Social Disadvantage and Child Emotional and Behavioural Problems:

At HOME in the Netherlands

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Social Disadvantage and Child Emotional and Behavioural Problems: At HOME in the Netherlands

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Voor mijn ouders, die mij leerden
mijn doelen na te streven
en
nooit op te geven

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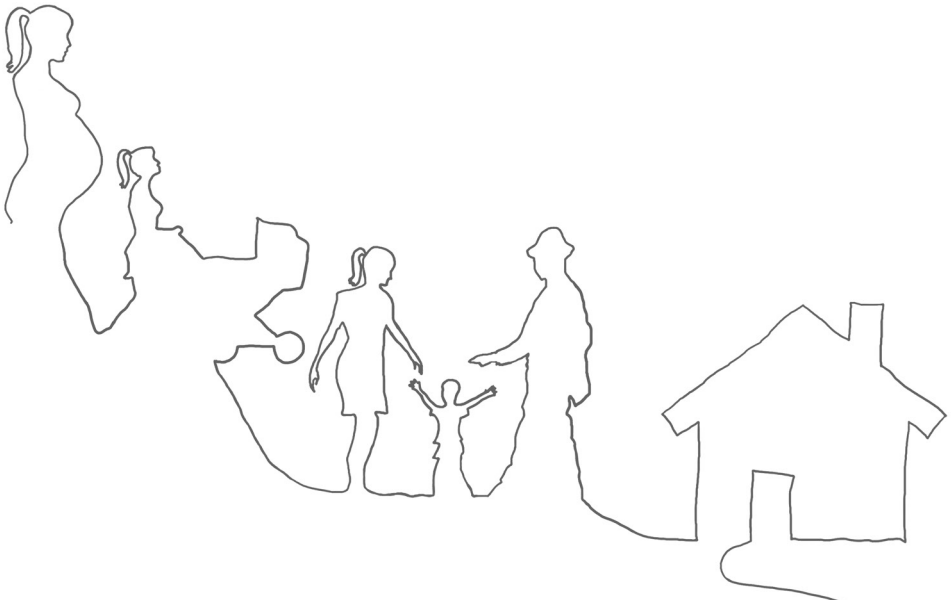

Chapter 1

Introduction

Social disadvantage is a construct that captures various dimensions of social position, such as economic status, educational attainment, as well as ethnicity. There is considerable evidence that social disadvantage is associated with emotional and behavioural problems in children (Bradley & Corwyn, 2002; Brooks-Gunn & Duncan, 1997; McLoyd, 1998). These associations may occur when children are as young as age 3 and 5 years (Kiernan & Huerta, 2008; Linver, Brooks-Gunn, & Kohen, 2002; Yeung, Linver, & Brooks-Gunn, 2002).

A challenge for intervention includes that social disadvantage is often structural in nature and, as a result, is largely impervious to change (McLoyd, 1998). It has been found that much of the association of low family income with adverse child development is indirect, through more proximal processes such as parental mental health and the home environment, rather than direct (Bor et al., 1997; Kiernan & Huerta, 2008; Linver et al., 2002; McLeod & Shanahan, 1993; NICHD, 2005; Pachter, Auinger, Palmer, & Weitzman, 2006; Yeung et al., 2002). This evidence invites a number of possible policy responses. Among these possible responses is the exploration of more proximal family processes as potential mechanisms underlying the detrimental associations of social disadvantage with children's development. Information on such mechanisms is key to the identification of leverage points amenable to policy intervention.

It was the overarching aim of this thesis to provide a better understanding of how social disadvantage is associated with young children's emotional and behavioural problems. Furthermore, given that harmful associations of social disadvantage with children's emotional and behavioural development may already emerge in early childhood and, as such, may be reduced most effectively by early childhood interventions (Brooks-Gunn & Duncan, 1997; Duncan & Brooks-Gunn, 2000), the focus of this thesis was directed at the early years of a child's life.

HOW SOCIAL DISADVANTAGE MATTERS FOR YOUNG CHILDREN'S EMOTIONAL AND BEHAVIOURAL DEVELOPMENT

Numerous studies have revealed that social disadvantage is negatively associated with parental material investments in the development of children (Conger & Donnellan, 2007; Martin et al., 2010). There is evidence that children residing in low-income households have limited access to age-appropriate learning resources (e.g., learning toys or books) in the home. The availability of home learning-oriented toys for children does not only serve as a motivational base for continued learning. It also affords opportunities for social exchanges with parents and, consequently, enforces the development of social arousal mechanisms (Bradley & Corwyn, 2002). In the absence of such learning materials, boredom may set in, leading children to become frustrated and engage in problematic behaviours (Bradley

& Corwyn, 2002). Furthermore, low-income children are more likely to live in houses that are physically deteriorated (Bradley & Corwyn, 2002; Duncan & Brooks-Gunn, 2000; Evans, 2004; McLoyd, 1998). Substandard housing quality may adversely impact interpersonal relationships and social support, which then may affect children's mental health (Evans, 2006). Also, children living in physically deteriorated houses may get sick more often, which then increases school absenteeism (Evans, 2006). Although highly plausible for older children, these processes involving the physical home environment are less clear for infants. It was the purpose of the current thesis to assess home environments, including the physical conditions of the home and the provision of learning resources, in the first few months of the child's life and to examine their prospective associations with children's emotional and behavioural problems.

Care givers who are economically disadvantaged are at higher risk of poor emotional health than those who are not disadvantaged. It has been repeatedly shown that economic disadvantage is related to maternal depressive symptoms (Brooks-Gunn & Duncan, 1997; Martin et al., 2010; McLoyd, 1998). Maternal depressive symptoms, in turn, have been found to be associated with disruptions in parenting such as more harsh disciplinary practices but also more parenting stress (Forman et al., 2007; Lovejoy, Graczyk, O'Hare, & Neuman, 2000; McLoyd, 1998). Given that impaired parenting is an established risk factor for children's healthy development, economic disadvantage may affect children's emotional and behavioural development through maternal depression, which may diminish or disrupt parenting skills (Conger & Donnellan, 2007; Martin et al., 2010).

There is ample evidence that the above family processes involving home environments and parental characteristics constitute mechanisms explaining part of the association between family economic disadvantage and young children's emotional and behavioural problems (Bor et al., 1997; Kiernan & Huerta, 2008; Linver et al., 2002; McLeod & Shanahan, 1993; NICHD, 2005; Pachter et al., 2006; Yeung et al., 2002). However, the vast majority of the studies investigating these mechanisms in young children have been conducted in the United States, where social-economic inequalities are known to be more pronounced than in any other industrialised nation (Caminada & Goudswaard, 2001; Moss, 2000). Associations between social disadvantage and children's development also exist in publicly funded health-care systems but tend to be weaker (Propper, Rigg, & Burgess, 2007). In this thesis, we sought to extend the above findings on how economic disadvantage is associated with young children's emotional and behavioural problems to a non-American sample. In a population-based sample of Dutch children and their families, the home environment, parental psychopathology, and parenting were all analysed as potential mechanisms underlying these associations.

IN-DEPTH ASSESSMENTS

Observing the home environment

In-depth assessments of those physical and psychosocial settings inhabited by socially disadvantaged families may provide a better understanding of what mechanisms are operating on the associations of family social disadvantage with child emotional and behavioural problems. As mentioned above, information on these mechanisms may have implications for intervention programmes. Furthermore, these in-depth assessments may facilitate the identification of children in need of such intervention programmes.

Previous studies often used the Home Observation for Measurement of the Environment (HOME) Inventory (Caldwell & Bradley, 1984) as a measure of children's home environment. The HOME Inventory comprises of scales that measure household resources, such as the physical conditions of the home, the provision of learning materials and toys, and the emotional responsiveness of the caregiver to the child. The information needed to score the HOME Inventory is obtained not only through observation but also through an interview with the care giver. To reduce the possible effect of social desirability response bias associated with interview data, we developed an instrument for the assessment of children's home environments that relied exclusively on observation.

Conducting DSM-based psychiatric interviews

Effective planning of mental health facilities depends on accurate estimates not only of the prevalence of psychiatric disorders in the population, but also of the impairment imposed by these disorders and psychiatric comorbidity. Behavioural checklists have contributed enormously to the body of evidence by identifying subgroups of children at the extreme of the distribution of normative emotions and behaviours (Egger & Angold, 2006). In this thesis, we examined prevalence rates, multiple levels of impairment, and comorbidity of DSM (American Psychiatric Association, 1994) disorders using detailed interview.

AIMS OF THE STUDY

To better understand how social disadvantage is associated with young children's emotional and behavioural problems, the following specific aims were tested in this thesis. In *chapter 2*, we examined the psychiatric properties and usefulness of an instrument that was developed in the Generation R Study to assess infants' home environments exclusively by observation. In *chapter 2.1*, we reported on the development, validity,

and reliability of this observational instrument. In *chapter 2.2*, we examined prospective associations of young infants' home environments as assessed by the instrument with emotional and behavioural problems above and beyond indicators of family social disadvantage. By examining these independent associations, we aimed to investigate whether home observations with the current instrument add to screening information based on family socio-economic and socio-demographic background characteristics. In *chapter 3* we aimed to identify potential mechanisms through which indicators of social disadvantage contribute to the development of young children's emotional and behavioural problems. We focused on economic disadvantage and a maternal history of childhood maltreatment. In *chapter 3.1*, we analysed the observed home environment, maternal depressive symptoms, parenting stress, and harsh discipline as potential mediators of the associations between family economic disadvantage and children's emotional and behavioural problems. In *chapter 3.2*, we examined maternal and paternal mechanisms underlying the association between a maternal history of childhood maltreatment and her offspring's emotional and behavioural problems. In *chapter 4*, we estimated prevalence rates and comorbidity of DSM-based psychiatric disorders according to level of impairment for diagnosis. In *chapter 5*, the main findings of these studies are discussed, together with their clinical implications and methodological considerations.

THE GENERATION R STUDY

The current thesis is embedded in Generation R, a population-based cohort from fetal life onwards (Jaddoe et al., 2012; Tiemeier et al., 2012). The Generation R Study was designed to identify early biological and environmental determinants of growth, development, and health. Pregnant women living in the study area in Rotterdam, the Netherlands, with an expected delivery date between April 2002 and January 2006 were invited to participate. To explore the aims mentioned above, we utilized data obtained as part of the Generation R prenatal and postnatal phases to age 9. Data collection ranged from questionnaires to observations and detailed interview.

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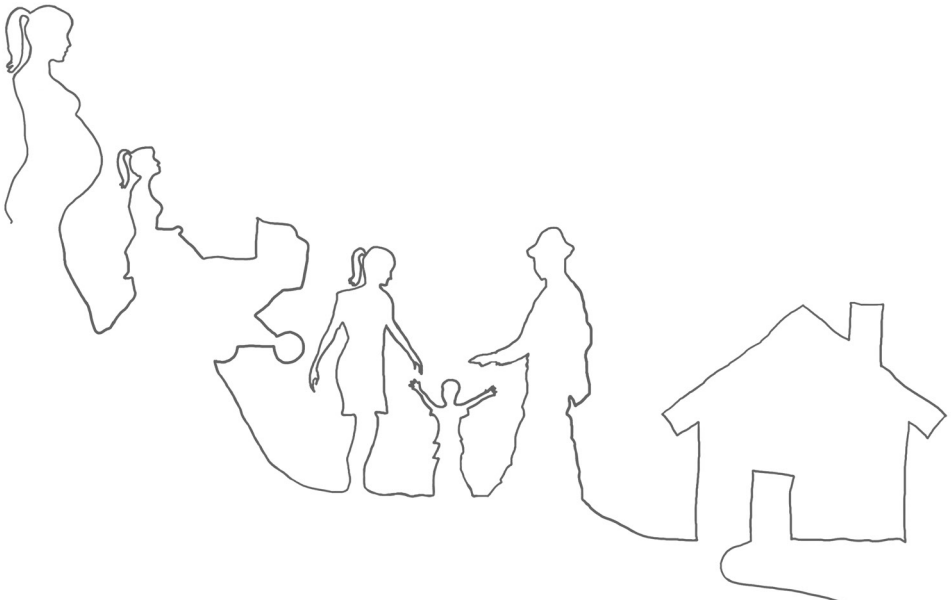
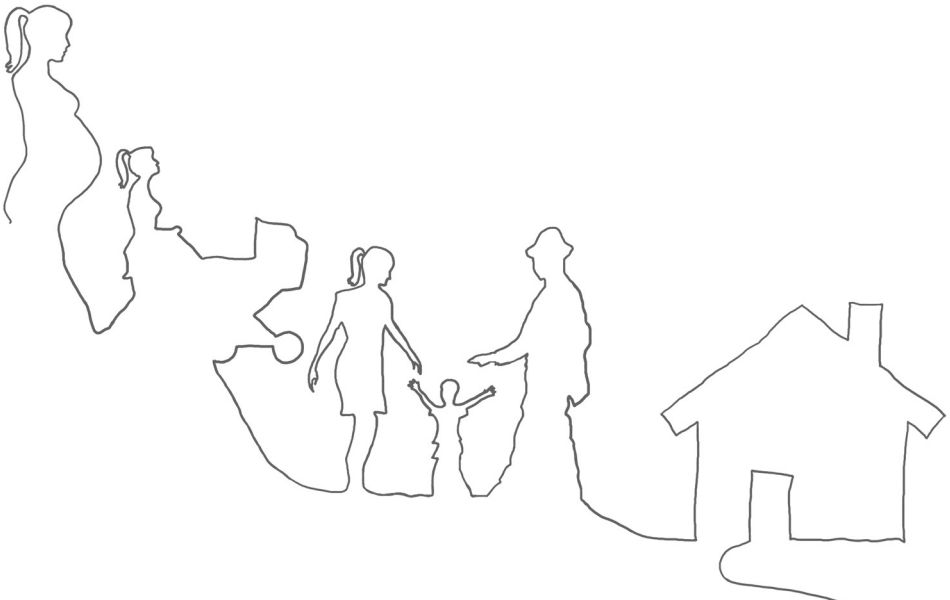


Chapter 2

Home environments of infants



Chapter 2.1

A brief observational instrument for the assessment of infant home environment: Development and psychometric testing

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ABSTRACT

The present paper reports on the development and the psychometric properties of a brief observational assessment of home environments for use in large-scale investigations with young infants. We generated observational items conceptually relevant for child development by two methods. First, we adapted the Infant Toddler Home Observation for Measurement of the Environment (IT-HOME) inventory for use in an exclusively observational context. Second, we added new observational items following a review of relevant literature and consulting professionals. The quality of the instrument was first evaluated in a pilot study (n = 926). In our study sample of 3,406 families and their children (median age = 3.1 months, range = 1.6 - 6.0), exploratory factor analysis was used to identify latent constructs, Cronbach's alpha was used as a measure of internal consistency, and convergent validity was evaluated against family socio-demographic characteristics. Inter-observer agreement was investigated in a sub-sample of the respondents (n = 124). The results supported good psychometric properties of the instrument based on: (a) exploratory factor analysis yielding three meaningful latent constructs, (b) Cronbach's alphas ranging from α = 0.66 to α = 0.90, (c) inter-observer agreement ranging from r = 0.75 to r = 0.91, and (d) associations between the instrument and socio-demographic characteristics in the expected direction [e.g., odds ratio for low income = 15.24, 95% confidence interval (11.60, 20.01)].

INTRODUCTION

Early environment affects multiple aspects of children's development. Research indicated that a poor early family environment influences the development of behavioural and emotional problems, cognitive and language problems, as well as health problems (Bradley, 1993, 1994; Evans, 2006; Taylor, Lerner, Sage, Lehman, & Seeman, 2004; Totsika & Sylva, 2004). Aspects of early family environment that have emerged as influential include psychosocial characteristics such as the amount of support, responsiveness and stimulation children receive in the home surroundings, as well as physical characteristics such as housing quality and the provision of developmentally stimulating material resources (Bradley, 1993, 1994; Evans, 2006; Taylor et al., 2004; Totsika & Sylva, 2004).

Given these findings, a structured validated assessment of home environments of young children may have potential implications for the early identification of children at risk of impaired development. Previous research investigating children's home environments generally considered the events, objects and social interactions experienced by a child in the family context (Bradley, 1993, 1994). The 45-item Infant Toddler Home Observation for Measurement of the Environment (IT-HOME) inventory (Caldwell & Bradley, 1984) currently distinguishes itself as the most widely used, validated measure of home environments of children from birth to three years of age. The information needed to score the IT-HOME inventory is obtained through observation of the child in the home surroundings but also relies on an interview with the primary caregiver (Caldwell & Bradley, 1984). Interview-based data have been criticized due to their exclusive reliance on participant's reporting, which is liable to distortion (Lytton, 1971). Predominant sources of distortion are social-desirability and inaccuracy of recall (Bailey, Hebbeler, Olmsted, Raspa, & Bruder, 2008; Holtgraves, 2004; Lytton, 1971). In contrast, observational measures have the advantage of directly assessing environments, without the interference of participant's subjective reporting (Bailey et al., 2008; Lytton, 1971).

In the current study, we aimed to develop a reliable, valid and brief observational assessment of home environments for use in large-scale investigations with young infants. We generated observational items conceptually relevant for child development by two methods. First, we adapted the IT-HOME inventory for use in an exclusively observational context. Second, we added new observational items following a review of relevant research literature and consulting professionals. This paper describes the development and initial validation of this adapted IT-HOME inventory which was tested in a large population-based study.

METHODS

Item generation and item selection

The purpose of this study was to develop a brief observational assessment of infants' home environments, defined as the events, objects and social interactions experienced by a child in the family context. We generated observational items conceptually relevant for child development by two methods. First, we adapted the 45-item IT-HOME inventory (Caldwell & Bradley, 1984) for use in an exclusively observational context. Consequently, we adapted or excluded IT-HOME inventory items that may require supplementary interview data. Second, we added new observational items following a review of relevant research literature and consulting professionals with experience in psychiatry, child psychiatry, epidemiology, or public health. Using these two methods we generated a pool of 48 items from which 25 were guided by the original IT-HOME inventory. In line with the IT-HOME inventory, all items were binary coded.

In order to determine the quality of these 48 items a pilot study was conducted. Trained research nurses observed the home environments of 926 families in the presence of the primary caregiver and the infant. In revising the items, we used the suggestions of the professionals who had contributed to the item generation. After evaluation we revised some items and deleted others because of insufficient variability or insufficient observational feasibility. The resulting revised scale consisted of 35 items that were administered in our total study sample (n = 3,406).

After the data collection in the study sample was completed, we performed a final evaluation of the items to obtain the present instrument. First, the correlation matrix of the 35 items was inspected for variables that had little in common with other variables and may thus have low communalities (the proportion of the variance in a given observed variable that is explained by all the factors jointly) (Fabrigar, Wegener, MacCallum, & Strahan, 1999). Examination of the correlation matrix of the 35 items resulted in the exclusion of four items that had low correlations with the majority of variables (coefficients < 0.2; e.g., "Brother or sister interferes with the assessment"). Second, when selecting items to include in the analysis, we performed a final evaluation of the face validity of the variables (Fabrigar et al., 1999). Although conceptually relevant in our setting, two items were rated as having a relatively low generalizability to other settings and were therefore excluded: (1) "Parents express interest in the study findings related to their children", and (2) "During the visit, television or radio noise is causing distraction".

