)	4.3 (2.0)	2.8 (1.6)	2.8 (1.9)	4.2 (1.7)
Gender (% Male)	50.4%	53.6%	47.9%	50.8%	51.1%
Highest Education (PMK)*	2.7 (1.1)	3.3 (0.9)	3.3 (0.8)	3.2 (0.1)	3.4 (0.9)
Depression Score (PMK)	4.6 (5.4)	4.3 (4.8)	4.9 (5.4)	4.9 (5.4)	4.3 (4.8)
Family Functioning Score	8.5 (5.1)	8.5 (5.0)	8.7 (5.2)	8.5 (5.1)	8.7 (5.1)
Social Support Score	14.3 (2.7)	14.5 (2.8)	14.6 (2.7)	14.5 (2.8)	14.6 (2.7)
Age (in months) when Mother Started Work	-	11.2 (11.6)	9.4 (8.4)	10 (9.4)	10.6 (11)
Single Parent (% of)	12%	19%	27%	22%	23%
Annual Household Income**	4.2 (1.1)	4.7 (0.7)	4.8 (0.7)	4.7 (0.7)	4.8 (0.6)
SES Index (9-point ordinal)	4.9 (2.0)	5.9 (1.8)	5.8 (1.8)	5.7 (1.9)	6.0 (1.7)
<i>Other Childcare Experiences</i>					
# Other Children In Care	—	21.8 (18)	20.8 (19)	19.7 (17)	22.7 (20)
Care Centre is Non-Profit	—	51.1%	53.5%	51%	54%
# Changes in Childcare	—	1.3 (1.9)	1.1 (1.3)	1.3 (1.9)	1.1 (1.3)
# of Care Arrangements	—	1.4 (0.6)	1.2 (0.5)	1.3 (0.5)	1.3 (0.6)

\*4-point ordinal scale, 2 representing "Secondary School Graduate"; 3 representing "Beyond High School" but less than "College/University Graduate"

\*\*5-point ordinal scale, 4 representing "30k-39k"; 5 representing "40k or more"

Family Functioning were also stable across groups at 8.5 to 8.7 (range of 0-36 with high scores indicating family dysfunction). Similarly, social support means were consistent across care groups between 14 and 15 on a 36-point scale. This latter measure was based on items regarding level of support available to parents in terms of people the parent can discuss problems with, ask for advice or depend on for help in an emergency, with higher scores indicating greater degree of reported support from others. Mean age of entry into care for all care groupings was between 9 and 11 months. Mean age of the PMK (when this was the mother) was also stable across care groups, with a mean age of 30-34 years across care levels. The care groups did not vary substantially on

**Table 4. Descriptive Statistics for Dependent Variables in the NLSCY**

<i>Outcomes</i>	Mean	SD	Minimum	Maximum	N
Motor & Social Development	99.47	17.85	26	205	11,351
PPVT-R	99.03	15.09	40	160	8582
Behavior 2-3 Years					
Hyperactivity-Inattention	4.07	2.94	0	14	3526
Prosocial Behavior	6.29	2.75	0	10	3289
Emotional disorder-Anxiety	1.08	1.42	0	12	3521
Physical Aggression-ODD	5.05	3.07	0	16	3511
Separation Anxiety	2.77	2.02	0	9	3548
Behavior 4-11 Years					
Hyperactivity-Inattention	4.6	3.45	0	16	15,243
Prosocial Behavior	13	3.8	0	20	15,297
Emotional disorder-Anxiety	2.26	2.36	0	15	15,297
Aggression	1.45	1.83	0	12	1,830
Indirect Aggression	0.82	1.38	0	10	14,559



**Table 5. Descriptive Statistics for All Variables Used in the Analyses**

Variable	M/%	SD	Minimum	Maximum	N
<i>Blocking/Control Variables</i>					
Gender (1=Male)	50.5%	-	-	-	5236
SES Index (9-point ordinal scale)	5.1	2.0	1	9	10,180
<i>Quantity-of-Care</i>					
Average hours per week					
Part-time Care	16.3	6.7	1	25	743
Full-Time Care	38.2	6.3	26	101	835
<14 Months Care	28.4	12.6	2	56	728
≥14 Months Care	27.3	12.7	1	101	772
Total Months in Care					
Part-time Care	21.9	20.3	1	104	707
Full-Time Care	17.6	15.1	1	66	793
<14 Months Care	6.0	3.6	1	13	728
≥14 Months Care	32.4	16.4	14	104	772
<i>Outcomes</i>					
Motor & Social Development	100.63	19.49	35	205	4561
PPVT-R	97.72	15.73	40	160	3299
Behavior 2-3 Years					
Hyperactivity-Inattention	3.98	2.94	0	14	1572
Prosocial Behavior	6.16	2.78	0	10	1462
Emotional disorder-Anxiety	1.09	1.45	0	12	1560
Physical Aggression-ODD	4.91	3.12	0	16	1560
Separation Anxiety	2.88	2.06	0	9	1580
Behavior 4-11 Years					
Hyperactivity-Inattention	4.45	3.44	0	16	5608
Prosocial Behavior	12.79	3.90	0	20	5318
Emotional disorder-Anxiety	2.11	2.29	0	15	5631
Aggression	1.42	1.81	0	12	5625
Indirect Aggression	0.77	1.34	0	10	5387

socioeconomic level or other features of care including care type (# children or type of funding) and stability of care (# changes in care or # of care arrangements). However, single parent status as a percentage of those with (in most cases) single mothers did vary as a function of whether a child participated in maternal as opposed to any other level of center care. While only 12% of the maternal care sample were comprised of single mothers, center care groups were made up of 19-27% of single mothers, the highest proportion of which was found in the full-time care group.

Descriptive statistics for all dependent variables in the total NLSCY sample are presented in Table 4. These provide for general estimates of values within the representative NLSCY sample of Canadian children. Descriptive statistics for comparison, covariate, blocking and outcome variables included in the daycare sample analyses are presented in Table 5. Standard scores for the Peabody and Motor-Social Development Scales were normally distributed in the daycare sample. Behavior/affect ratings reflected those obtained in the general NLSCY population and remained relatively low (non-clinical) overall. Sample sizes and scale ranges are also included in this table.

### **Main Comparisons**

To examine whether outcomes in the behavior, affect and prosocial behavior domains differed among care groups, a multivariate 2 (Sex) X 3 (Care Level) ANCOVA was computed separately for 2-3 year and 4-11 year age groups while controlling for SES. For center care hours, the results were significant for 2-3 years (Wilk's Lambda=.98;  $F(5,2)=2.8$ ,  $p<.01$ ) and highly significant for 4-11 years (Wilk's Lambda=.99;  $F(5,2)=6.0$ ,  $p<.001$ ). Follow-up univariate analyses,  $F_s$  (2-3 years  $df= 2,1404$ ; 4-11 years

df= 2, 5002) were significant for prosocial behavior ( $F=4.1$ ,  $p<.05$ ) in the 2-3 year age group and hyperactivity ( $F=22.7$ ,  $p<.001$ ), emotional disorder ( $F=4.0$ ,  $p<.05$ ), aggression ( $F=4.4$ ,  $p<.05$ ), indirect aggression ( $F=4.6$ ,  $p<.05$ ) in the 4-11 year age group. For center care months, the results of multivariate ANCOVAs were again significant for 2-3 years (Wilk's Lambda=.98;  $F(5,2)=2.5$ ,  $p<.01$ ) and highly significant for 4-11 years (Wilk's Lambda=.99;  $F(5,2)=5.9$ ,  $p<.001$ ). Follow-up univariate analyses, Fs (2-3 years df= 2,1409; 4-11 years df= 2, 5020) were significant for prosocial behavior ( $F=3.4$ ,  $p<.05$ ) and physical aggression ( $F=3.7$ ,  $p<.05$ ) in the 2-3 year age group and in the case of 4-11 years, hyperactivity ( $F=23.7$ ,  $p<.001$ ) and emotional disorder ( $F=3.1$ ,  $p<.05$ ). Sex effects were consistently significant in the multivariate models ( $p<.01$ ) as was the SES covariate ( $p<.001$ ). No significant interactions were found between sex and care level.

To examine whether outcomes in the motor-social and cognitive domains differed as a function of care, univariate ANCOVAs (using the same 2 X 3 design) were computed for care hours and months. For center care hours, results were nonsignificant for motor-social development ( $F(2,4437)=2.2$ ) and PPVT-R scores ( $F(2,3239)=0.2$ ). Similarly, for center care months, results were nonsignificant for both motor-social development ( $F(2,4427)=1.9$ ) and PPVT-R scores ( $F(2,3253)=0.7$ ) indicating no significant differences among means based on average weekly hours or total number of months spent in care while controlling for SES. Sex effects were found to be significant ( $p<.001$ ) for motor-social development scores, indicating that males performed higher on motor-social ratings than females across groups (See Table 6). SES effects were found to be significant in the case of PPVT-R scores ( $p<.001$ ) but not for motor-social development. Based on previous findings in the literature review for the role of family

