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Is Early Center-Based Child Care Associated with Tantrums and Unmanageable Behavior over Time up to School Entry?

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Abstract

Background. Existing research suggests that there is a relationship between greater exposure to center-based child care and child behavioral problems though the mechanism for the impact is unclear. However the measure used to document child care has usually been average hours, which may be particularly unreliable in the early months when fewer children are in center care. In addition individual trajectories for behavior difficulties have not been studied.

Objective. The purpose of the current study was to examine whether the extent of exposure to center-based child care before two years predicted the trajectory of children's difficult behavior (i.e., tantrums and unmanageable behavior) from 30 to 51 months controlling for child and maternal characteristics.

Method. Data were drawn from UK-based Families, Children and Child Care (FCCC) study (n=1201). Individual growth models were fitted to test the relation between early center-based child care experiences and subsequent difficult behavior.

Results. Children with more exposure to center-based care before two had less difficult behavior at 30 months, but more increase over time. Initial levels were predicted by higher difficult temperament and lower verbal ability. Higher difficult temperament and lower family socio-economic status predicted its change over time.

Conclusion. Findings suggest that early exposure to center-based care before two years old is a risk factor for subsequent behavior problems especially when children have a longer period of exposure. A possible explanatory process is that child coping strategies to manage frustration are less well developed in a group context, especially when they lag behind in expressive language.

Keywords: tantrums; unmanageable behavior; center-based child care; early exposure; child characteristics; maternal characteristics

Introduction

The potentially negative impact of child care on children's behavior has been a concern for researchers and policy-makers for decades. The National Institute of Child Health and Human Development (NICHD) Early Child Care Research Network (ECCRN) has examined extensively the link between early child care experiences and behavioral outcomes and concluded that time spent in child care (i.e., center-based care or non-maternal home-based care) had significant and positive relations with subsequent negative behaviors, such as externalizing problems (Belsky, Burchinal, McCartney, Vandell, Clarke-Stewart, & Owen, 2007; Jacob, 2009; McCartney, Clarke-Stewart, Owen, Burchinal, Bub, & Belsky, 2010; NICHD ECCRN, 1998, 2003, 2004), although the negative behaviors reported were not at a clinical level (Anme & Segal, 2004). There is also evidence from other countries that more exposure to child care significantly predicts higher child behavioral outcomes (Crosby, Gennetian, Dwsett, & Huston, 2010; Gupta & Simonsen, 2007; Stein, Malmberg, Leach, Barnes, & Sylva, 2012; van Beijsterveldt, Hudziak, & Boomsms, 2005). One of the main conclusions of these studies is that exposure to center-based child care is likely to be the most relevant scenario for predicting child behavioral problems, especially if it is of low quality (Melhuish, Phan, Sylva, Sammons, Siraj-Blatchford, & Taggart, 2008a). Another important finding has been that the quantity of child care experienced can be related to later behavioral problems (Belsky, et al., 2007; Pluess & Belsky, 2009). Reviewing the evidence Jacob (2009) concluded that specifically more hours of center-based care in the first two years predicts negative behavioral outcomes. Therefore, in the current study, the impact of early exposure to center-based child care on subsequent negative behavior was examined in detail

while controlling for other child and family related factors in order to contribute to the current literature by providing detailed evidence about the structure of this impact.

Exposure to Center-based Child Care

While several studies have found that more exposure to center-based child care can be predictive of more child behavioral problems (Jacob, 2009; McCartney et al., 2010; Melhuish et al., 2008a, 2008b; NICHD ECCRN, 2004), only some have supported its longitudinal impact on behavior (Belsky et al., 2007). Using the NICHD ECCRN dataset, it was found that children with more early experience of center-based child care continued to display more problem behaviors throughout the preschool phase (NICHD ECCRN, 2004) and up to sixth grade (Belsky et al., 2007). In another study looking at the same children McCartney and colleagues (2010) did not find a significant impact of center-based child care experience on child behavior between 24 and 54 months. However, they showed that exposure to child care was more strongly related to child externalizing behaviors when more time was spent with a large group of peers and when the care was of low quality. In contrast, a large-scale Danish study (Gupta & Simonsen, 2007) found a negative impact of home-based child care experience on behavior problems, which indicates that center-based child care can be an advantage in relation to behavioral problems when quality is also high, as reported in this study.

Some other, predominantly non-US, studies have suggested that the impact of center-based child care on child outcomes is either very small (Stein et al., 2012) or disappears over time (van Beijsterveldt et al., 2005). A large representative UK study found that there was no effect of the amount or type of child care on disruptive behavior at 36 months (Barnes, Leach, Malmberg, Stein, & Sylva, 2010) but that children who received more center-based day care were reported to have more total problems and particularly hyperactivity at 51 months (Stein et al., 2012); whereas, children who spent more time in a preschool playgroup (which usually

does not begin until 24 to 30 months and is always part-time) were likely to have fewer problems in their relationships with their peers at that age. A Dutch study showed that the impact of early child care on later behavioral problems is not only small but also disappears over time (van Beijsterveldt et al., 2005). They showed that children aged 3 years with low or medium amounts of early child care displayed not more behavioral problems than those with maternal care.