The remaining pool consisted of 29 items and was subjected to exploratory factor analysis (EFA). When conducting EFA, factor loadings (> 0.30) and communalities (> 0.50) were inspected for item inclusion (Fabrigar et al., 1999). We further based item inclu-

sion on theoretical notions. That is, items were included based on existing literature on children's home environments and developmental outcomes.

Exploratory factor analysis (EFA)

We conducted EFA accommodating binary variables as implemented in Mplus version 5 (Muthén & Muthén, 2007). EFA is a common statistical method used to determine the number of latent constructs that are needed to explain the correlations among a set of observed variables (Rabe-Hesketh & Skrondal, 2008). By using EFA, our goal was to understand the structure of correlations among our observed variables (i.e., identifying latent constructs). Reversed adapted IT-HOME items were recoded before analysis.

EFA analysis was conducted with weighted least squares mean- and variance-adjusted (WLSMV) parameter estimates that are appropriate for categorical data (Muthén & Muthén, 2007). We used geomin (oblique) rotation, which is the default rotation in Mplus. Oblique rotations such as geomin permit correlations among factors and estimates of the correlations among factors are provided (Fabrigar et al., 1999).

We decided on how many factors to extract based on the inspection of the eigenvalues and a scree plot (Fabrigar et al., 1999). Because chi-square values are sensitive to the sample size, we used the comparative fit index (CFI), the Tucker-Lewis index (TLI) and the root mean square error of approximation (RMSEA) as our main indices of model fit (Browne & Cudeck, 1993; Hu & Bentler, 1999). For the CFI and TLI, values greater than 0.90 generally indicate reasonably good fit. For the RMSEA, values of 0.05 or lower indicate close fit, the range of 0.05 to 0.08 is interpreted as reasonable fit, the range of 0.08 to 0.10 as marginal fit, and values greater than 0.10 as unacceptable fit.

Items were retained to define the factors for the adapted IT-HOME inventory based on factor loadings (> 0.30), communalities (> 0.50), and theoretical notions. Items that did not meet these criteria were labelled "Other observation items". These items contribute to the total score. See the Achenbach System of Empirically Based Assessment (ASEBA; Achenbach & Rescorla, 2000) for an example of a comparable approach.

Study design and participants

The present study was conducted within Generation R, a population-based cohort from foetal life onwards (Jaddoe et al., 2010). Pregnant women living in the study area in Rotterdam, the Netherlands, with an expected delivery date between April 2002 and January 2006, were approached to participate. Prenatal assessments including foetal ultrasound examinations were planned in early, mid-, and late pregnancy. In the period from birth to the age of four years, data collection in children included a home visit at the age of three months, questionnaires, and routine visits to the child health centres. Currently, at

the age of five years, detailed hands on assessments are performed in a dedicated Generation R research centre. These ongoing assessments focus on several developmental outcomes including behaviour, cognition, asthma, and infectious diseases. The study was conducted in accordance with the guidelines proposed in the World Medical Association Declaration of Helsinki, and was approved by the Medical Ethical Committee at Erasmus University Medical Centre Rotterdam. Written informed consent was obtained from all participants.

For the current study, a total of 6,649 caregivers and their infants were eligible for a systematic observation of their home environment. Assessing home environments within the framework of such a large cohort study, we deemed it important to develop a brief and easy to administer instrument. In order to minimize mutual influence of child and environment, the aim was to plan a visit of all eligible families when infants were around 3 months of age (± 1 months) (Bradley, 1994). Our planning of the date for the home visit took into account the expected date of delivery. Because the assessments were conducted during a home visit and visits were frequently rescheduled, it was not logistically possible to visit all children at exactly the same age. We did not exclude children visited after this target age to age six months to minimize selection bias. In the present study, home visits were scheduled for 45 minutes. During these home visits, additional assessments were performed. Generally, when assessing the home environment of families and their infants exclusively by observation, other activities should be added. Although participants were informed in general terms of measurements of their living conditions during consent, they were blinded to the actual observational assessments.

Of the 6,649 eligible caregivers and their infants, 4,609 participated in the Generation R home visitation program (response rate 69%). Of these 4,609 observations, 926 were administered in the pilot phase. Non-participation was due to refusal to participate, administrative problems or change of address. The study version was tested in 3,683 infants (4,609 - 926). For psychometric reasoning, we excluded infants above the age limit of six months (n = 220) from analyses. We used this age-restriction because the quality of home environments may change as children mature and become more capable of managing their environment (Bradley, 1994). By the age of six months, many infants are already able to provoke encouragement and attention from their parents, suggesting mutual influence (Bradley, 1993, 1994; Zeanah, Boris, & Larrieu, 1997). In order to avoid paired observations, we randomly excluded one twin per pair (n = 33). Home observational data of 24 infants were not included because of missing data on all variables. After excluding these infants, our population for analysis comprised 3,406 infants. Table 1 presents the characteristics of our study sample. The measures are described later in this section.

Comparing families in which home observations were performed (the respondents) with families in which no home observations were performed (the non-respondents),

Table 1. Characteristics of the study population

	Total (*n* = 3,406)
Family net income	
> €2000	60.4
€1200 - €2000	19.6
< €1200	20.0
Educational level mother	
High	46.4
Middle	29.9
Low	23.7
Age mother (years)	30.3 (5.2)
Marital status, single	13.3
Age infant at home visit (months)	3.1 (1.6-6.0)
Infant gender, girl	51.1
Infant national origin	
Dutch	49.7
Other-Western	11.5
Non-Western	38.8

Note. Values are means (standard deviations) for continuous normally distributed variables, medians (range) for continuous non-normally distributed variables, and percentages for categorical variables.

we found that the respondents and non-respondents did not differ on prevalence of low income. Non-respondents were more often of Dutch national origin than respondents (59.0% vs. 49.9%, $\chi^2 = 47.82$, $p < 0.001$). Non-respondents more often completed higher levels of education than respondents (48.1% vs. 45.2%, $\chi^2 = 4.30$, $p = 0.038$).

Internal consistency

In order to measure the degree to which the items that make up a latent construct are all producing similar scores, Cronbach's alpha coefficients were calculated (Cronbach, 1951). Cronbach's alphas were examined for the total scale and subscales using SPSS version 17.0 for Windows (SPSS Inc., 2009). Generally, a Cronbach's alpha coefficient of 0.70 or higher indicates acceptable internal consistency.

Inter-observer reliability

Consistency of the responses to the scales between observers was assessed in a sub-sample of the respondents. A convenience, non-random sample of 124 families was selected for this purpose. In these families, two research assistants performed a home visit together and independently observed the same home environment. Respective

adapted IT-HOME inventory scores were summed to derive scale scores and intra-class correlation coefficients (*ICCs*) were calculated using SPSS version 17.0 for Windows (SPSS Inc., 2009).

Validation of the adapted IT-HOME inventory

As there was no instrument available that exclusively measures infants' home environments by observation, we subjected the adapted IT-HOME inventory to the following type of validity test. Convergent validity was tested by examining both univariate and multivariate associations between family socio-demographic characteristics and the adapted IT-HOME inventory. Respective adapted IT-HOME inventory scores were summed to derive the total scale. Higher scores on this total scale represented more favourable home environments. Following a suggestion in earlier IT-HOME research (Totsika & Sylva, 2004), we calculated the 25th percentile as a cut-off point. Scores below the cut-off point were considered "less-optimal home environments". Using this dichotomised variable, binary logistic regression analyses were performed using SPSS version 17.0 for Windows (SPSS Inc., 2009). In multivariate analysis, a category missing was added to the categorical socio-demographic variables with missing values, which were infant national origin (7.6%), maternal education (10.3%), family income (25.2%), and marital status (10.2%).

In order to test consistency, we also performed multivariate analysis with the adapted IT-HOME total score on a dimensional level. The score had a negatively skewed distribution and the reflect and inverse transformation was applied in order to resemble a symmetric distribution (Tabachnick & Fidell, 1996). Using this transformed variable, linear regression analysis was performed. We used the mean substitution method to handle missing data of socio-demographic characteristics.

Socio-demographic characteristics

Information on socio-demographic characteristics was obtained by questionnaire during pregnancy. *Family income*, defined by the total monthly net income of the household was categorised as "< 1200 €" (below social security level), "1200 - 2000 €" (modal), and "> 2000 €" (more than modal income). *Educational level of mother* was defined by the highest completed educational level and was classified into three categories according to the definition of Statistics Netherlands (2004a): low (lower vocational training or three years general secondary school), intermediate (> three years general secondary school), and high (higher vocational training or higher academic education). *Marital status* was categorised as "married or cohabiting" and "single". *Infant national origin* was classified into three categories in accordance with Statistics Netherlands (2004b): Dutch, other-Western, and non-Western. Child national origin was based on the country of birth of the

parents. If both parents were non-Dutch, we used the country of birth of the mother to classify the child's national origin. The group classified as other-Western includes American Western, Asian Western, European, and Australian children. The non-Western group is comprised of children with a Turkish, Moroccan, Surinamese, Cape Verdean, Dutch Antillean, African, American non-Western and Asian non-Western national origin. *Age of infant* was reported during the home visit. *Infant gender* was obtained from midwife and hospital registries at birth.

RESULTS

Exploratory factor analysis (EFA)

An EFA was performed on the full set of 29 observational items. The eigenvalues for the first six factors were, respectively, 10.82, 3.78, 3.26, 1.69, 1.24, and 1.16. The scree plot suggested three factors by showing a last substantial drop in the magnitude of the eigenvalues after the third value. The fit indices for this three factorial solution were acceptable (CFI = 0.96, TLI = 0.97, RMSEA = 0.04). The χ^2 value was significant (987.37, $df = 138$, $p < 0.001$). Factor determinacies (the proportion of variance in each factor that is explained by the observed variables) were, respectively, 0.98, 0.99, and 0.98. The factor structure for the three-factor model is shown in Table 2. The first factor was characterized by variables such as "The windows or walls are damp inside the residence" and "The kitchen or toilet is unclean". We interpreted this factor as the organization of the physical environment. The second factor included variables such as "Musical toys are available for the infant" and "Muscle activity toys or equipment are available for the infant". We labelled this factor as the provision of appropriate play and learning materials capable of stimulating development. The third factor consisted of items such as "Parent spontaneously vocalizes to infant at least once during visit" and "Parent caresses or kisses infant at least once during visit". We interpreted this factor as the social and emotional responsivity of the parent.

Of these 29 items, six items (see Table 2) did not theoretically correspond to the factor's area of content (e.g., "Paid daily paper is present" loaded on the second factor which encompasses play and learning materials for children). These six items were labelled "Other observation items" and contributed to the total score. A new EFA was conducted for the 23 items that were included in the factor structure. The EFA yielded a similar three-factor model and the estimates presented in Table 2 were derived from this final EFA. Similar to the former EFA, the scree plot of the final EFA suggested three factors (eigenvalues of the first six factors: 9.22, 3.42, 2.88, 1.35, 1.08, 0.87). The fit indices for this three factorial solution were acceptable (CFI = 0.98, TLI = 0.98, RMSEA

Table 2. Exploratory factor analysis (EFA) of the adapted IT-HOME inventory

Item	F1	F2	F3	h^2
The exterior of the house is well maintained	1.03			0.82
The living room is tidy	1.02			0.72
The walls inside the house are in good condition	1.00			0.76
The kitchen or toilet is unclean (-)	0.98			0.63
Neglected houses are present in the street (-)	0.94			0.73
The windows or walls are damp inside the residence (-)	0.88			0.56
The street where the family lives looks clean	0.82			0.65
Basic furniture is present	0.64			0.40
Central heating system is present	0.59			0.25
One could smell cigarette smoke in the residence (-)	0.56			0.23
Various toys are available for the infant during home visit[a]		0.97		0.97
Cuddly toys are available for the infant[a]		0.96		0.91
Musical toys are available for the infant[a]		0.87		0.89
Muscle activity toys or equipment are available for the infant[b]		0.86		0.89
Infant has a special place to lay down and play[a]		0.69		0.73
Parent responds verbally to infant's vocalizations or verbalizations[b]			0.91	0.92
Parent expresses positive feelings toward infant[a]			0.89	0.79
Parent spontaneously vocalises to infant at least once[a]			0.87	0.81
Parent caresses or kisses infant at least once[b]			0.69	0.62
Parent makes eye contact with infant			0.65	0.73
Parent spontaneously praises infant at least twice[b]			0.62	0.57
Parent responds positively to praise of infant offered by Visitor[b]			0.38	0.57
Parent keeps infant in visual range, looks at often[b]			0.25	0.25
Factor correlations				
Factor 2	0.58	-		
Factor 3	0.47	0.32	-	
Other observation items				
At least 10 books or CD's are available[a]				
Paid daily paper is present				
Infant is clean				
Infant has clean clothes and bed linen				
Infant's play environment is unsafe (-)[b]				
The television is on in the residence (-)				

Note. Values are factor loadings and communalities (h^2) for EFA using geomin rotations in 3,406 families. Factor labels: F1, Physical environment; F2, Play and learning environment; F3, Social-emotional environment. (-) Reversed items were recoded before EFA.
[a]Slightly revised original IT-HOME item.
[b]Original IT-HOME item.

= 0.04). The χ^2 value was significant (635.63, df = 89, $p < 0.001$). Factor determinacies were, respectively, 0.98, 0.99, and 0.98.

Three of the factor loadings were equal to or larger than one in magnitude (see Table 2). If factors are correlated (oblique), factor loadings are regression coefficients and thus can be larger than one in magnitude (Jöreskog, 1999). In this study, oblique rotations were used and inter-relatedness between factors was shown. Factor correlations were 0.58 for the first and second factor, 0.47 for the first and third factor, and 0.32 for the second and third factor.

All factor loadings exceeded 0.30 except for the loading of one single item (see Table 2: "Parent keeps infant in visual range, looks at often"). Despite its relatively low factor loading, we decided to retain this item as it was obtained from the original IT-HOME inventory which has shown meaningful links to children's health, growth, intelligence, and socio-emotional development (for a review, see Bradley, 1993). Communalities were all 0.5 or higher, except for the item mentioned above and three other items (see Table 2: "Basic furniture is present", "Central heating system is present", and "One could smell cigarette smoke in the residence"). Although their communalities were relatively low, we retained these items as they have shown to play a meaningful role in child development. Poor housing conditions may elevate psychological distress in children (for a review, see Evans, Wells, & Moch, 2003). Indoor climatic conditions, structural deficiencies and physical shortcomings may be salient aspects of housing quality for psychological health (Evans, Wells, Chan, & Saltzman, 2000; Evans et al., 2003). In addition, exposure to secondary tobacco smoke may be a risk factor for children's healthy development (for a review, see Katic, Fucic, & Gamulin, 2010).

Internal consistency and inter-observer agreement

Cronbach's alphas ranged from 0.66 to 0.90 for the three subscales and was 0.82 for the total scale (see Table 3). *ICCs* for inter-observer agreement ranged from 0.75 to 0.91 for the three subscales and was 0.87 for the total scale (see Table 3).

Convergent validity

In univariate analysis, we found that all socio-demographic characteristics under study except for gender and age of the child were statistically significantly associated with less-optimal home environments as measured by the adapted IT-HOME inventory (see Table 4). All associations were in the expected direction. For instance, a modal family income [odds ratio (*OR*) = 5.62, 95% confidence interval (*CI*) (4.21, 7.50)] and a low family income [*OR* = 15.24, 95% *CI* (11.60, 20.01)] were significantly (all $p < 0.001$) associated with less-optimal home environments. Middle maternal educational level

Table 3. Internal consistency and inter-observer agreement

Adapted IT-HOME inventory	Reliability estimates	
	Internal consistency (n = 3,406)	Inter-observer agreement (n = 124)
Total scale, 29 items	0.82	0.87***
Physical environment subscale, 10 items	0.73	0.75***
Play and learning environment subscale, 5 items	0.90	0.91***
Social-emotional environment subscale, 8 items	0.66	0.79***

Note. Internal consistency was calculated with Cronbach's alpha statistic. Inter-observer agreement was calculated with intra-class correlation coefficient statistic.
*** $p < 0.001$

[*OR* = 3.49, 95% *CI* (2.72, 4.48)] and low maternal educational level [*OR* = 9.13, 95% *CI* (7.15, 11.66)] were significantly (all $p < 0.001$) associated with less-optimal home environments.

In multivariate analysis, effect sizes attenuated but remained statistically significant (see Table 4). For instance, a modal family income [*OR* = 2.49, 95% *CI* (1.81, 3.42)], a low family income [*OR* = 3.97, 95% *CI* (2.87, 5.51)], middle maternal educational level (*OR* = 1.45, 95% *CI* (1.09, 1.93)] and low maternal educational level [*OR* = 2.41, 95% *CI* (1.80, 3.23)] remained associated with less-optimal home environments. When repeating multivariate analysis with the adapted IT-HOME score on a dimensional level, we found similar results (see Table 4).

DISCUSSION

The objective of this study was to develop a reliable and valid instrument based on the IT-HOME inventory, to assess the home environments of young infants exclusively via observation. Measures of internal consistency and inter-observer agreement supported the reliability of the adapted IT-HOME inventory.

EFA yielded three meaningful constructs that were labelled as "the physical environment", "the play and learning environment" and "the social-emotional environment". These three constructs were all positively correlated. The highest correlation was found for the physical environment and the play and learning environment. The remaining factor inter-correlations were of a moderate magnitude, indicating no substantial overlap in the content domain represented by each factor. Given that environmental factors often co-occur (Bradley, 1993), creating independent subscales would not have been ecologically valid and was therefore not our purpose. The Cronbach's alpha coefficients for these subscales (range = 0.66 to 0.90), as well as their *ICCs* for inter-observer agreement (range = 0.75 to 0.91), were at an acceptable level.

Table 4. Regression analyses predicting children's home environments from socio-demographic characteristics of the family

	Home environments, less-optimal* (categorical)						Home environments, score (continuous)		
	Univariate analysis			Multivariate analysis			Multivariate analysis		
	OR	(95% *CI*)	*p*-value	*OR*	(95% *CI*)	*p*-value	β	(95% *CI*)	*p*-value
Family net income									
> €2000	1.00 (reference)			1.00 (reference)			0.00 (reference)		
€1200-€2000	5.62	(4.21, 7.50)	< 0.001	2.49	(1.81, 3.42)	< 0.001	-0.12	(-0.11, -0.06)	< 0.001
< €1200	15.24	(11.60, 20.01)	< 0.001	3.97	(2.87, 5.51)	< 0.001	-0.16	(-0.14, -0.09)	< 0.001
Educational level									
High	1.00 (reference)			1.00 (reference)			0.00 (reference)		
Middle	3.49	(2.72, 4.48)	< 0.001	1.45	(1.09, 1.93)	0.010	-0.11	(-0.08, -0.04)	< 0.001
Low	9.13	(7.15, 11.66)	< 0.001	2.41	(1.80, 3.23)	< 0.001	-0.17	(-0.13, -0.09)	< 0.001
Age mother (years)	0.88	(0.86, 0.89)	< 0.001	0.94	(0.93, 0.96)	< 0.001	0.14	(0.01, 0.01)	< 0.001
Marital status, single	4.81	(3.86, 6.00)	< 0.001	1.95	(1.51, 2.52)	< 0.001	-0.05	(-0.06, -0.01)	0.003
Age infant (months)	1.05	(0.95, 1.15)	0.388	0.90	(0.81, 1.01)	0.077	0.00	(-0.01, 0.01)	0.832
Infant gender, girl	1.00	(0.86, 1.18)	0.959	1.04	(0.86, 1.25)	0.681	0.00	(-0.01, 0.02)	0.955
Infant national origin									
Dutch	1.00 (reference)			1.00 (reference)			0.00 (reference)		
Other-Western	2.08	(1.50, 2.87)	< 0.001	1.76	(1.24, 2.52)	0.002	-0.06	(-0.07, -0.02)	< 0.001
Non-Western	6.36	(5.17, 7.84)	< 0.001	2.82	(2.22, 3.58)	< 0.001	-0.20	(-0.13, -0.09)	< 0.001

Note. Unless otherwise indicated, values are odds ratios (95% *CI*). β is a standardized coefficient and denotes *SD* change in children's home environments per category or unit change of the socio-demographic characteristics.