**Table 6. Adjusted Means (Standard Error): All Outcomes by Care Group**

Blocking Variable		Level of Care	Behavior Means (s.e.)					Affect Means (s.e.)			Social-Motor Means (s.e.)		Cognitive Means (s.e.)	
			<i>Hyper-activity (2-3 Years)</i>	<i>Physical Aggression &amp; Opposition (2-3 Years)</i>	<i>Hyper-activity (4-11 Years)</i>	<i>Aggression (4-11 Years)</i>	<i>Indirect Aggression (4-11 Years)</i>	<i>Emotional Disorder (2-3 Years)</i>	<i>Separation Anxiety (2-3 Years)</i>	<i>Emotional Disorder (4-11 Years)</i>	<i>Motor-Social Development (0-3 Years)</i>	<i>Prosocial Behavior (2-3 Years)</i>	<i>Prosocial Behavior (4-11 Years)</i>	<i>PPVT-R (4-7 Years)</i>
Hours/ Week	Males	Maternal	4.24 (0.12)	5.29 (0.14)	4.80 (0.07)	1.57 (0.04)	0.71 (0.03)	1.08 (0.06)	2.94 (0.09)	2.12 (0.05)	103.7 (0.45)	5.61 (0.12)	12.25 (0.08)	97.08 (0.41)
		Part-Time	3.79 (0.36)	4.33 (0.39)	<b>5.93 (0.22)*</b>	1.81 (0.12)	0.67 (0.09)	1.21 (0.18)	2.92 (0.25)	2.34 (0.15)	102.7 (1.75)	6.16 (0.34)	11.73 (0.25)	96.57 (1.09)
		Full-Time	4.68 (0.27)	5.17 (0.30)	5.41 (0.30)	1.70 (0.16)	0.61 (0.12)	1.28 (0.14)	2.97 (0.19)	2.23 (0.21)	102.4 (1.23)	6.18 (0.26)	12.41 (0.34)	98.0 (1.43)
	Females	Maternal	3.68 (0.12)	4.81 (0.13)	3.72 (0.07)	1.21 (0.04)	0.87 (0.03)	1.11 (0.06)	2.74 (0.09)	2.01 (0.05)	97.90 (0.44)	6.53 (0.12)	13.50 (0.08)	98.29 (0.42)
		Part-Time	4.02 (0.43)	4.80 (0.47)	<b>4.70 (0.23)*</b>	1.50 (0.12)	1.00 (0.09)	1.28 (0.22)	3.33 (0.30)	<b>2.44 (0.16) *</b>	93.58 (1.98)	6.88 (0.41)	13.17 (0.26)	98.72 (1.11)
		Full-Time	3.91 (0.28)	4.14 (0.31)	4.34 (0.27)	1.05 (0.15)	0.57 (0.11)	0.96 (0.15)	2.91 (0.20)	2.12 (0.19)	97.21 (1.21)	7.02 (0.27)	13.16 (0.31)	98.52 (1.28)
	TOTAL	Maternal	3.96 (0.09)	5.05 (0.10)	4.23 (0.05)	1.39 (0.03)	0.79 (0.02)	1.10 (0.04)	2.84 (0.06)	2.07 (0.04)	100.8 (0.32)	6.06 (0.01)	12.87 (0.06)	97.68 (0.30)
		Part-Time	3.91 (0.28)	4.57 (0.30)	<b>5.31 (0.16)*</b>	<b>1.65 (0.09)*</b>	0.84 (0.06)	1.24 (0.14)	3.13 (0.20)	<b>2.40 (0.11) *</b>	98.16 (1.32)	6.52 (0.27)	12.45 (0.18)	97.64 (0.78)
		Full-Time	4.30 (0.20)	4.66 (0.22)	<b>4.88 (0.20)*</b>	1.38 (0.11)	0.59 (0.08)	1.12 (0.10)	2.94 (0.14)	2.17 (0.14)	99.83 (0.87)	<b>6.60 (.19)*</b>	12.78 (0.23)	98.26 (0.96)
Months	Male	Maternal	4.23 (0.12)	5.23 (0.14)	4.80 (0.07)	1.57 (0.04)	0.71 (0.03)	1.08 (0.06)	2.93 (0.09)	2.12 (0.05)	103.7 (0.45)	5.61 (0.12)	12.25 (0.08)	97.10 (0.42)
		<14 Months	4.40 (0.31)	4.57 (0.34)	<b>5.91 (0.29)*</b>	1.86 (0.16)	0.63 (0.12)	1.22 (0.16)	2.90 (0.22)	2.40 (0.20)	102.2 (1.29)	5.71 (0.29)	11.88 (0.34)	98.28 (1.41)
		≥14 Months	4.21 (0.31)	5.03 (0.33)	<b>5.72 (0.22)*</b>	1.67 (0.12)	0.69 (0.09)	1.28 (0.16)	2.95 (0.22)	2.21 (0.15)	103.2 (1.64)	6.40 (0.29)	12.12 (0.25)	97.03 (1.07)
	Females	Maternal	3.68 (0.12)	4.81 (0.13)	3.71 (0.07)	1.21 (0.04)	0.87 (0.03)	1.11 (0.06)	2.74 (0.09)	2.01 (0.05)	97.90 (0.44)	6.52 (0.12)	13.50 (0.08)	98.30 (0.43)
		<14 Months	3.71 (0.33)	4.18 (0.36)	<b>4.61 (0.31)*</b>	1.33 (0.17)	0.79 (0.13)	1.20 (0.17)	3.15 (0.23)	2.36 (0.21)	96.25 (1.25)	7.06 (0.32)	13.0 (0.36)	99.63 (1.49)
		≥14 Months	3.95 (0.33)	4.39 (0.36)	<b>4.57 (0.21)*</b>	1.32 (0.11)	0.83 (0.09)	0.95 (0.17)	2.84 (0.23)	2.26 (0.14)	95.25 (1.87)	6.85 (0.32)	13.07 (0.24)	98.10 (1.01)
	TOTAL	Maternal	3.96 (0.09)	5.05 (0.10)	4.26 (0.05)	1.39 (0.03)	0.79 (0.02)	1.09 (0.05)	2.84 (0.06)	2.07 (0.04)	100.8 (0.32)	6.06 (0.08)	12.87 (0.06)	97.70 (0.30)
		<14 Months	4.05 (0.23)	4.37 (0.25)	<b>5.26 (0.21)*</b>	1.60 (0.11)	0.71 (0.09)	1.21 (0.12)	3.03 (0.16)	2.38 (0.15)	99.23 (0.90)	6.39 (0.22)	12.44 (0.25)	98.95 (1.03)
		≥14 Months	4.08 (0.23)	4.71 (0.25)	<b>5.14 (0.15)*</b>	1.50 (0.08)	0.76 (0.06)	1.11 (0.12)	2.89 (0.16)	2.24 (0.10)	99.21 (1.25)	6.62 (0.22)	12.60 (0.18)	97.56 (0.74)

*Values represent adjusted means covarying for an index of SES (9-point ordinal scale; Statistics Canada, 2002)*

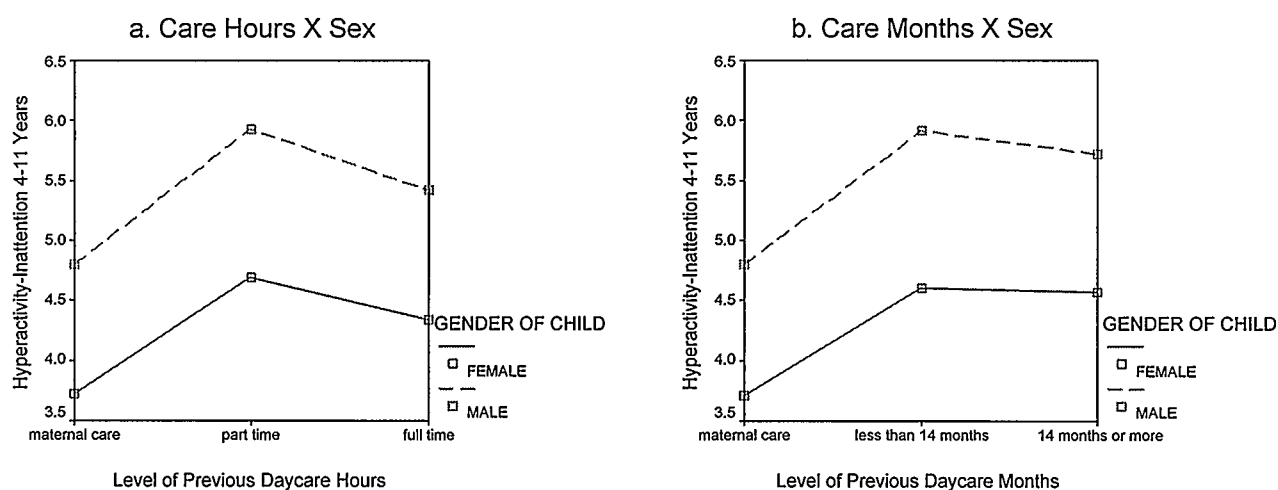
*\* Significantly higher ( $p < .05$ ) than maternal care group*

education and income in childcare cognitive outcomes, SES effects were explored further and are described in the following section under cognitive outcomes. Results of post-hoc tests among outcome means are reported under the categories of behavioral, cognitive, affect and motor-social development in the following sections. Adjusted means for all outcomes by care grouping are presented in Table 6.

### Behavior Outcomes

Any level of time in care was found to result in significantly higher hyperactivity ratings (4-11 years;  $p < .05$ ), such that being in center care resulted in hyperactivity increases of 0.8 – 1.7 points compared with children in maternal care (See Table 6). Although this effect appeared equally across genders (See Figure 1), increases were found to be nonsignificant for males and females specifically in full-time care.

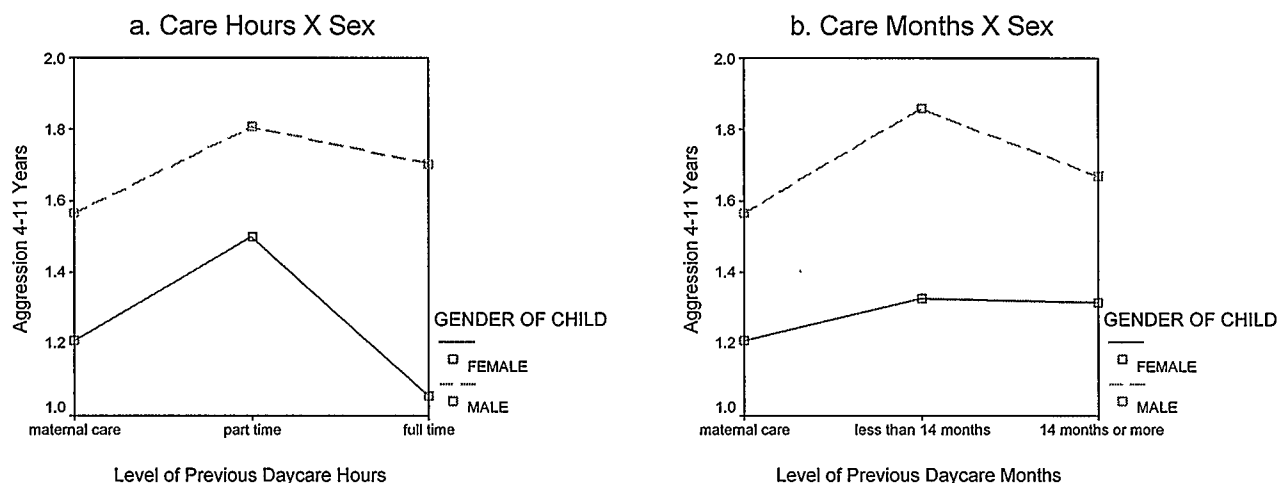
**Figure 1. Adjusted Means for Hyperactivity-Inattention (4-11 Years)**



Post-hoc comparisons revealed a significant ( $p < .05$ ) though small (.26 points) increase in aggression for the 4-11 year age group in part-time center care. No significant increase was observed for being in full-time care or as a function of care months.

