Reliability and validity analyses of a new measure on infants’ environment
Does fostering explain a fourth?

Hildigunnur Anna Hall

Lokaverkefni til BS gráðu
Sálfræðideild
Heilbrigðísísindasvið
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Lokaverkefni til BS gráðu í sálfraði
Leiðbeinendir: Rory T. Devine og Sigurður J. Grétarsson

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Abstract

Home and neighbourhood environment and parents’ well-being are among factors that affect children’s development in the first years of life. That can in turn have a major impact on important outcomes later on. The New Fathers and Mothers Study, a longitudinal study on origins of early individual differences in self-regulation carried out at the University of Cambridge, explores this topic among others. The current study is based on data from 190 families taking part in the New Fathers and Mothers Study, all containing a father, mother and their first born. It had four aims: (1) to examine the inter-rater reliability of the Windshield Survey, a recent 12 item measurement on children’s home and neighbourhood environment consisting of three subscales; (2) to examine the internal consistency of the scale; (3) to assess the validity of the scale by examining its structure and associations with socioeconomic status, stimulation in the home, parental depression and early indicators of children’s development; (4) to examine if early indicators of children’s development are predicted by any of the above mentioned variables. The results supported the reliability and validity of the Windshield Survey to some extent. The inter-rater reliability was not satisfactory for some items when preliminary analyses were done after 74 families had been seen, so further researcher training was implemented which improved the reliability for most items. The internal consistency was satisfactory (α > .70) for one subscale out of three. Inadequate reliability can be explained by a lack of variability for some items. The structure of the scale represented the three subscales fairly well and a number of correlations between the Windshield Survey subscales and other study variables emerged that supported the construct validity of the scale. Further examination is needed for predictors of children’s development as very few associations emerged between children’s development and other study variables. A possible explanation is that the measurements on children’s development in this study were only preliminary.
Acknowledgements

The subtitle of the dissertation is a reference to Brennu-Njáls saga, one of the Icelandic Sagas. There, the saying “one-fourth comes from fostering” or “fjórðungi bregður til fösturs” in Icelandic, is presented, which means that upbringing explains a fourth of children’s strength and character. The saga is meant to take place in Iceland around the year 1000 and thus suggests that influential factors on the development of children have been a topic of discussion through the centuries. I do not promise to answer the question put forth, but merely shed light on various influential factors in infants’ environment.

The dissertation was supervised by Dr Rory T. Devine at the University of Cambridge and Professor Sigurður J. Grétarsson at the University of Iceland. I am very grateful to both of them for their guidance and support. The data for the study was partly collected during a summer internship at the Centre for Family Research, University of Cambridge. I thank Professor Claire Hughes and Dr Rory T. Devine for giving me the opportunity to work with them for the past two summers. It was a very good experience and a true honour. I also thank the rest of the NewFAMS team for a fruitful collaboration and a wonderful summer. Lastly, I thank my mother, Professor Áslaug Helgadóttir, for all her help and support.
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Introduction

The New Fathers and Mothers Study

The current study is a part of the New Fathers and Mothers Study headed by Professor Claire Hughes at the Centre for Family Research, University of Cambridge. The New Fathers and Mothers Study is an ongoing longitudinal study conducted in the United Kingdom, the Netherlands and the United States of America that started in 2014. The study follows around 400 couples and their first born from the third trimester of pregnancy through the second year of the child’s life. The overall aim of the study is to understand the origins of early individual differences in self-regulation, where executive functions play a vital role. A key contribution of the study to the field lies in its inclusion of fathers, as many basic questions regarding parental influences remain unanswered.

The study consists of four phases. An interview is conducted with each parent at the third trimester followed by visits to the family when the child is 4, 14 and 24 months old. Parents also answer online questionnaires at each phase of the study without a researcher present. At the prenatal phase of the study the expectant parents are asked about their mental health, relationship with their partner, significant life events and views towards the near future changes. In addition, their cortisol levels are measured and warmth and criticism towards their baby is assessed. At the 4, 14 and 24 month phases a short follow-up interview is conducted along with behavioural observations and questionnaires. The 14-month phase also includes measures of the children’s cortisol levels. The 14 and 24 month phases both include measures on parent and child executive functions and IQ. Two team members, a researcher and a research assistant, go together on each home visit and rate the home and neighbourhood environment after visits at the 4, 14 and 24 month phases. Four lead researchers visit the participating families and conduct all data collection along with research assistants.

My role in the New Fathers and Mothers Study was mainly in data collection, data entry and preliminary analyses during a three-month summer internship at the Centre for Family Research, University of Cambridge in 2015. I accompanied one of the four lead researchers on 56 home visits where I interviewed parents and conducted observations. I entered in the data that were collected at all 4-month visits during the
time of my internship. Additionally, I collected saliva samples and labelled them for analysis, coded speech samples and assisted with the training of new research assistants.

I was responsible for the reliability analysis of a recent measurement of the home and neighbourhood environment, the Windshield Survey, which has not been used before in studies carried out by the Centre for Family Research. In this dissertation I present results from my reliability analyses along with results from a preliminary assessment of the scale validity. In addition, I examine whether any of the study variables related to the home and neighbourhood environment predict early indicators of children’s development, as that relates to the core topic of the New Fathers and Mothers Study. I begin by putting my work in a theoretical context. I briefly go back in time and discuss views of a few influential scholars on the development children and then turn to more recent research on children’s cognitive development with emphasis on executive functions. This is followed by a discussion on the home and neighbourhood environment along with parental well-being, and how the two can affect the development of children. Lastly, I argue what needs to be kept in mind when developing a new measure.

Influences on children’s development: A few historical stepping stones
Many scholars have deliberated which factors influence the development of children. Writings on genetic and environmental influences, the so called nature-nurture debate, have been among central features in developmental science. The course of the debate has not been progressive from extreme views in the past to integrative theories today. Plato wrote about children’s inherent differences in his Republic, but he also emphasized that early childhood training was important to cultivate each child’s strengths and talents (Mussen et al., 1974). The contrasting writings of John Locke and Jean Jacques Rousseau on the matter also shed light on the longevity of the debate. Locke argued that education and experience were the cardinal elements in children’s development. His metaphor about the infant’s mind being a blank slate – tabula rasa – has become a renowned hallmark for his views. Rousseau, on the other hand, argued that children were active participants in their own development and were naturally endowed with an innate moral sense and components for a healthy growth. In his view, children responded actively to their environments (Mussen et al., 1974).
It seems that the idea of innate abilities and the environment working in harmony to shape children’s development have existed for over two millennia. John B. Watson, a pivotal behaviourist in the 20th century, had extreme views in favour of the nurture side of the debate which are portrayed, for example, in his *Behaviorism* (Watson, 1931). Many more have debated about the influences of innate abilities and the environment on children’s development. B.F. Skinner and Noam Chomsky, for example, had heated arguments about the development of language (Skinner, 1957; Chomsky, 1968).

In this day and age there seems to be a consensus that innate factors, such as genes, are intertwined with environmental ones in shaping every aspect of human development. Many writers insist that development cannot be described by considering nature and nurture in isolation from each other (Gottlieb, 1997; Shonkoff, & Phillips, 2000; Moffitt, Caspi, & Rutter, 2005). More recent research has shifted towards exploring influences, both genetic and environmental, on different domains of children’s development. The *New Fathers and Mothers Study* focuses on early individual differences in self-regulation by analysing the children’s cognitive development and especially their executive functions. One aim of the current study is to examine what factors in infants’ environment predict early indicators of their development. Measurements on the home and neighbourhood environment, parental socioeconomic status and well-being are examined in relation to the children’s development in order to further understand the influences on children’s development.

*Cognitive development in childhood*

The first years of life are a time of dramatic changes in all areas of development. In the years prior to school age the neurons in the brain form connections at a fast rate. This is a critical time as day to day experiences can greatly affect these connections. A stimulating social environment along with physical and emotional support are vital for successful cognitive, social and behavioural development (Maggi, Irwin, Siddiqi, & Hertzman, 2010).

Executive functions are higher-order cognitive processes such as working memory, inhibitory control and cognitive flexibility. These functions are linked to the prefrontal cortex and underlie self-regulation, goal-directed behaviours (Cuevas et al.,
2013), and adaptive responses to novel, complex, or ambiguous situations (Hughes, Graham, & Grayson, 2005). Executive functions start to emerge in the first years of life (Diamond, 1991), progress rapidly around the age of five, at the time most children start school (Gerstadt, Hong, & Diamond, 1994), and continue to develop into adulthood (Huizinga, Dolan, & van der Molen, 2006). Executive functions seem to affect various aspects of children’s lives as the following examples from the literature show.