Overall, the findings in the literature provide evidence that the relation between exposure to center-based child care and child behavioral problems is complicated and may differ between countries. Possible reasons for the conflicting findings might be the timing and operationalization of child care, the extent to which it is a typical experience and the conceptualization of behavioral problems. The impact of center-based child care experience at an early age, such as before the age of 2 years when infants need more one-to-one interaction with an adult, is likely to be more negative than its impact at later ages (Jacob, 2009; Leach, 2009). Empirical studies have shown that specifically early exposure to center-based child care is detrimental for child behavioral outcomes (Belsky et al., 2007; Melhuish et al., 2008a; Stein et al., 2012). One limitation of these studies is that they used hours per week to operationalize the amount of child care experienced, generally averaging the hours across time points studied. An alternative method would be calculating the extent of exposure over specific periods of time, such as the first two years. A second methodological limitation is that very few studies examined the impact of child care longitudinally on the trajectories of behavior over time. Child behavioral problems are generally defined by questionnaires asking about the frequency of behaviors, such as aggression, temper tantrums, restlessness, and defiance, which peak in the toddler years and are likely to decline over time in the general population (Einon & Potegal, 1994; Miner & Clarke-Stewart, 2008; Shaw, Keemam, & Vondra, 1994). Thus, when examining the impact of child care on behavioral problems over

time, the fact that these problems are expected to decline over time should be taken into account. Considering these limitations, the current study aimed to examine the change in difficult behavior,indicated by. frequency of temper tantrums and the extent to which child's behaviors are not manageable/controllable, as a function of the child's exposure to center-based child care before the age of two years.

Child and Family Characteristics

While exposure to center-based child care before the age of two years is likely to be a risk factor for difficult behavior in children, there are child and family factors which should also be taken into account in order to clarify the possible mechanisms involved. Bath (1994) reviewed the developmental nature and context of negative behaviors in children with center-based child care experiences and highlighted attachment theory as an important developmental perspective to explain negative child behavior. From this perspective, insecurity in relationships is identified as a risk factor for behavior problems (McCartney, Owen, Booth, Clarke-Stewart, & Vandell, 2004; Pauli-Pott, Haverkock, Pott, & Beckmann, 2007). The link between attachment quality and stranger sociability is well-established (Thompson & Lamb, 1983). Securely attached children are more sociable to adult strangers and less anxious than insecurely attached children. Insecurely attached children show stress when separated from their main caregiver or when introduced a stranger; and become difficult to manage and control. Thus, difficult behavior during childhood might be a function of low quality attachment relation with main caregiver; therefore, the quality of attachment was controlled in the current study.

Difficult behavior might be seen as an alternative communication tool especially when adequate language skills are absent. When children lack sufficient verbal skills and vocabulary they might choose alternative, behavioral ways of expressing themselves. The association between language ability and behavior problems has been shown in empirical

studies with both clinical and community samples (Redmond & Rice, 2002; Rescorla, Ross, & McClure, 2007). In general, moderate associations were found between language delays and behavior problems, including difficulty to make adaptations and difficulty to tolerate frustration. Thus, in the current study the impact of verbal ability on difficult behavior was also controlled.

Difficult behavior might develop also as a result of a learning process. Children might learn that throwing tantrums, being oppositional, restless, and impulsive gain the attention of adults, who then reinforce those behaviors with their responses. It is also possible that caregivers themselves might act as models for their children if they also have difficulty to control their anger and become impulsive. Parents who have a neurotic personality (i.e., anger, anxiety, depression, vulnerability) or who are not agreeable (i.e., cooperative, compassionate, and friendly) are more likely to have such negative behaviors. Children of these individuals might learn negative behaviors as means of coping with anger and frustration (Wahl & Metzner, 2012). Therefore, mothers' personality, as measured by neuroticism and agreeableness traits, was controlled in the current study. Another factor that is expected to influence parenting quality, and in consequence child behavior problems, is parents' psychological health (Civic & Holt, 2000; Goodman, Rouse, Connell, Broth, Hall, & Heyward, 2011). Depressed and/or highly anxious parents might have difficulty fulfilling the demands of parenting, failing to be sufficiently available and responsive to their children.

Child temperament and gender are other consistent predictors of child behavior problems. Children who have difficult temperament, such as being high on anger proneness and hyperactivity, are likely to be more difficult (Miner & Clark-Stewart, 2008; Pluess & Belsky, 2009). Literature also shows that girls are less likely to be defiant, aggressive, and uncontrollable than their male counterparts (Miner & Clark-Stewart, 2008; NICHD ECCRN, 2004). Finally, family socio-economic status and minority status were also taken into account

due to their significant contributions to parents' preferences about child care arrangements, and children's behavior problems (McCartney et al., 2010).