* Less-optimal home environments are defined by adapted IT-HOME inventory scores below the 25th percentile cut-off (n = 774). The remaining scores are considered the reference (n = 2,601). We excluded 31 children due to missing data: this left 3,375 children in the analyses.

The adapted IT-HOME inventory was statistically significantly related to family socio-demographic variables such as maternal educational level and infant national origin. In particular, a strong association was found between the adapted IT-HOME inventory and family income. All of the associations were in the expected direction. These findings suggest high convergent validity of the adapted IT-HOME inventory. However, an important, but at present an unanswerable question, is whether home observations with the adapted IT-HOME inventory add to screening information based on socio-demographic characteristics.

Elardo and Bradley (1981) noted that the use of social class or socio-economic status (SES) indices in research on development has several shortcomings, such as the inability to capture essential differences within SES classes. For example, the finding that low SES is positively related to adverse child development provides us with little information about those home settings in low-SES families which may underlie this relationship (Elardo

& Bradley, 1981). Thus, there is a need for measures which could help unravel these environmental processes. Although past research supports the screening efficiency of the original HOME inventory (Bradley & Caldwell, 1977), the usefulness and added value of the adapted IT-HOME inventory as a screening tool remains to be seen. It may be particularly important for future research to address whether home observations using the adapted IT-HOME inventory are useful to identify at risk families in ethnic minorities or other subgroups. Because of cultural differences, it cannot be assumed that environmental factors have the same meaning and lead to the same developmental outcomes in majority and minority children (Bradley, 1994). Although the IT-HOME inventory has been used in different ethnic groups and few differences in psychometric properties have been reported (Bradley, Corwyn, McAdoo, & Garcia Coll, 2001; Bradley, Corwyn, & Whiteside-Mansell, 1996), this may not apply to the present instrument.

The current findings shed light on the development and several psychometric properties of a brief observational assessment of home environments. In comparison with the original IT-HOME inventory, administration time was shortened as the present instrument contains only 29 binary coded items, which do not require a supplementary interview. Our restriction to observational items should minimise distortion by socially desirable response patterns. Importantly, using a large population-based cohort increased the extent to which our results may be generalized.

When interpreting the current results, some methodological considerations should be taken into account. First, an exclusively observational context excludes certain areas of an infant's experience such as out-of-home-activities. Second, our observational assessment of children's home environments may provide only snapshots of a certain time point. For example, the tidiness of the home may fluctuate over time. However, this is inherent to observational assessments that can be applied during short home visits. Finally, the possibility of reactivity should be considered (Lytton, 1971). This denotes changes in the participant's behaviour due to the knowledge that he or she is being observed. For example, parents may act in a socially desirable manner while being observed (Lytton, 1971). In the current study, however, possible reactivity was minimized by blinding our participants to the actual observational assessments.

The adapted IT-HOME inventory was specifically designed as a brief, convenient measure suitable for use in large-scale population-based epidemiological studies. Demonstrating that home environments can be accurately observed with the adapted IT-HOME inventory is but a first step towards a programme of research on young infants' home environments. We know from research that the association between the home environment and children's developmental outcomes may be stronger for certain subgroups of children. For instance, associations between a higher quality physical home environment and lower levels of behaviour problems were observed somewhat more often in poor than in non-poor families (Bradley, Corwyn, Burchinal, McAdoo, & García Coll, 2001). In

addition, it has been found that access to stimulating materials in the home mediated the association between SES and child behaviour problems (for a review, see Bradley & Corwyn, 2002). Before passing judgements on the instrument's effectiveness as a screening tool, additional research is required on the relation between the adapted IT-HOME inventory and children's developmental outcomes. A particular focus on moderating or mediating constructs may enhance our understanding of a possible relationship between the adapted IT-HOME inventory and developmental outcomes. In essence, further research is needed to examine whether the adapted IT-HOME inventory is a valuable instrument for population-based investigations examining the impact of infants' home environments on developmental outcomes of the child.

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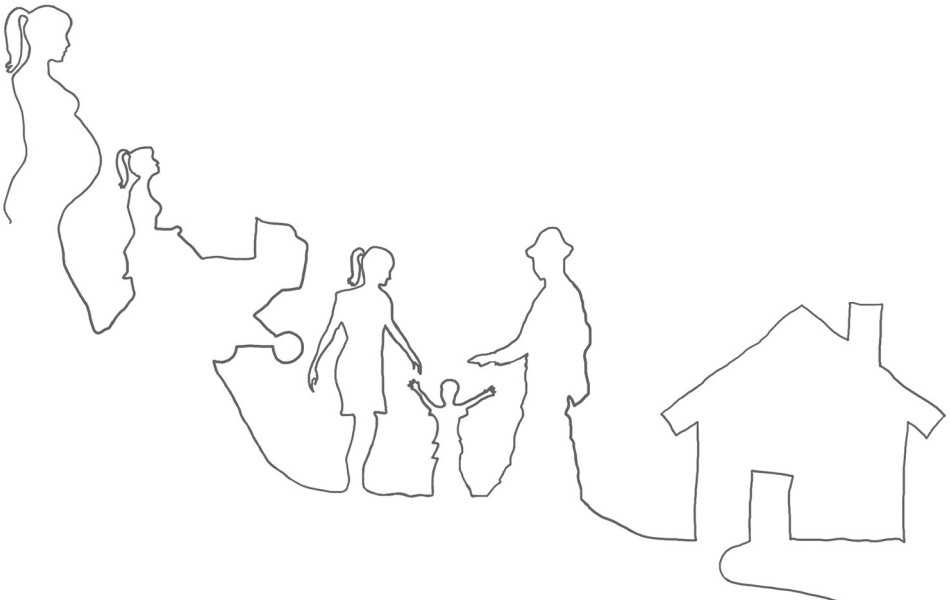

Chapter 2.2

Home environments of infants: Relations with child development through age 3

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ABSTRACT

Background: This study aimed to examine prospective associations of young infants' home environments with expressive vocabulary delay and internalising and externalising problem scores independently of family socioeconomic status (SES) and national origin.
Methods: Prospective data from fetal life to age 3 were collected in a total of 2,711 families participating in the Generation R Study, a longitudinal, population-based cohort. Infants' home environments (i.e., the learning environment and the physical environment) were assessed exclusively by observation in their first few months of life (mean age = 3.38 months, *SD* = 1.17). Internalising and externalising problems were measured at age 1.5 and 3; expressive vocabulary delay was assessed at age 2.5. Family socio-demographic characteristics, including SES variables and national origin, were measured during pregnancy.
Results: Lower-quality learning environments of young infants, but not physical environments, were associated with expressive vocabulary delay and more internalising problems in toddlerhood independently of SES and national origin. Associations of SES and national origin with children's outcomes were reduced when the home environmental variables were added to the regression model.
Conclusion: The current findings suggest that SES and national origin are reflected, to some degree, in the quality of infants' home environments. Some of the possible interpretations of these results are discussed together with their implications for the early identification of children at risk of impaired development.

INTRODUCTION

Past research has repeatedly emphasised the important role of children's home environments in shaping their development (Bradley, 1993, 1994; Evans, 2006; Evans, Wells, & Moch, 2003). The home environment constitutes a set of conditions which are arranged by a care giver and may assist or impede the child in acquiring verbal and social skills (Bradley & Caldwell, 1995; Bradley et al., 1995). These conditions may include the provision of learning materials in the home, as well as practices of making physical home environments safe and orderly (Bradley & Caldwell, 1995; Bradley et al., 1995). There is ample evidence that children who have limited access to age-appropriate learning materials in the home more often manifest behavioural and language problems (Bradley, 1993, 1994). Poor physical conditions of the home, such as low housing quality and uncleanliness, have been linked to children's social-emotional problems (Evans, 2006; Evans et al., 2003). In addition, there is evidence that early childhood is a key period in which interventions can provide strong foundations for future healthy development (Bricker, Davis, & Squires, 2004; Feeney-Kettler, Kratochwill, Kaiser, Hemmeter, & Kettler, 2010). Given the above findings, the study of children's home environments in their first few months of life may facilitate early identification of children in need of such intervention programmes.

Although the associations between low-quality physical home environments and social-emotional problems are well-established for older children and adults (Bradley, Corwyn, Burchinal, McAdoo, & Coll, 2001; Evans, Wells, Chan, & Saltzman, 2000; Hopton & Hunt, 1996), less is known about the prospective associations of young infants' physical home environments with their behavioural or cognitive development. Low-quality housing may negatively affect interpersonal relationships and social support, which then affects mental health (Evans, 2006). Also, children living in low-quality houses may get sick more often, which then increases school absenteeism (Evans, 2006). In young infants, however, such processes are less clear and poor housing quality may predominantly be an indicator of poverty or of parental organisation or efficiency (e.g., cleanliness) (Evans, 2004, 2006).

In contrast to low-quality physical home environments, low-quality learning environments have been related to language and behavioural problems in children as young as 6 months of age (Bradley & Caldwell, 1977, 1980, 1982; Bradley, Caldwell, & Elardo, 1979; Bradley, Caldwell, & Rock, 1988; Elardo, Bradley, & Caldwell, 1977; Linver, Martin, & Brooks-Gunn, 2004). However, certain noteworthy gaps in the literature persist. First and foremost, these studies investigating relations between young infants' home environments and their development often failed to adjust for potential confounding by family socio-demographic characteristics such as socio-economic status (SES) (Bradley & Corwyn, 2002). Second, the sample of most studies is both small and restricted, often including predominantly ethnic minority or disadvantaged families. Thus, there remains considerable uncertainty regarding the generalizability of these findings to a broader

population. Additionally, it is unclear to what extent these associations differ by SES and national origin. Although some studies showed that relations between children's home environments and cognitive and behavioural outcomes were strongest among low income and ethnic minority samples (Bradley & Corwyn, 2001; Linver et al., 2004), others found strongest relations for European-American families (Berlin, Brooks-Gunn, Spiker, & Zaslow, 1995; Sugland et al., 1995). Finally, as former research often assessed an overall score of child problem behaviour, it is not clear whether effects of learning or physical home environments are specific to particular types of symptoms (e.g., internalising or externalising).

This paper uses data from a large population-based cohort to examine the associations between aspects of young infants' home environments (i.e., the learning environment and the physical environment) and toddler language functioning and internalising and externalising problems. In studying these associations, we accounted for family SES and national origin, and tested whether relations varied by these socio-demographic characteristics.

METHODS

Study design

The present study was conducted within Generation R, a population-based cohort from fetal life onwards (Jaddoe et al., 2010). Pregnant women living in Rotterdam, the Netherlands, with an expected delivery date between April 2002 and January 2006 were invited to participate. Written informed consent was obtained from all participants. The study was conducted in accordance with the guidelines proposed in the World Medical Association Declaration of Helsinki, and was approved by the Medical Ethical Committee of the Erasmus University Medical Center, Rotterdam.

Population for analysis

In the Generation R Study, we obtained information on home environments in 4,609 of 6,649 eligible caregivers and their infants (response rate 69%) (Rijlaarsdam et al., 2012). Of these, 237 care givers did not give consent for further postnatal follow-up. We excluded 951 children as their home environments had been assessed in the developmental phase of the instrument in which several core items were missing. Furthermore, children who were older than 12 months at the time of the home observations (n = 21) and twins (n = 66) were excluded, leaving 3,334 children eligible for follow-up. Overall, 2,711 children with follow-up data (81%) were included in one or more of our analyses. Characteristics of the

Table 1. Percentages, means (*M*), standard deviations (*SD*) and range of all study variables (*n* = 2,711)

Variable	*M*	*SD*	Range
Child outcome variables			
Internalising problem scores at age 3	5.30	5.12	0.00-55.64
% borderline (>12.00)*	8.3		
Externalising problem scores at age 3	8.50	6.30	0.00-40.00
% borderline (>18.00)*	7.1		
Expressive vocabulary at age 2.5, % delay (<10th percentile)	8.4		
Socio-demographic characteristics			
Child national origin, % non-Western	34.2		
Family income, % < €1200/month	16.3		
Maternal education level			
% higher education	52.4		
% > 3 years general secondary school	28.1		
% ≤ 3 years general secondary school	19.5		
Home environment characteristics			
Physical home, score	8.98	1.56	0.00-10.00
Learning home, score	4.19	1.53	0.00-5.00
Gender, % boys	48.5		
Social-emotional involvement, score	7.75	0.72	1.00-8.00
Maternal depressive symptoms, score	0.20	0.44	0.00-3.50

*Defined according to a Dutch norm group.

2,711 participants are presented in Table 1. Thirty-four per cent of children in the current sample had a non-Western national origin, which reflects the urban setting of the cohort. Of the mothers, 52.4% had a higher education. In the Netherlands, approximately 16% of children have a non-Western national origin (Statistics Netherlands, 2010) and 43% of women aged 25 to 35 years have a higher education (Statistics Netherlands, 2011).

Non-respondents (n = 623) were more often of non-Western national origin (62.4% vs. 34.2%, χ^2 = 141.11, p < 0.001) and were more often lower educated (42.5% vs. 19.5%, χ^2 = 117.69, p < 0.001) than respondents (n = 2,711). Non-respondents reported lower quality physical (χ^2 (1) = 93.63, p < 0.001) and learning home environments (χ^2 (1)= 135.20, p < 0.001) than respondents.

Measures

Infants' home environments

Home environments were assessed by means of observation during a home visit when the infant was on average 3.38 months of age (*SD* = 1.17). In the Generation R Study,

the Infant-Toddler Home Observation for Measurement of the Environment (IT-HOME) Inventory (Caldwell & Bradley, 1984) was adapted for use in an exclusively observational context. The IT-HOME Inventory is a 45-item, empirically validated measure of the events, objects and social interactions experienced by a child in the family context. Good reliability has been demonstrated for the adapted IT-HOME (inter-observer agreement r = 0.87) (Rijlaarsdam et al., 2012). For the purposes of the present study, the physical environment and learning environment subscales were employed, with higher scores reflecting higher quality environments. The physical environment scale consists of 10 binary-coded items registering, among others, whether the home was clean or whether a central heating system was present. The learning environment subscale consists of five binary-coded items assessing, for example, whether the infant had musical or muscle activity toys.

Child behaviour

Child behaviour was assessed when children were 1.5 years (mean age = 18.37 months, *SD* = 0.98) and 3 years of age (mean age =36.60 months, *SD* = 1.27) using the Child Behavior Checklist for toddlers (CBCL/1,5-5; Achenbach & Rescorla, 2000). The CBCL is a parents-report questionnaire containing 99 items rated on a 3-point scale: 0 (*not true*), 1 (*somewhat or sometimes true*) and 2 (*very true or often true*). In this study, the two broadband scales (internalising and externalising) were used. The internalising problem score is a summary score of the items in four syndrome scales: emotionally reactive, anxious/depressed, somatic complaints, and withdrawn. The externalising problem score is a summary score of the items in the attention problems and aggressive behaviour syndrome scales. The psychometric properties of the CBCL are well established (Achenbach & Rescorla, 2000).

Child vocabulary

Expressive vocabulary skills were assessed when children were 2.5 years of age (mean age = 30.95 months, *SD* = 1.27) using the Language Development Survey (LDS; Rescorla, 1989). The LDS includes 310 words arranged into 14 semantic categories (e.g., food, animals, people, vehicles). Parents were asked to identify each word that their child used spontaneously. The LDS has good psychometric properties (Rescorla, 1989). To determine vocabulary delay, we converted raw total vocabulary scores into age- and gender-specific percentile scores as described in the LDS manual (Achenbach & Rescorla, 2000). In line with previous research, the highly skewed percentile scores were dichotomized using a cut-off for expressive vocabulary delay of scores < 10th percentile (Henrichs et al., 2011).

Family socio-demographics and covariates

Information on different indicators of SES was obtained by questionnaire during pregnancy. Mothers reported the total monthly net income of their household. To compare poor and non-poor families, we dichotomised our measure of family income in accordance with the social security level: above (≥ €1200) versus below social security level (< €1200). Mothers further reported their highest completed educational level, which was classified into three categories according to the definition of Statistics Netherlands (Statistics Netherlands, 2004a): low (lower vocational training or 3 years general secondary school), intermediate (> 3 years general secondary school), and high (higher vocational training or higher academic education). Infant national origin was classified into Western and non-Western and was based on the country of birth of the parents (Statistics Netherlands, 2004b). We also included data on the child's gender and age at the assessment of outcome.

Additionally, the socio-emotional involvement scale from the adapted IT-HOME was included to examine whether relations for the physical and the learning environment were independent of socio-emotional support. This scale consists of eight binary-coded items assessing, among others, whether the parent caresses or kisses the child at least once.

The six-item depression scale of the Brief Symptom Inventory, a validated self-report questionnaire (Derogatis, 1993), was used to assess maternal depressive symptoms at 20 weeks of gestation. We included this measure to illustrate how a proximal variable other than the home environment may help to delineate the association between SES variables and children's development.

Statistical analyses

Bivariate correlations were conducted to explore the relations between home environments, socio-demographics and children's outcome variables. To approximate a normal distribution, reflect and inverse transformations were applied to the home environmental variables. The positively skewed internalising, externalising, and maternal depression scores were square root transformed.

To examine associations of infants' home environments and family socio-demographic characteristics with toddler expressive vocabulary delay and internalising and externalising problem scores multiple regression analysis was conducted. In model 1, child gender and age at the assessment of outcome were adjusted for. In model 2a, the socio-demographic characteristics were mutually controlled for to estimate their independent effects on children's outcomes. Similarly in model 2b, both the physical home and the learning home variable were entered into the model with age and gender. In model 3, all

home and socio-demographic variables were simultaneously added to model 1. We also examined interactions of the family socio-demographic variables and child gender with the home environmental variables in linear models. By adding these multiplicative terms to the regression equation, we examined whether the coefficients can be interpreted in the same way as they would in a linear-additive model. Next to two-way interactions, three-way interactions for home environment variables, national origin, and income were entered, as national origin may be confounded by income. Additionally, we repeated the analyses of internalising and externalising problems using CBCL scores at age 1.5 years to check for consistency.