A number of disorders are related to poor executive functions. These include attention-deficit/hyperactivity disorder, autism spectrum disorders, brain damage, mental disabilities and phenylketonuria. Executive functions are also related to school performance (Gioia, Isquith, Guy, & Kenworthy, 2000; Diamantopoulou, Rydell, Thorell, & Bohlin, 2007). The inhibitory control element of executive functions plays a large role in that relationship. The ability to inhibit responses in the event of a distraction seems to benefit school performance, particularly in mathematics and reading. Research suggests that a beneficial way to help children succeed in school may be to promote self-regulation skills as well as early academic abilities (Blair, & Razza, 2007).

Executive functions are also important for children’s social understanding (Hughes, 2011). Several studies have revealed correlations between executive functions and theory of mind (Hughes, 1998; Keenan, Olson, & Marini, 1998; Carlson, Moses, & Breton, 2002). Hughes and Ensor’s (2007) findings from a longitudinal study on children seen at ages 2, 3 and 4 demonstrated that executive functions predicted theory of mind later on (Hughes, & Ensor, 2007). Furthermore, studies have shown that executive functions are related to various problem behaviours (Hughes, Dunn, & White, 1998; Hughes, White, Sharpen, & Dunn, 2000; Hughes & Ensor, 2008), which can in turn lead to antisocial behaviour and delinquency later on (White, Moffitt, Earls, Robins, & Silva, 1990).

The literature clearly shows that executive functions are related to and affect many life outcomes. Therefore, it is vital to explore what factors can influence the development of executive functions early in life, regardless of whether the influences are beneficial or impairing. The current study examines whether any of the study variables predict the children’s development. Early indicators of the children’s developmental outcomes are used as the four month old children were considered too
young to assess their executive functions properly. Such examinations will take place at the 14 and 24-month phases of the *New Fathers and Mothers Study*. It will be interesting to see whether the early indicators used in the current study will correlate well with the measures on the children’s executive functions.

*The home and neighbourhood environment*

It has long been recognised that the home environment is related to children’s cognitive development. Urie Bronfenbrenner was a leading researcher on environmental influences on the development of children. He emphasized the need for researchers to look further than children’s immediate settings when examining environmental influences on development (Bronfenbrenner, 1977; Bronfenbrenner, 1979).

Robert H. Bradley and Bettye M. Caldwell’s research has also been influential in the field of environmental influences on children’s development, especially on measurements of children’s environments. They created the *Home Observation Measurement of the Environment* (HOME) (Caldwell, & Bradley, 1984), which is a widely used measure on children’s home environment. It consists of an interview with the child’s mother and an observation of the mother-child interactions in their home. Caldwell and Bradley discovered links between several environmental factors and indicators of cognitive development such as mental test scores (e.g. Bradley, & Caldwell, 1976a; Bradley, & Caldwell, 1976b; Bradley, & Caldwell, 1979; Bradley et al., 1989). Their research shows that emotional and verbal responsivity of mothers, maternal involvement with their children and provision of appropriate play materials seem to be the most beneficial factors for the children’s cognitive development (Bradley, & Caldwell, 1976a; Bradley, & Caldwell, 1976b; Bradley et al., 1989). On the other hand, inadequate organization of physical and temporal environment seems to be related to decreased performance on tests on mental development (Bradley, & Caldwell, 1976a). The findings remain similar for different age and ethnic groups (Bradley et al., 1989).

More recent research has shown that environmental confusion or chaos in the home, as well as low socioeconomic status, can negatively affect children’s cognitive development (Petrill, Pike, Price, & Plomin, 2004; Hart, Petrill, Deater-Deckard, & Thompson, 2007). Hackman, Farah, & Meaney (2010) provide an interesting review of the literature on the association between socioeconomic status and brain development.
and how policy makers should aim to reduce disparities in socioeconomic status. They conclude that prenatal factors, interactions between parent and child, and cognitive stimulation in the home underlie the association between socioeconomic status and brain development. They urge that educational and treatment programs targeted at families of low socioeconomic status, which are intended to reduce disparities related to socioeconomic status, must be empirically tested. They further emphasise that policies should aim to improve parental well-being and provide competent resources for parents and communities in order to enhance children’s environments and care (Hackman, Farah, & Meaney, 2010).

Given the influence that home and neighbourhood environment can have on children’s cognitive development it is important for researchers and professionals in the field to have access to proper measurements. Unfortunately, HOME is time consuming to administer, taking around 60 to 90 minutes to complete in a home setting and in addition requires special researcher training (Johnson et al., 1993). A shorter scale requiring less training would be very advantageous for research where home visits are conducted. The aim of such visits is often to gather data on various topics without putting too much strain on the families. The current study introduces the Windshield Survey, a recent measure on the home and neighbourhood environment, that can be used in studies involving home visits. It contains 12 items that researchers answer after each visit. It is simple and only takes a few minutes to complete. In this study two researchers completed the survey in order to establish inter-rater reliability. The scale items are derived from the Post-Visit Reaction Inventory from the Conduct Problems Prevention Research Group (1990) which in turn base their items on Caldwell and Bradley’s HOME (Caldwell, & Bradley, 1984).

**Parental well-being**

Parental well-being, at least to some extent, comes hand in hand with the influences of home and neighbourhood environment on children’s developmental and behavioural outcomes (Hackman, Farah, & Meaney, 2010). Prevalence rates of depression during pregnancy are around 7-13% of expectant mothers (Bennett, Einarson, Taddio, Koren, & Einarson, 2004; Vesga-López et al., 2008). Prevalence rates of postnatal depression seem to be slightly higher, or around 13-19% of mothers (Josefsson, Berg, Nordin,
The literature on postnatal depression among fathers is more scarce than for mothers, but studies show that the prevalence rates range from around 4-26%, and that maternal and paternal postnatal depression seem to be correlated (Ramchandani, Stein, Evans, & O’Connor, 2005; Pinheiro et al., 2005; Paulson, & Bazemore, 2010). The literature shows that parental depression can have major influences on children’s lives.

Depression during pregnancy can is a risk factor for preterm birth and low birth weight (Grote et al., 2010) as well as depression (Pawlby, Hay, Sharp, Waters, & O’Keane, 2009) and antisocial behaviour during adolescence (Hay, Pawlby, Waters, Perra, & Sharp, 2010). A review of 10 years of research on children of affectively ill parents showed that those children were at greater risk for psychiatric disorders, difficulties in functioning, increased guilt, interpersonal and attachment difficulties than the children of mentally healthy parents (Beardselee, Versage, & Giadstone, 1998). Martins and Gaffan’s (2000) meta-analysis showed that infants of mothers clinically diagnosed with depression were more likely to show avoidant or disorganised attachment and less likely to show secure attachment than the children of mothers without depression (Martins, & Gaffan, 2000). Furthermore, Murray et al. (2011) suggest that children of mothers suffering postnatal depression are of increased risk for depression at the age of 16 (Murray et al., 2011). Studies on children of depressed fathers also show that those children are at greater risk of having conduct and emotional problems than children of fathers that did not suffer depression (Ramchandani et al., 2005; Ramchandani et al., 2008).

Studies on the relations between parental depression and children’s executive functions have provided somewhat mixed results. Hughes, Roman, Hart, & Ensor (2013) suggest that early maternal depression predicts poor development in children’s executive functions, but other studies report no association between the two (Klimes-Dougan, Ronsaville, Wiggs, & Martinez, 2006; Rhoades, Greenberg, Lanza, & Blair, 2011). Given the severe influences parental depression can have on children’s development there is great need of assessing this further. Associations with other variables affecting children’s development, for example the home and neighbourhood environment, might be a good place to start. Early detection is also vital so relevant treatment can be provided if needed. This study includes measures on the depression of
both mothers and fathers in order to clarify whether this has an impact on the children’s development.

Reliability and validity of measures

When a new measure is used it is vital to make sure that it is reliable and valid. In the current study, the reliability of the Windshield Survey was examined by analysing the internal consistency of the scale. Cronbach’s $\alpha$, a widely used method to estimate internal consistency on an item-level, was used. Furthermore, inter-rater agreement between the two researchers that completed the survey after each home visit were assessed using intraclass correlations. Intraclass correlations measure the association between two variables that measure the same thing and are thus more suitable for assessing inter-rater agreement than other correlations which assume that errors are independent (Field, 2013).