Taken together, this study sought to clarify the mechanism through which early exposure to center-based child care may increase the likelihood of difficult behavior by studying behavior that was assessed over several time points, so that individual trajectories could be studied. We hypothesized that early exposure to center-based child care is expected to be a risk factor for a higher initial level of difficult behavior which could ether remain at that level, compared to other children who will show a decline, or which will decline at a slower rate from 30 months to 51 months after controlling for the concurrent impact of center-based child care experience and child and family factors know to be linked with behavior problems: child gender, verbal ability, attachment quality, temperament, maternal personality and psychological health, and family socio-economic status.

Method

Participants

Data were drawn from Families, Children and Child Care (FCCC) Study which recruited in ante-natal clinics in two UK locations, London and Oxfordshire. Eligibility criteria were: mother at least 16 years, infant full term singleton with no congenital abnormalities, and no plans to put the child into care or adoption (Malmberg, et al., 2005). The study participants (n=1201) were representative of the populations of the recruitment areas. (Details of sample characteristics can be found on FCCC webpage: http://www.familieschildrenchildcare.org). Half of the infants were female and from London area. The majority (79%) of the mothers had a white ethnic background, English was the spoken language at home for 86 %, the majority of parents (90%), were married or in stable partnership and just under two thirds of the families (58%) had below average socio-economic status.

Measures

Child difficult behavior. Difficult behavior was measured by two items of Behaviour Checklist (Richman, 1977) completed by mothers at three time points, 30, 36 and 51 months. The items asked about the extent to which a child has a tantrum and to extent to which she or he is difficult to manage/control. The responses ranged from 1 (not at all) to 3 (frequently). The items were moderately correlated with each other (r=.30 at 30 and 36 months; .32 at 51 months; p<.001). Mean scores were used in order to compute a single difficult behavior score at 30, 36 and 51 months. To test the composite scores' statistical significance we examined their associations with related constructs using subscales of the Adaptive Social Behavior Inventory (ASBI; Hogan, Scott & Bauer, 1992) at 36 months, the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997) and the Conners' Oppositional Behavior Questionnaire (Conners, Sitarenios, Parker, & Epstein, 1998) at 51 months completed by mothers and fathers. All the associations were significant and in expected directions (see Table 1) which suggested that the mean of the two items used in this study represent a valid measure of child difficult behavior. Table 2 shows the mean and standard deviation at each time point.

Exposure to center-based child care before two years of age. Mothers reported on the type and amount of child care arrangements for every month from birth to 51 months. On the basis of this information, three types of dominant child care (i.e. maternal care, non-maternal home care and center-based care) were computed per month. Consistent with previous literature (Leach, Barnes, Malmberg, Sylva, & Stein, 2008), dominant child care for each month was defined as an average of 12 or more hours of care per week. If the child had more than one type of child care experience totaling 12 hours or more per week, the one with the most hours was chosen. To operationalize exposure to center-based child care, a continuous variable was computed calculating the proportion of center-based dominant care

experience within the first 24 months. The number of months with center-based child care dominant was divided by the total number of months; the scores ranged from zero to one, where higher scores indicated more exposure to center-based child care and zero indicated no substantial center-based child care experience.

Exposure to center-based child care after two years of age. This was calculated in the same way as exposure to center-based child care before two years of age was computed. The number of months of dominant center-based care experience between 25 months and 51 months was divided by the number of months (27).

Child characteristics: In terms of child characteristics, child sex, difficult temperament, attachment quality, and expressive language ability were included in the current study.

Child sex. Child sex was added to the models as a dummy variable "Female" where "1" represented female, and "0" represented male.

Difficult temperament. The 10 item anger proneness subscale of the mother-completed Toddler Behavior Assessment Questionnaire (TBAQ: Goldsmith, 1996) completed at 18 months was used. The measure assesses anger in conflict situations by protesting, crying and hitting. The mean item score can range from 1 to 7 with higher scores indicating more anger. It was found to be internally consistent with a Cronbach Alpha of .65.

Attachment. Stranger sociability (Melhuish, 1987; Stevenson & Lamb, 1979) was observed at 18 months as an indicator of the quality of attachment relationship between the child and his or her main caregiver. Children were observed in a test situation (e.g., the child's reaction was observed when she or he was offered a toy while placed on their mother's lap and when she or he was offered a toy when placed on the floor) and non-test situation (e.g., upon separation and reunion with the mother). Item scores ranged from 0 to 5

and a mean score was computed with higher scores indicating more sociability (mean= 3.30, *sd*= 1.12). The scale was found to be internally consistent with a Cronbach Alpha of .90.

Language ability. Children's expressive language ability was measured by the vocabulary index of the MacArthur Communicative Development Inventory (CDI; Fenson, Dale, Reznick, Bates, Thai, & Pethick, 1994) at 18 months. The CDI is maternal report questionnaire, asking which of a list of common words is used regularly by the child with a range from 0 to 513 (mean= 79.1, *sd*= 85.1).