We carried out multiple imputation to handle missing data of family socio-demographics and children's home environments (Schafer, 1997, 1999). Data were imputed five times, resulting in five imputed data sets. For each of these five data sets, the same statistical analyses were carried out and the results were pooled. Of the 2,711 children in our analyses, 1,852 (68%) had complete data on all home environmental items, 859 had one or more missing item but all had more than 60% completed. However, only six children had more than 20% missing home items. The percentage of missing data of the family socio-demographic variables ranged from 3.6% (national origin) to 18.0% (family income). However, we did not impute data of outcome measures. Hence, the population of analyses differs. Statistical analyses were performed using SPSS Statistics 17.0 (IBM Corporation, Somers, NY, USA).

RESULTS

Home environments, socio-demographics, child vocabulary delay, and child internalising and externalising problem scores were all significantly correlated, except that the physical home environment was unrelated to the child outcomes (see Table 2). The associations of infants' home environments and family socio-demographic characteristics with toddler internalising problem scores, externalising problem scores, and expressive vocabulary delay are presented in Tables 3-5, respectively. Table 3 shows that when adjusting for child gender and age, children who had less access to learning materials in the home during infancy more often had internalising problems at age 3 (β = - 0.16, 95% *CI* -0.74 to -0.42, $p < 0.001$). All three socio-demographic characteristics (i.e., child national origin, family income, and maternal education), but not socio-emotional involvement, were related to internalising problem scores when they were mutually controlled for (see Table 3). These associations attenuated but remained significant when home environmental variables were added to the regression analysis. Lower quality learning environments were related to more internalising problems independently of socio-demographics and socio-emotional involvement (β = -0.07, 95% *CI* -0.44 to -0.05, p = 0.015). There was

Table 2. Bivariate correlations for predictor and outcome variables (n = 2,711)

	1	2	3	4	5	6	7	8	9	10
1. Internalising problem score (3 years)	-									
2. Externalising problem score (3 years)	0.63**	-								
3. Expressive vocabulary delay (2.5 years)	0.12***	0.09***	-							
4. National origin, non-Western	0.17***	0.09***	0.13***	-						
5. Family income, low	0.16***	0.09***	0.15***	0.40***	-					
6. Lower maternal education (per level)	0.17***	0.11***	0.13***	0.38***	0.43***	-				
7. Socio-emotional involvement, score	-0.07**	-0.03	-0.07*	-0.13***	-0.15***	-0.12***	-			
8. Physical home, score	-0.02	-0.03	-0.01	-0.09***	-0.17***	-0.13***	0.13***	-		
9. Learning home ,score	-0.16***	-0.08**	-0.13***	-0.42***	-0.41***	-0.34***	0.20***	0.20***	-	
10. Maternal depressive symptoms, score	0.25***	0.17***	0.04	0.24***	0.27***	0.22***	-0.08**	-0.13***	-0.17***	-

Note. Values represent Pearson and Spearman correlation coefficients for continuous and categorical variables, respectively.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

no evidence that associations between home environments and internalising problems were moderated by socio-demographic factors or gender.

Table 4 shows that when adjusting for child gender and age, lower quality learning environments during infancy were associated with more externalising problems at age 3 (β = -0.08, 95% *CI* -0.47 to -0.13, p = 0.001). Only maternal education was associated with externalising problem scores when socio-demographics and socio-emotional involvement were mutually controlled for (see Table 4). There was no independent association of home environmental variables with toddler's externalising problem scores and no evidence of moderation was found.

The findings pertaining to expressive vocabulary delay at age 2.5 years showed that lower-quality learning environments (*OR* = 0.25, 95% *CI* 0.15 to 0.40, $p < 0.001$) and all three family socio-demographic characteristics contributed to the outcome in the single risk factor model (see Table 5). When these socio-demographic characteristics were mutually controlled for, associations with expressive vocabulary delay attenuated but remained significant for maternal education and national origin. The addition of the home environmental variables to the regression analysis further reduced the effect of socio-demographics on expressive vocabulary delay. Lower-quality learning environments were associated with expressive vocabulary delay (*OR* = 0.48, 95% *CI* 0.25 to 0.92, p = 0.032), independently of socio-demographics and socio-emotional involvement.

Table 3. Regression analysis predicting internalising problem scores from family socio-demographic factors and children's home environments* (*n* = 2,164)

	Internalising problem scores at age 3								
	Single risk factor (model 1)			All socio-demographic factors (model 2a)			All risk factors (model 3)		
Variable	*B* (95% *CI*)	β	*p*-value	*B* (95% *CI*)	β	*p*-value	*B* (95% *CI*)	β	*p*-value
Socio-demographic factors									
Child national origin, non-Western	0.43 (0.33: 0.53)	0.18	<0.001	0.26 (0.15; 0.38)	0.11	<0.001	0.23 (0.10; 0.35)	0.09	<0.001
Family income, low	0.52 (0.38; 0.66)	0.16	<0.001	0.23 (0.06; 0.41)	0.07	0.010	0.20 (0.03; 0.38)	0.06	0.025
Lower maternal education (per level)	0.25 (0.19; 0.32)	0.17	<0.001	0.14 (0.07; 0.22)	0.10	<0.001	0.13 (0.05 ; 0.20)	0.09	0.001
Socio-emotional involvement, score†	-0.37 (-0.61; -0.13)	-0.07	0.002	-0.16 (-0.39; 0.08)	-0.03	0.186	-0.13 (-0.36; 0.10)	-0.03	0.272
	Internalising problem scores at age 3								
	Single risk factor (model 1)			All home environment observations (model 2b)			All risk factors (model 3)		
Variable	*B* (95% *CI*)	β	*p*-value	*B* (95% *CI*)	β	*p*-value	*B* (95% *CI*)	β	*p*-value
Home environment									
Physical home, score†	-0.04 (-0.18; 0.11)	-0.01	0.638	0.09 (-0.06; 0.23)	0.03	0.255	0.12 (-0.03; 0.27)	0.04	0.103
Learning home, score†	-0.58 (-0.74; -0.42)	-0.16	<0.001	-0.60 (-0.77; -0.43)	-0.16	<0.001	-0.24 (-0.44; -0.05)	-0.07	0.015

Note. Model 1, adjusted for child gender and age at the assessment of outcome; model 2, additionally adjusted for socio-demographic factors (model 2a) or home environment (model 2b); model 3, fully adjusted. R^2 for models 2a to 3, respectively, was 0.06, 0.03, and 0.06.
We excluded children due to missing data on the outcome; this left 2,164 children in the analysis.
* Values are unstandardised and standardised coefficients (95% *CI*s). *B* is unstandardised and denotes change in child internalising problem scores per unit change in the predictor. β is a standardised coefficient and denotes *SD* change in child internalising problem scores per *SD* or unit change in the predictor.
† Higher scores indicate higher quality home environments or involvement.

Similar patterns were observed in the analysis of internalising and externalising problem scores at age 1.5 years (see appendix). For internalising problem scores, we found consistent relations among children aged 1.5 and 3 years. For externalising problem scores, we consistently found that the learning environment was related to the outcome in the single risk factor model but that this association was no longer significant when adjusting for socio-demographic factors. All three socio-demographic factors were independent predictors of externalising problem scores at age 1.5.

In order to test consistency, a separate analysis with father report on internalising problems was performed. A total of 1,618 fathers in the current sample reported on child internalising problems at age 3, and multiple imputation was used to obtain a sample as big as the one with mother report (*n* = 2,164). Similar patterns of effect sizes and

Table 4. Regression analysis predicting externalising problem scores from family socio-demographic factors and children's home environments* (*n* = 2,164)

	Externalising problem scores at age 3								
	Single risk factor (model 1)			All socio-demographic factors (model 2a)			All risk factors (model 3)		
Variable	*B* (95% *CI*)	β	*p*-value	*B* (95% *CI*)	β	*p*-value	*B* (95% *CI*)	β	*p*-value
Socio-demographic factors									
Child national origin, non-Western	0.20 (0.09; 0.31)	0.08	<0.001	0.10 (-0.02; 0.22)	0.04	0.110	0.08 (-0.05; 0.21)	0.03	0.212
Family income, low	0.26 (0.10; 0.41)	0.08	0.001	0.09 (-0.10; 0.27)	0.03	0.349	0.07 (-0.13; 0.26)	0.02	0.501
Lower maternal education (per level)	0.15 (0.08; 0.22)	0.10	<0.001	0.11 (0.03; 0.19)	0.07	0.006	0.10 (0.02; 0.18)	0.07	0.011
Socio-emotional involvement, score†	-0.22 (-0.49; 0.04)	-0.04	0.097	-0.12 (-0.39; 0.16)	-0.02	0.402	-0.09 (-0.36; 0.18)	-0.02	0.495
	Externalising problem scores at age 3								
	Single risk factor (model 1)			All home environment observations (model 2b)			All risk factors (model 3)		
Variable	*B* (95% *CI*)	β	*p*-value	*B* (95% *CI*)	β	*p*-value	*B* (95% *CI*)	β	*p*-value
Home environment									
Physical home, score†	-0.08 (-0.23; 0.07)	-0.02	0.307	-0.02 (-0.18; 0.14)	-0.01	0.803	-0.00 (-0.16; 0.16)	-0.00	0.981
Learning home, score†	-0.30 (-0.47; -0.13)	-0.08	0.001	-0.30 (-0.47; -0.12)	-0.08	0.001	-0.12 (-0.33; 0.09)	-0.03	0.265

Note. Model 1, adjusted for child gender and age at the assessment of outcome; model 2, additionally adjusted for socio-demographic factors (model 2a) or home environment (model 2b); model 3, fully adjusted. R^2 for models 2a to 3, respectively, was 0.03, 0.02, and 0.03.
We excluded children due to missing data on the outcome; this left 2,164 children in the analysis.
* Values are unstandardised and standardised coefficients (95% *CIs*). *B* is unstandardised and denotes change in child externalising problem scores per unit change in the predictor. β is a standardised coefficient and denotes *SD* change in child externalising problem scores per *SD* or unit change in the predictor.
† Higher scores indicate higher quality home environments or involvement.

statistical significance were found, although effect sizes of the several associations were somewhat smaller (see appendix). Consistent with the analysis with mother report, the learning home environment was associated with internalising problems when adjusting for age and gender. A trend towards a significant effect was observed in the fully adjusted model.

Maternal depressive symptoms were correlated with internalising and externalising problems scores, but not with expressive vocabulary delay (see Table 2). The addition of maternal depressive symptoms to model 3 reduced the effect of national origin, family income and maternal education on internalising problem scores. For example, the effect of maternal education was reduced by 22% (adjusted β = 0.07, 95% *CI* 0.03 to 0.18, *p* = 0.005) (other data not shown). The association of the learning environment on internalis-

Table 5. Regression analysis predicting expressive vocabulary delay from family socio-demographic factors and children's home environments* (*n* = 2,090)

	Expressive vocabulary delay at age 2.5 years† (*n* = 176)					
	Single risk factor (model 1)		All socio-demographic factors (model 2a)		All risk factors (model 3)	
Variable	*OR* (95% *CI*)	*p*-value	*OR* (95% *CI*)	*p*-value	*OR* (95% *CI*)	*p*-value
Socio-demographic factors						
Child national origin, non-Western	2.49 (1.82; 3.41)	<0.001	1.71 (1.17; .2.51)	0.006	1.49 (1.01; 2.20)	0.046
Family income, low	2.81 (1.90; 4.17)	<0.001	1.54 (0.94; 2.52)	0.092	1.42 (0.83; 2.42)	0.213
Lower maternal education (per level)	1.74 (1.44; 2.11)	<0.001	1.37 (1.09; 1.73)	0.008	1.31 (1.04; 1.66)	0.022
Socio-emotional involvement, score‡	0.49 (0.22; 1.06)	0.080	0.78 (0.36; 1.67)	0.519	0.85 (0.37; 1.93)	0.702
	Expressive vocabulary delay at age 2.5 years† (*n* = 176)					
	Single risk factor (model 1)		All home environment observations (model 2b)		All risk factors (model 3)	
Variable	*OR* (95% *CI*)	*p*-value	*OR* (95% *CI*)	*p*-value	*OR* (95% *CI*)	*p*-value
Home environment						
Physical home, score‡	0.93 (0.58; 1.50)	0.764	1.26 (0.77; 2.05)	0.362	1.38 (0.83; 2.29)	0.212
Learning home, score‡	0.25 (0.15; 0.40)	<0.001	0.24 (0.15; 0.39)	<0.001	0.48 (0.25; 0.92)	0.032

Note. Model 1, univariate; model 2, additionally adjusted for socio-demographic factors (model 2a) or home environment (model 2b); model 3, fully adjusted.
R^2 (Nagelkerke) for models 2a to 3, respectively, was 0.06, 0.04, and 0.07.
We did not adjust for child gender and age at the assessment of outcome in the analysis on expressive vocabulary delay because age- and gender-specific percentile scores were used.
We excluded children due to missing data on the outcome; this left 2,090 children in the analysis. The number of exposed individuals was as follows: non-Western (*n* = 648), low income (*n* = 298), low education (*n* = 362), intermediate education (*n* = 565), and higher education (*n* = 1,163).
* Values are odds ratios (*OR*) and 95% confidence intervals (*CI*).
† Expressive vocabulary delay was defined as Language Development Survey age- and gender-specific percentile scores below the 10th percentile.
‡ Higher scores indicate higher quality home environments or involvement.

ing problems remained unchanged (β = -0.07, 95% *CI* -0.43 to -0.06, *p* =0.009). Maternal depression also reduced the effect of education on externalising problem scores (β = 0.05, 95% *CI* 0.01 to 0.16, *p* = 0.036).

DISCUSSION

Within a large population-based cohort, we found that lower-quality learning home environments of young infants, but not physical home environments, were univariately associated with expressive vocabulary delay and more internalising and externalising problems in toddlerhood. Associations of the learning environment with expressive vocabulary delay and internalising problem scores were independent of socio-demographics, includ-

ing SES and national origin, and socio-emotional involvement. There was no evidence that these associations were moderated by socio-demographics or gender.

Effects of socio-demographics on children's outcomes were reduced, albeit slightly, when the home environmental variables were added to the regression model. Thus, socio-demographics are reflected, to some degree, in the quality of infants' home environments. This finding supports previous research of Berlin et al. (1995), suggesting that the learning environment is a possible mechanism through which socio-demographic factors such as mothers' education may impact children's language development. Evidence of such mediating mechanisms underscores the potential value of providing these parents with information about children's developmental needs and may thus lead to more targeted interventions (McLoyd, 1998). Yet, the current study illustrated that other factors such as maternal mental health also mediate associations of socio-demographics with children's developmental outcomes. Interestingly, the observed association between the learning environment and internalising problem scores remained largely unchanged when maternal depressive symptoms were accounted for, suggesting that several risk factors must be addressed to unravel the effects of SES on children's development.

Learning environments, but also socio-demographics, were substantially more strongly associated with internalising than with externalising problems. If not a chance finding, this may reflect the higher stability of internalising than externalising problems in young children (Achenbach & Rescorla, 2000). At these young ages, externalising problems may be more transitional than internalising problems and, thus, associations of learning home environments and family demographics with externalising problems may be weaker.

The present study supports earlier research suggesting that the longitudinal relations between children's home environments assessed in their first year of life and later cognitive and behavioural development are generally small to moderate (Bradley & Caldwell, 1980; Bradley et al., 1988; Bradley et al., 1989). First, observed relations between children's environments and their developmental outcomes may have been stronger for older children than for younger ones partly because the more capable older children may elicit more adequate provision of developmentally advanced play materials (Bradley, 1993, 1994; Zeenah, Boris, & Larrieu, 1997). Second, stronger associations generally emerge when assessments of children's developmental outcomes are less distant in time from the home environmental assessments (Bradley, 1994). Consistently, we found somewhat stronger relations between young infants' learning environments and internalising problems when internalising problems were assessed at the age of 1.5 years than when internalising problems were assessed at the age of 3 years. Nevertheless, patterns of findings were largely similar between the ages, supporting stability of associations in a short follow-up period.

We cannot rule out that associations between the early environment and later development result from the fact that early environment tends to be highly correlated with later environment (Bradley, 1994). In that case, the early environment may be a less critical

target for intervention than the later environment. In the current study, data on home environments were obtained only once and the unique contribution of the early environment could not be determined. Previous research showed significant, albeit weak, correlations between the 6-month learning environment and children's intellectual competence at age 3 when the 12-month learning environment was accounted for, providing some evidence in favour of unique effects of the very early environment (Bradley & Caldwell, 1980, 1982).

Certain other methodological issues also have to be addressed. Our response analysis showed that selection occurred towards well-functioning families with higher SES. This may have reduced statistical power and may have limited generalizability of the findings.

Due to the exclusively observational context, the sample of indicators used to represent each home environment domain was limited. This does not necessarily affect the domain's validity but will certainly affect its precision. Although this observational context minimised distortion by socially desirable response patterns, it may have the disadvantage of providing only snapshots of a certain time point. For instance, despite research suggesting that children's home environments are relatively stable (Bradley et al., 1989), the tidiness of the home may fluctuate over time.

Furthermore, we used mother reports on child outcomes and reporting bias cannot be excluded. However, we repeated the analysis with father reports on internalising problems and results were largely consistent. The fact that home environments were observed at very young ages and that a temporal sequence was established does not mean that the relationships between the variables are necessarily unidirectional. For instance, genetic factors may contribute to home environments, child behaviour and child vocabulary. An exhaustive analysis of risk indicators of home environments and young children's development, however, is beyond the scope of the present study. Rather, it was our intention to investigate the ability of structured observations of infant's home environments to predict behaviour and language functioning in toddlerhood independently of family socio-demographics.

Conclusion

In this large population-based cohort, lower quality learning environments of young infants were independently related to toddler internalising problem scores and expressive vocabulary delay. The findings suggest that the socio-demographic characteristics that were examined are reflected, to some degree, in the quality of children's home environments. There was no evidence to suggest that the observed quality of home environments more strongly predicted toddler behavioural problems for particular subgroups, such as ethnic minority or low-income families. Designing interventions may benefit from studies of children's developmental risks that do not exclusively rely on questionnaire assessment of SES indicators but observe the home environment.