Test validity refers to “the degree to which evidence and theory support the interpretation of test scores entailed by the proposed uses of test” (American Education Research Association, the American Psychological Association, & the National Council on Measurement in Education, 1999, p. 9). Without test validity decisions based on test scores can be misleading or even harmful. One way to assess test validity is to examine the internal structure of the measure by using factor analysis, as is done in the current study. A structure consistent with the theory is considered evidence for test validity. Another way to assess test validity is to examine the associations with other variables related to the construct that the test intends to measure. This is also done in this study using two-tailed bivariate correlations. Validity hinges on reliability, i.e. in order for the interpretation of a scale’s results to be valid, the scale must be reliable (Furr, & Bacharach, 2014).

The aims of the current study

This part of the study is based on data collected in the United Kingdom at the prenatal and 4-month phases of the New Fathers and Mothers Study. The current study has four aims. First, to assess the inter-rater reliability of the Windshield Survey, a recent post-visit rating scale; second, to assess the internal consistency of the scale; third, to assess the validity of the scale by analysing the structure of the scale and associations with socioeconomic status, stimulation in the home, parental depression and early indicators
of children’s development, and fourth, to examine if early indicators of children’s development are predicted by any of the above mentioned variables.
Method

Sampling procedures
Participants were recruited using an enriched sampling design to maximise the participation of expectant parents showing high levels of stress, anxiety or depression. The majority of participants were recruited at The Rosie Hospital in Cambridge. Other participants were recruited at Hinchingbrooke Hospital, through prenatal yoga classes, events for expectant parents and through personal acquaintances. During recruitment, details from 585 couples were obtained of whom 517 completed an eligibility screening questionnaire. Of those, 221 couples met eligibility criteria and agreed to take part. Thus, the intended size of the UK sample, 220 participants, was successfully met with 221 participants taking part in the study. However, only 190 participants had completed both the prenatal and 4-month phases when this thesis was written and only data from those participants were included.

Participants
The current study is based on data from 190 families in the UK sample, each containing a mother, father and their first and only child. Families were not included in the study if either parent did not speak English, had a history of psychotic depression, psychosis, substance misuse or addiction or was being treated by an extensive medical or therapeutic intervention. Parental demographics are listed in Table 1.
Table 1. Parental demographics

<table>
<thead>
<tr>
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<td><em>SD</em></td>
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<td>22,337</td>
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</table>

Missing values are excluded from percentages.

Data on parental demographics were collected at the prenatal phase of the study. All families lived in Cambridgeshire and surrounding areas. All the children were born between November 2014 and October 2015, 56% were male.

**Measures**

The home and neighbourhood environment was measured with the Windshield Survey, a recent post-visit rating scale intended for researchers to assess the home and neighbourhood environment along with how a home visit went. The main aim of this study was to assess its psychometric properties to assess its fitness for further use. The scale consists of 12 items derived from the Post-Visit Reaction Inventory from the Conduct Problems Prevention Research Group (1990). That inventory consists of 60 items intended to tap researchers’ ratings on the family’s physical environment, child’s
behaviour toward the parent, mother’s and father’s behaviour toward the child, parental behaviour toward the visitors, validity of the data, and need for intervention. The Windshield Survey has been used in the current form in the Family Life Project (De Marco, & Vernon-Feagans, 2013). The goal was to find a brief but accurate measure on children’s home and neighbourhood environment for researchers to use when conducting home visits. The scale contains three subscales. The first subscale, Completing the Home Visit, consists of five items assessing how the home visit went, e.g. How much difficulty did you have in completing this interview? The second subscale, Indoor Environment, consists of three items assessing the interior of the home, e.g. How clean is this dwelling? The third subscale, Outdoor Environment, consists of four items assessing the neighbourhood around the dwelling, e.g. The safety of the neighbourhood around this dwelling is... The items are scored on a scale from 0 to 3 or 4 where in all cases 0 = Can’t rate, as shown in Appendix A.

Socioeconomic status was assessed with self-reported information about parental yearly income and highest level of education achieved.

Subjective socioeconomic status was rated by the participants themselves by using the Scale of Subjective Status (Operario, Adler, & Williams, 2004). Participants received the following instructions:

This ladder represents where people stand in society. Where would you be on this ladder? Please mark the rung where you think you stand.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

The worst off people are at the bottom of the ladder – these people have the least education and money and the worst jobs.

The best off people are at the top of the ladder – these people have the most education and money and the best jobs.

Relative deprivation was assessed with information from The English Indices of Deprivation 2015 (Department for Communities and Local Government, 2015). The Index of Multiple Deprivation (IMD) was used as it is a broad measure of relative deprivation. The IMD combines information from seven domains; Income Deprivation, Employment Deprivation, Education, Skills and Training Deprivation, Health
Deprivation and Disability, Crime, Barriers to Housing and Services and Living Environment Deprivation. The IMD is scored on a scale from 1 to 10 where 1 = Most Deprived and 10 = Least Deprived. The index is linked to each family’s postcode, therefore it is an assessment of the area the family lives in, not of that individual family.

**Stimulation** was measured by researchers after each 4-month home visit with six items from the *Post-Visit Reaction Inventory* from the Conduct Problems Prevention Research Group (e.g. Lanza, Rhoades, Nix, Greenberg, & The Conduct Problems Prevention Group, 2010). The scale contains items about the stimulation the infant receives as detected by the researchers during the home visit, e.g. *Does the infant have space for recreation?* The items are all scored on the same scale from 0-4 as shown in Appendix B.

**Early indicators of child development** were assessed by either parent with 10 items from the 4-month *Ages and Stages Questionnaire* (ASQ) (Bricker, Squires, & Mounts, 1995; Squires, Bricker, & Potter, 1997). The ASQ is a widely used developmental screening tool and is highly reliable and valid (Squires, Bricker, & Potter, 1997). Parents were asked about their child’s communication skills, e.g. *Does baby make sounds when looking at toys or people?*, problem solving skills, e.g. *When you move a toy slowly from side to side in front of baby’s face does baby follow the toy with his/her eyes?*, personal or social skills e.g. *When in front of a large mirror, does baby smile or coo at him/herself?* and if they had any concerns about their child’s development. The items are all scored on the same scale from 0-2 as shown in Appendix C.

**Parental depression** was measured with the *CES-D Scale* (Radloff, 1977) consists of 20 self-report items intended to measure depressive symptoms in the general population. The items are scored on a 4-point scale as shown in Appendix D.

**Procedures**
Researchers contacted the families and organised a home visit at a suitable time. Participants answered questions about demographics, perceived social standing and depression in online questionnaires using Qualtrics software at the prenatal and 4-month phase. This was carried out in the participants’ own time, on their own computer and
without a researcher present. Parents answered the *Ages and Stages Questionnaire* at the 4-month home visit. Two researchers were present at all 4-month visits. Both researchers filled out the *Windshield Survey* and the stimulation questionnaire separately after each visit in order to maximise accuracy. Participants were not placed into any manipulated conditions. Each parent was remunerated £15 for each phase of the study.

Recruitment, interviewing, observation and data-storage was conducted in accordance with the highest ethical standards, with parents fully informed of the nature of the research and the procedures involved, as well as of their right to withdraw from the research at any stage. The informed consent forms for the prenatal and 4-month waves of the *New Fathers and Mothers Study* can be found in Appendix E. Before contacting families for the 4-month phase of the study, the researchers checked with midwives to ensure that there had been a live birth with no major complications for either mother or infant. Through prior contact with local medical services it was ensured that any researcher who was concerned that a parent was a risk to self or others had the training and support needed to assist that participant access help as required. Approval from the Research Ethics Committee is in Appendix F.

Statistical analyses
The data used in this dissertation were obtained from the 190 families that had been seen when writing up took place. The data were collected by the four main researchers mentioned before, along with six research assistants, including myself. Two researchers, one of the main researchers and a research assistant, went on every visit and filled out the post-visit questionnaires separately so inter-rater reliability could be established. I visited 56 families myself, but in order to maximise the quality of the analyses I used all the data on the relevant measures that had been collected in the study. I entered in all data collected at the 4-month visits during my time at the Centre for Family Research. After my departure, another research assistant was responsible for data entry. The following analyses were my final dissertation project, so all analyses of the data were carried out by myself.