Maternal characteristics. Maternal' personality was measured by the NEO Personality Inventory (NEO PI; Costa & McCrae, 1992) at 18 months. The NEO PI is a comprehensive assessment of normal adult personality and has five scales. In the current study only the neuroticism (which identifies individuals who are prone to psychological distress) and agreeableness (which describes the kinds of interactions an individual prefers from compassion to tough mindedness) scales were used. Both neuroticism and agreeableness scores range from 1 to 5 with a mean of 2.5 (*sd*=.63) for neuroticism and a mean of 3.8 (*sd*=.41) for agreeableness scales. These scales also were internally consistent with Cronbach Alphas of .82 and .71, respectively.

Maternal psychological health was assessed using the General Health Questionnaire (GHQ; Goldberg & Hillier, 1979). The GHQ is a validated measure of non-psychotic mental health symptoms with four subscales but only two were included in the current study, measuring anxiety and depression. An example item in the anxiety scale is "Lost much sleep over worry;" and in the depression scale is "Been thinking about yourself as worthless person." The measure was found to be internally consistent with Cronbach Alphas of .85 and .87 for anxiety and depression respectively.

Family socio-economic status (Family SES) was based on the ESRC Computer Assisted Standard Occupational Coding (CASOC) scheme (Rose & O'Reilly, 1998). It

ranges from 1 (never worked/ long term unemployed) to 8 (higher managerial or professional occupations) where higher scores indicates higher SES. Family SES had significant and moderate correlations with maternal education (r= .52, p= .000), paternal education (r= .51, p= .000), and family annual income (r= .65, p= .000). A dummy variable was created to indicate mother's minority status where "1" represented having non-white ethnicity.

Procedure

Data were collected when children were 3, 10, 18, 30, 36, and 51 months old. At each time point detailed information about children, parents, family context, and childcare arrangement was obtained via home visits for mother interviews and questionnaires. In the current study, only those with data at 18, 30, 36, 51 months were included. The first author takes the responsibility for the integrity of the data and the accuracy of the data analysis.

The study was given full approval by the ethics committees of the Royal Free Hospital Medical School (now Royal Free and University College Medical School) and Oxford University in 1999 when the participants were recruited. Initial written consent was given when participants were first approached, in pregnancy. Once infants were born full written informed consent was obtained prior to the first (3 month) research visit.

Analytic Strategy

Individual growth modeling (Singer & Willett, 2003) was used to examine both within and between individual variations in difficult behavior using the SPSS program, version 18. Change over time was examined with data from 30, 36 and 51 months. Because there were only three time points, the functional form was determined as linear. First the unconditional means model was tested to determine whether there was a significant intercept and rate of change in difficult behavior from 30 to 51 months. Second, the model which examined the effect of child characteristics was fitted. Next, exposure to center-based child

care before 2 years old was added to the model, as a continuous variable, to test its effect on difficult behavior after controlling for child characteristics. In the following model exposure to center-based child care after the age of two, maternal characteristics and family demographics were added. Log-likelihood, AIC, and BIC comparisons were examined in order to decide on the best fitting model.

Results

Table 2 shows the sample sizes, means and standard deviations and bivariate associations among key variables. There was some stability in difficult behavior over time indicated by correlations among the three difficult behavior scores ranging from .36 to .52. Average exposure to center-based child care as the dominant child-care before two years old was approximately 2 months in the whole sample (n=1201) including children whose exposure scores were zero. In the current sample, 288 children had dominant center-based child care experience before they were two years old. When children, who had no dominant center-based child care before age two (score zero), were removed, average exposure to center-based care before two years of age was .38 (*sd*= .30), reflecting an average of 7.9 months of dominant center-care. Although scores ranged from 1-21 months, the majority of children had dominant center care before age two years for 15 months or less.

Average exposure to center-based child care after the age of two was found to be 9 months of dominant center-based child care (exposure rate .34, *sd*= .31), whereas when only children, who had center-based child care experience before their second birthday, were included the average exposure was .63 (*sd*= .25) which reflects 17 months. The two exposure variables were moderately correlated (r= .51, $p<.001$).

Significant but weak positive associations were found between exposure to center-based child care before and after age two and difficult behavior at 36 months, with stronger associations for behavior at 51 months, but associations were not significant with difficult

behavior at 30 months. There was a significant correlation (r=.15, p<.001) between difficult behavior at 30 months and exposure to center-based child care only within the subsample of children who had some months of dominant center-based child care before two years old (n=288).

In terms of child characteristics, only child temperament and verbal ability were significantly associated with difficult behavior (see Table 2). Difficult behavior was significantly associated with maternal personality and psychological health. Specifically, children with more neurotic, less agreeable mothers who have anxiety and depression problems, displayed more difficult behavior at each time point. An increase in family socio-economic status was associated with less difficult behavior only at 30 and 36 months.

Examination of the unconditional growth model (see Table 3 – Model A) showed that average intercept was 1.97, which reflected an average difficult behavior rating of "sometimes." The estimated rate of change was -.16, which was small but significant (p<.001). In other words, without taking any predictors into account, the frequency of difficult behavior was characterized by a slight decrease from 30 to 51 months for all the children in the sample.