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APPENDIX

Table 1. Regression analysis predicting internalising problem scores at age 1.5 years from family socio-demographic factors and children's home environments* (*n* = 2,445)

	Internalising problem scores at age 1.5								
	Single risk factor (model 1)			All socio-demographic factors (model 2a)			All risk factors (model 3)		
Variable	*B* (95% *CI*)	β	*p*-value	*B* (95% *CI*)	β	*p*-value	*B* (95% *CI*)	β	*p*-value
Socio-demographic factors									
Child national origin, non-Western	0.55 (0.46; 0.64)	0.24	<0.001	0.34 (0.23; 0.45)	0.15	<0.001	0.30 (0.19; 0.40)	0.13	<0.001
Family income, low	0.72 (0.58; 0.86)	0.25	<0.001	0.45 (0.28; 0.62)	0.15	<0.001	0.41 (0.22; 0.59)	0.14	<0.001
Lower maternal education (per level)	0.27 (0.21; 0.32)	0.19	<0.001	0.09 (0.02; 0.16)	0.06	0.007	0.08 (0.02; 0.14)	0.06	0.016
Socio-emotional involvement, score†	-0.50 (-0.78; -0.23)	-0.10	0.001	-0.25 (-0.51; 0.01)	-0.05	0.057	-0.23 (-0.51; 0.05)	-0.04	0.107
	Internalising problem scores at age 1.5								
	Single risk factor (model 1)			All home environment observations (model 2b)			All risk factors (model 3)		
Variable	*B* (95% *CI*)	β	*p*-value	*B* (95% *CI*)	β	*p*-value	*B* (95% *CI*)	β	*p*-value
Home environment									
Physical home, score†	-0.05 (-0.18; 0.08)	-0.01	0.469	0.10 (-0.04; 0.23)	0.03	0.161	0.17 (0.03; 0.30)	0.04	0.014
Learning home, score†	-0.74 (-0.88; -0.59)	-0.21	<0.001	-0.76 (-0.91; -0.61)	-0.21	<0.001	-0.29 (-0.48; -0.10)	-0.08	0.003

Note. Model 1, adjusted for child gender and age at the assessment of outcome; model 2, additionally adjusted for socio-demographic factors (model 2a) or home environment (model 2b); model 3, fully adjusted. R^2 for models 2a to 3, respectively, was 0.10, 0.05, and 0.10.
We excluded children due to missing data on the outcome; this left 2,445 children in the analysis.
* Values are unstandardised and standardised coefficients (95% *CIs*). *B* is unstandardised and denotes change in child internalising problem scores per unit change in the predictor. β is a standardised coefficient and denotes *SD* change in child internalising problem scores per *SD* or unit change in the predictor.
† Higher scores indicate higher quality home environments or involvement.

Table 2. Regression analysis predicting externalising problem scores at age 1.5 years from family socio-demographic factors and children's home environments* (*n* = 2,445)

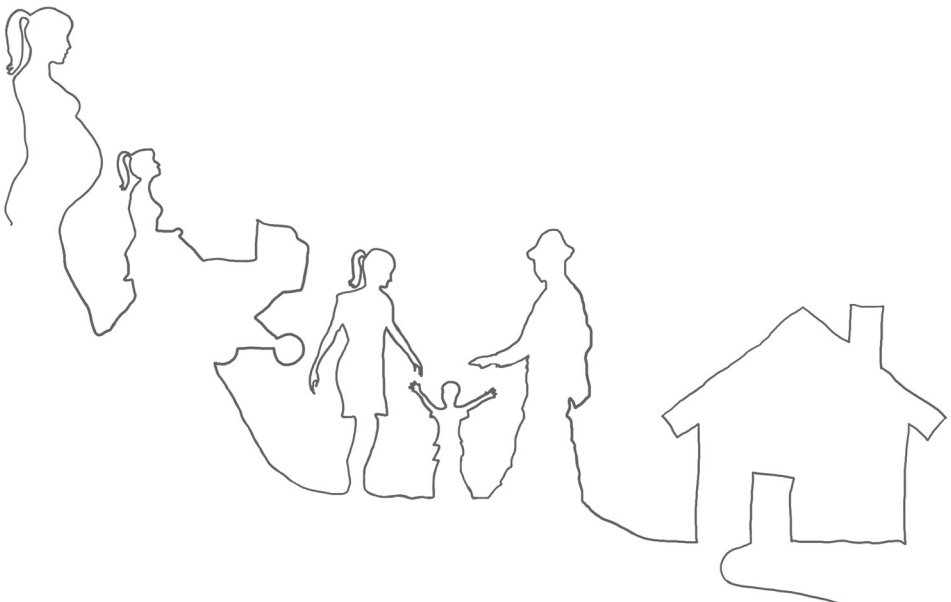
	Externalising problem scores at age 1.5								
	Single risk factor (model 1)			All socio-demographic factors (model 2a)			All risk factors (model 3)		
Variable	*B* (95% *CI*)	β	*p*-value	*B* (95% *CI*)	β	*p*-value	*B* (95% *CI*)	β	*p*-value
Socio-demographic factors									
Child national origin, non-Western	0.22 (0.12; 0.32)	0.09	<0.001	0.11 (-0.01; 0.22)	0.04	0.066	0.12 (0.00; 0.23)	0.05	0.048
Family income, low	0.31 (0.18; 0.45)	0.10	<0.001	0.18 (0.00; 0.35)	0.06	0.046	0.19 (0.00; 0.37)	0.06	0.048
Lower maternal education (per level)	0.14 (0.08; 0.20)	0.10	<0.001	0.07 (0.00; 0.14)	0.05	0.046	0.07 (0.00; 0.14)	0.05	0.039
Socio-emotional involvement, score†	-0.31 (-0.58; -0.03)	-0.06	0.029	-0.20 (-0.48; 0.08)	-0.04	0.159	-0.20 (-0.48; 0.08)	-0.04	0.153
	Externalising problem scores at age 1.5								
	Single risk factor (model 1)			All home environment observations (model 2b)			All risk factors (model 3)		
Variable	*B* (95% *CI*)	β	*p*-value	*B* (95% *CI*)	β	*p*-value	*B* (95% *CI*)	β	*p*-value
Home environment									
Physical home, score†	-0.13 (-0.27; 0.01)	-0.04	0.063	-0.10 (-0.24; 0.04)	-0.03	0.176	-0.05 (-0.20; 0.09)	-0.02	0.454
Learning home, score†	-0.20 (-0.34; -0.05)	-0.05	0.009	-0.18 (-0.33; -0.03)	-0.05	0.023	0.07 (-0.11; 0.25)	0.02	0.432

Model 1, adjusted for child gender and age at the assessment of outcome; model 2, additionally adjusted for socio-demographic factors (model 2a) or home environment (model 2b); model 3, fully adjusted.
R^2 for models 2a to 3, respectively, was 0.02, 0.01, and 0.03.
We excluded children due to missing data on the outcome; this left 2,445 children in the analysis.
* Values are unstandardised and standardised coefficients (95% *CIs*). *B* is unstandardised and denotes change in child externalising problem scores per unit change in the predictor. β is a standardised coefficient and denotes *SD* change in child externalising problem scores per *SD* or unit change in the predictor.
† Higher scores indicate higher quality home environments or involvement.

Table 3. Regression analysis predicting internalising problem scores reported by fathers from family socio-demographic factors and children's home environments* (*n* = 2,164)

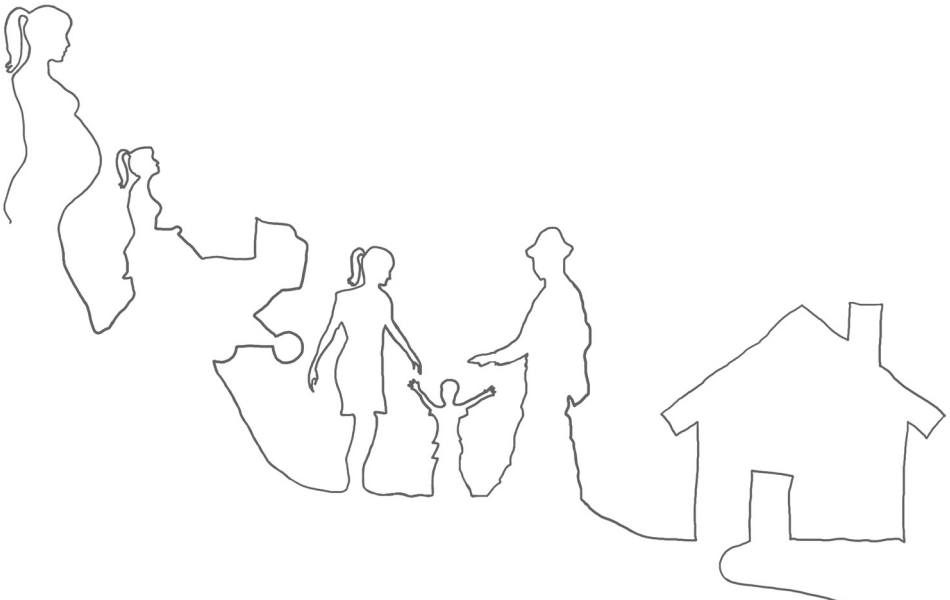
	Internalising problem scores at age 3 reported by fathers								
	Single risk factor (model 1)			All socio-demographic factors (model 2a)			All risk factors (model 3)		
Variable	*B* (95% *CI*)	β	*p*-value	*B* (95% *CI*)	β	*p*-value	*B* (95% *CI*)	β	*p*-value
Socio-demographic factors									
Child national origin, non-Western	0.33 (0.21; 0.45)	0.14	<0.001	0.23 (0.09; 0.38)	0.10	0.002	0.20 (0.06; 0.34)	0.08	0.006
Family income, low	0.29 (0.06; 0.53)	0.09	0.017	0.06 (-0.18; 0.30)	0.02	0.610	0.03 (-0.22; 0.28)	0.01	0.782
Lower maternal education (per level)	0.17 (0.11; 0.24)	0.12	<0.001	0.10 (0.03; 0.18)	0.07	0.008	0.09 (0.02; 0.17)	0.06	0.019
Socio-emotional involvement, score†	-0.28 (-0.92; 0.37)	-0.06	0.326	-0.15 (-0.73; 0.42)	-0.03	0.545	-0.13 (-0.73; 0.46)	-0.03	0.609
	Internalising problem scores at age 3 reported by fathers								
	Single risk factor (model 1)			All home environment observations (model 2b)			All risk factors (model 3)		
Variable	*B* (95% *CI*)	β	*p*-value	*B* (95% *CI*)	β	*p*-value	*B* (95% *CI*)	β	*p*-value
Home environment									
Physical home, score†	0.03 (-0.16; 0.21)	0.01	0.781	0.12 (-0.08; 0.31)	0.03	0.237	0.14 (-0.07; 0.34)	0.04	0.185
Learning home, score†	-0.42 (-0.62; -0.21)	-0.11	<0.001	-0.44 (-0.67; -0.21)	-0.12	0.001	-0.21 (-0.43; 0.01)	-0.06	0.065

Model 1, adjusted for child gender and age at the assessment of outcome; model 2, additionally adjusted for socio-demographic factors (model 2a) or home environment (model 2b); model 3, fully adjusted.
R^2 for models 2a to 3, respectively, was 0.03, 0.02, and 0.04.
We excluded children due to missing data on the outcome; this left 2,164 children in the analysis.
* Values are unstandardised and standardised coefficients (95% *CIs*). *B* is unstandardised and denotes change in child internalising problem scores per unit change in the predictor. β is a standardised coefficient and denotes *SD* change in child internalising problem scores per *SD* or unit change in the predictor.
† Higher scores indicate higher quality home environments or involvement.



Chapter 3

Social disadvantage, home environments, parenting, and emotional and behavioural problems in children



Chapter 3.1

Economic disadvantage and young children's emotional and behavioural problems: Mechanisms of risk

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ABSTRACT

This study aimed to establish potential mechanisms through which economic disadvantage contributes to the development of young children's internalising and externalising problems. Prospective data from fetal life to age 3 years were collected in a total of 2,169 families participating in the Generation R Study. The observed physical home environment, the provision of learning materials in the home, maternal depressive symptoms, parenting stress, and harsh disciplinary practices were all analysed as potential mediators of the association between economic disadvantage and children's internalising and externalising problem scores. Findings from structural equation modelling showed that for both internalising and externalising problems, the mechanisms underlying the effect of economic disadvantage included maternal depressive symptoms, along with parenting stress and harsh disciplining. For internalising but not for externalising problem scores, the lack of provision of learning materials in the home was an additional mechanism explaining the effect of economic disadvantage. The current results suggest that interventions that focus solely on raising income levels may not adequately address problems in the family processes that emerge as a result of economic disadvantage. Policies to improve the mental health of mothers with young children but also their home environments are needed to change the economic gradient in child behaviour.

INTRODUCTION

It has been widely acknowledged that poverty has a harmful impact on children's development (Bradley & Corwyn, 2002; Brooks-Gunn & Duncan, 1997; McLoyd, 1998). Children residing in economically deprived families more often manifest behavioural and emotional problems (Bradley & Corwyn, 2002). In addition, there is evidence that the harmful effects of poverty are already observable early in a child's life. For example, studies in the United States and the United Kingdom have shown that associations of low income with children's behaviour and emotional well-being occur when children are as young as age 3 and 5 years (Kiernan & Huerta, 2008; Linver, Brooks-Gunn, & Kohen, 2002; Yeung, Linver, & Brooks-Gunn, 2002). Given these findings, interventions during the early years of a child's life may be most important in diminishing the harmful effects of poverty on children's behavioural and emotional development (Brooks-Gunn & Duncan, 1997).

However, without information on the mechanisms underlying the association between poverty and adverse child development, leverage points amenable to policy intervention are unclear, leaving professionals and policy makers with little information on how to guide these interventions. There is ample evidence that the home environment and parental emotional well-being mediate the association between low family income and child emotional and behavioural problems (Bor et al., 1997; Kiernan & Huerta, 2008; Linver et al., 2002; McLeod & Shanahan, 1993; NICHD, 2005; Pachter, Auinger, Palmer, & Weitzman, 2006; Yeung et al., 2002). Using data from the National Longitudinal Survey of Youth, Pachter et al. (2006) found that poverty affected children's behavioural and emotional problems from the age of 6 to 9 years through more proximal variables such as maternal depression and the child's home environment. Yeung et al. (2002) found that children residing in families with lower income had more behavioural problems, and this effect was partially mediated by the quality of the child's home environment, maternal depressive symptoms, and parenting quality. Their results demonstrated that family income was directly associated with maternal depressive symptoms, but also indirectly, through the physical home environment. Maternal depressive symptoms were in turn associated with punitive parenting, which was then related to children's behavioural problems (Yeung et al., 2002).

The results of Yeung et al. (2002) are consistent with the family investment model and the family stress model that have been proposed to explain mechanisms connecting socio-economic status (SES) and behavioural development (Conger & Elder, 1994). Conger and his colleagues have postulated that economic disadvantage is negatively related to parental material investments in the development of children (RD Conger & KJ Conger, 2002; Conger & Donnellan, 2007; Conger & Elder, 1994; Martin et al., 2010). These investments in children involve dimensions of family support, such as stimulation of learning and adequate housing. In addition, Conger and his colleagues have proposed that economic disadvantage adversely affects the child's development through its nega-

tive impact on parental emotional well-being such as depression, which in turn diminishes or disrupts parenting skills (RD Conger & KJ Conger, 2002; Conger & Donnellan, 2007; Conger & Elder, 1994; Martin et al., 2010). In line with expectations derived from the family investment model, research has shown that children residing in poor families have limited access to age-appropriate learning resources (e.g., learning toys or books) in the home, and are more likely to live in houses with structural defects (Bradley & Corwyn, 2002; Duncan & Brooks-Gunn, 2000; Evans, 2004; McLoyd, 1998). Consistent with predictions from the family stress model, economic disadvantage has been related to maternal depression, which predicts disruptions in parenting including more harsh disciplinary practices and parenting stress (Forman et al., 2007; Goodman & Brumley, 1990; Lovejoy, Graczyk, O'Hare, & Neuman, 2000; McLoyd, 1998).

The vast majority of studies investigating mechanisms underlying the association between low income and young children's emotional and behavioural problems have been conducted in the United States. In the United States, economic inequalities are more pronounced than in any other industrialized nation (Caminada & Goudswaard, 2001; Moss, 2000) and economic mobility for those in poverty is among the lowest (Belle & Doucet, 2003). Whereas the essence of US antipoverty policies is to indirectly approach poverty reduction by providing poor families with education and support services, European interventions seek to provide social insurance programs (e.g., universal health care) and programs that directly raise incomes of poor families (e.g., minimum wage) (McLoyd, 1998; Moss, 2000). Associations between low income and children's development exist in such publicly funded health-care systems but these associations tend to be weaker (Propper, Rigg, & Burgess, 2007).

There may also be differences between the United States and other wealthy nations in the specific mechanisms by which low income influences children's well-being. Income inequality has been strongly related to depression, particularly among women with young children (Belle & Doucet, 2003; Kahn, Wise, Kennedy, & Kawachi, 2000). High levels of depressive symptoms are common in the United States; recent estimates suggest that the 12-months prevalence of major depressive disorder in mothers is 10.2% (Ertel, Rich-Edwards, & Koenen, 2011). Thus, in a family stress based model explaining the effects low income has on the child's development, associations involving maternal depressive symptoms may be absent or less strong in nations with less income disparities. Despite these potential differences, few studies extended this research on economic disadvantage and young children's emotional and behavioural development to nations other than the United States.

A notable exception is the recent study of Kiernan et al. (2008) that used data from the UK Millennium Cohort Study to examine associations between economic deprivation and child emotional and behavioural problems at the age of 3 years. The authors reported that economic deprivation was related to children's emotional and behavioural problems and that these associations were partially explained by maternal depressive symptoms and

parenting factors such as disciplinary practices. However, such efforts remain rare and additional research that addresses family processes underlying the impact of economic disadvantage on a non-USA sample of children is needed.

The current study assessed whether the mediational processes by which economic disadvantage is proposed to affect child emotional well-being and behavioural problems held true for a Dutch sample of young children. Using data from a population-based prospective study, we examined children's home environments, maternal depressive symptoms, and disruptions in parenting as potential mediators of the association between economic disadvantage and children's emotional and behavioural problems. We investigated two different dimensions of disrupted parenting: mother's harsh disciplining and parent related parenting stress (i.e., mother's attitudes toward her parenting). In addition, we focused on two dimensions of the home environment: the physical home (e.g., housing quality) and the provision of learning materials and toys in the home. This allowed us to examine predictions from both the family stress model and the family investment model. We hypothesized that family investments (as indicated by home environments) and family stress (as indicated by maternal depressive symptoms or disrupted parenting) constitute non-exclusive mechanisms that explain the association between economic disadvantage and children's behavioural development. Firstly, we hypothesized that economic disadvantage directly affects the quality of home environments and maternal depressive symptoms. Maternal depressive symptoms in turn disrupt parenting, which then has an effect on young children's behavioural development. Secondly, we hypothesized that home environments are also directly related to children's behavioural development. Finally, we postulated that home environments are indirectly related to children's behavioural development through maternal depressive symptoms and disrupted parenting. Figure 1 represents the conceptual framework of our proposed model.

METHOD

Study design

The present study was conducted within Generation R, a longitudinal, population-based cohort from fetal life onwards (Jaddoe et al., 2010). Pregnant women living in the study area in Rotterdam, the Netherlands, with an expected delivery date between April 2002 and January 2006, were invited to participate. Written informed consent was obtained from all participants. The study was conducted in accordance with the guidelines proposed in the World Medical Association Declaration of Helsinki, and was approved by the Medical Ethics Committee of the Erasmus Medical Center, Rotterdam (numbers: prenatal, MEC 198.782/2001/31 and postnatal, MEC 217.595/2002/202).