Prior to the main analyses descriptive statistics were carried out and the data cleaned. Inter-rater reliability for the *Windshield Survey* was examined using intraclass correlations followed by the internal consistency of the scale using Cronbach’s alpha.
The scale validity was then assessed by looking at the structure of the scale and correlations with socioeconomic status, stimulation in the home, parental depression, and early indicators of the children’s development. A principal component analysis with a Varimix rotation was used to examine the structure of the scale. This was selected because the structure had not been analysed before, no existing theory was used to infer about the structure of the scale, and all items were rated on a fairly small scale with 3-4 points. Kaiser’s criterion was used when reporting the number of factors as the number of items were less than 30 and the average communality after extraction was over .6. Two-tailed bivariate correlations were used to examine the associations between measures as no directional hypotheses were put forth. Lastly, it was examined whether any of the above mentioned variables predicted early indicators of the children’s development, using a multiple regression analysis. For the Windshield Survey, items 4, 5, 11, and 12 were reverse coded and values = 0 (Can’t rate) were coded as missing. For the stimulation questionnaire, values = 3 (Not available/Not observed) were coded as missing. For the CES-D Scale, items 4, 8, 12, and 16 were reverse coded. For the ASQ, item 10 was reverse coded. All analyses were carried out using SPSS Statistics version 23.
Results

Descriptive statistics

Descriptive statistics for all study measures can be found in Tables 2–6.

Table 2. Descriptive statistics for the Windshield Survey (based on means for the two raters)

<table>
<thead>
<tr>
<th>Item(^1)</th>
<th>N</th>
<th>Min.</th>
<th>Max.</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>188</td>
<td>1</td>
<td>4</td>
<td>3.1</td>
<td>.51</td>
</tr>
<tr>
<td>2</td>
<td>188</td>
<td>2</td>
<td>4</td>
<td>3.2</td>
<td>.58</td>
</tr>
<tr>
<td>3</td>
<td>181</td>
<td>1</td>
<td>4</td>
<td>3.0</td>
<td>.60</td>
</tr>
<tr>
<td>4</td>
<td>187</td>
<td>1</td>
<td>4</td>
<td>3.5</td>
<td>.75</td>
</tr>
<tr>
<td>5</td>
<td>187</td>
<td>2</td>
<td>3</td>
<td>3.0</td>
<td>.18</td>
</tr>
<tr>
<td>6</td>
<td>188</td>
<td>2</td>
<td>4</td>
<td>3.6</td>
<td>.55</td>
</tr>
<tr>
<td>7</td>
<td>188</td>
<td>2</td>
<td>4</td>
<td>3.0</td>
<td>.23</td>
</tr>
<tr>
<td>8</td>
<td>112</td>
<td>1</td>
<td>4</td>
<td>1.8</td>
<td>.75</td>
</tr>
<tr>
<td>9</td>
<td>187</td>
<td>2</td>
<td>4</td>
<td>3.1</td>
<td>.50</td>
</tr>
<tr>
<td>10</td>
<td>187</td>
<td>1</td>
<td>4</td>
<td>1.2</td>
<td>.61</td>
</tr>
<tr>
<td>11</td>
<td>188</td>
<td>2</td>
<td>4</td>
<td>3.4</td>
<td>.52</td>
</tr>
<tr>
<td>12</td>
<td>188</td>
<td>3</td>
<td>4</td>
<td>3.3</td>
<td>.41</td>
</tr>
</tbody>
</table>

\(^1\)For item names, see Appendix A.

Table 3. Descriptive statistics for stimulation (based on means for the two raters)

<table>
<thead>
<tr>
<th>Item(^1)</th>
<th>N</th>
<th>Min.</th>
<th>Max.</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>187</td>
<td>0</td>
<td>2</td>
<td>1.9</td>
<td>.32</td>
</tr>
<tr>
<td>2</td>
<td>187</td>
<td>1</td>
<td>2</td>
<td>2.0</td>
<td>.15</td>
</tr>
<tr>
<td>3</td>
<td>169</td>
<td>0</td>
<td>2</td>
<td>1.7</td>
<td>.62</td>
</tr>
<tr>
<td>4</td>
<td>187</td>
<td>0</td>
<td>2</td>
<td>1.7</td>
<td>.53</td>
</tr>
<tr>
<td>5</td>
<td>187</td>
<td>0</td>
<td>2</td>
<td>2.0</td>
<td>.22</td>
</tr>
<tr>
<td>6</td>
<td>181</td>
<td>0</td>
<td>2</td>
<td>1.8</td>
<td>.52</td>
</tr>
</tbody>
</table>

\(^1\)For item names, see Appendix B.
Table 4. Descriptive statistics for the *Ages and Stages Questionnaire*

<table>
<thead>
<tr>
<th>Item</th>
<th>N</th>
<th>Min.</th>
<th>Max.</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>174</td>
<td>0</td>
<td>2</td>
<td>1.7</td>
<td>.57</td>
</tr>
<tr>
<td>2</td>
<td>174</td>
<td>0</td>
<td>2</td>
<td>1.9</td>
<td>.36</td>
</tr>
<tr>
<td>3</td>
<td>165</td>
<td>0</td>
<td>2</td>
<td>1.1</td>
<td>.83</td>
</tr>
<tr>
<td>4</td>
<td>171</td>
<td>0</td>
<td>2</td>
<td>1.7</td>
<td>.64</td>
</tr>
<tr>
<td>5</td>
<td>172</td>
<td>0</td>
<td>2</td>
<td>1.6</td>
<td>.67</td>
</tr>
<tr>
<td>6</td>
<td>173</td>
<td>0</td>
<td>2</td>
<td>1.8</td>
<td>.44</td>
</tr>
<tr>
<td>7</td>
<td>172</td>
<td>0</td>
<td>2</td>
<td>1.9</td>
<td>.31</td>
</tr>
<tr>
<td>8</td>
<td>166</td>
<td>0</td>
<td>2</td>
<td>1.8</td>
<td>.51</td>
</tr>
<tr>
<td>9</td>
<td>170</td>
<td>0</td>
<td>2</td>
<td>1.6</td>
<td>.76</td>
</tr>
<tr>
<td>10</td>
<td>161</td>
<td>0</td>
<td>1</td>
<td>.9</td>
<td>.27</td>
</tr>
</tbody>
</table>

1For item names, see Appendix C.

Table 5. Descriptive statistics for the *Scale of Subjective Status and Index of Multiple Deprivation*

<table>
<thead>
<tr>
<th>Subjective Status</th>
<th>Parent</th>
<th>N</th>
<th>Min.</th>
<th>Max.</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother</td>
<td>176</td>
<td>3</td>
<td>10</td>
<td>7.5</td>
<td>1.32</td>
<td></td>
</tr>
<tr>
<td>Father</td>
<td>170</td>
<td>3</td>
<td>10</td>
<td>7.4</td>
<td>1.23</td>
<td></td>
</tr>
<tr>
<td>Multiple Deprivation</td>
<td>180</td>
<td>2</td>
<td>10</td>
<td>7.7</td>
<td>1.92</td>
<td></td>
</tr>
</tbody>
</table>
Table 6. Descriptive statistics for the *CES-D Scale*

| Item | N | Min. | Max. | M   | SD  | N   | Min. | Max. | M   | SD  |
|------|---|------|------|-----|-----|-----|------|------|-----|-----|-----|
|      |   | Mothers | | | | Fathers | | |
| 1    | 177 | 1   | 4 | 1.5 | .65 | 169 | 1   | 3 | 1.4 | .62 |
| 2    | 177 | 1   | 4 | 1.2 | .55 | 169 | 1 | 3 | 1.1 | .35 |
| 3    | 177 | 1 | 4 | 1.2 | .55 | 169 | 1 | 4 | 1.3 | .58 |
| 4    | 177 | 1 | 4 | 1.6 | .87 | 169 | 1 | 4 | 1.7 | .98 |
| 5    | 177 | 1 | 4 | 1.8 | .84 | 169 | 1 | 4 | 1.9 | .87 |
| 6    | 177 | 1 | 4 | 1.2 | .56 | 169 | 1 | 4 | 1.3 | .61 |
| 7    | 177 | 1 | 4 | 1.8 | .78 | 169 | 1 | 4 | 1.7 | .80 |
| 8    | 177 | 1 | 4 | 1.4 | .63 | 169 | 1 | 4 | 1.6 | .68 |
| 9    | 177 | 1 | 4 | 1.1 | .31 | 169 | 1 | 3 | 1.1 | .36 |
| 10   | 177 | 1 | 4 | 1.3 | .57 | 169 | 1 | 4 | 1.2 | .49 |
| 11   | 177 | 1 | 4 | 2.1 | .97 | 169 | 1 | 4 | 2.1 | .93 |
| 12   | 177 | 1 | 4 | 1.4 | .59 | 169 | 1 | 4 | 1.6 | .74 |
| 13   | 177 | 1 | 4 | 1.5 | .68 | 169 | 1 | 4 | 1.6 | .74 |
| 14   | 177 | 1 | 4 | 1.6 | .72 | 169 | 1 | 4 | 1.3 | .60 |
| 15   | 177 | 1 | 4 | 1.1 | .40 | 169 | 1 | 4 | 1.2 | .54 |
| 16   | 177 | 1 | 4 | 1.3 | .59 | 169 | 1 | 4 | 1.6 | .69 |
| 17   | 177 | 1 | 4 | 1.4 | .61 | 169 | 1 | 2 | 1.0 | .17 |
| 18   | 177 | 1 | 4 | 1.5 | .65 | 169 | 1 | 3 | 1.4 | .58 |
| 19   | 177 | 1 | 3 | 1.2 | .47 | 169 | 1 | 3 | 1.2 | .45 |
| 20   | 177 | 1 | 4 | 1.6 | .71 | 169 | 1 | 4 | 1.8 | .81 |

For item names, see Appendix D.