Child Characteristics and Difficult Behavior

Model B (see Table 3) tested the impact of child characteristics on difficult behavior. Adding these predictors significantly improved the model fit (Δ -2 LL= 763.78, p < .001) accounting for an additional 16% of variance between children based on *Pseudo* R^2 calculations. Difficult temperament significantly predicted both the initial level of difficult behavior at 30 months and its rate of change from 30 to 51 months. Children with more difficult temperament had more difficult behavior at 30 months and had a smaller decline over time. Expressive language ability was associated only with the initial level of difficult

behavior; children with lower scores displayed more difficult behavior at 30 months, but it had no impact on change over time.

Exposure to Center-based Child Care and Difficult Behavior

Exposure to dominant center-based child care before the age of two significantly predicted both the initial level of difficult behavior and its change over time in the next model (see Table 3, Model C). Adding the exposure variable did not change the associations between child characteristics and difficult behavior but the model showed a better fit (Δ -2 LL= 219.72, $p < .001$). The exposure variable per se explained an additional 26% of between-child variation and 13% of within-child variation as well as 33% of the variation in its rate of change. Surprisingly, exposure to center-based child care had a negative association with the initial level of difficult behavior at 30 months. Children who had more dominant center-based child care experience were reported to have less difficult behavior on average at 30 months old. However, comparisons of mean values for children who had no, three months, six months, and twelve months of center care experiences showed small differences. For instance, a child had a difficult behavior score of 1.51 when she or he had no exposure to center-based child care. The average decreased to 1.45 when children had three months of center-based child care experience; decreased to 1.40 when they had six months of experience, and decreased to 1.30 when they had twelve months of center-based child care experience. Although these differences were significant they were small in that they were all between the ratings of "not at all" to "sometimes."

Although children with more exposure to center-based child care started with lower levels of difficult behavior at 30 months, they showed an increase over time. In contrast, when there was no center-based child care, the level of difficult behavior significantly decreased over time (β= -.12). The estimated impact of early center-based child care on change was .49 which indicated that, for higher levels of exposure to center-based child care,

difficult behavior showed an increase rather than a decrease. For instance, when children had six months of early center-based child care (exposure score .25) their difficult behavior scores were expected to be similar across time indicating no change, whereas with 12 months of early center-based child care experience (exposure score .50), a significant increase was expected. Therefore, controlling for child characteristics, exposure to center-based child care before two years old appeared to be a risk factor for more difficult behavior in the subsequent years, while for other children this behavior decreased over time.

Maternal and Family Factors and Difficult Behavior

Early exposure to center-based care remained a strong predictor of difficult behavior after controlling for the exposure to center-based child care after the age of two and maternal characteristics (see Table 3, Model D). Exposure to center-based child care after two did not predict difficult behavior. Maternal personality, mental health, family socio-economic status and minority status did not significantly contribute to predicting either the initial levels of difficult behavior or the change over time except for the impact of family socio-economic status on the change in difficult behavior over time. Children with higher family socio-economic status displayed less difficult behavior over time.

Prototypical Plots

The majority of the sample (76%) did not have any early exposure to dominant center-based child care. Of those who did have exposure to center-based child care before two years old, 25 % had ‘low’ exposure defined by the scores 1 standard deviation below the sample mean (mean=.38, *sd*=.33); and 26 % had ‘high’ exposure with scores 1 standard deviation above the sample mean. To illustrate change in the level of difficult behavior for a prototypical child in each group, three scores were selected based on one standard deviation below (representing a low exposure group, score=.08) and above (representing a high exposure group, score=.68). Zero was selected representing no exposure to center-based care

group. Figure 1 shows the variation in the intercept and the shape of difficult behavior trajectories based on exposure to center-based child care before the age of two. Prototypical plots were fitted for three different scores: when there was no exposure to center-based child care before two years old; when there was low exposure; and when there was high exposure.

The figure indicates that difficult behavior declined for the children who had no early exposure to center-based child care, whereas it did not change when there was low exposure to center-based child care. However, difficult behavior showed an increase over time when early exposure to center-based child care was high.

Discussion

This study aimed to examine trajectories in difficult behavior during the preschool years, defining as the frequency of temper tantrums and the extent to which the child's behaviors were not manageable and controllable. It was expected that trajectories would be related to exposure to substantial center-based child care before two years old, controlling for child and maternal characteristics, as well as concurrent exposure to center-based child care. This study focused on center-based child care due to the conclusions of previous research, based on mean scores at different time points, which have suggested that center-based care experienced early in life, especially when it is for more hours, can have adverse consequences for child behavior (Belsky et al, 2007; Jacob, 2009; NICHD, 2004). This study looked at individual patterns of change over time in behavior that generally decrease over the toddler and preschool period and incorporated in the analysis a range of child maternal and family characteristics, some of which (e.g. maternal personality) have not features in previous studies.