Aggression (4-11 year) means are plotted in Figure 2 below. Despite significant univariate Fs for aggression (2-3 years) and indirect aggression (4-11 years) post-hoc comparisons revealed no substantial differences among care group means ( $p > .05$ ).

**Figure 2. Adjusted Means for Aggression (4-11 Years)**



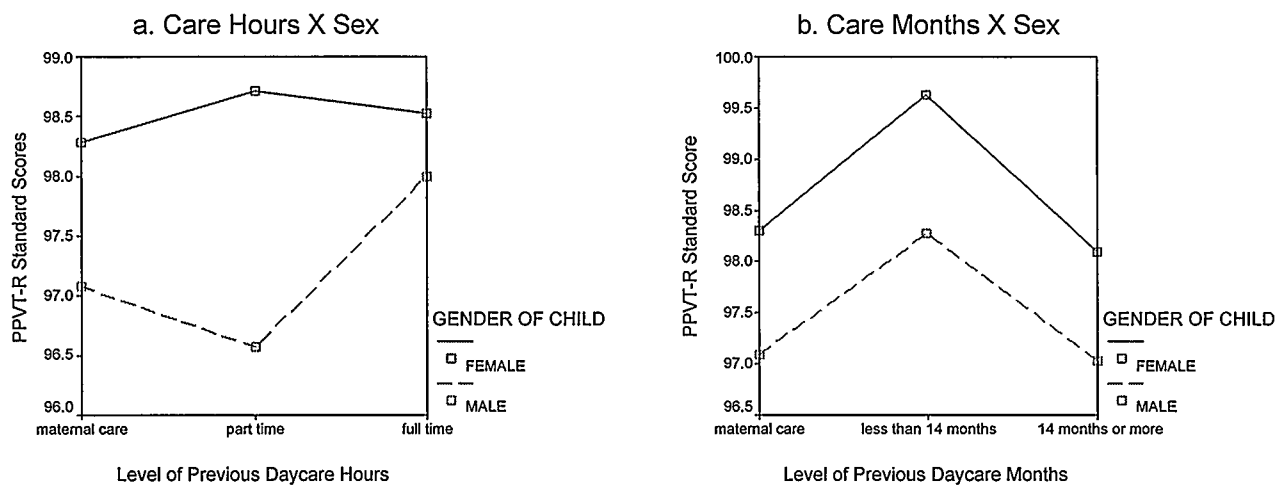
### Cognitive Outcomes

While univariate Fs for PPVT-R scores as a function of care were nonsignificant ( $p > .05$ ), SES itself contributed significantly to the ANOVA model (Months  $F(2, 3250) = 264, p < .001$ ; Hours  $F(2, 3236) = 268, p < .001$ ). In order to assess the nature of this covariate relationship, two additional univariate ANOVAs were computed first without the SES covariate in the 2 (Sex) X 3 (Care level) design and next while including annual household income as a blocking factor in a 5 (Income) X 3 (Care Level) design. Household income (on a 5-point ordinal scale) was chosen as a blocking variable in order to provide for a measure of SES while still ensuring adequate cell sizes in the ANOVA design.

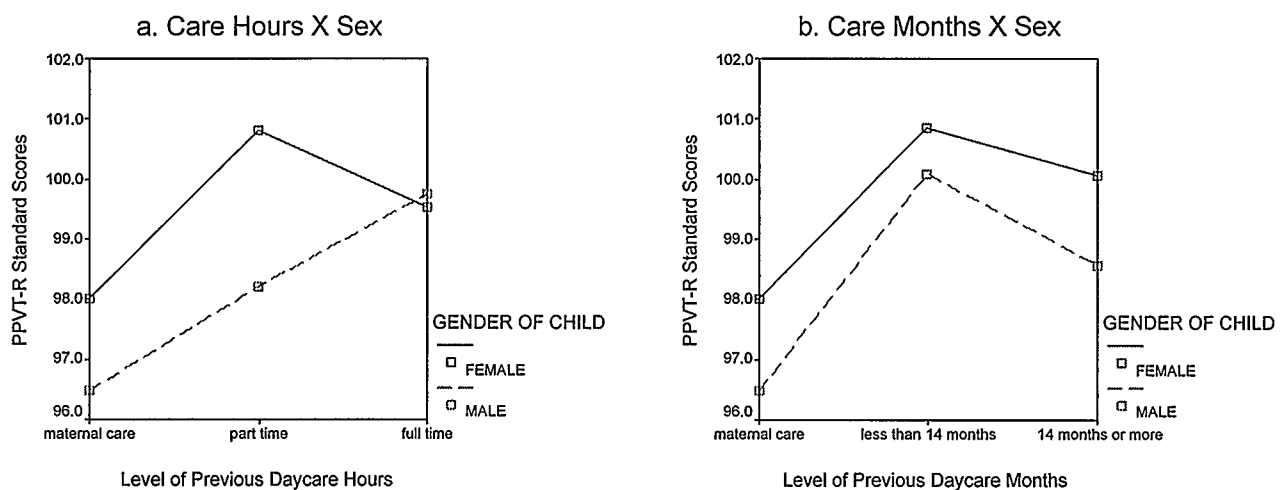
For PPVT-R analyses without the use of an SES covariate, univariate Fs were

found to be significant for both care hours ( $F(2,3256)=5.6, p<.01$ ) or months ( $F(2, 3270)=6.7, p<.001$ ). Post-hoc comparisons indicated significant increases for all levels of care (except full-time care,  $p>.05$ ), but only when groups were collapsed across gender. This translated into mean score increases of 2.0-3.2 standard points across care groups with females obtaining the highest means in the part-time and short-term care groups. Adjusted and unadjusted means are presented in Figures 3 and 4 below, respectively.

**Figure 3. Adjusted Means for PPVT-R Standard Scores**

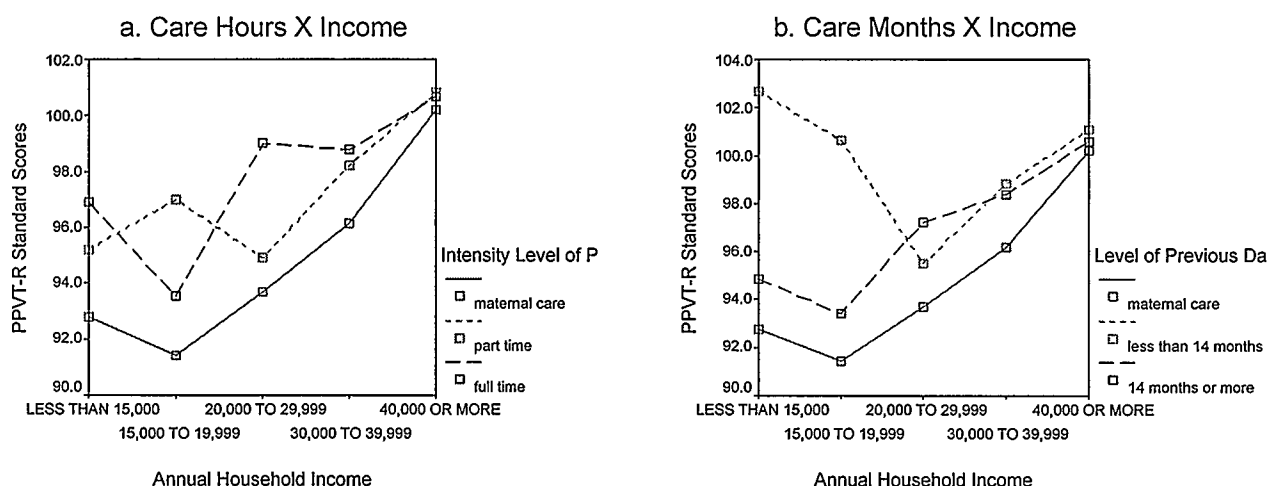


**Figure 4. Unadjusted Means for PPVT-R Standard Scores**



Univariate ANOVAs employing household income as a blocking variable were significant for hours ( $F(2, 3256)=3.2, p<.05$ ) or months ( $F(2, 3270)=5.1, p<.01$ ) as well as income level ( $p<.001$  in both sets). Post-hoc comparisons indicated significant gains ( $p<.05$ ) of 2-3 standard points as a function of any level of daycare participation. A trend was observed wherein lower income groups derived the highest gains on receptive vocabulary scores as a function of daycare participation, although this relationship was significant ( $p<.05$ ) only for the lowest household income group ( $< \$15,000$ ), for which an increase of 10 standard points was observed as a function of short-term daycare participation. These gains appeared to decrease with higher incomes and longer time spent in care, such that care effects in the highest income group failed to exist (See Figure 5).