*Inter-rater reliability*

At the beginning of the study researchers administered the *Windshield Survey* using the available scales. Preliminary analyses were done for the inter-rater reliability of the scale after the first 74 families had been seen at the 4-month phase. The reliability was unsatisfactory for some items as is shown in Table 7. Consequently, all researchers underwent training in order to improve the inter-rater reliability. The training entailed modifying the scales to include more examples and making sure all researchers were familiar with them. Examples were added to seven items as shown in Appendix G.
Table 7. Intraclass correlations (ICC) for the Windshield Survey before training (BT) and after training (AT)

<table>
<thead>
<tr>
<th>Item</th>
<th>ICC BT (N=74)</th>
<th>ICC AT (N=116)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family’s preparation for session and organization of session</td>
<td>.63</td>
<td>.68</td>
</tr>
<tr>
<td>Mother’s receptivity toward visitors</td>
<td>.69</td>
<td>.79</td>
</tr>
<tr>
<td>Father’s receptivity toward visitors</td>
<td>.71</td>
<td>.79</td>
</tr>
<tr>
<td>How much difficulty did you have in completing this interview?</td>
<td>.54</td>
<td>.85</td>
</tr>
<tr>
<td>Do you have reason to doubt the validity of this interview and</td>
<td>.64</td>
<td>.41</td>
</tr>
<tr>
<td>home visit?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>How clean is this dwelling?</td>
<td>.82</td>
<td>.67</td>
</tr>
<tr>
<td>How safe is the interior of this building?</td>
<td>.32</td>
<td>.33</td>
</tr>
<tr>
<td>How many rooms are in this dwelling?</td>
<td>.83</td>
<td>.89</td>
</tr>
<tr>
<td>How safe is the area outside of this building?</td>
<td>.51</td>
<td>.69</td>
</tr>
<tr>
<td>The street on which this dwelling is located is:</td>
<td>.52</td>
<td>.86</td>
</tr>
<tr>
<td>The noise level in this neighbourhood around this dwelling is:</td>
<td>.57</td>
<td>.62</td>
</tr>
<tr>
<td>The safety of the neighbourhood around this dwelling is:</td>
<td>.34</td>
<td>.45</td>
</tr>
</tbody>
</table>

Intraclass correlations > .70 are in boldface.

Table 7 shows the inter-rater reliability on an item level for the Windshield Survey before and after training of team members. The training improved the reliability overall, with the exception of two items where the reliability became poorer. The intraclass correlations were still below .70 for seven items out of 12. As the Windshield Survey contains three subscales, inter-rater reliability was also assessed for composite mean scores of items within each subscale. The first subscale, Completing the Home Visit, consists of items 1-5, the second subscale, Indoor Environment consists of items 6-8 and the third subscale, Outdoor Environment, consists of items 9, 11, 12. Item 10 was not included in any subscale as it is a categorical variable.

Table 8. Intraclass correlations (ICC) for each subscale within the Windshield Survey before training (BT) and after training (AT)

<table>
<thead>
<tr>
<th>Subscale</th>
<th>ICC BT (N=74)</th>
<th>ICC AT (N=116)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completing the Home Visit</td>
<td>.74</td>
<td>.86</td>
</tr>
<tr>
<td>Indoor Environment</td>
<td>.81</td>
<td>.62</td>
</tr>
<tr>
<td>Outdoor Environment</td>
<td>.67</td>
<td>.66</td>
</tr>
</tbody>
</table>

Intraclass correlations > .70 are in boldface.
Table 8 shows the inter-rater reliability for the three subscales. The training of researchers had a positive effect on the reliability for the first scale, a negative effect for the second scale and a minimal effect for the third scale.

*Internal consistency*

Table 9 shows the internal consistency for the three subscales within the *Windshield Survey* for each rater before and after training. The highest $\alpha$ values were for the *Outdoor Environment* subscale. The lowest $\alpha$ values were for the *Indoor Environment* subscale.

<table>
<thead>
<tr>
<th>Subscale</th>
<th>$\alpha$ Before Training</th>
<th>$\alpha$ After Training</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completing the Home Visit</td>
<td>.61</td>
<td>.61</td>
</tr>
<tr>
<td>Indoor Environment</td>
<td>.37</td>
<td>.43</td>
</tr>
<tr>
<td>Outdoor Environment</td>
<td><strong>.76</strong></td>
<td><strong>.81</strong></td>
</tr>
</tbody>
</table>

Cronbach’s $\alpha > .70$ are in boldface.

*Validity*

When the structure of a scale is analysed the aim is to obtain a simple structure that is easily interpreted. The ideal structure here would be three components appearing, with items within each subscale having high loadings for the same component and low loadings for other components.
Table 10. Exploratory factor analysis of the *Windshield Survey* (based on means for the two raters). Subscale names are (1) *Completing the Home Visit*, (2) *Indoor Environment*, (3) *Outdoor Environment*

<table>
<thead>
<tr>
<th>Item</th>
<th>Component</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Subscale</strong></td>
<td>1</td>
</tr>
<tr>
<td>1  Family’s preparation for session and organization of session</td>
<td>-.07</td>
</tr>
<tr>
<td>1  Mother’s receptivity toward visitors</td>
<td>-.12</td>
</tr>
<tr>
<td>1  Father’s receptivity toward visitors</td>
<td>.05</td>
</tr>
<tr>
<td>1  How much difficulty did you have in completing this interview?</td>
<td>-.10</td>
</tr>
<tr>
<td>1  Do you have reason to doubt the validity of this interview and</td>
<td>.54</td>
</tr>
<tr>
<td>2  home visit?</td>
<td></td>
</tr>
<tr>
<td>2  How clean was this dwelling?</td>
<td>.12</td>
</tr>
<tr>
<td>2  How safe was the interior of this dwelling?</td>
<td>.14</td>
</tr>
<tr>
<td>2  How many rooms are in this dwelling?</td>
<td>.27</td>
</tr>
<tr>
<td>3  How safe is the area outside of this building?</td>
<td>.82</td>
</tr>
<tr>
<td>3  The street on which this dwelling is located is</td>
<td>.07</td>
</tr>
<tr>
<td>3  The noise level in the neighbourhood around this dwelling is</td>
<td>.84</td>
</tr>
<tr>
<td>3  The safety of the neighbourhood around this dwelling is</td>
<td>.80</td>
</tr>
</tbody>
</table>


The factor solution was not completely consistent with the subscales of the *Windshield Survey*. Four components were drawn and the solution was not perfectly clear. Three items of the third subscale, *Outdoor Environment*, clearly loaded on the first component and had low loadings for other components. However, one item had a low loading for the first component, but high loadings for the fourth component. Three items of the first subscale, *Completing the Home Visit*, clearly loaded on the second component. Two items of the subscale loaded on the third component and one on the first component. Two out of three items of the second subscale, *Indoor Environment*, clearly loaded on the third component, but the third item of the subscale loaded on the fourth component. All items except two had clear high loadings for one component and low loadings for the other components. The four components explained 67.7% of the total variance with the first, second, third and fourth component explaining 29.8%, 16.8%, 11.3% and 9.7%, respectively.

Two-tailed Pearson correlations were used to assess the associations between the home and neighbourhood environment, socioeconomic status, stimulation, parental depression and early indicators of child development. For the home and neighbourhood environment, averages of the two raters’ scores for each subscale of the *Windshield*
Survey were used. All the data for the subscales were used as the difference in internal consistency before and after training was minimal. For stimulation, an average score was computed from the two raters’ scores on each item. Those six scores were then used to compute a total stimulation score. For parental depression, a total score was computed out of the 20 questions for each parent. For early indicators of the children’s development, a total score was computed from the 10 ASQ items.