Some of the key findings of the current study were that:

- Approximately 24 % of the whole sample (n=1201) had at least some experience of early child care before their second birthday; children who entered center-based child care early, before the age of two years, tended to continue with same type of care later.
- As expected, taking the whole group, difficult behavior declined after the age of two years. On the other hand, children who had early exposure to center-based child care had significantly lower scores at 30 months than those with little or no center-based child care experiences but showed an increase over time even after controlling for child characteristics, exposure to center-based care after two years old, and maternal characteristics.
- Difficult child temperament and lower expressive language ability assessed at 18 months predicted more difficult behavior at the age of two and a half; difficult temperament and lower family socio-economic status predicted less reduction over time.
- Attachment, assessed by stranger sociability, was not related to difficult behavior or to its change over time.

The present study aimed to replicate previous studies of the impact of group child care early in life and contribute to the literature by using a novel way of operationalizing the child care experience In contrast to previous studies, where modest relations were found after controlling for family or other factors (Belsky, 2007; McCartney et al, 2010; NICHD, 2003), the detected effect of early exposure to center-based child care was strong even after controlling for a variety of factors. A more detailed examination of exposure to center-based child care, defining it based on center-based care being the dominant pattern rather than by using the average number of hours per week, has shown that having only a few months of center-based care experience before age two was not detrimental to child behavioral outcomes but that prolonged experience of dominant center-based care before two years old is likely to be a risk factor for anger prone and unmanageable behavior at later ages.

One difference from previous, mainly NICHD studies, was that the current study revealed that children with early exposure to center-based child care had lower levels of difficult behavior at two and a half years old. The difference might be due to that this study focused only on center-based care, whereas the majority of previous studies examined child care regardless of its type. Alternatively, child behavior problems were reported by mothers. It might be a response-bias; mothers of children who were cared in nurseries or day care centers for a long period of time, might perceive their children's behaviors as non-aggressive at 30 months because they see them for less time during the day.

Although mothers of center-cared children reported less temper and management difficulty at 30 months, they perceived an increase in these problems over time from 30 to 51 months. Leach suggests in her book on child care (2009) that children in their early years might benefit more from one-to-one continuous caring interactions in order to meet their needs effectively. A center caregiver usually looks after more than one infant, generally three to four infants, and might not have time and energy to attend every infant equally and respond their needs as quickly and effectively as would be the case in a one-to-one situation. Continuity of the caregiving may not always be the norm in the nurseries due to staff vacations, absence during sickness and mobility. From an attachment perspective, it is both responding to an infant's needs and having a continuing relation with a caregiver that helps to develop a secure attachment which in turn will impact a child's future aggression and non-compliance. It would have been useful to examine the possibility of a direct link between the attachment relation with the caregiver in the center-based care and child behavioral outcomes. In the current study the stranger sociability measure at 18 months reflected the mother-infant relationship, which did not have a significant contribution in understanding child difficult behavior.

Expressive language ability at 18 months was related to difficult behavior but not to its change over time. Possibly the combination of lower language ability and experiencing center-based care is a particular risk factor for developing methods of communication which are effective (i.e. to shout and scream) so that they continue to be used even as language improves. In other words, difficult behavior might not only be compensation for lack of verbal communication skills but also become an alternative communication strategy.

Consistent with the literature, children with a more difficult temperamental style has more difficult behavior and it was less likely to diminish over time. In a group setting this type of child may be a challenge for caregivers whereas in a home context, either parental care or care from a family day care provider, is able to be more sensitive to this type behavior. Surprisingly, maternal personality and mental health symptoms did not have a significant effect on child outcome. The findings in the literature (Jacob, 2009; McCartney et al, 2010) suggest that parent factors have more impact than child care on child behavioral outcomes. Parenting behaviors, such as sensitivity or responsivity, were not examined and possibly this would have led to significant effects, whereas the underlying maternal characteristics did not.

There are other limitations to the current study. Although a comparison of a baseline model with the subsequent models showed significant differences for -2LL ratios, the random components as well as the amount of variance explained did not show an excellent model fit. This might also be related to the fact that the outcome variable was only a 2-item measure of difficult behavior limiting the variation in the sample. Further research should consider using other measures of behavioral problems that can be repeated over time, starting at a young age. Second, this study did not examine parenting behaviors or change in mother –infant relationships and child verbal ability over time. Future research would benefit from assessing such characteristics in order to see whether direct measures of parenting, caregiving relation,

and changes in child characteristics significantly predict behavior problems. Third, the quality of child care was not included in the current study due to lack of complete data on child care quality in the dataset. There is strong evidence in the literature that quality is a crucial aspect of childcare experience in relation to child outcomes (Leach, 2009; McCartney et al., 2010) and that in infancy the quality of interactions in center-based care is lower that than observed in home-based settings (Leach et al., 2008); however it is also known that the link between the quantity of child care and child behavioral outcomes significantly exists beyond the impact of quality (NICHD, 2003). Beyond these limitations, the current study contributed to the debate on the negative effect of child care on child behavioral outcomes (Leach, 2009). Previous studies have concluded that it is not the experience of non-maternal child care but group-based experience (representing center-based child care in the UK) which predicts more behavior problems. The current study also specified that it is not center-based child care experience at a later age but only in the first two years of life that is crucial. More specifically it is extensive use of center-based child care before child's second birthday which is likely to escalate difficult behavior.