**Figure 5. Unadjusted Means for PPVT-R Standard Scores (Care X Income)**



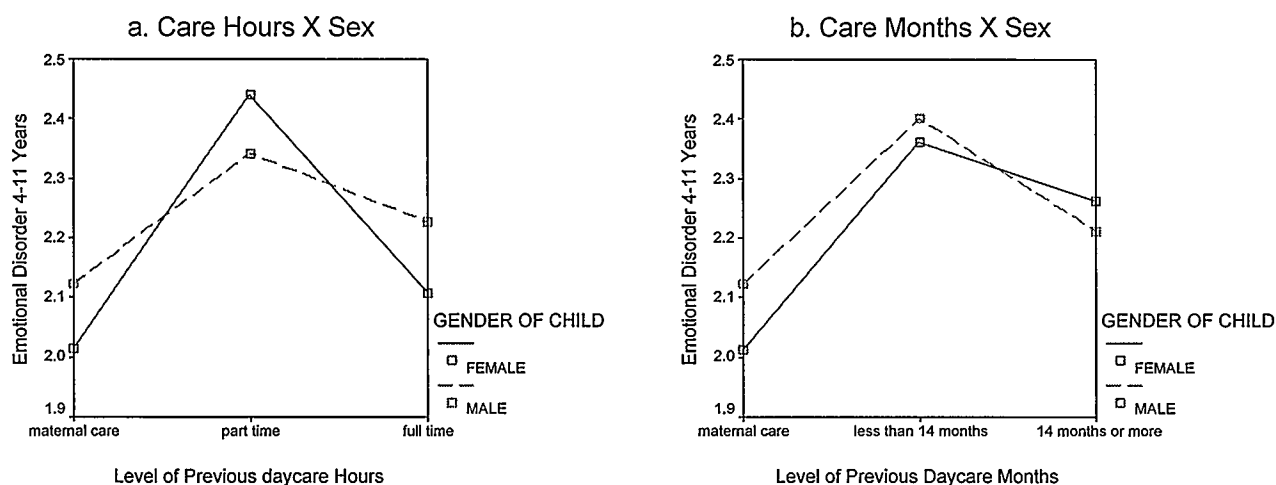
### Affect Outcomes

Small and significant ( $p<.05$ ) increases in emotional disorder for the 4-11 year age group were observed for females in part-time care (0.4 points) and for the combined



care hours sample (0.3 points), but not for males in daycare. A similar though nonsignificant trend was observed for care months (See Table 6). Again, as can be seen in the plotted means in Figure 6 below, these effects were more pronounced for children having experienced less extensive care (part-time or short-term).

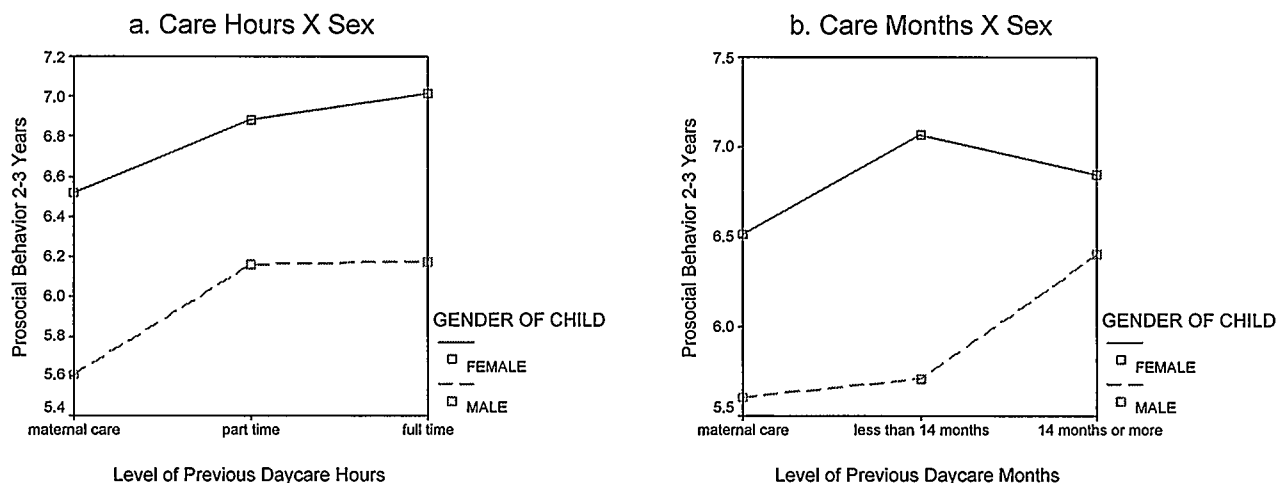
**Figure 6. Adjusted Means for Emotional Disorder (4-11 Years)**



### Motor-Social Outcomes

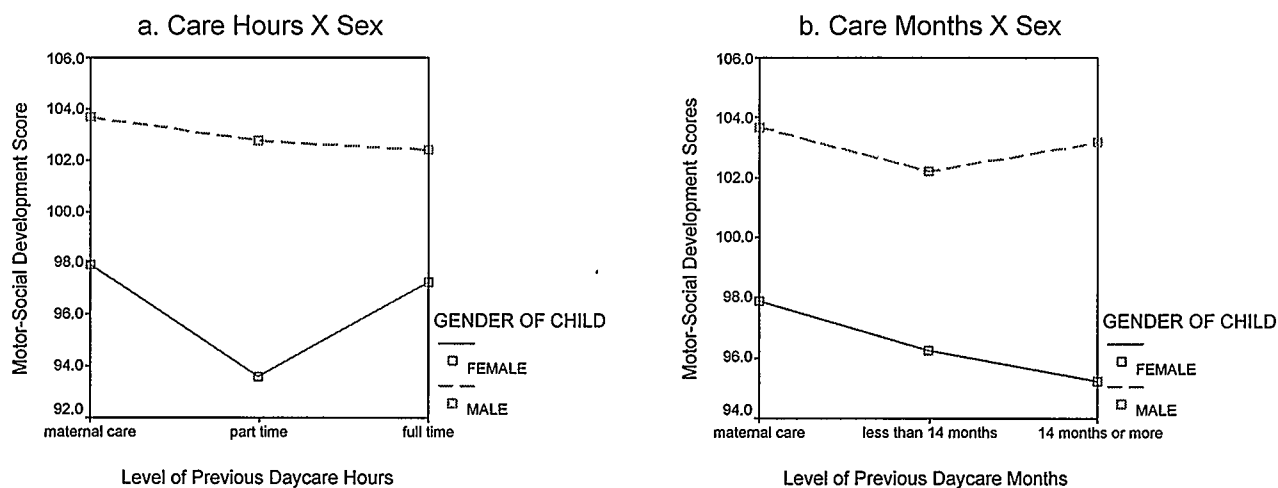
A small (0.5 point) increase in mean prosocial behavior was observed for the 2-3 year age group as a function of full-time care participation, but only presented as significant ( $p < .05$ ) when gender groups were collapsed, suggesting that test power may have played a role in the analyses. There was no discernable impact of care participation on prosocial behavior ratings for children in the 4-11 year age group. Although a trend was observed for marginal increases in prosocial behavior across the remaining care levels for the 2-3 year age group, these were nonsignificant (See Figure 7).

**Figure 7. Estimated Marginal Means for Prosocial Behavior (2-3 Years)**



Motor-social development scale scores were not found to vary significantly as a function of care, although small decreases were observed with degree of center care use (See Figure 8 below).

**Figure 8. Estimated Marginal Means for Motor-Social Development Score**



In summary, significant ( $p < .05$ ) intra-group differences were observed as a function of participation in daycare while accounting for family SES. Specifically, increases (0.3-1.0 points) were observed for mean hyperactivity-inattention, aggression and emotional

disorder ratings in the 4-11 year age group and mean prosocial behavior in the 2-3 year age group. There were no mean differences observed as a function of daycare participation on measures of motor-social development in infants and receptive vocabulary scores in toddlers. However, removing the SES covariate from the PPVT-R analyses resulted in significant increases (by up to 3.2 standard score points) as a function of daycare participation both with and without household income as a blocking variable, which appeared to reflect gains specifically for lower household income groups.

## CHAPTER V

### DISCUSSION

The results of the present study extend previous findings of large-scale surveys of childcare use with a dataset of Canadian children. Among behavioral outcomes measured for children between 4 and 11 years of age, daycare participation at any of the four care levels was related to increased levels of hyperactivity-inattention. Part-time daycare participation was also related to marginally increased ratings of aggression. There were no significant differences observed among behavioral outcomes for the 2-3 year age group. In the cognitive domain, daycare participation was not found to impact on standardized scores for receptive vocabulary (PPVT-R) when the direct influence of family education and income (SES) was employed as a covariate. However, ad-hoc analyses in the absence of the SES covariate revealed significant mean gains (up to 3.2 standard points) on receptive vocabulary scores as a function of daycare participation that appeared related to level of children's household income. Among the measures of affect, marginally higher levels of emotional disorder in the 4-11 year age group were rated for females in part-time daycare but not for those in full-time care. These effects did not appear to extend to males or as a function of daycare months. Motor-social behavior was not found to vary as a function of care use employing a standardized infant measure (0-3 years), however prosocial behavior ratings were found to increase marginally with level of center care use but only to a degree wherein full-time care increases were significant. Prosocial behavior in the 4-11 year age group was not found to vary as a function of time in center care. In summary, findings from the present analyses suggest that center care

may provide some risks for later behavior in terms of hyperactivity, aggression and emotional disorder yet may also provide some benefits in terms of prosocial behavior and early verbal abilities. A categorized summary of these findings, including effect sizes (Cohen, 1988), is provided in Table 7 below.

**Table 7. Categorical Summary of Significant Findings (Effect Sizes)**

Domain	Maternal Care Means (Standard Error)	Part-time Daycare	Full-time Daycare	Short-term Daycare	Long-term Daycare
<i>Behavior</i> (4-11 Years)	Hyperactivity=4.23 (.05)	+1.1 $\underline{d}=.32$	+0.7 $\underline{d}=.20$	+1.0 $\underline{d}=.29$	+0.8 $\underline{d}=.23$
	Aggression=1.39 (.03)	+0.3 $\underline{d}=.16$	-	-	-
<i>Cognitive</i> (4-6 Years)	PPVT-R (Unadjusted)=97.2 (1.1)	+2.3 $\underline{d}=.15$	+2.4 $\underline{d}=.16$	+3.2 $\underline{d}=.21$	+3.1 $\underline{d}=.21$
<i>Affect</i> (4-11 Years)	Emotional Disorder=2.1 (.04)	+0.3 $\underline{d}=.13$	-	-	-
<i>Motor-Social</i> (2-3 Years)	Prosocial Behavior=6.1 (.01)	-	+0.5 $\underline{d}=.18$	-	-

*+ Indicates significant ( $p<.05$ ) increases over corresponding maternal care mean*

*$\underline{d}$  Indicates effect size (Cohen's  $d$ ) statistic based on total sample standard deviations (Table 4)*

It must be cautioned that in considering the above findings, even where significant statistically, increases on ratings for negative or positive outcomes were small, usually comprising less than a full point on scales with ranges of 9 to 20 (See Table 7). Considered this way, effects of daycare participation were not profound and were certainly less substantial than the impact of SES and even child sex in most cases. The balance of these contributions mirrors those found in previous studies employing large-scale datasets including the recent NICHD (2003) study, which reported family economic

and mother-child interaction variables to contribute more significantly to outcome models than quantity of care itself. Also mirroring previous studies is the fact that average outcomes among the sample for daycare and maternal care groups did not appear to fall within “clinical” or even “at-risk” ranges on the scales as defined by t-scores of over 60 (greater than 1 standard deviation above the mean), a criteria suggested by Achenbach (1991) for standardized scales. Nonetheless, in the case of hyperactivity increases, effects were relatively constant regardless of center care grouping or even SES.