Table 11. Pearson correlations between variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Completing the Home Visit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Indoor Environment</td>
<td></td>
<td></td>
<td>.22**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Outdoor Environment</td>
<td></td>
<td>-.00</td>
<td>.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Mother's Income</td>
<td></td>
<td>.00</td>
<td>.13</td>
<td>.10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Father's Income</td>
<td></td>
<td>-.12</td>
<td>.23**</td>
<td>.07</td>
<td>.24**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Mother's Education</td>
<td></td>
<td>.02</td>
<td>.12</td>
<td>-.00</td>
<td>.20**</td>
<td>.23**</td>
<td></td>
<td></td>
<td></td>
<td></td>
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Significant correlations at \( p < .05 \) are marked with *. Significant correlations at \( p < .01 \) are marked with **.

The significant correlations between the Windshield Survey subscales and other variables were a positive correlation between Indoor Environment and stimulation and
father’s income, a positive correlation between *Outdoor Environment* and the Index of Multiple Deprivation, a negative correlation between *Outdoor Environment* and stimulation, a positive correlation between *Completing the Home Visit* and stimulation, and negative correlations between *Completing the Home Visit* and mother’s depression and father’s depression. The only significant correlation between the Windshield subscales was between *Completing the Home Visit* and *Indoor Environment*.

Stimulation was not significantly correlated with child development, neither were *Indoor Environment* and child development. The only socioeconomic status variable that correlated significantly with child development was father’s income. Mother’s depression was negatively correlated with child development, however the correlation between father’s depression and child development was not significant. Mother’s depression and father’s depression were not significantly correlated.

Not surprisingly, a significant correlation was found between mother’s subjective status and father’s subjective status. Mother’s subjective status was positively correlated with mother’s income, and mother’s education. Likewise, father’s subjective status was positively correlated with father’s income, and father’s education. Mother’s income and father’s income were positively correlated. Interestingly, the correlation between mother’s education and father’s education was not significant.

*Predictors of early indicators of children’s development*

A multiple regression analysis was used to assess if any of the above mentioned variables predicted child development. Father’s income and mother’s depression, the only two variables that correlated significantly with child development, were used. Father’s income provided significant prediction of child development, $\beta = -.18$, $p < .05$ as did maternal depression, $\beta = -.16$, $p < .05$. Father’s income and maternal depression explained 6% of the variance of child development, $R^2 = .06$. 

**Discussion**

The first aim of the study was to assess the inter-rater reliability of the *Windshield Survey*. That was done on an item level and for the three subscales within the survey before and after researchers received additional training. The norm for an acceptable reliability coefficient is .70 or higher. Only three of twelve items provided intraclass correlation coefficients at .70 or higher before training. Three items provided coefficients at .63 to .69 and the other six items provided coefficients lower than .60. After training the reliability improved overall with higher coefficients for 10 out of 12 items. Still, only five items yielded intraclass correlation coefficients over .70.

A possible explanation for the low reliability is the lack of variability for some of the items. For example, item 7, *How safe is the interior of this building?* (ICC after training = .33), lacked variability with the majority of homes considered safe. In such cases, minor deviations in judgement can result in lowered reliability. The same may apply to the last item, *The safety of the neighbourhood around this dwelling is...* (ICC after training = .45). These two items had the lowest standard deviations as can be seen in Table 1, and thus the least variance.

Another possible explanation for low reliability is that some items might have been too subjective. The aim of the training was to add examples to some of the items so guidelines were clear for raters. People have different views on what they consider safe or noisy so that may weigh more than objective guidelines. In support of this explanation, item 8, *How many rooms are in this dwelling?* (ICC after training = .89), which is an objective item, provided the highest reliability coefficients. The inter-rater reliability improved when the items were aggregated into the three subscales and a composite mean score for the items within each subscale was used. However, the effects of the training were positive for only one of the three subscales, which was a little disappointing.

The second aim of the study was to assess the internal consistency of the *Windshield Survey*. That was done for each subscale, before and after training. Only the *Outdoor Environment* subscale provided acceptable coefficients (α > .70). *Completing the Home Visit* provided coefficients of .61 and *Indoor Environment* even lower. The training had minimal effects on the internal consistency of all three subscales. Again, a possible explanation for low reliability could be lack of variability for some items.
De Marco & Vernon-Feagans’ (2013) study, where the Windshield Survey was administered, only the Outdoor Environment subscale was reported. Thus the other two might not have been considered useful, possibly due to lack of reliability. The two reliability analyses, inter-rater agreement and internal consistency, provided somewhat different results, especially for the Indoor Environment subscale. That further emphasises the need to use more than one analysis to assess the reliability of a scale.

The third aim of the study was to assess the validity of the Windshield Survey by analysing its structure and associations with socioeconomic status, stimulation in the home, parental depression and early indicators of children’s development. The structure reflected the subscales to some extent. The first component represents the Outdoor Environment subscale, with the exception of one item loading on another component. The second component represents Completing the Home Visit with the exception of two items. The third component is a bit more ambiguous but seems to represent the Indoor Environment subscale and Completing the Home Visit subscale. The fourth component is quite ambiguous as well, representing the size of house and type of area the family lived in. The results for the last component should be interpreted with caution as one of the items loading on it, The street on which this dwelling is located, is a categorical variable.

To further strengthen the validity associations between the Windshield Survey subscales and similar variables were assessed. It was assumed that the first subscale, Completing the Home Visit, would be related to stimulation and parental depression, the second subscale, Indoor Environment, to stimulation, and the third subscale, Outdoor Environment, to socioeconomic status.

A number of significant associations appeared that supported the validity. Completing the Home Visit, the first subscale was negatively correlated with both mother’s and father’s depression. This indicates that parents showing signs of depression were less receptive towards visitors, were less prepared for the visit, the visitors had more difficulty completing the visit and were more likely to doubt the validity of the visit than if parents did not show signs of depression. The first subscale was also positively associated with stimulation. This suggests that receptive and prepared parents, where the visit went well and was considered valid had homes where the infant had enough space for recreation, age appropriate toys and books, TV was
used appropriately, parents used correct grammar and the infant attended groups outside the home and vice versa.

*Indoor environment*, the second subscale, was positively correlated with stimulation. Clean and safe homes with multiple rooms were associated with enough space and toys for the infant, appropriate TV use, correct grammar of parents and attendance in groups outside of the home. *Indoor Environment* was also positively associated with father’s income. The higher the father’s income, the safer and cleaner home with more rooms.

The third subscale, *Outdoor Environment*, was positively associated with relative deprivation indicating that homes in safe and quiet areas are less deprived than homes in unsafe and noisy areas. *Outdoor Environment* was also negatively associated with stimulation which was surprising. This indicates that homes in safe and quiet areas provide less space, toys and activities for the infant which is puzzling. No significant associations appeared between *Outdoor Environment* and parental income, education or subjective status as was assumed. All validity analyses should be interpreted with caution as the reliability of the *Windshield Survey* was not completely satisfactory.

The fourth aim was to examine whether early indicators of child development were predicted by any of the variables relating to the children’s environment. Father’s income and mother’s depression were the only two variables significantly correlated with child development. Both were negatively associated with child development and significant predictors as well. The association between maternal depression and children’s developmental problems is known in the literature (e.g. Beardselee, Versage, & Giadstone, 1998; Martin, & Gaffan, 2000; Hughes, Roman, Hart, & Ensor, 2013). These results further emphasize the need for supporting mothers suffering post-natal depression.

It was more surprising to see that father’s income was negatively associated with child development. One could speculate that high income fathers might spend less time with their children that would result in worse child development. A quick search in the literature, however, revealed that the association between father’s income and child development might be a little more complicated. Tamis-LeMonda, Shannon, Cabrera, & Lamb (2004) suggest that father’s income has an indirect positive effect on child development by promoting sensitivity, positive regard and cognitive stimulation of
mothers toward the child. Furthermore, Gershoff, Aber, Raver, & Lennon (2007) emphasize the inclusion of material hardship when analysing the associations between parental income and child development. Clearly this topic needs further investigation.

Significant associations were neither found between paternal depression and child development, thus contradicting prior studies (e.g. Ramchandani et al., 2005; Ramchandani et al., 2008), nor between maternal and paternal depression as otherwise would be expected (Ramchandani et al., 2005; Pinheiro et al., 2005; Paulson, & Bazemore, 2010). Bradley and Caldwell’s research suggests that provision of appropriate play materials may have beneficial influences on children’s development (Bradley, & Caldwell, 1976a; Bradley, & Caldwell, 1976b; Bradley et al., 1989). However, no significant associations between stimulation and child development were found in the current study. The literature also suggests that chaos in the home and low socioeconomic status has negative effects on child development (Petrill, Pike, Price, & Plomin, 2004; Hart, Petrill, Deater-Deckard, & Thompson, 2007) but in this study no significant associations were found between child development and the Indoor Environment subscale, parental education, parental subjective status, maternal income or relative deprivation. It is though important to emphasize that the items measuring child development in this study are only early indicators as the children were only 4 months old. A detailed analysis of parental effects on development later on in the New Fathers and Mothers Study will be useful as more measurements on children’s development are available for older children.