When the study was completed it was relatively unusual in the UK for children to start center-based care at an early age. For instance, in the current sample, only 24 % of children had at least some early experience of center-based care; and only 7% had 12 or more months of center-based care before they were two years old. However in the current economic climate there is increasing pressure for parents to work, and to return to work as soon as paid maternity leave is over, which in the UK is currently up to about 9 months (UK Government, 2012). Overall, even though this study represents a small group of children and non-pathological problems, it suggests that early extensive use of center-based child care is a risk factor for later behavior problems.

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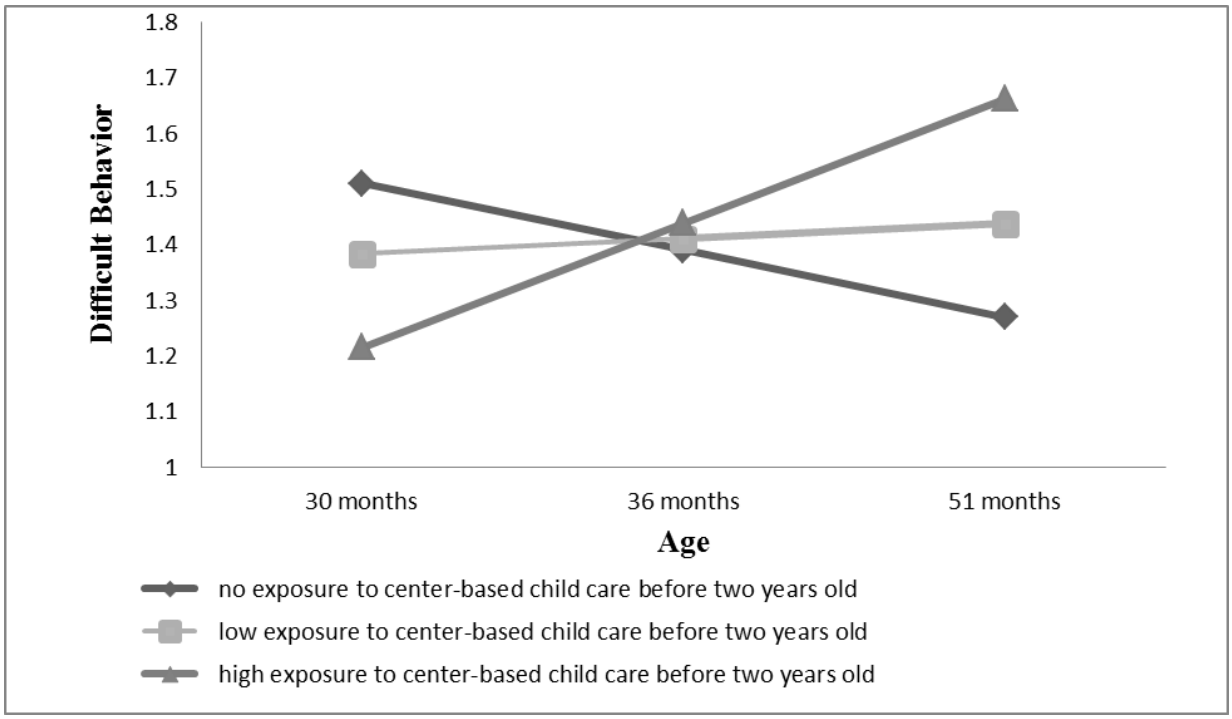

Figure 1. Prototypical Plots for difficult behavior based on no exposure (exposure score = 0), low exposure (exposure score = .08, approximately 2 months of exposure to center-based child care) and high exposure (exposure score = .68, approximately 16.5 months) to center-based child care before two years old.

Table 1

The Correlation Coefficients between Difficult Behavior at 30, 36 and 51 Months and the Subscales of the Adaptive Social Behavior Inventory (ASBI), Strengths and Difficulties Questionnaire (SDQ) and Conners' Oppositional Behavior Scales, all significant at p<.001

	Difficult Behavior		
	At 30 months	At 36 months	At 51 months
Questionnaire scales	(n=1024)	(n=1023)	(n=1024)
36 months			
Mother-reported ASBI compliance	-.38	-.49	-.42
Mother-reported ASBI disruptiveness	.28	.33	.28
Father-reported ASBI compliance	-.26	-.38	-.34
Father-reported ASBI disruptiveness	.15	.25	.22
51 months			
Mother-reported SDQ hyperactivity	.25	.30	.42
Mother-reported SDQ conduct problems	.35	.38	.37
Father-reported SDQ hyperactivity	.15	.21	.41
Father-reported SDQ conduct problems	.29	.32	.18
Mother-reported Conners' oppositional behavior	.32	.39	.57
Father-reported Conners' oppositional behavior	.25	.29	.12