The results of the cognitive outcomes must also be considered carefully. Main comparisons showed no significant differences among PPVT-R scores as a function of care grouping while controlling for family education and income, yet small increases (maximum effect size  $d=2.1$ ,  $p<.05$ ) were observed when the design did not include a covariate and while blocking for household income, which was itself a primary indicator used in the SES covariate. The only apparent difference among the SES variables employed in the above analyses is that the covariate also accounted for family education (of both parents) and occupation status. However, this would appear unlikely to impact results as maternal education did not appear to vary substantially in descriptive comparisons (See Table 3) and there are no immediate theoretical reasons for supposing paternal education or occupational status to impact on child verbal performance beyond that already accounted for by economic factors.

Another finding that deserves careful consideration is that less extensive daycare groups (part-time & short-term daycare groups) often appeared to perform more poorly than children having experienced more extensive care. This appeared to be the case for several significant post-hoc findings, including those among the aggression and

emotional disorder outcomes. The question raised by this observation is whether the stronger effects for less extensive groups represent random scatter among outcomes values or if there is another factor not accounted for by the analytic variables causing systematic differences (i.e. more negative outcomes) in the care groups. This is largely due to the fact that theoretically, there appear to be no viable reasons why one might expect less extensive time in care to produce more negative outcomes. At the same time, the above is not an isolated finding given that a small number of previous studies have also found a tendency for infants receiving part-time care to have more negative outcomes (See for example, Roggman, Langlois, Hubbs-Tait & Reisor-Danner, 1994). It may be that there are systematic differences characterizing children enrolled in part-time care (under specific circumstances) which make them more susceptible to later psychosocial problems. Further study with the NLSCY dataset may provide answers to this difficult question.

Descriptive statistics for a number of potentially mediating variables were also examined although these were not included in the analyses. Mean age of participants did vary as a function of center care grouping, such that children in the full-time or short-term care group were almost two years younger, on average, than those in maternal care and the remaining center care groups. While this would not appear to impact on differences between maternal and center care groups (and certainly no clear pattern emerged), it is possible that the age differences may have confounded intra-group differences among the center care participants. Another factor not accounted for in the analyses was single-parent status, whereby the maternal care group had from 7%-15% less single-parent families than the center care groups, indicating that single parents were

more likely to use daycare for their child. If one accepts that single-parent families in society are generally less well-off than two parent families, this factor could theoretically be argued to account for some degree of the negative outcomes observed in the sample, although the true impact cannot be ascertained based on results from the present analyses. Despite previous arguments in the literature that childcare effects may be explained by instability rather than quantity-of-care per se, mean number of changes in care arrangements did not appear to vary substantially between care groups drawn from the NLSCY sample.

### **Theoretical Interpretation of Findings**

While effects were detected in the present study as a function of time in centre care, interpreting how these differences were produced remains less clear. Nonetheless, a number of theoretical considerations are relevant to the interpretation of the above findings within a model of childcare effects. First, hyperactivity-inattention increases (maximum effect size  $d=.32$ ) were observed for the daycare groups as well as smaller increases in aggression ( $d=.16$ ) for the part-time daycare group at 4-11 years of age. Studies of attachment disruption have shown that children from extremely impoverished environments evidence higher levels of aggression as well as motor-activity levels (e.g. see Schwarz et al., 1978). Similarly, recent studies of childcare and particularly the NICHD investigations have found increased levels of reported externalizing problems for children participating in childcare. This suggests that there may be one or more mechanisms involved in quantity of care effects such as that observed in the present study. For example, a number of physiological studies already reviewed have shown that



low maternal stimulation leads to higher cortisol levels, which in turn have been associated with poorer performance on attentional tasks in animal studies (Lovic & Flemming, 2004). A second mechanism has been identified for increased cortisol levels in that centre care appears to increase the stress response of at least some children (See Watamura et al., 2003), which may in turn further impact on neural development related to frontal lobe functioning and control of attentional resources (Lupien et al., 2002).

Another aspect of daycare that could be theorized to account for these behavioral increases is the fact that there were, on average, approximately 20 other children in centre care environments assessed in the NLSCY sample (See Table 3). The same indicates that participants would have been forced to interact within a broader peer group at an early age, giving rise to a number of possibilities. Among these is the hypothesis that children may have become more aggressive or hyperactive in response to the environmental demands of the daycare setting. However, this aspect of the care environment might also be argued to account for the prosocial behavior reported among 2-3 year olds, for which a marginal increase ( $d=.18$ ) increase was observed in the full-time daycare group. As has been previously suggested, it may be that children in daycare are provided greater opportunities for learning how to behave and resolve interpersonal conflict without recourse to antisocial responses. Also, with less individual supervision, the independence of the child among peers may be encouraged. While Clarke-Stewart (1989) has previously suggested that measures of aggression and social behavior may reflect similar behaviors, visual inspection (face validity) of the items employed for use in the NLSCY scales (See Appendix B) suggests there was exclusivity between these measured constructs.

Both of the theoretical considerations detailed above might also be used to explain the small ( $d=.13$ ) yet significant ( $p<.05$ ) increases observed for emotional disorder in the part-time daycare group. Numerous studies reviewed herein have reported links between nonmaternal care and attachment insecurity, which may have been reflected in the items used on the Emotional Disorder scale employed in NLSCY. These items, which were developed specifically to measure of feelings of anxiety and depression in children, may have been elevated in the care groups as a result of maternal separation and stress resulting from the care environments. However, in opposition to this hypothesis is the fact that significant increases were only observed in one daycare group (part-time) and that similar findings were not observed on the measure of separation anxiety employed for the same age group in the NLSCY.

Results for cognitive outcomes showed marginal increases (maximum effect size  $d=.21$ ) on PPVT-R mean scores among the daycare groups, while blocking for household income in the analyses. However, this effect appeared most pronounced among the lower income groups to the extent that a significant increase of 10 standard points ( $d=.66$ ) was observed for the lowest income group as a function of short-term care (See Figure 5). This finding reflects numerous previous studies that have reported positive effects of childcare for cognitive outcomes as a function of care quality in lower economic status groups (Harvey, 1999; Votruba-Drzal et al., 2004). Based on a number of attachment and physiological studies showing environmental enrichment to compensate for maternal separation effects (See for example, Francis et al., 2002), it can be argued that children from lower income groups may benefit from the potential enrichment and stimulation offered by daycare environments. Furthermore, while previous studies have found

cortisol levels to be elevated in children from lower economic groups (See Lupien et al., 2000), recent investigations also suggest that chronically increased cortisol production during development results in reduced neuronal enervation of areas in the mammalian brain related to memory (Liu et al., 2002). Taken together in consideration of the present findings, it may be that children from low-income families derive enhanced benefits from daycare through maternal-like stimulation which has already been maximized in the higher income groups. However, while individual studies support specific aspects of this hypothesized mechanism, further studies are required in order to integrate findings within a comprehensive model of childcare effects.

### **Limitations of the Present Study**

The first limitation of the present study is the cross-sectional nature of the design, which did not allow for pre and post measures of the behaviors identified in the present findings. A longitudinal design may have provided a clearer picture of the development over time of negative or positive outcomes. As well, any temporal associations derived from a longitudinal design would have allowed for greater causal inferences to be made between daycare variables (participation) and later developmental outcomes. Also due to the cross-sectional nature of the design was the fact that only children currently participating in daycare at the time of data collection could be included in the centre care groups, thus limiting the range of participants and particularly older children for which longer-term effects may have been detected. Another limiting factor recognized in the present design is one that characterizes most if not all prior work regarding childcare effects. Specifically, that is the lack of random assignment to treatment groups, the

presence of which would have approximated equal distribution of confounding variable effects.

This last point leads to many associated limitations in the present study around use and control of variables used in the analyses. The advantage of the present design over historical studies of childcare effects was the inclusion of socioeconomic status as a covariate in the analyses. This allowed estimates of outcome effects while holding constant the measured impact of family income, education and type of employment. Sex effects, particularly important in estimates of motor behavior, hyperactivity, social and affect ratings, were also employed in the present design as blocking variables. However, a number of other variables known to influence the same developmental outcomes were not included in the design, including those recently identified in other large-scale studies of childcare effects which more importantly include maternal sensitivity and childcare quality. While type of daycare centres attended in the present sample were evenly distributed in terms of attendance size and profit/non-profit status, no information was available regarding more important characteristics of care quality such as caregiver-child ratios and interaction. Given the uneven distribution of ages among the care groups, there may also have been systematic differences in quality of care according to the age at which children were enrolled in Canadian daycare centres. Finally, although a number of previous studies have attempted to control for a number of confounding variables, it was impossible to account for all potential variables in the present investigation and in fact, all variables measured in the dataset itself could not be incorporated into the between-groups design due to problems with smaller sample sizes and missing data when analyzed by care grouping.

Also of concern in considering results of the present study is the nature of the behavior measures themselves. Far from observational, these measures relied heavily on historical ratings provided by a single rater who in most cases was the mother. Although the factor structure and internal consistency of these newly developed measures have been established by the NLSCY researchers (See Appendix B), there remains a lack of evidence for external validity of the scales as measured by relationships with established instruments and the ability to predict later outcomes. While intercorrelations of the instruments themselves appear to demonstrate acceptable convergent and discriminant validity (See Appendix B, Tables 6 & 7), caution is warranted in interpreting the meaning of present findings in terms of actual behavior and diagnostic utility.