As mentioned earlier, the literature on paternal effects on children’s development is scarce and the New Fathers and Mothers Study is taking a step in a positive direction in that regard. The study is being conducted in an interesting time in the history of child care in the United Kingdom. In early 2015 new rights allowing parents to share up to 50 weeks of leave came into effect. Fathers are now able to spend considerably more time with their new born child compared to the two weeks as it was previously. It will be interesting to see if these changes will be observed later on in the New Fathers and Mothers Study and other studies to come.
Conclusion

The inter-rater reliability of the *Windshield Survey* was satisfactory for some, but not all items. The results indicate that more training is needed to establish acceptable inter-rater reliability than was initially assumed at the onset of the study. A few items of the scale lacked variability in the current sample indicating that the scale might be more useful in more diverse areas. The internal consistency was acceptable for one subscale, *Outdoor Environment*. Again, the subscales might prove more reliable in more diverse areas. However, the *Outdoor Environment* subscale is an acceptable measure on its own in a sample such as this one. The results supported the validity of the *Windshield Survey* to some extent. The structure of the scale was somewhat consistent with the subscales and associations with similar variables emerged. Further investigation is needed on predictors of child development. Associations proposed in the literature did not appear in this study, with the exception of mother’s depression. A probable explanation is that the measures for child development were very preliminary.
References


Appendix A

Windshield Survey

Subscales:
Completing the Home Visit: Items 1-5
Indoor Environment: Items 6-8
Outdoor Environment: Items 9-12

1. Family’s preparation for session and organization of session.
   0 = Can’t rate
   1 = Surprise/Difficulty
   2 = Aware but unprepared
   3 = Aware/Ready
   4 = Good Hosts

2. Mother’s receptivity toward visitors.
   0 = Can’t rate
   1 = Very Uncomfortable
   2 = Distant but Polite
   3 = Average Friendliness
   4 = Very warm

3. Father’s receptivity toward visitors.
   0 = Can’t rate
   1 = Very Uncomfortable
   2 = Distant but Polite
   3 = Average Friendliness
   4 = Very warm

4. How much difficulty did you have in completing this interview?
   0 = Can’t rate
   1 = Very Smooth
   2 = Slight Difficulty
   3 = Some Difficulty
   4 = Great Difficulty

5. Do you have reason to doubt the validity of this interview and home visit?
   0 = Can’t rate
   1 = Probably Valid
   2 = Respondent Responses Possibly Invalid
   3 = Definitely Reasons to Doubt Validity
6. How clean is this dwelling?
   0 = Can’t rate
   1 = Very Dirty
   2 = Slightly Dirty
   3 = Messy
   4 = Clean

7. How safe is the interior of this building?
   0 = Can’t rate
   1 = Obviously dangerous
   2 = Slightly Dangerous
   3 = Average
   4 = Above Average Safety

8. How many rooms are in this dwelling?
   0 = Can’t rate
   1 = 1 or 2
   2 = 3 or 4
   3 = 5 or 6
   4 = >6

9. How safe is the area outside of this building?
   0 = Can’t rate
   1 = Obviously dangerous
   2 = Slightly Dangerous
   3 = Average
   4 = Above Average Safety

10. The street on which this dwelling is located is…:
    0 = Can’t rate
    1 = Mainly residential
    2 = Mixed Residential & Commercial
    3 = Mostly Commercial
    4 = Rural or Agricultural

11. The noise level in this neighbourhood around this dwelling is…:
    0 = Can’t rate
    1 = Very Quiet
    2 = Average
    3 = Noisy
    4 = Very Noisy
12. The safety of the neighbourhood around this dwelling is…:
   0 = Can’t rate
   1 = Very Safe/Crime Free
   2 = Average for This City
   3 = Unsafe
   4 = Very Unsafe/High Risk
Appendix B

Stimulation

Scale for all items:
0 = No
1 = Sometimes
2 = Yes
3 = Not available / Not observed

Items:
1. Does the infant have space for recreation?
2. Does the infant have age-appropriate toys?
3. Does the infant have books?
4. Is the use of TV appropriate (not left on continuously)?
5. Did the parent use correct grammar and pronunciation during the visit?
6. Does the infant attend groups outside the home?
Appendix C
Ages and Stages Questionnaire

Scale for all items:
0 = Not yet
1 = Sometimes
2 = Yes

Items:
1. Does baby chuckle softly?
2. After parent has been out of sight, does baby smile or get excited?
3. Does baby stop crying when he/she hears a voice other than parents?
4. Does baby make high-pitched squeals?
5. Does baby laugh?
6. Does baby make sounds when looking at toys or people?
7. When you move a toy slowly from side to side in front of baby’s face, does baby follow the toy with his/her eyes?
8. When you move a toy slowly up and down in front of baby’s face, does baby follow the toy with his/her eyes?
9. When in front of a large mirror, does baby smile or coo at him/herself?
10. Do you have any concern about your baby’s development?
Appendix D

CES-D Scale

Below is a list of some of the ways you may have felt or behaved. Please indicate how often you have felt this way during the past week by clicking the appropriate space.

Scale for all items:
1 = Rarely or none of the time (less than 1 day)
2 = Some or a little of the time (1-2 days)
3 = Occasionally or a moderate amount of time (3-4 days)
4 = Most or all of the time (5-7 days)

Items:
1. I was bothered by things that usually don't bother me
2. I did not feel like eating; my appetite was poor
3. I felt that I could not shake off the blues even with help from my family or friends
4. I felt that I was just as good as other people
5. I had trouble keeping my mind on what I was doing
6. I felt depressed
7. I felt that everything I did was an effort
8. I felt hopeful about the future
9. I thought my life had been a failure
10. I felt fearful
11. My sleep was restless
12. I was happy
13. I talked less than usual
14. I felt lonely
15. People were unfriendly
16. I enjoyed life
17. I had crying spells
18. I felt sad
19. I felt that people disliked me
20. I could not get "going"
Appendix E

Consent forms

Consent form

New Fathers and Mothers Study: Pre-natal Interview

1. I confirm that I have read the information sheet for the New Fathers and Mothers Study. I have had an opportunity to consider the information, ask questions and received satisfactory answers.

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my medical care or legal rights being affected.

3. I understand that the New Fathers and Mothers Study team will contact my health visitor to check that my baby has been delivered safely.

4. I understand that anonymous information collected about me may be used to support other research and shared with other researchers.

5. I understand that we may be chosen for either the general or the in-depth study, which involves saliva samples and home visits when my infant is 4, 14 and 24-months old.

6. If selected, my family would be happy to be contacted at each phase of the in-depth study to decide if we would like to take part.

7. I agree to take part in the questionnaire-based interview that is the first phase of the general part of the study.

________________________         ____________             ________________________
Name of Participant                        Date                        Signature

________________________         ____________             ________________________
Name of Person taking consent                        Date                        Signature

This study has been approved by the Cambridge Psychology Research Ethics Committee and by the local NHS Ethics Committee.
Consent Form

New Fathers and Mothers Study: First Home visit

1. I confirm that I have read the information sheet for this wave of the New Fathers and Mothers Study. I have had an opportunity to consider the information, ask questions and received satisfactory answers.

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my medical care or legal rights being affected.

3. I understand that anonymous information collected about me may be used to support other research and shared with other researchers.

4. I understand that I can opt out of specific questions or tasks without consequence.

5. I agree to take part in the home activities with my baby and the questionnaire-based interview

Please initial box

___________________________        ____________             ________________________
Name of Participant                  Date                      Signature

___________________________        ____________             ________________________
Name of Person taking consent        Date                      Signature

This study has been approved by the Cambridge Psychology Research Ethics Committee and by the local NHS Ethics Committee.
Appendix F

Ethical approval

05 August 2014

Professor Claire Hughes
Centre for Family Research
University of Cambridge
Free School Lane
Cambridge
CB2 3RQ

Dear Professor Hughes

Study title: Origins of early individual differences in self regulation: A multi-method study involving mothers, fathers and infants in the UK, the Netherlands and the USA

REC reference: 14/LO/1113

Protocol number: A093314

IRAS project ID: 148749

Thank you for your letter of 22 July 2014, responding to the Committee’s request for further information on the above research and submitting revised documentation.

The further information was considered in correspondence by a Sub-Committee of the REC. A list of the Sub-Committee members is attached.