Table 2

Summary of Sample Sizes, Means, Standard Deviations, and Intercorrelations among Variables

Variable	*n*	*M (SD)*	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Difficult Behavior																
1. at 30 months	1024	1.74 (.40)	.52***	.36***	-.00	.01	.25***	-.01	-.10**	-.06	.13***	-.12***	.08*	.09**	-.10***	.02
2. at 36 months	1023	1.71 (.40)		.41***	.11***	.09*	.23***	-.02	-.12***	-.07*	.15***	-.11**	.11**	.06	-.07*	.06*
3. at 51 months	1024	1.64 (.49)			.43***	.23***	.14***	.00	-.06	-.04	.09*	-.07	.10*	.13*	-.02	.03
Exposure to center-based care																
4. Exposure before 2	1201	.09 (.23)				.51***	-.02	.01	-.00	-.03	-.05	.04	.02	-.03	.25***	-.04
5. Exposure after 2	1201	.34 (.31)					.05	.01	.02	-.02	-.06	-.02	-.01	-.02	.17***	-.03
Child Characteristics																
6. Temperament	872	3.42 (.77)						-.06	-.14***	-.03	.19***	-.12***	.18***	.12***	-.05	.17***
7. Stranger sociability	1017	3.30 (1.12)							.18***	.02	-.03	.01	-.01	.04	-.01	-.06
8. Language ability	1018	79.10 (85.1)								.16***	-.00	.02	.04	.04	.10***	-.05
9. Child sex	1201	50.10[a]									-.02	-.03	.03	-.02	-.04	.06
Mother Characteristics																
10. Neuroticism	872	2.49 (.62)										-.36***	.56***	.53***	-.17***	.02
11. Agreeableness	872	3.82 (.41)											-.20***	.27***	.19***	-.03
12. GHQ – anxiety	758	1.71 (.53)												.48***	-.07	-.03
13. GHQ – depression	758	1.16 (.34)													-.27***	.01
Family demographics																
14. Family SES	1201	6.19 (2.13)														.15**
15. Minority Status	1201	21.0[a]														

Note: [a] *percentages*

* $p<.05$. ** $p<.01$. *** $p<.001$.

Table 3

Intercept and Rate of Change in Difficult Behavior from 30 Months to 51 Months by Exposure to Center-Based Child Care before the Age of Two after Controlling for Child and Mother Factors, Family Demographics and Concurrent Exposure to Child Care (n=1024).

Parameter	Model A	Model B	Model C	Model D
		Fixed effects		
Intercept				
In S (p_{0i})	1.97 *** (.02)	1.46*** (.12)	1.51*** (.12)	1.82*** (.01)
Exposure before 2			-.42*** (.08)	-.27** (.12)
Exposure after 2				.07 (.08)
Difficult Temperament		.17*** (.03)	.17*** (.03)	.15** (.03)
Stranger Sociability		.01 (.01)	.01 (.02)	.00 (.02)
Verbal Ability		-.05** (.01)	-.01* (.00)	-.06** (.00)
Child Sex		-.01 (.04)	-.01 (.04)	-.04 (.04)
Neurotic personality				.05 (.04)
Agreeableness				-.10 (.05)
Health-anxiety				-.04 (.05)
Health- depression				-.01 (.08)
Family SES				.01 (.01)
Minority status				-.08 (.06)
Rate of Change				
Slope (p_{1i})	-.16*** (.01)	-.08* (.01)	-.12** (.05)	-.12** (.04)
Exposure before 2			.49*** (.03)	.37*** (.05)
Exposure after 2				-.01 (.04)
Difficult Temperament		.03* (.01)	.03** (.01)	.02** (.01)
Stranger Sociability		.00 (.01)	.00 (.01)	-.00 (.01)
Verbal Ability		.01 (.00)	.02 (.01)	.01 (.00)
Child Sex		-.00 (.02)	-.01 (.02)	-.03 (.02)
Neurotic personality				-.00 (.02)
Agreeableness				.03 (.02)
Health-anxiety				.03 (.02)
Health- depression				.01 (.04)
Family SES				-.01* (.01)
Minority status				.03 (.03)
		Random parameters		
Level 2				
In Initial Status (σ^2_1)	.19 (.019)	.16 (.020)	.14 (.019)	.09 (.020)
In Rate of Change (σ^2_2)	.03 (.003)	.03 (.004)	.02 (.003)	.01 (.004)
Covariance	-.05 (.007)	-.05 (008)	-.03 (.007)	-.01 (.008)
Level 1				
Within-person (σ^2_ϵ)	.08 (.003)	.08 (.004)	.07 (.004)	.07 (.005)
-2 LL	3251.19	2487.41	2267.69	1803.70
AIC	3263.19	2515.41	2299369	1867.70
BIC	3299.38	2596.47	2396.32	2046.75

Note. Standard errors are in parentheses.

* *p* <. 05. ***p*< .01. ****p*< .001.