Another aspect of the design for the present study must also be considered in critiquing the present findings. It was observed in many cases that while increases among outcomes were often significant, many times they also were not, usually failing to cross the threshold for significance by only a few decimal place values. When conducting tests of statistical parameter estimates on very large samples such as the NLSCY, it is acknowledged that many results may be the outcome of test power. It may have been that lone care effects observed at only one daycare level were simply archetypes of this test power issue, although the same cannot be determined accurately post-hoc.

## **Conclusions**

This study examined the effects of daycare for a representative sample of Canadian children enrolled in centre care at the time of Statistics Canada's data collection

for the NLSCY. While there were no large or dramatic differences observed between level of care groups, a consistently higher mean hyperactivity-inattention score was observed for daycare groups of approximately one scale point which translated into small increases (maximum effect size  $d=.32$ ) as a function of participation in a daycare centre. Smaller increases in PMK-reported aggression and emotional disorder at ages 4-11 were also found for children having participated in part-time center care. Despite the conclusion that children participating in care were more likely to be hyperactive, not all results were negative.

The results of the present study suggest that there may be benefits of daycare for children in lower-income groups, characterized by improved performance on measures of receptive vocabulary with more extensive care. A measure of prosocial behavior in the 2-3 year age group also was slightly higher in the part-time daycare care group. However, this advantage was not found at later ages (4-11 years). A number of limitations were noted in this study, which include the non-experimental and cross-sectional nature of the results making the case for causation among the results difficult to establish. Also, not all factors could be controlled in the analyses, and between-group differences were observed ad-hoc that may have confounded the quantity-of care findings. Caution is also warranted in interpreting the meaning of behavioral outcomes given the lack of demonstrated external validity for the measures. Future studies of childcare outcomes could address some of these limitations by employing longitudinal measures over time and assessing the predictive value of childcare variables while controlling for a larger number of factors including maternal sensitivity and childcare quality. Combining multiple aspects of childcare while also assessing the relative

influences on specific subgroups of children (low income, socially fearful) in future research may provide integrative findings useful in the development of a comprehensive model of childcare effects.

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## APPENDIX A

### Description of the National Longitudinal Survey of Children and Youth

#### Introduction

The National Longitudinal Survey of Children and Youth (NLSCY) is a long-term survey study conducted in partnership by Human Resources Development Canada (HRDC) and Statistics Canada. It was developed in response to the paucity of statistical studies measuring physical and psychological characteristics of children in Canada. The NLSCY was designed to follow a representative sample of Canadian children aged newborn to 11 years, into adulthood with data collection occurring at two-year intervals. The primary objective of the survey is to monitor the development and well being of Canada's children as they grow from infancy to adulthood. Specific objectives, as outlined in the Statistics Canada NLSCY Data User's Guide (2002) include:

1. Determining the prevalence of various biological, social and economic characteristics and risk factors of children and youth in Canada.
2. Understanding how these factors and life events influence child development.
3. Making this information available for developing policies and programs to help children and youth.
4. Collecting information on a wide variety of variables within the biological, social and economic domains.
5. Collecting information about the environments within which children develop, including the family, peers, school and community.

6. Ensuring information comes from a variety of sources (parent, child, teacher) and from direct measures (e.g. PPVT-R, math/reading tests, etc.)

### Survey Method

The guideline for data collection was to select a representative sample of children in Canada and to follow/monitor these children over time and into adulthood. The target population consisted of Canadian children aged newborn to 11 years of age (i.e. defined by age at time of interview). The sampling unit was the family household and these were initially identified in cycle 1 from a random sample of households included in the Labour Force Survey, also conducted by Statistics Canada. The rationale for sampling from an existing survey was that only 26% of Canadian households in the 10 target provinces contained at least one child in the required age group. Sampling from the Labour Force Survey ensured representativeness of the Canadian population while also conserving costs in generating a new random sample. The Labour Force Survey collects basic demographic information about all household members of a representative sample of Canadian households as well as labor market information about the adults living in these households. Those households with children in the 0-11 age range served as the basis of the household sample for the NLSCY (Approximately 12,900 households), and one child who lived the majority of the time in each selected household was chosen at random. Thereafter, other children in the same economic family were selected randomly up to a maximum of four children per household (However, this was reduced to a maximum re-sampling of two children per household in cycles 2 and 3). The Labour Force Survey

excluded children from the Yukon, Northwest Territories, institutional populations and Indian Reserves.

Cycle two introduced a second longitudinal cohort into the NLSCY sample and these were newborns (aged 0-1) selected randomly from the available brothers and sisters of cycle one participants as well as from new households randomly drawn from the Labour Force Survey. New participants were randomly selected from the available households up to a maximum of two children per household. In the case of twins, both children were included. This introduced approximately 4,000 new households to the NLSCY sample also included in cycle three.

Cycle three introduced a third cohort into the NLSCY sample and these were newborns aged 0-12 months randomly selected from approximately 2,000 new households included in the Labour Force Survey. Increased numbers of 1 and 5 year old children for cycle 3 were also added due to the Canadian federal government's 1997 Speech of the Throne, which outlined the intent to improve measures of the early years and to produce provincial estimates of "readiness to learn" for 5 year old children. These children were randomly selected from the Canadian Birth Registry and resulted in approximately 14,300 new households being added to the cycle 3 sample.

### Response Rates

The cross-sectional data for cycle 3 included longitudinal households sampled in cycles 1 and 2, as well as new households contacted for the first time in cycle 3 from the Labour Force Survey and Canadian Birth Registry. Household response rates by sample source are presented in Table 1 below.

**Table 1. Household Response Rate by Sample Source**

	<b>Households Contacted</b>	<b>Respondent Households</b>	<b>Response Rate</b>
Longitudinal Households			
Selected in Cycle 1	16,563	14,777	90%
Longitudinal Households			
Selected in Cycle 2	3,947	3,640	92%
Newborn Children (0-11 Months)			
Selected from the LFS	1,999	1,736	86%
1-Year-Old Children Selected			
from the Birth Register	7,542	6,390	85%
5-Year-Old Children Selected			
from the Birth Register	6,685	5,420	81%
<b>Total</b>	<b>36,736</b>	<b>31,963</b>	<b>87%</b>

A total of 38, 035 children (living in 36,736 households) were sampled in Cycle 3. Of those sampled children 1,089 (3%) were not eligible either because the respondent had moved permanently outside of Canada or because the household did not contain a child who was eligible to complete the NLSCY. As a percentage of all eligible children (N=36,946), a response rate of 88% was achieved with 87% of cases being fully completed (N=32,097) and 1% of cases being partially completed (N=254). In 3% of total cases, no responses were obtained because the respondent no longer resided at the address or phone number on file and attempts to trace their current location were unsuccessful. In 6% of cases, households refused to participate and in 3% of cases other non-responses occurred. Examples of other non-responses included being unable to interview due to unusual circumstances (i.e. death in the family, illness), the household

being absent during the collection period, or being unable to interview due to language problems. Based on the pattern of non-responses according to demographic characteristics, Statistics Canada concluded that non-responses generally occurred most often in households with lower incomes, lower education, single parents or in those located in larger cities.

### Sample Allocation

The sample size was not determined through the use of power/effect size calculations but rather with the intent of ensuring that all provinces had a sufficient sample size to meet the requirements of determining reliable estimates for all children 0-11 years of age (stratified). The responding sample sizes by province and age group are listed in Tables 2 and 3 below. In total 31,194 children were retained on the final data file (cross-sectional) for which complete data were available.

**Table 2. Responding Sample Size by Province**

<i>Province</i>	<i>Respondents</i>
Newfoundland	1,612
Prince Edward Island	948
Nova Scotia	2,019
New Brunswick	1,956
Quebec	6,298
Ontario	8,658
Manitoba	2,254
Saskatchewan	2,307
Alberta	3,125
British Columbia	2,817
<b>Total</b>	<b>31,194</b>

**Table 3. Responding Sample Size by Age of Child**

<i>Age in Years</i>	<i>Respondents</i>
0	1,736
1	6,391
2	1589
3	2029
4	1,983
5	6,958
6	1,536
7	1,053
8	1,381
9	940
10	1,238
11	842
12	1,264
13	875
14	1262
15	916
<b>Total</b>	<b><i>31993</i></b>

Data Collection

The NLSCY was conducted by Labour Force Survey interviewers under the supervision of a staff of senior interviewers responsible for ensuring appropriate follow-up and reassignment of non-responding cases. A combination of self-study and approximately 14 hours of classroom training was provided to each interviewer to ensure proper understanding of survey concepts and methods as well as practical training in minimizing non-responses and in administering various tests including the PPVT-R. Data collection occurred over three collection periods each lasting approximately six

weeks. These were: 1) November-December 1998, 2) February-March 1999 and 3) April-May 1999.

Information for the household collection was obtained via face-to-face or telephone interviewing using computer-assisted interviewing (CAI). Questions were asked to the respondent in the home or by telephone and directly entered into a computer. The person identified as the most knowledgeable about the selected child was labeled the PMK. In most cases the PMK was the mother of the child. After completing the contact and demographic information, the PMK was asked to complete a series of questionnaires. These were the Parent Questionnaire, Child Questionnaire and a computerized consent form utilized for contacting the schools attended by the children. The Parent Questionnaire included questions about socioeconomic and health data of one or both parents as well as questions regarding the child's family environment, mental health of PMK and family functioning. The Child Questionnaire was completed for selected children in the household aged newborn to 15 years and included questions regarding health, birth information, temperament, behavior, education, activities, literacy, social relationships, parenting and legal custody of the children. An informed consent was completed for the administration of selected children's math and reading comprehension skills at the school. Finally, the PPVT-R was administered by the interviewer to each selected child between 4 and 5 years old, as well as to children aged 6 years and older who were not yet in grade 2. The purpose of this test was to assess the child's level of receptive vocabulary. An additional questionnaire was administered to selected children aged 10-15 that was self-report in nature (Included in a separate datafile not utilized for the present study). Median length for household collection interviews was 1 hour 38

minutes (Median Range of 81-171 minutes), which varied as a function of the number of participating children in the household.