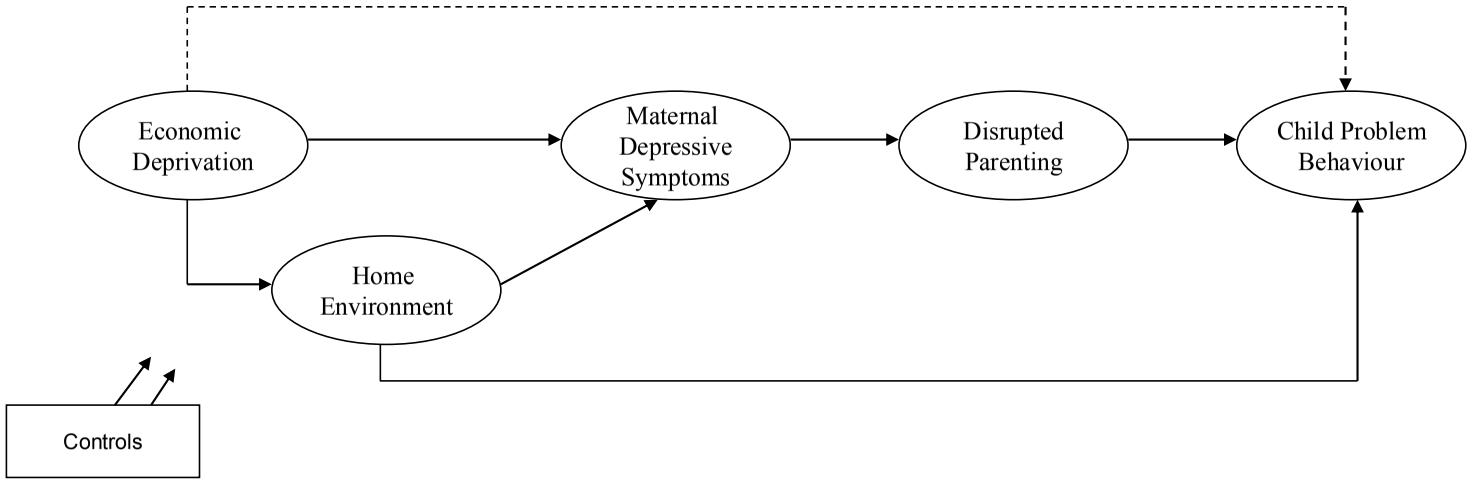

Figure 1. Conceptual model

The conceptual framework of our proposed model in which the quality of children's home environments, maternal depressive symptoms, and disrupted parenting mediate the association between economic disadvantage and child problem behaviour.

Population for analysis

This study was embedded in the postnatal phase of the Generation R Study, which was constituted with a renewed consent procedure when infants were around 3 months of age. In 3,400 children this consent procedure was combined with a home visit which included an observation of the home environment. We excluded twins, leaving 3,334 children eligible for follow-up. A total of 2,169 mothers reported on child behaviour at the 3-year assessment. These 2,169 children and their families (65% of 3,334) were included in the current analyses. In order to test consistency, we also used father reports of child behaviour. A total of 1,621 fathers in this sample reported on child behaviour at the 3-year assessment.

In the current sample of 2,169 children and their families, the mean age of children at the behavioural assessment was 36.58 months (*SD* = 1.22). Forty eight percent of the children in this sample were boys. Thirty one percent of children were non-Western, and 47% were first born. The mean age of mothers in this sample at intake was 31.38 years (*SD* = 4.66). General secondary school was the highest educational level attained in 44% of the mothers. Of the mothers, 9% were single.

Respondents (*n* = 2,169) were more often of Western national origin (69.2% vs. 44.4%, $\chi^2 = 175.03$, $p < 0.001$) and were less often poor (12.9% vs. 37.7%, $\chi^2 = 198.22$, $p < 0.001$) than non-respondents (*n* = 1,165). Respondents more often completed higher levels of education than non-respondents (56.5% vs. 26.2%, $\chi^2 = 240.11$, $p < 0.001$).

Measures

Our analysis included child internalising and externalising problem behaviour assessed at the age of 3 years, economic disadvantage assessed at 30 weeks of gestation, and five mediators (the physical and the stimulating home environment assessed at the age of 3 months, maternal depressive symptoms assessed at the age of 6 months, parenting stress assessed at the age of 1.5 years, and harsh disciplining assessed at the age of 3 years). We examined all these variables via latent constructs. Table 1 presents the variables that were used as indicators of the latent constructs. The first column of Table 1 displays the means or percentages of these variables.

Child behaviour

The Child Behavior Checklist for toddlers (CBCL/1,5-5; Achenbach & Rescorla, 2000) was used to obtain standardized reports of children's problem behaviour at the age of 3 years. The CBCL includes 99 items on which parents rate the extent to which each statement describes their child "now or within the past 2 months" on a three point scale; 0 = *not*

Table 1. Summary of confirmatory factor analysis measurement models

Measurement model	% yes / Mean (*SD*)[a]	Estimates[b]	
Model 1: Children's outcomes			
Internalising			
Emotionally reactive	1.62 (1.83)	1.00[c]	(0.00) **.83**
Anxious or depressed	1.09 (1.54)	0.74***	(0.03) **.63**
Somatic complaints	1.63 (1.75)	0.62***	(0.03) **.53**
Withdrawn behaviour	0.95 (1.37)	0.64***	(0.03) **.59**
Externalising			
Attention	1.48 (1.62)	1.00 [c]	(0.00) **.64**
Aggressive	7.00 (5.16)	1.96***	(0.07) **.90**
Internalising with Externalising		0.28 ***	(0.01) **.83**
CFI=0.97; TLI=0.95; RMSEA=0.08; $\chi^2(8)$ =123.18			
Model 2: Economic disadvantage			
Low income	13	1.00[c]	(0.00) **.69**
Financial difficulties	18	1.22***	(0.06) **.84**
Not having friends or family over for dinner	2	1.29***	(0.07) **.89**
No evening out once every two weeks	8	1.29***	(0.07) **.89**
No holiday from home	8	1.33***	(0.07) **.92**
No membership of a social or cultural club	5	1.34***	(0.07) **.92**
No leisure items	3	1.27***	(0.07) **.87**
No regular purchase of new clothes	10	1.23***	(0.07) **.84**
Postponed payment of rent or mortgage	2	1.05***	(0.08) **.72**
No car or lease car	5	1.12***	(0.07) **.77**
CFI=0.99; TLI=0.99; RMSEA=0.03; $\chi^2(25)$ = 68.60			
Model 3: Home environment			
Physical home			
Street is clean	89	1.00[c]	(0.00) **.83**
Exterior of the house is well maintained	93	1.10***	(0.04) **.91**
Neglected houses in the street[d]	87	0.99***	(0.04) **.81**
Basic furniture is present	97	0.79***	(0.06) **.65**
Windows or walls are damp inside[d]	96	0.85***	(0.06) **.70**
The walls inside the house are in good condition	94	0.96***	(0.05) **.79**
Central heating system is present	95	0.61***	(0.06) **.51**
The living room is tidy	79	0.70***	(0.04) **.58**
The kitchen or toilet is unclean[d]	79	0.78***	(0.04) **.65**
Cigarette smoke in the residence[d]	96	0.60***	(0.07) **.50**
Stimulating home			
Various toys	87	1.00[c]	(0.00) **.99**
Special place to lay down and play	90	0.89***	(0.02) **.88**
Cuddly toys are available	86	0.97***	(0.01) **.96**
Muscle activity toys or equipment	83	0.94***	(0.01) **.94**
Musical toys or equipment	84	0.94***	(0.01) **.94**

Table 1. Summary of confirmatory factor analysis measurement models *(continued)*

Measurement model	% yes / Mean (*SD*)[a]	Estimates[b]	
Physical home with Stimulating home		0.34***	(0.03) **.41**
CFI=0.97; TLI=0.97; RMSEA=0.07; $\chi^2(40) = 495.21$			
Model 4: Maternal depressive symptoms			
Feeling suicidal	3	1.00[c]	(0.00) **.83**
Feeling lonely	26	0.95***	(0.06) **.79**
Feeling down	23	1.05***	(0.06) **.87**
Having no interest	13	1.00***	(0.06) **.83**
Feeling desperate about the future	17	1.04***	(0.06) **.87**
Feeling worthless	11	0.98***	(0.06) **.81**
CFI=1.00; TLI=1.00; RMSEA=0.02; $\chi^2(8) = 12.60$			
Model 5: Parenting			
Parenting stress			
Being a parent is difficult	27	1.00[c]	(0.00) **.68**
Trouble raising child	19	1.23***	(0.05) **.83**
Thinking about giving up	9	1.14***	(0.06) **.77**
Not capable of caring for child	5	1.24***	(0.06) **.84**
Difficulties making decisions about child	8	0.96***	(0.06) **.65**
Not being able to cope with things	16	1.19***	(0.05) **.80**
Getting tired quickly	78	0.49***	(0.06) **.33**
Feeling not to have things under control	23	1.15***	(0.05) **.77**
Wanting to be a mother like that	16	0.97***	(0.05) **.65**
I often do not understand my child	15	0.90***	(0.06) **.60**
I am not confident about the future upbringing	26	0.61***	(0.06) **.41**
Harsh disciplining			
I shook my child	7	1.00[c]	(0.00) **.74**
I shouted or screamed angrily at my child	76	0.92***	(0.08) **.68**
I called my child names	5	1.14***	(0.09) **.84**
I threatened to give a slap but I didn't do it	30	0.67***	(0.06) **.50**
I angrily pinched my child's arm	15	0.74***	(0.07) **.55**
I called my child stupid or lazy or something like that	7	1.01***	(0.08) **.75**
Parenting stress with harsh disciplining		0.21***	(0.03) **.43**
CFI=.97; TLI=.98; RMSEA=0.03; $\chi2(83) = 218.40$			

CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation.
[a] Values represent mean (*SD*) for continuous indicator variables and percentages for categorical indicator variables.
[b] Unstandardized and standardized (bold) coefficient estimates (values given in parentheses are standard errors).
[c] According to requirements for structural equation modelling one variable loading on each latent factor was set equal to 1.00 to set the metric for that factor. Consequently, significance values are not calculated for these variable loadings.
[d] Reversed items were recoded prior to analysis
*** $p < .001$

true, 1 = *somewhat or sometimes true* and 2 = *very true or often true*. In the present study, six CBCL syndrome scales were used, to index emotionally reactive behaviour (9 items), anxious or depressed behaviour (8 items), somatic complaints (11 items), withdrawn behaviour (8 items), attention problems (5 items) and aggressive behaviour (19 items). Scale scores were computed by summing respective items. The psychometric properties of the CBCL are well established (Achenbach & Rescorla, 2000). The CBCL syndrome scales were square root transformed for the current study to approximate a normal distribution.

Economic disadvantage

The economic disadvantage construct included several measures collected at 30 weeks of gestation: family income, financial difficulties, and adjustments the family had to make because of financial difficulties (see Table 1). Primary caretakers were asked to report the total monthly net *income* of their household. To compare poor and non-poor families, we dichotomized our measure of family income in accordance with the social security level (above (≥ €1200) versus below the social security level (< €1200)). Individuals living below social security level are considered to have insufficient means to acquire immediate needs and are entitled to apply for social security benefits. Primary caregivers also reported whether they experienced *financial difficulty* in acquiring immediate needs such as food, rent and electricity in the last year. Responses were coded as 0 = not difficult; 1 = difficult. In addition, primary caregivers reported on 13 *adjustments* the family had to make in the last year because of financial difficulties. For example, caregivers were asked whether they regularly purchased new clothes. For negative answers, a follow-up question examined whether this adjustment was made because of financial difficulties. Due to very low prevalence rates (≤ 0.5%) and estimation problems that were encountered because of empty cells, five of these follow-up items were removed from analyses (i.e., at least one warm meal a day, adequate heating, having a refrigerator, a telephone, or a washing machine at home). In order to address upward mobility (i.e., families may increase wealth several years later), we also included a family income measure collected when the child was 3 years of age.

Home environments

Home environments were assessed by means of observation during a home visit when the infant was on average 3.37 months of age (*SD* = 1.15). The physical home environment construct was derived from ten binary-coded items from the adapted IT-HOME Inventory (Rijlaarsdam et al., 2012), registering, among other things, whether the home was clean or whether a central heating system was present (see Table 1). The stimulating home en-

vironment construct was derived from five binary-coded items from the adapted IT-HOME Inventory assessing, among other things, whether the infant had musical toys (see Table 1). These five items were guided by the Infant-Toddler Home Observation for Measurement of the Environment Inventory (IT-HOME; Caldwell & Bradley, 1984). Good reliability has been demonstrated for the adapted IT-HOME Inventory (Rijlaarsdam et al., 2012).

Depressive symptoms

The construct of maternal depressive symptoms was derived from the six items of the depression scale from the Brief Symptom Inventory (BSI; De Beurs, 2004; Derogatis, 1993) collected when the child was 6 months of age. The BSI is a validated self-report measure consisting of 53 items, which is widely used in clinical and research settings. The items define a spectrum of depressive symptoms such as "feeling lonely" in the preceding 7 days and are rated on 5-point uni-dimensional scales, ranging from 0 (*not at all*) to 4 (*extremely*).

Parenting stress

The parenting stress construct included 11 items of the parenting domain of the Nijmeegse Ouderlijke Stress Index-Kort (NOSIK; De Brock et al., 1992) collected when the child was 1.5 years of age. The NOSIK is the Dutch version of the Parenting Stress Index-Short Form (Abidin, 1983). Sample parenting stress items include "I often do not understand my child" and "Being a parent is difficult". Items were rated on a 4-point Likert scale. Higher scores indicate greater levels of stress. Good reliability (Cronbach's alpha = 0.95) and validity have been reported for the NOSIK (De Brock et al., 1992).

Disciplinary practices

The harsh discipline construct was derived from six items of the Parent-Child Conflict Tactics Scale (CTS; Straus, Hamby, Finkelhor, Moore, & Runyan, 1998) collected when the child was 3 years of age. Mothers rated their disciplinary practices during the past 2 weeks on a 6-point scale ranging from 0 (*never*) to 5 (*five times or more*). Examples of questions are "I shouted or screamed angrily at my child" and "I angrily pinched my child's arm" (see Table 1).

Family socio-demographics

Information on family socio-demographic characteristics was obtained by questionnaire during pregnancy. We included as covariates in our analyses child gender, child's age at

the assessment of outcome, parity (previous pregnancies: 0 versus ≥1), maternal age at intake, marital status (married or cohabiting versus single), and mothers' highest attained educational level (no formal education completed or general secondary education versus higher vocational training or higher academic education), and child national origin. Child national origin was classified into Western versus non-Western and was based on the country of birth of the parents. The group classified as Western includes European, North-American, Australian, and Asian Western (Japanese) children. The non-Western group is comprised of children with a Turkish, Moroccan, Surinamese, Cape Verdean, Dutch Antillean, African, South-American, and Asian non-Western (Asia except Japan) national origin.

Statistical analysis

The analyses were conducted in Mplus version 5.1 (Muthén & Muthén, 1998-2007). Missing data were estimated in order to use all available data in Mplus with full information maximum likelihood (FIML) procedures as described by Asparouhov and Muthén (2010). First, the factor structures of the predictor, outcome, and mediator variables were tested to confirm that these measures show good psychometric properties in the current sample. This was accomplished by conducting five confirmatory factor analyses (CFA); (1) children's outcomes including internalising and externalising problems, (2) economic disadvantage, (3) home environments including the physical and the learning home environment, (4) maternal depressive symptoms, and (5) parenting including parenting stress and harsh disciplining.

We determined identification of all CFA measurement models. For example, the internalising and externalising model was identified by the two-indicator rule (e.g., Kline, 2011): (a) there is more than one factor, (b) there are two or more indicators per factor, (c) the two factors are allowed to covary, and (d) theta is diagonal, which means that there are no correlated errors in indicators. The Maximum Likelihood estimator was used for the internalising and externalising CFA measurement model, which is the default in Mplus for analysis with all continuous variables. Categorical items were recoded to be dichotomous (0=never or not true and 1=yes, any endorsement of the item) prior to entry into CFA and the weighted least squares with means and variance adjustment (WLSMV) estimator for categorical data was employed. This technique is consistent with previous CFAs establishing psychometric properties of the outcome scales (Achenbach & Rescorla, 2000) and allows for increased power relative to models using indicators with empty cells.

Next, structural equation modelling (SEM) using the WLSMV estimator was employed to test the hypotheses that economic disadvantage would predict child internalising and externalising problems at age 3 years, and these relations would be mediated by maternal depressive symptoms, disrupted parenting, and home environments. In order to clarify

the SEM findings, we conducted additional tests of indirect effects using the 'indirect' option in Mplus. Control variables were allowed to covary with each other and with economic disadvantage, and were entered as predictors of all other variables in the model (home environment, maternal depressive symptoms, parenting stress, harsh parenting, and child outcomes). In addition, our model took into account possible covariance among the two latent home environment constructs, the two latent parenting constructs, and the two latent child behaviour constructs.

We tested whether child gender moderated the relationships shown in Fig. 1. In SEM analysis, the differences in chi-square values between a model that allows the parameters to vary among groups and a model that constrains the parameters to be equal across groups provides a test for moderation effects. When the difference is non-significant, there is no evidence of moderation. We did not evaluate ethnic differences in the processes linking economic disadvantage and children's internalising and externalising problems because numbers of national origin groups in the Western and the different non-Western categories were too small for meaningful multiple-group analysis when considered separately. However, we included national origin as a control variable.

A separate analysis was run with father reports on internalising and externalising problems. Also in this analysis, missing data were estimated in order to use all available data in Mplus with FIML procedures. In addition, we conducted a separate analysis excluding those families who reported upward mobility (i.e., those families who were poor during pregnancy but were no longer poor when the child was 3 years of age).

Because chi-square values are sensitive to the sample size, we used the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), and the Root Mean Square Error of Approximation (RMSEA) as our main indices of model fit (Browne & Cudeck, 1993; Hu & Bentler, 1999). For the CFI and TLI, values greater than 0.90 generally indicate reasonably good fit. For the RMSEA, values of 0.05 or lower indicate close fit, the range of 0.05 to 0.08 is interpreted as reasonable fit, the range of 0.08 to .10 as marginal fit, and values greater than 0.10 as unacceptable fit.

RESULTS

Measurement models

Before testing our structural model, we first performed confirmatory factor analyses to establish the validity of our proposed latent factors. The variable loadings on the latent factors and the fit indices are summarized in Table 1. For all five measurement models, a reasonably good fit to the data was found (see Table 1). In addition, all variable loadings on the hypothesized latent factors were strong and statistically significant. Thus,

confirmatory factor analyses indicated that it was acceptable to employ the proposed latent constructs in the remaining analyses.

Structural model

The results of our hypothesized model are presented as follows. Figure 2 presents the unstandardized and standardized path coefficients of the model. To enhance the readability of the figure, paths between control variables and outcomes are not shown in the model. For the same reason, only paths that were statistically significant at the $p < 0.05$ level are presented. Table 2 shows the total effect of economic disadvantage on internalising and externalising problem scores disaggregated into direct and indirect effects. All the estimates in Table 2 and Fig. 2 take into account the background variables of the families. The chi-square difference test for the multiple-group analysis of child gender was non-significant, $\chi^2(36) = 39.94$, $p = 0.2994$, indicating no evidence of moderation.