We plan to publish your research summary wording for the above study on the HRA website, together with your contact details. Publication will be no earlier than three months from the date of this opinion letter. Should you wish to provide a substitute contact point, require further information, or wish to make a request to postpone publication, please contact the REC Manager, Dr Ashley Totenhofer, nrescommittee.london-bloomsbury@nhs.net.
Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised, subject to the conditions specified below.

Conditions of the favourable opinion

The favourable opinion is subject to the following conditions being met prior to the start of the study.

You should notify the REC in writing once all conditions have been met (except for site approvals from host organisations) and provide copies of any revised documentation with updated version numbers. The REC will acknowledge receipt and provide a final list of the approved documentation for the study, which can be made available to host organisations to facilitate their permission for the study. Failure to provide the final versions to the REC may cause delay in obtaining permissions.

Management permission or approval must be obtained from each host organisation prior to the start of the study at the site concerned.

Management permission ("R&D approval") should be sought from all NHS organisations involved in the study in accordance with NHS research governance arrangements.

Guidance on applying for NHS permission for research is available in the Integrated Research Application System or at http://www.rdforum.nhs.uk.

Where a NHS organisation’s role in the study is limited to identifying and referring potential participants to research sites ("participant identification centre"), guidance should be sought from the R&D office on the information it requires to give permission for this activity.

For non-NHS sites, site management permission should be obtained in accordance with the procedures of the relevant host organisation.

Sponsors are not required to notify the Committee of approvals from host organisations

Registration of Clinical Trials

All clinical trials (defined as the first four categories on the IRAS filter page) must be registered on a publically accessible database within 6 weeks of recruitment of the first participant (for medical device studies, within the timeline determined by the current registration and publication trees).

There is no requirement to separately notify the REC but you should do so at the earliest opportunity e.g. when submitting an amendment. We will audit the registration details as part of the annual progress reporting process.
To ensure transparency in research, we strongly recommend that all research is registered but for non-clinical trials this is not currently mandatory.

If a sponsor wishes to contest the need for registration they should contact Catherine Blewett (catherineblewett@nhs.net), the HRA does not, however, expect exceptions to be made. Guidance on where to register is provided within IRAS.

**It is the responsibility of the sponsor to ensure that all the conditions are complied with before the start of the study or its initiation at a particular site (as applicable).**

**Ethical review of research sites**

**NHS sites**

The favourable opinion applies to all NHS sites taking part in the study, subject to management permission being obtained from the NHS/HSC R&D office prior to the start of the study (see "Conditions of the favourable opinion" below).

**Approved documents**

The final list of documents reviewed and approved by the Committee is as follows:

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Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

After ethical review

Reporting requirements

The attached document “After ethical review – guidance for researchers” gives detailed guidance on reporting requirements for studies with a favourable opinion, including:

- Notifying substantial amendments
- Adding new sites and investigators
- Notification of serious breaches of the protocol
- Progress and safety reports
- Notifying the end of the study

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<td>Summary, synopsis or diagram (flowchart) of protocol in non technical language [Pathways of participation]</td>
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<td>21 May 2014</td>
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<td>Validated questionnaire [GHQ]</td>
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<td>Validated questionnaire [Five Minutes Speech Sample Adaption]</td>
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<td>Validated questionnaire [CSI-16]</td>
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<td>Validated questionnaire [Life History Calendar]</td>
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<td>Validated questionnaire [Conflict Tactics Scale: Partner Conflict]</td>
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<td>Validated questionnaire [STAI-Y-6]</td>
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<td>Validated questionnaire [BITSEA]</td>
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The HRA website also provides guidance on these topics, which is updated in the light of changes in reporting requirements or procedures.

**User Feedback**

The Health Research Authority is continually striving to provide a high quality service to all applicants and sponsors. You are invited to give your view of the service you have received and the application procedure. If you wish to make your views known please use the feedback form available on the HRA website: [http://www.hra.nhs.uk/about-the-hra/governance/quality](http://www.hra.nhs.uk/about-the-hra/governance/quality)

**HRA Training**

We are pleased to welcome researchers and R&D staff at our training days – see details at [http://www.hra.nhs.uk/hra-training/](http://www.hra.nhs.uk/hra-training/)

| 14/L0/1113 | Please quote this number on all correspondence |

With the Committee's best wishes for the success of this project.

Yours sincerely

Signed on behalf of:
**Reverend James Linthicum Vice-Chair**

Email: [nrescommittee.london-bloomsbury@nhs.net](mailto:nrescommittee.london-bloomsbury@nhs.net)

**Enclosures:**

List of names and professions of members who were present at the meeting and those who submitted written comments

“After ethical review – guidance for researchers”

**Copy to:**

Professor Stephen Kelleher - Cambridge University Hospitals

Ms Sarah Foley – University of Cambridge

**NRES Committee London - Bloomsbury**

Attendance at Sub-Committee of the REC meeting on 05 August 2014
**Committee Members:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Profession</th>
<th>Present</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr Rachel L Knowles</td>
<td>Clinical Research Fellow</td>
<td>Yes</td>
<td></td>
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<tr>
<td>Dr Leah Li</td>
<td>Statistician</td>
<td>Yes</td>
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<tr>
<td>Reverend Jim Linthicum (ViceChair)</td>
<td>Lay member - Hospital Chaplain</td>
<td>Yes</td>
<td>Chaired the meeting</td>
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</table>

**Also in attendance:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Position (or reason for attending)</th>
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</thead>
<tbody>
<tr>
<td>Dr Ashley Totenhofer</td>
<td>REC Manager</td>
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</tbody>
</table>
Appendix G

*Rater guidelines for the Windshield Survey*

*(Guidelines in brackets)*

4. How much difficulty did you have in completing this interview?
   - 0 = Can’t rate
   - 1 = Very Smooth
   - 2 = Slight Difficulty *(Stopping and restarting tasks, fussy baby)*
   - 3 = Some Difficulty *(Visit exceeds 1¼ hours after consent / chat)*
   - 4 = Great Difficulty *(Incomplete data after 2 visits)*

5. Do you have reason to doubt the validity of this interview and home visit?
   - 0 = Can’t rate
   - 1 = Probably Valid
   - 2 = Respondent Responses Possibly Invalid *(Signs of inappropriate behaviour in one task – e.g. smiling/laughing during still-face)*
   - 3 = Definitely Reasons to Doubt Validity *(Signs of inappropriate behaviour in more than one task – e.g. smiling/laughing during still-face)*

6. How clean is this dwelling?
   - 0 = Can’t rate
   - 1 = Very Dirty *(Examiner would not accept a drink and does not feel comfortable sitting down)*
   - 2 = Slightly Dirty *(Food / dirty plates lying around, stacks of dirty plates in kitchen)*
   - 3 = Messy *(Things scattered around floor, examiner has to move things out of the way to get around)*
   - 4 = Clean

7. How safe is the interior of this building?
   - 0 = Can’t rate
   - 1 = Obviously dangerous *(Imminent risk, e.g. big objects that could easily fall on baby, sharp objects lying around baby)*
   - 2 = Slightly Dangerous *(Possible risk, e.g. big, overenthusiastic pets)*
   - 3 = Average
   - 4 = Above Average Safety *(Baby proofing)*
8. How many rooms are in this dwelling? *(Bedrooms)*
   - 0 = Can’t rate
   - 1 = 1 or 2
   - 2 = 3 or 4
   - 3 = 5 or 6
   - 4 = >6

9. How safe is the area outside of this building?
   - 0 = Can’t rate
   - 1 = Obviously dangerous *(Front door opens immediately on to a very busy road, dangerous construction work, e.g. whole in road)*
   - 2 = Slightly Dangerous *(Front door opens immediately on to a street)*
   - 3 = Average *(Front door does not open immediately on to a street, some space between street and door)*
   - 4 = Above Average Safety *(Big space between street and front door, e.g. long garden, driveway / private parking space)*

11. The noise level in this neighbourhood around this dwelling is…:
   - 0 = Can’t rate
   - 1 = Very Quiet *(Nothing can be heard from inside the house, e.g. suburbs, country houses)*
   - 2 = Average *(Very little noise can be heard from inside the house, e.g. occasional cars or people)*
   - 3 = Noisy *(Some noise can be heard from inside the house for most of the visit, e.g. busy streets, trucks, cars, people)*
   - 4 = Very Noisy *(Constant loud noises can be heard from inside of the house, e.g. construction work, train lines)*

12. The safety of the neighbourhood around this dwelling is…:
   - 0 = Can’t rate
   - 1 = Very Safe/Crime Free *(Very quiet areas, e.g. suburbs, country houses)*
   - 2 = Average for This City
   - 3 = Unsafe *(Possible threat, e.g. antisocial behaviour)*
   - 4 = Very Unsafe/High Risk *(Obvious threat, e.g. criminal activity)*