Although the NLSCY follows the development of children longitudinally, these data are not easily accessible. Statistics Canada has also suppressed variables identifying respondents in an effort to protect confidentiality. There was concerns, for example, that teachers supplying information about individual children would be able to locate their responses on the survey as well as those supplied by other sources. These limitations to the data, therefore, prevented the construction of purely continuous variables for household income and parent education as covariates.



## **APPENDIX B**

### **Scales Included in the Present Study**

#### Socio-Economic Status (SES)

The measure of SES in the NLSCY was calculated for each household assigned to every selected child in that household and derived from five sources: education level of the PMK, education level of the spouse/partner, prestige of the PMK's occupation, prestige of the occupation of the spouse/partner and household income. The education variable used in the construction of the SES index was years of schooling for the PMK and spouse/partner which was used to create a 13-point continuous interval-level education variable. Occupational status was determined using a modified version of a scale developed by Pineo, Porter and McRoberts (1977) that grouped occupations into 16 homogeneous categories with 1 representing the highest level of occupation (Self-employed Professional) and 16 representing the lowest (Farm Labourer). For the NLSCY, this was determined based on a detailed description of the job considered to be the PMK or spouse/partner's main job during the previous 12 months. Although ranked ordinally, the intervals between categories were not considered to be equal. The last variable used to derive SES was household income coded in \$1000 intervals (Maximum value \$150,000 or greater). Each of these variables were standardized to have a mean of zero and a standard deviation of one. An SES composite was calculated for each selected child based on the unweighted average of the standardized variables described above. If there was no spouse/partner in the household or if missing data were present, the average was taken for the remaining variables. The result was a range of standardized values from -2.00 to +1.75 that were transformed into a 9-point ordinal scale. The meaning of

these values is approximated in Table 4 below, which provides an estimated description of the broad score categories with corresponding descriptors.

**Table 4. SES Approximated Descriptors**

<i>SES Score</i> <i>(Cross-Sectional)</i>	<i>EXAMPLE : A Family in Which...</i>
1.5	Both the PMK and spouse have a university degree (BA/BSC); both are employed professionals; the household income is \$80,000
0.5	The PMK has a university degree (BA/BSC) and the spouse has grade 13; the PMK is employed as a semi-professional and the spouse is employed in a semi-skilled clerical position; the household income is approximately \$65,000
0.0	The PMK has grade 13 and the spouse grade 12; the spouse is employed in a semi-skilled manual position and the PMK has a semi-skilled clerical position or is not in the labor force; household income is approximately \$55,000
-0.5	The PMK and spouse have both completed grade 12; the PMK is employed in a semi-skilled manual position and the spouse in an unskilled manual position; the household income is approximate \$30,000
-1.0	Neither the PMK nor the spouse have completed high school; the PMK is employed in an unskilled manual position and the spouse is employed in an unskilled manual position; the household income is approximately \$25,000
-1.5	Neither the PMK nor the spouse have completed high school; neither are in the labour force; household income is approximately \$15,000
-2.0	There is no spouse; the PMK has not completed high school, is not in the labour force; the household income is less than \$10,000

### Depression Scale

The depression scale was administered to the PMK as part of the Parent Questionnaire and is based on 20-item rating scale originally developed by L.S. Radloff of the US National Institute of Mental Health. Intended for use with public (non-clinical) populations, this scale measures the frequency and severity of depressive symptoms having occurred for the respondent over the previous week. A 12-item version was developed for administration in the NLSCY yielding a single factor structure with a Cronbach's alpha coefficient of 0.82. Items were based on four response categories, the values of which were reduced by one in order for the lowest score to be 0. Also, values were reversed for items having a negative loading. This yielded a total score range of 0-36 with a higher score indicating the presence of depressive symptoms. Administration of the Depression Scale is described below.

On the following scale:

*Rarely or none of the time (Less than one day) = 1*

*Some or a little of the time (1-2 days) = 2*

*Occasionally or a moderate amount of time (3-4 days) = 3*

*Most or all of the time (5-7 days) = 4*

Preamble: "The next set of statements describe feelings or behaviours. For each one, please tell me how often you felt or behaved this way during the past week."

1. I did not feel like eating; my appetite was poor.
2. I felt that I could not shake off the blues even with help from my family or friends.
3. I had trouble keeping my mind on what I was doing.
4. I felt depressed.
5. I felt that everything I did was an effort.
6. I felt hopeful about the future.
7. My sleep was restless.
8. I was happy.
9. I felt lonely.
10. I enjoyed life.

11. I had crying spells.
12. I felt that people disliked me.

### Family Functioning

Questions related to family functioning were developed by researchers at the Cherokee-McMaster Hospital (McMaster University) and have been used widely in Canada and abroad. The scale was intended to provide a global assessment of various aspects of family functioning including the relationship quality between parents/partners. The scale includes 12 items based on four response categories, the values of which were reduced by 1 in order for the lowest score to be 0 (negative loading items reversed). administered to either the PMK or household spouse/partner, yielding a total score range of 0-36 with a higher score indicating family dysfunction. Items were based on a single factor structure which resulted in a Cronbach's alpha coefficient of 0.88. Administration of the Family Functioning Scale is described below.

On the following scale:

*Strongly Agree=1      Agree=2      Disagree=3      Strongly Disagree=4*

Preamble: "The following statements are about families and family relationships. For each one, please indicate which response best describes your family: strongly agree, agree, disagree or strongly disagree."

1. Planning family activities is difficult because we misunderstand each other.
2. In times of crisis we can turn to each other for support.
3. We cannot talk to each other about sadness we feel.
4. Individuals (in the family) are accepted for what they are.
5. We avoid discussing our fears or concerns.
6. We express feelings to each other.
7. There are lots of bad feelings in our family.
8. We feel accepted for what we are.
9. Making decisions is a problem for our family.
10. We are able to make decisions about how to solve problems.
11. We don't get along well together.

12. We confide in each other.

### Social Support Scale

The Social Support Scale was derived from a total of six items administered to the PMK regarding perceived social support from others (family and friends). In order to associate a value of 0 for the lowest score, item values were reduced by one. The result was a total score range of 0-18 with a high score indicating positive presence of social support. Derived from a single factor, the Cronbach's alpha coefficient was 0.82.

Administration of this scale is described below.

On the following scale:

*Strongly Agree=1      Agree=2      Disagree=3      Strongly Disagree=4*

Preamble: "The following statements are about relationships and the support which you get from others. For each of the following, please tell me whether you strongly disagree, disagree, agree, or strongly agree."

1. If something went wrong, no one would help me.
2. I have family and friends who help me feel safe, secure and happy.
3. There is someone I trust whom I would turn to for advice if I were having problems.
4. There is no one I feel comfortable talking about problems with.
5. I lack a feeling of closeness with another person.
6. There are people I can count on in an emergency.

### Motor and Social Development Scale

The Motor and Social Development (MSD) Scale of the Child's Questionnaire was completed for children aged 0-3 years and was intended to measure the motor, social, and cognitive development of young children. Developed by Dr. Gail Poe of the U.S. National Center for Health Statistics, the MSD scale consists of a set of 15 questions varying according to the age group of the child. Each item asks whether or not a child is

able to perform a specific task and a score is calculated by summing the number of “yes” answers to each item in the scale. Each child tested using the MSD scale was assigned a standard score such that the mean for all age groupings (by month) was 100 and the standard deviation 15, thus allowing for comparison of scores across all children in the 0-3 year age group. Administration of the MSD scale is described below.

Children 0-3 months: Items 1-15

Children 4-6 months: Items 8-22

Children 7-9 months: Items 12-26

Children 10-12 months: Items 18-32

Children 13-15 months: Items 22-36

Children 16-18 months: Items 26-40

Children 19-21 months: Items 29-43

Children 22-47 months: Items 34-48

On the following scale:

*Yes=1                  No=2*

Preamble: “The following questions are about ... 's motor and social development”.

1. When lying on his/her stomach, has ... ever turned his/her head from side to side?
2. Have his/her eyes ever followed a moving object?
3. When lying on his/her stomach on a flat surface, has he/she ever lifted his/her head off the surface for a moment?
4. Have his/her eyes ever followed a moving object all the way from one side to the other?
5. Has he/she ever smiled at someone when that person talked to or smiled at (but did not touch) him/her?
6. When lying on his/her stomach, has he/she ever raised his/her head and chest from the surface while resting his/her weight on his/her lower arms or hands?
7. Has he/she ever turned his/her head around to look at something?
8. When lying on his/her back and being pulled up to a sitting position, did ... ever hold his/her head stiffly so that it did not hang back as he/she was pulled up?
9. Has he/she ever laughed out loud without being tickled or touched?
10. Has he/she ever held in one hand a moderate size object such as a block or a rattle?
11. Has he/she ever rolled over on his/her own on purpose?
12. Has ... ever seemed to enjoy looking in the mirror at him/herself?
13. Has he/she ever been pulled from a sitting to a standing position and supported his/her own weight with legs stretched out?

14. Has he/she ever looked around with his/her eyes for a toy which was lost or not nearby?
15. Has he/she ever sat alone with no help except for leaning forward on his/her hands or with just a little help from someone else?
16. Has he/she ever sat for 10 minutes without any support at all?
17. Has he/she ever pulled him/herself to a standing position without help from another person?
18. Has ... ever crawled when left lying on his/her stomach?
19. Has he/she ever said any recognizable words such as "mama" or "dada"?
20. Has he/she ever picked up small objects such as raisins or cookie crumbs, using only his/her thumb and first finger?
21. Has he/she ever walked at least 2 steps with one hand held or holding on to something?
22. Has ... ever waved good-bye without help from another person?
23. Has he/she ever shown by his/her behavior that he/she knows the names of common objects when somebody else names them out loud?
24. Has he/she ever shown that he/she wanted something by pointing, pulling, or making pleasant sounds rather than crying or whining?
25. Has he/she ever stood alone on his/her feet for 10 seconds or more without holding on to anything or another person? Has ... ever walked at least 2 steps without holding on to anything or another person?
26. Has he/she ever crawled up at least 2 stairs or steps?
27. Has he/she said 2 recognizable words besides "mama" or "dada"?
28. Has ... ever run?
29. Has he/she ever said the name of a familiar object, such as a ball?
30. Has he/she ever made a line with a crayon or pencil?
31. Did he/she ever walk up at least 2 stairs with one hand held or holding the railing?
32. Has he/she ever fed him/herself with a spoon or fork without spilling much?
33. Has ... ever let someone know, without crying, that wearing wet (soiled) pants or diapers bothered him/her?
34. Has he/she ever spoken a partial sentence of 3 words or more?
35. Has he/she ever walked up stairs by him/herself without holding on to a rail?
36. Has he/she ever washed and dried his/her hands without any help except for turning the water on and off?
37. Has he/she ever counted 3 objects correctly?
38. Has he/she ever gone to the toilet alone?
39. Has he/she ever walked upstairs by him/herself with no help, stepping on each step with only one foot?
40. Does he/she know his/her own age and sex?
41. Has he/she ever said the names of at least 4 colors?
42. Has he/she ever pedaled a tricycle at least 10 feet?
43. Has he/she ever done a somersault without help from anybody?
44. Has he/she ever dressed him/herself without any help except for tying shoes (and buttoning the backs of dresses)?