Structural equation modelling showed a good fit to the data for the model, CFI = 0.94, TLI = 0.96, RMSEA = 0.03, $\chi^2(350) = 1166.19$. The model explained 36% of the variance in children's internalising problem scores and 36% of the variance in children's externalising problem scores. First, we examined the total effect of economic disadvantage on children's internalising and externalising problem scores. Table 2 shows that children residing in economically deprived families are more likely to have internalising, $\beta = 0.27$, $p < 0.001$, and externalising, $\beta = 0.12$, $p < 0.05$, problems at age 3 years. Next, we examined the extent to which the home environment, maternal depressive

Table 2. Direct, indirect, and total effects of economic disadvantage on children's internalising and externalising problem scores

Economic disadvantage	Internalising		Externalising	
	b(SE) β		*b(SE)* β	
Total	0.175***	(0.033) **.269**	0.068*	(0.028) **.120**
Total direct	0.100**	(0.033) **.154**	0.005	(0.029) **.009**
Total Indirect	0.075***	(0.015) **.115**	0.063***	(0.014) **.111**
Via Physical home	-0.011	(0.006) **-.016**	-0.005	(0.005) **-.008**
Via Stimulating home	0.024*	(0.010) **.037**	0.009	(0.008) **.017**
Via Depression and harsh disciplining	0.022***	(0.006) **.034**	0.027***	(0.007) **.048**
Via Depression and parenting stress	0.033***	(0.008) **.051**	0.025***	(0.007) **.045**
Via Physical home, depression, and harsh disciplining	0.001	(0.001) **.002**	0.001	(0.001) **.003**
Via Physical home, depression, and parenting stress	0.002	(0.001) **.003**	0.001	(0.001) **.002**
Via Stimulating home, depression, and harsh disciplining	0.001	(0.001) **.002**	0.002	(0.001) **.003**
Via Stimulating home, depression, and parenting stress	0.002	(0.002) **.003**	0.002	(0.001) **.003**

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

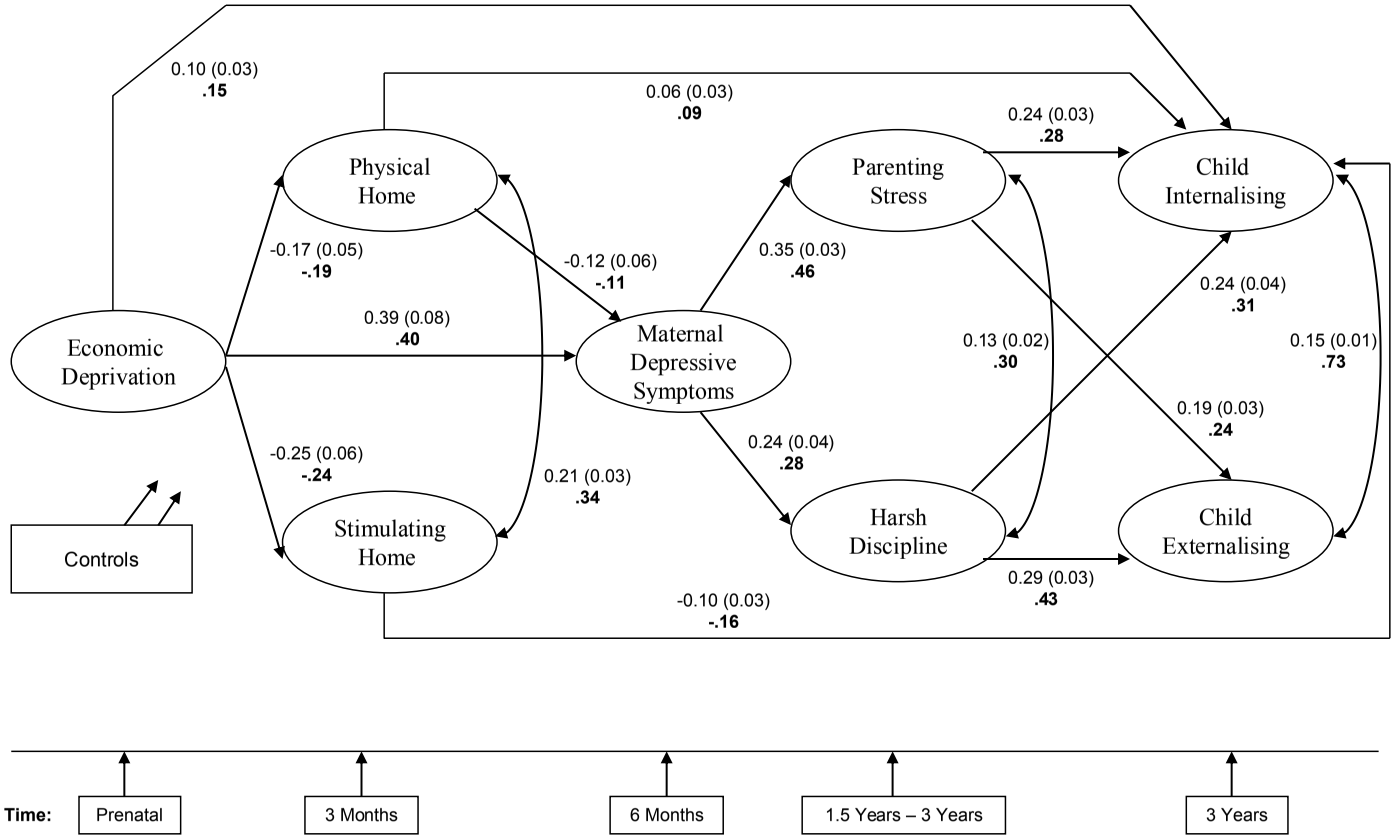

Figure 2. Unstandardized and standardized (bold) coefficient estimates (values given in parentheses are standard errors)

Note. All paths shown are statistically significant at the $p < .05$ level. All estimates include controls (age of child, gender, national origin, parity, maternal education, marital status and maternal age).

symptoms and parenting played a mediating role in the associations between economic disadvantage and children's internalising and externalising problems. The decomposition of the total effects of economic disadvantage is presented in Table 2 and shows that, for internalising problems, both the direct, $\beta = 0.15$, $p < 0.01$, and the total indirect effects, $\beta = 0.12$, $p < 0.001$, are statistically significant. For externalising problems, the total indirect, $\beta = 0.11$, $p < 0.001$, but not the direct effect, $\beta = 0.01$, $p > 0.05$, of economic disadvantage was significant. In the next paragraphs, we present the specific indirect effects of economic disadvantage on children's internalising and externalising problems.

Mediating role of home environments

Figure 2 shows that economic disadvantage was negatively associated with the quality of the physical, $\beta = -0.19$, $p < 0.01$, and the stimulating home environment, $\beta = -0.24$, $p < 0.001$. For the physical as well as the stimulating home environment, a significant direct association with children's internalising problem scores was found. The association of the stimulating home environment was negative, and thus in the expected direction, $\beta = -0.16$, $p < 0.01$, whereas the association of the physical home environment was positive, $\beta = 0.09$, $p < 0.05$. Table 2 presents the specific direct effects of economic disadvantage on children's outcomes. From this table, it is clear that the stimulating home environment, $\beta = 0.04$, $p < 0.05$, but not the physical home environment, is a mechanism through which economic disadvantage affects children's internalising problems.

Mediating role of maternal depressive symptoms and disrupted parenting

Figure 2 further shows that economic disadvantage was positively associated with maternal depressive symptoms, $\beta = 0.40$, $p < 0.001$, which in turn was positively associated with parenting stress, $\beta = 0.46$, $p < 0.001$, and harsh disciplining, $\beta = 0.28$, $p < 0.001$. For both parenting stress and harsh disciplining, a significant association with internalising and externalising problem scores was found (see Fig. 2). The specific indirect effects presented in Table 2 confirm that maternal depressive symptoms, along with parenting stress or harsh disciplining are mechanisms through which economic disadvantage affects children's internalising and externalising problem scores.

Mediating role of home environments, maternal depressive symptoms, and disrupted parenting

In line with our hypothesis, the quality of the physical home environment was negatively associated with maternal depressive symptoms, $\beta = -0.11$, $p < 0.05$. However, estimates in Table 2 show that for both internalising and externalising problem scores, the specific

indirect effects involving home environments, maternal depressive symptoms, and disrupted parenting simultaneously were non-significant. Thus, these pathways involving all constructs did not add to the prediction of children's internalising and externalising problems above the effect each construct had.

Father report

Father and mother reports of child internalising problems, $\beta = 0.60$, $p < 0.001$, and externalising problems, $\beta = 0.62$, $p < 0.001$, were interrelated. Separate analysis with father reports on internalising and externalising problems yielded only small changes in effect sizes and patterns of statistical significance when compared with the model using mother reports (data not shown), with one notable exception. In the analysis with father reports, mother's harsh disciplining was less strongly, albeit significantly, associated with children's externalising problems, $\beta = 0.24$, $p < 0.001$, and was unrelated to internalising problems, $\beta = 0.06$, $p > 0.05$.

Upward mobility

A total of 98 children (4.5%) in this sample were no longer poor at age 3 years, indicating upward mobility. Results were largely similar when excluding these 98 children from analysis, although the size of effect of the several associations was slightly larger (data not shown). However, the size of effect of the association between the stimulating home environment and internalising problem scores was somewhat smaller in this analysis, $\beta = -0.10$, $p = 0.110$.

DISCUSSION

In this study we aimed to extend previous findings on how economic disadvantage affects young children's emotional and behavioural problems to a non-American sample. Consistent with our hypotheses, economic disadvantage was associated with both internalising and externalising problems when children were as young as 3 years of age. Furthermore, as hypothesized, these associations were partially explained by maternal depressive symptoms, along with disrupted parenting including parenting stress and harsh disciplining. For internalising, but not for externalising problem scores, the quality of the stimulating home environment was an additional mechanism explaining the effect of economic disadvantage.

The pattern of the current results is largely consistent with those reported in a number of US studies (Linver et al., 2002; McLeod & Shanahan, 1993; NICHD, 2005; Pachter

et al., 2006; Yeung et al., 2002) supporting the mediating roles of home environments, maternal emotional well-being, and parenting in the association between economic disadvantage and young children's behavioural development. In this study, we found no direct effects of the physical home environment and the stimulating home environment on children's externalising problems, but rather a direct effect of a lower quality physical environment on the mother's depressive symptoms. This extends the findings of Yeung et al. (2002) to a Dutch sample of young children. The current results also demonstrated support for the most basic propositions of the family investment model and those of the family stress model. That is, that economic disadvantage is negatively related to parental investments (e.g., the provision of learning toys in the home) that are expected to foster positive development for children, and that economic deprivation adversely affects the child's development through its negative impact on maternal depression, which in turn diminishes or disrupts parenting skills.

Despite these consistent patterns, some considerable differences between the current study and related research can be noted. In their US sample, Yeung et al. (2002) observed that the physical environment of the home was indirectly related to children's externalising problems through its relation with maternal depressive symptoms and punitive parenting. Such an indirect effect was absent in the present study. This difference may be due to methodological differences in the assessment procedure of the Yeung et al. (2002) study and that of the current study. Unlike Yeung et al. (2002), who combined observed and interviewed reports, we assessed the home environment exclusively by observation, thereby limiting shared method variance bias. Furthermore, in the current study children's home environments, maternal depressive symptoms, and developmental outcomes were all assessed at different points in time, whereas Yeung et al. (2002) assessed these constructs cross-sectionally. Related studies have often relied, at least in part, on cross-sectional designs. For example, Kiernan and Huerta (2008) assessed all their potential mediators, with the exception of maternal depression, at the same time as the child outcome measures. Given that the present study assessed the predictor, mediators, and outcomes at different points in time, tests of mediation are more rigorous. Indeed, of the five mediators being tested, only the assessment of maternal harsh disciplining was conducted at the same time as the outcomes.

Furthermore, previous research suggested that low income or socio-economic position is more closely related to externalising than to internalising problems (Amone-P'Olak et al., 2009; Kiernan & Huerta, 2008; McLeod & Shanahan, 1993; Yeung et al., 2002), while, if anything, the reverse was observed in the current study. Few studies, however, have investigated the associations between economic disadvantage and internalising and externalising problems in children as young as 3 years of age, as was done in the present study. In a study by Kiernan and Huerta (2008), economic disadvantage predicted both children's internalising and externalising problems at age 3 years, showing relatively

large effects on externalising problems. However, any comparison must account for the different indicators used for both economic disadvantage and children's internalising and externalising problems.

As with economic disadvantage, the current findings suggest that the stimulating home environment has a distinct effect on children's internalising problems, but less so on children's externalising problems. Therefore, our hypothesis that parental investments and family stress each independently explain the association between economic disadvantage and children's behavioural development was confirmed in our analysis of internalising but not in our analysis of externalising problem scores. This finding may reflect the higher stability of internalising than externalising problems in young children (Achenbach & Rescorla, 2000). The observed associations of economic disadvantage and home environments with children's problem behaviour were small to moderate in magnitude and thus their impact on externalising problems may not have reached significance as externalising problems are less stable at very young ages.

Much of the effect of economic disadvantage on externalising problems was indirect rather than direct, indicating that this association is largely attributable to maternal emotional well-being and disrupted parenting. In contrast, the effect of economic disadvantage on children's internalising problems was direct rather than through the home environment, depressive symptoms, and disrupted parenting. This suggests that additional factors should be considered to explain this effect. This is in line with observations after a natural experiment that moved rural American families out of poverty (Costello, Compton, Keeler, & Angold, 2003). Moving out of poverty by sudden wealth significantly decreased children's externalising problems, but not internalising problems (Costello et al., 2003). The authors suggested that internalising problems may also be caused by some characteristics of poor families not directly related to poverty, such as a higher genetic loading for these conditions (Costello et al., 2003).

In order to achieve effective and efficient targeted intervention and prevention programs for young children and their families, additional research must delineate the processes by which economic disadvantage affects children's emotional and behavioural problems. For example, nutrition and neighbourhood quality are likely to mediate these associations (Evans, 2004; Martin et al., 2010). In this study, children's home environments were observed in the presence of the primary caregiver, who is mostly the mother. Thus, our model focused on maternal emotional well-being. Other studies, however, found effects of paternal depressive symptoms on their parenting and their children's developmental outcomes (Wilson & Durbin, 2010). This gives rise to an important question for future research; namely, whether father's emotional well-being and parenting contribute to the association between economic disadvantage and early-childhood problem behaviour. Furthermore, the observed association between parental socio-economic status and children's emotional and behavioural problems may be due to a third factor such as social

selection (Conger & Donnellan, 2007). More specifically, parents who are genetically predisposed to feelings of distress may have more difficulties in acquiring everyday financial necessities and have children who are also predisposed to distress and attendant behavioural problems.

Although the present study has a number of important strengths, its results must be interpreted within the context of several limitations. Firstly, the present study is population-based and maternal depression was assessed with a self-rating scale. Therefore, the results may not be easily generalizable to clinical populations. However, given that we were able to detect effects of maternal depressive symptoms in this study, it is likely that these effects would be more pronounced in populations at higher risk for psychopathology. Like other cohort studies, the Generation R Study is prone to selective drop-out. Our response analysis showed that selection occurred toward well-functioning families with higher socio-economic status. Although it is certain that selective drop out has an impact on statistical power, a recent study and simulations on the Avon Longitudinal Study of Parents and Children (ALSPAC) sample showed that this does not need to affect the validity of regression models with regard to disruptive behaviour (Wolke et al., 2009). In cases of selective drop out of families with lower socio-economic status some of the effects associated with economic disadvantage may be underestimated. It is possible that these associations are stronger in those who did not participate than in those who did. Furthermore, as is often the case within large-scale studies, data on child behaviour relied on parental report. Consequently, associations between maternal depressive symptoms and child problem behaviour may reflect a negative impact of maternal depression but could also be influenced by a tendency on the part of depressed mothers towards describing their children more negatively. However, we reduced possible reporter bias on the part of mothers in several ways. First, a temporal sequence was established and maternal depressive symptoms were assessed several years prior to the assessment of the outcome. Also, information on the home environment was not obtained by self-report of mothers but relied exclusively on observations by trained research nurses. Lastly, both mothers and fathers reported on child behavioural problems, and the associations were found to be largely consistent across informants. A notable exception was that in the analysis with father report, mother's harsh disciplining was less strongly associated with children's externalising problems and was unrelated to internalising problems. Of all constructs, this harsh disciplining construct was the only one assessed cross-sectionally with internalising and externalising problems. This study thus underscores the importance of temporal sequences in research on family processes and children's behavioural development. However, the fact that a temporal sequence was established does not mean that the relationships between these variables are necessarily unidirectional. For instance, a less-optimal home environment may lead to maternal depressive symptoms but the reverse could also be true. Finally, the family income and home environment variables

were measured very early in life and are likely to fluctuate over time. Particularly for young parents, there may be upward mobility. We addressed this by conducting a separate analysis excluding those children and their families who had moved out of poverty at the age of 3 years. Results were found to be largely consistent. Data on home environments, however, were obtained only once and early in life. However, it has been documented that by the age of 6 months, many children are already able to provoke encouragement and attention from their parents, suggesting mutual influence of child and environment (Bradley 1993, 1994; Zeenah et al. 1997).

Young children constitute an important group to policy makers and intervention designers. As early as the first few years of life, associations between economic disadvantage and children's developmental problems are observable and the future burden of mental health problems may be preventable by the use of well-designed interventions based on empirical research. By investigating possible mechanisms underlying the harmful impact of economic disadvantage on children's behavioural and emotional development, the findings of the current study have implications for early intervention programs. In a publicly funded health-care system such as the Netherlands, children residing in economically disadvantaged households are at increased risk of developing emotional and behavioural problems. The present study supports earlier US research indicating that interventions that focus solely on raising income levels may not adequately address problems in the family processes that emerge as a result of economic disadvantage (Linver et al., 2002; McLeod & Shanahan, 1993; NICHD, 2005; Pachter et al., 2006; Yeung et al., 2002). Policies to improve the mental health of mothers with young children but also their home environments are needed to change the economic gradient in child behaviour.

This study contributes to the literature by unravelling pathways between economic disadvantage, children's home environments, maternal depressive symptoms, disrupted parenting, and child emotional and behavioural outcomes at the age of 3 years. We conclude that for both children's internalising and externalising problems, mechanisms explaining the effect of economic disadvantage include those of maternal depressive symptoms, along with disrupted parenting. For children's internalising but not externalising problems, the stimulating learning environment of the home explained part of the effect of economic disadvantage.