- 45. Has he/she ever said his/her first and last name together without someone's help? (Nickname may be used for first name.)
- 46. Has he/she ever counted out loud up to 10?
- 47. Has he/she ever drawn a picture of a man or woman with at least 2 parts of the body besides a head?

### The Peabody Picture Vocabulary Test – Revised (PPVT-R)

The Peabody Picture Vocabulary Test (PPVT-R) measures children's receptive vocabulary through presentation of picture sets wherein children are asked to identify the picture corresponding to a word read by the interviewer. The PPVT-R was administered to each selected child between 4 and 5 years old, as well as to children aged 6 years and older who were not yet in grade 2. The oral consent of the PMK was obtained before the test was administered. Scores for the NLSCY sample were standardized to have a mean of 100 and a standard deviation of 15. A French version of the test (*Échelle de Vocabulaire en Images Peabody*) was also developed and normed separately for children who completed the test in French. For more information see K.T. Williams and J.J. Wang, *Technical references to the Peabody Picture Vocabulary Test – Third Edition (PPVT-III)* (Circle Pines, MN: American Guidance Service, 1997).

### Behavior Scales

The objective of the behavior scales in the NLSCY was to assess aspects of behavior in children two years of age and older. The selection of specific subject areas and their measures was determined by the NLSCY expert advisory group consisting of researchers in the area of child development. Behavior scales utilized in the NLSCY were developed based on individual items adopted from various sources as opposed to the adoption of a standardized scale as in the case of the MSD and PPVT-R instruments.



**Table 5. Cronbach's Alpha Coefficients for the Behavior Scales**

Factor	Cronbach's Alpha (Raw)
For 2 and 3 Year Olds	
Hyperactivity-Inattention	0.798
Prosocial Behavior	0.847
Emotional Disorder-Anxiety	0.593
Physical Aggression-Opposition	0.754
Separation Anxiety	0.561
For 4-11 Year olds	
Hyperactivity-Inattention	0.838
Prosocial Behavior	0.816
Emotional Disorder-Anxiety	0.794
Physical Aggression-Conduct Disorder	0.770
Indirect Aggression	0.781

In order to develop and standardize the scales used in the NLSCY, the authors first determined constructs they wished to measure, thereafter identifying items theoretically and empirically known to measure these constructs from existing sources including the Ontario Child Health Study, Montreal Longitudinal Survey and the Achenbach Child Behavior Checklist (CBCL). The authors initially identified 9 theoretical constructs in the 2-3 year age group and 8 constructs in the 4-11 year age group for the pool of items. However, after performing factor analyses on all items for each age group, the authors collapsed these into five factors for the 2-3 year measures and six factors for the 4-11 year measures. Hence, the actual scales that emerged from the

factor analyses varied from the theoretical constructs as a result of factor loadings.

The resulting factors and the corresponding Cronbach's alpha values are listed in Table 5.

In order to assess the construct validity of behavioral measures employed in the present study, intercorrelation matrices were computed separately for both the 2-3 year old and 4-11 year old measures (See Tables 6 & 7, respectively). The purpose of these calculations was to assess the convergent and discriminant validity of measures based on the theoretical constructs adopted by NLSCY researchers.

**Table 6. Intercorrelations Among Behavior Scales – 2 & 3 Years**

	1	2	3	4	5
1. Hyperactivity-Inattention		-.08**	.36**	.54**	.40**
2. Prosocial Behavior			.04	-.01	-.03
3. Emotional Disorder-Anxiety				.35**	.47**
4. Physical Aggression & Opposition					.39**
5. Separation Anxiety Score					

*Pearson Product Moment Statistic \* $p < .05$ , \*\* $p < .01$*

For the 2-3 year measures, it was hypothesized that positive correlations would be observed among scales measuring hyperactivity-inattention, emotional disorder and physical aggression, based on the theoretical nature of those factors. It was also hypothesized that scales for hyperactivity-inattention and physical aggression would negatively correlate with prosocial behavior ratings. Finally, it was hypothesized that a positive correlation would be observed between ratings of emotional disorder and separation anxiety due to the similarity of those constructs.

Hyperactivity-inattention ratings correlated significantly ( $p < .01$ ) with all other variables in the expected directions. An association was found between ratings for hyperactivity-inattention and separation anxiety which was not predicted by hypotheses, however may have related to the similarities among items measuring motor behavior, which on the separation anxiety scale were intended to measure anxious behaviors. Prosocial behavior negatively correlated with hyperactivity-inattention ratings confirming a hypothesis for the same. While a negative correlation was observed for prosocial behavior and physical aggression/opposition, this was marginal and nonsignificant ( $p > .05$ ). Finally, a hypothesized positive association between emotional disorder-anxiety and separation anxiety was also observed. In summary, with the exception of a single non-significant prediction, hypotheses for convergent and discriminant validity among the 2-3 year measures were generally confirmed.

**Table 7. Intercorrelations Among Behavior Scales – 4-11 Years**

	1	2	3	4	5
1. Hyperactivity-Inattention		-.14**	.40**	.43**	.25**
2. Prosocial Behavior			.02	-.12**	-.02
3. Emotional Disorder-Anxiety				.37**	.29**
4. Aggression Score					.38**
5. Indirect Aggression Score					

*Pearson Product Moment Statistic \* $p < .05$ , \*\* $p < .01$*

A similar set of hypotheses was made for expected associations relating to convergent and discriminant validity among the 4-11 year measures. While

hyperactivity-inattention, emotional disorder-anxiety and aggression ratings were hypothesized to positively correlate; hyperactivity-inattention, aggression and indirect aggression ratings were expected to negatively correlate with prosocial behavior. The above hypotheses were confirmed in the matrix (See Table 7) with the exception of an association between indirect aggression and prosocial behaviour, which while negative, was nonsignificant ( $p>.05$ ). Additionally significant was the positive relationship between indirect aggression and hyperactivity-inattention, which, while not predicted among the hypotheses, may have reflected the comorbidity of behavioral attention deficits with poorer psychosocial outcomes.

Administration of behavior scale items is described in the following section.

Although individual items have been organized by scale, actual administration interspersed items throughout the behavior interview.

On the following scale:

Never or not true=1                      Sometimes or somewhat true =2                      Often or very true=3

Preamble: "Now I'd like to ask you questions about how ... seems to feel or act. Using the answers never or not true, sometimes or somewhat true, or often or very true, how often would you say that ..."

*Hyperactivity-Inattention Scale Items (2-3 & 4-11 Year Olds)*

1. Can't sit still, is restless or hyperactive?
2. Is easily distracted, has trouble sticking to any activity?
3. Fidgets?
4. Can't concentrate, can't pay attention for long?
5. Is impulsive, acts without thinking?
6. Cannot settle down to do anything for more than a few moments?
7. Is inattentive?
8. Has difficulty waiting for his/her turn in games or groups?\*

\*Asked only of 4-11 year olds

*Prosocial Behavior Scale Items (2-3 & 4-11 Year Olds)*

1. Shows sympathy to someone who has made a mistake?\*
2. Will try to help someone who has been hurt?
3. Volunteers to help clear up a mess someone else has made?\*
4. If there is a quarrel or dispute, will try to stop it?\*
5. Offers to help other children (friend, brother or sister) who are having difficulty with a task?
6. Comforts a child (friend, brother, or sister) who is crying or upset?
7. Spontaneously helps to pick up objects which somebody has dropped?\*
8. Will invite others to join in a game?\*
9. Helps those who do not do as well as he/she does?
10. Helps other children (friends, brother or sister) who are feeling sick?

\*Asked only of 4-11 year olds

*Emotional Disorder-Anxiety (2-3 Years)*

1. Seems to be unhappy, sad or depressed
2. Is not as happy as other children?
3. Is too fearful or nervous?
4. Is worried?
5. Cries a lot?\*
6. Appears miserable, unhappy, tearful, or distressed?\*
7. Is nervous, highstrung or tense?
8. Has trouble enjoying him/herself?

\*Asked only of 4-11 year olds

*Physical Aggression - Opposition (2-3 years)*

1. Gets into many fights?
2. Has difficulty waiting for his/her turn in games or groups?
3. When somebody accidentally hurts him/her , he/she reacts with anger and fighting?
4. Is defiant?
5. Punishment doesn't change his/her behavior?
6. Has temper tantrums or hot temper?
7. Has angry moods?
8. Kicks, bites, hits other children?

*Physical Aggression – Conduct Disorder (4-11 years)*

1. Gets into many fights?

2. When somebody accidentally hurts him/her , he/she reacts with anger and fighting?
3. Physically attacks people?
4. Threatens people?
5. Is cruel, bullies or is mean to others?
6. Kicks, bites, hits other children?

*Indirect Aggression (4-11 Years)*

1. When mad at someone, tries to get others to dislike that person
2. When mad at someone, becomes friends with another as revenge?
3. When mad at someone, says bad things behind the other's back?
4. When mad at someone, says to others: let's not be with him/her?
5. When mad at someone, tells that person's secrets to a third person?

*Separation Anxiety (2-3 years)*

1. Cries a lot?
2. Clings to adults or is too dependent?
3. Doesn't want to sleep alone?
4. Constantly seeks help?
5. Gets too upset when separated from parents?