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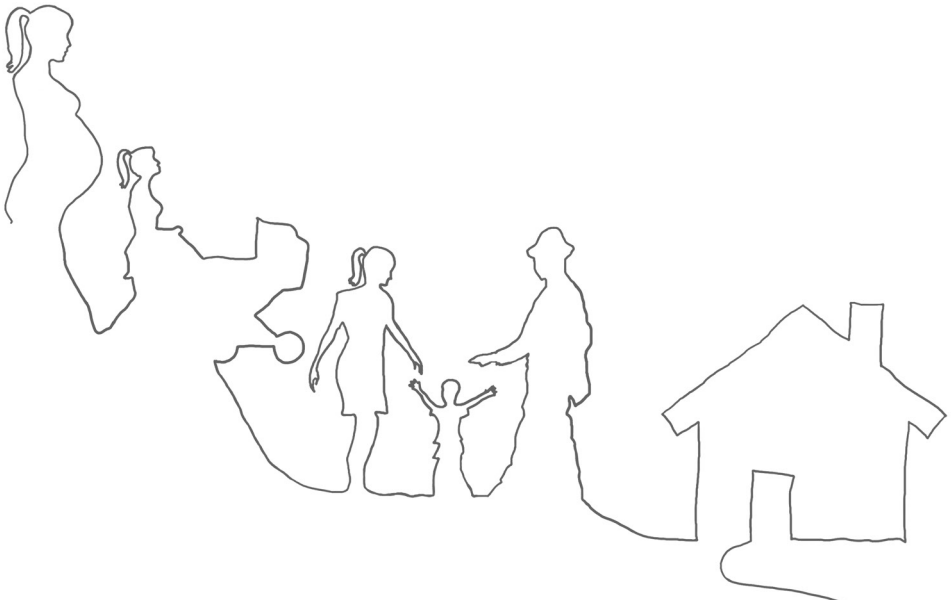

Chapter 3.2

Maternal childhood maltreatment and offspring emotional and behavioural problems: Maternal and paternal mechanisms of risk transmission

Jolien Rijlaarsdam, Gonneke W.J.M. Stevens, Pauline W. Jansen, Ank P. Ringoot, Vincent W.V. Jaddoe, Albert Hofman, Lynsay Ayer, Frank C. Verhulst, James J. Hudziak, and Henning Tiemeier

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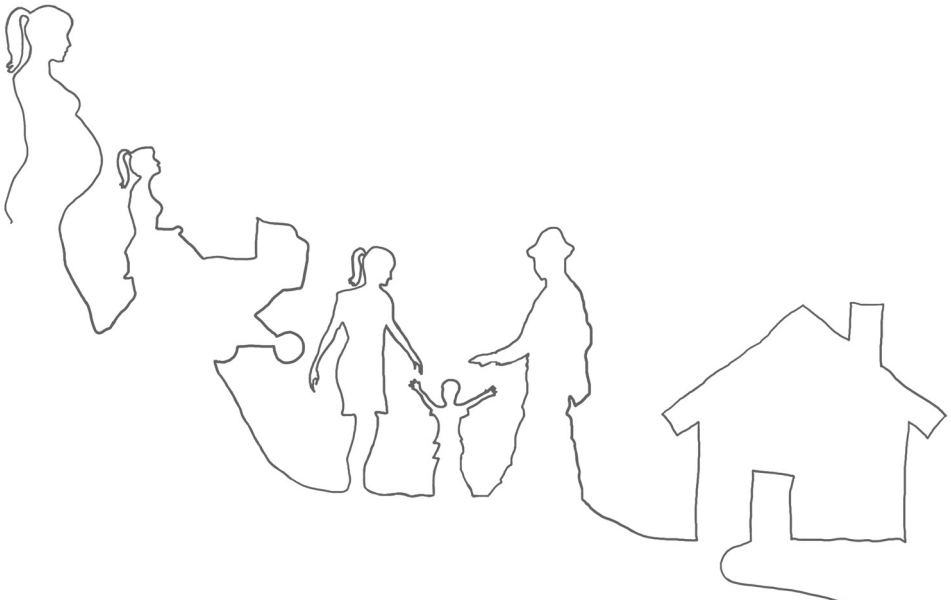

Chapter 4

Prevalence, comorbidity, and impairment of psychiatric disorders in young children at the DSM-IV to DSM-5 crosswalk

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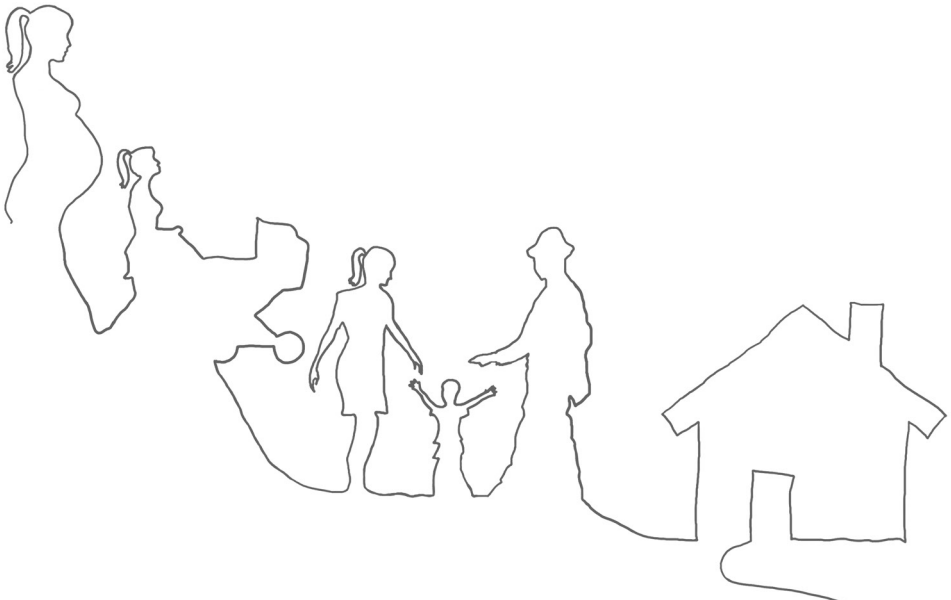

Chapter 5

General discussion

RATIONALE

It has been repeatedly shown that social disadvantage, as indicated by, for example, low family income or low maternal educational level, is associated with children's emotional and behavioural problems (Bradley & Corwyn, 2002; Brooks-Gunn & Duncan, 1997; McLoyd, 1998), and that these associations occur early in a child's life (Kiernan & Huerta, 2008; Linver, Brooks-Gunn, & Kohen, 2002; Yeung, Linver, & Brooks-Gunn, 2002). Furthermore, social disadvantage is often regarded as a crude indicator of the quality of stimulation and support available to the child in the home environment (Bradley et al., 1989; McLoyd, 1998). It is well recognized that reliable and valid in-depth assessments of children's home environments may improve our understanding of the mechanisms underlying the association between social disadvantage and children's emotional and behavioural problems (Elardo & Bradley, 1981). A better understanding of this association may aid in the identification of leverage points amenable to policy intervention. In addition, in-depth assessments of home environments may facilitate early identification of children in need of such intervention programs.

The overarching aim of this thesis was to investigate how social disadvantage is associated with young children's emotional and behavioural problems. To achieve this aim, we firstly developed an in-depth assessment of children's home environments. Secondly, we examined the extent to which home environments as assessed by this instrument, but also parental characteristics such as harsh discipline and depressive symptoms, explain the associations of family social disadvantage with children's emotional and behavioural problems.

SUMMARY OF MAIN FINDINGS

An observational measure of infants' home environments and its prospective associations with emotional and behavioural problems

Chapter 2.1 describes the psychometric properties of an instrument that was developed in the Generation R Study to assess infants' home environments exclusively by observation. Item development was based on a review of relevant literature and consulting professionals, and was also partially guided by the existing HOME Inventory (Caldwell & Bradley, 1984). Measures of internal consistency and inter-observer agreement supported the reliability of this modified version of the HOME Inventory. The modified HOME Inventory comprised of three scales measuring the organisation of the physical home environment, the provision of learning materials in the home, and the social-emotional involvement of the care giver. Strong associations of social disadvantage (as indicated by, for example,

low family income and low maternal educational level) with the modified HOME scores suggested acceptable validity of the instrument, but also raised the question as to whether it is redundant if social disadvantage is assessed by questionnaire. In chapter 2.2 we tested this possibility by investigating prospective associations of the modified HOME Inventory with children's emotional and behavioural problem scores independently of family social disadvantage assessed by questionnaire. In multivariate analysis controlling for age, gender, and multiple indicators of social disadvantage, lower quality learning home environments of young infants, but not physical and social-emotional environments, showed independent associations with emotional problems in toddlerhood.

Social disadvantage and children's emotional and behavioural problems: Mechanisms of risk

Chapter 3.1 describes the extent to which the quality of home environments and parental characteristics such as harsh discipline and depressive symptoms constitute mechanisms explaining the associations of family economic disadvantage with children's emotional and behavioural problems. For both emotional and behavioural problems, the mechanisms underlying the association of economic disadvantage included maternal depressive symptoms, along with parenting stress or harsh discipline. For emotional but not for behavioural problem scores, a lower quality learning home environment was an additional mechanism explaining the association of economic disadvantage. Chapter 3.2 describes mechanisms through which a maternal history of childhood maltreatment is associated with her offspring's emotional and behavioural problems. We reported indirect paths of a maternal history of maltreatment to her offspring's behavioural problems through maternal hostility and harsh discipline, but also through paternal hostility and harsh discipline.

Prevalence of childhood psychiatric disorders

Chapter 4 reports on the prevalence of DSM disorders and the DSM-5 disruptive mood dysregulation disorder (DMDD) in children ages 5 to 8 years. The overall prevalence rates were 31.1% and 22.9% for DSM-IV disorders without and with the additional diagnosis-specific impairment criteria, respectively. For all levels of impairment, the most common disorders were behavioural disorders, particularly oppositional defiant disorder (ODD). The findings as presented in chapter 4 show that depending upon type of disorder, a considerable amount of children who attained symptom thresholds for diagnosis appeared not to show impairment. This was most marked in the case of specific phobia, which was very common when symptom thresholds alone were considered but much less common when impairment was also required for diagnosis. The prevalence of behavioural

disorders was affected only slightly when mild impairment was required for diagnosis, but declined considerably for more severe levels of impairment. Children attaining symptom thresholds for mood disorder, and in particular major depressive episode, were nearly always impaired. The overall prevalence rate for meeting the DSM-5 disruptive mood dysregulation disorder (DMDD) criteria was 0.4%. Gender differences were only significant for DMDD, with a higher rate in boys (0.7%) than in girls (0.1%). A high level of co-occurrence among disorders was apparent. The rate of comorbidity between DMDD and ODD was substantial and was outside the range observed for other disorder pairs.

INTERPRETATION OF FINDINGS

Added value of home observations

According to the findings presented in chapter 2, the modified HOME Inventory measures aspects of the environment that are associated with both children's emotional and behavioural problems. Separate univariate tests showed that fewer provisions of learning materials and less social-emotional involvement of the care givers as observed with the current instrument were associated with more emotional problems. Fewer provisions of learning materials were also associated with more behavioural problems, whereas a poorer organisation of the physical environment was unrelated to both children's outcomes. Although the contribution of the home observation scores was minimal when several indicators of social disadvantage (i.e., low family income, maternal educational level, and child non-Western national origin) were controlled for, fewer provisions of learning materials showed independent associations with more emotional problems in children.

The above findings suggest that the quality of the learning environment at home may contribute to predicting children's emotional problems over and beyond indicators of family social disadvantage. However, given that these home observation scores added only little to the prediction of children's emotional problems beyond existing demographic characteristics, their relative usefulness in identifying environments that pose a risk to these outcomes may be only minimal. Thus, according to these findings, there is little point in adding relatively expensive and laborious home observations with the modified HOME Inventory to existing screening programs.

Furthermore, environmental indicators other than those measured by either the modified HOME Inventory or social disadvantage, such as maternal mental health, may explain the observed associations. Interestingly, the association of the learning home environment with children's emotional problems remained largely unchanged when maternal depressive symptoms were added to the regression model, whereas the associations of family social disadvantage with this outcome tended to decrease.

Taken together, the above findings suggest that although not particularly useful for screening purposes, home observations using the modified HOME Inventory may well provide a better understanding of how social disadvantage is associated with child outcomes. More specifically, the small effect sizes obtained here represent the marginal usefulness of screening with the modified HOME Inventory beyond that expected by questionnaire on social disadvantage. However, a robust finding of association may contribute to advances in the understanding of child development, whatever the effect size. The findings as presented in chapter 2 suggest that not only the quality of children's learning home environments but also maternal mental health may be considered mechanisms through which social disadvantage exerts its effects on children's development. However, this needs to receive a sophisticated statistical modelling approach, which we considered in chapter 3.

Family social disadvantage and children's emotional and behavioural problems

The vast majority of studies on how economic disadvantage is associated with young children's emotional and behavioural problems (Bor et al., 1997; Kiernan & Huerta, 2008; Linver et al., 2002; McLeod & Shanahan, 1993; NICHD, 2005; Pachter, Auinger, Palmer, & Weitzman, 2006; Yeung et al., 2002) have been conducted in the US, where social-economic inequalities are known to be more pronounced than in any other industrialised nation (Caminada & Goudswaard, 2001; Moss, 2000). We aimed to extend previous findings on how economic disadvantage is associated with young children's emotional and behavioural problems to a non-American sample. Findings from structural equation modelling as presented in chapter 3.1 indicated that fewer provisions of learning materials in the home and maternal characteristics, such as depressive symptoms and harsh discipline, each independently explained the association between family economic disadvantage and children's emotional problems. For children's behavioural problems, mechanisms explaining the association of family economic disadvantage included those of maternal depressive symptoms and parenting but not home environments. The current findings supported earlier research of Yeung et al. (2002), suggesting that a poorer physical environment of the home is associated with maternal depressive symptoms. However, the indirect path from family economic disadvantage to children's emotional problems through the physical environment of the home and maternal depressive symptoms was non-significant. According to the above findings, the provision of learning materials and maternal depressive symptoms along with parenting each independently and exclusively explained the association between family economic disadvantage and children's emotional problems.

Much of the association of economic disadvantage with children's emotional problems was direct rather than through the home environment or maternal depressive symptoms

and harsh discipline, suggesting that several additional variables must be considered to explain this association. In contrast, much of the association of economic disadvantage with children's behavioural problems was indirect rather than direct, suggesting that this association is largely attributable to the family background and maternal characteristics included in our model. These findings are in line with observations made after a natural experiment that moved rural American families out of poverty (Costello, Compton, Keeler, & Angold, 2003). Moving out of poverty by sudden wealth significantly decreased children's behavioural problems but not emotional problems, suggesting that emotional problems may also be caused by some characteristics of disadvantaged families not directly related to poverty (Costello et al., 2003). For example, the association between family economic disadvantage and children's emotional problems may be due to social selection (Conger & Donnellan, 2007), suggesting that parents who are genetically predisposed to distress may have more difficulties in acquiring everyday financial necessities and have children who are also predisposed to distress and adjustment problems. In addition, the quality of the neighbourhood environment or health care provided may explain this association.

Comparison between the current findings and those of other studies (Bor et al., 1997; Kiernan & Huerta, 2008; Linver et al., 2002; McLeod & Shanahan, 1993; NICHD, 2005; Pachter, Auinger, Palmer, & Weitzman, 2006; Yeung et al., 2002) may be hampered by differences in sample composition or assessment procedures. Related studies have often relied, at least in part, on cross-sectional designs. In the current study, a temporal sequence was established. More specifically, we assessed economic disadvantage, potential mediators, and child outcomes on separate occasions over a period of several years in order to meet rigorous standards for mediation. Indeed, of the five mediators being tested, only the assessment of maternal harsh discipline was conducted at the same time as that of the outcome. Furthermore, unlike most previous studies, which combined observation and interview based reports, we assessed the home environment exclusively by observation. By following this procedure, we also limited shared method variance bias on the part of the associations of children's home environments.

In chapter 3.2 we examined indirect paths of a maternal maltreatment history to her offspring's emotional and behavioural problems. The experience of maltreatment during childhood often has a negative impact on the individual's functioning (Browne & Finkelhor, 1986; Cicchetti & Toth, 1995). There is now evidence that the consequences of maltreatment may extend beyond its immediate victims into succeeding generations (Collishaw, Dunn, O'Connor, & Golding, 2007; Lang, Gartstein, Rodgers, & Lebeck, 2010; Roberts, O'Connor, Dunn, & Golding, 2004).

Based on theory and empirical research, we expected that children of maltreated mothers are exposed not only to maternal but also to paternal hostility and harsh discipline, which in turn places the child at risk for behavioural problems. According to the widely acknowledged cycle-of-violence hypothesis, children who experienced maltreatment in

their families of origin are more likely to both perpetrate and experience violence in their family in adulthood (Gómez, 2011; Heyman & Smith Slep, 2002). Several studies have indicated that victims of childhood maltreatment are more likely to have partners who display hostile behaviour (Browne & Finkelhor, 1986; Testa, VanZile-Tamsen, & Livingston, 2005). Fathers' hostile behaviour, in turn, is a known risk factor for children's adjustment problems (Blazei, Iacono, & McGue, 2008; Chang, Schwartz, Dodge, & McBride-Chang, 2003; Harold et al., 2011). Despite this evidence, the current study was one of the first to examine characteristics of fathers as potential mechanisms explaining the associations between a maternal maltreatment history and her offspring's emotional and behavioural problems.

As expected, we observed indirect paths from a maternal history of childhood maltreatment to her offspring's behavioural problems through maternal hostility and harsh discipline, but also through paternal hostility and harsh discipline. Child interview data provided strong support for the association of both maternal and paternal harsh discipline with offspring behavioural problems, with associations largely similar to those observed for the maternal questionnaire data. However, genetic factors or environmental factors such as social support may contribute to this risk. It was, however, clear from additional analyses that the quality of home environments as observed with the modified HOME was not a mechanism through which a maternal history of childhood maltreatment is associated with children's emotional and behavioural problems.

METHODOLOGICAL CONSIDERATIONS

Measurement of variables

Social disadvantage

Social disadvantage captures various dimensions of social position, such as economic status, educational attainment, as well as ethnicity. There is general agreement that these dimensions are not interchangeable indicators of social disadvantage: family economic status, paternal educational attainment and ethnicity may all differently predict child adjustment (Conger & Donnellan, 2007). Furthermore, although most of these indicators of social disadvantage are considered to be relatively structural in nature, they may have different levels of stability across time. As evidenced in chapter 3.2, there may be upward mobility in terms of economic status, and this may be particularly true for young families (e.g., at this young age parents may have been receiving promotions). Upward mobility may also apply to parents' educational attainment (e.g., parents may have been graduating from professional schools) but this, clearly, does not apply to ethnic

status. Thus, instead of combining them into a simple composite score, we included measures of social disadvantage as separate variables in chapter 2.1 and 2.2 to examine their independent associations with children's home environments and outcomes.

In chapter 2.1 and 2.2, family economic status, maternal educational attainment, and children's national origin were all included as indicators of social disadvantage. Building on the dominant perspectives that have emerged in the literature on how social disadvantage may be associated with children's adjustment problems (Conger & Donnellan, 2007; Kiernan & Huerta, 2008; Linver et al., 2002; Martin et al., 2010; Yeung et al., 2002), we focused on the economic dimension of social disadvantage in chapter 3.1. These dominant perspectives are rooted in economic principles of the material investments families can make in the development of their children. Several measures capturing these principles were included in chapter 3.2 to form a latent economic disadvantage variable: a family's net monthly income, economic difficulties, and the adjustments the family had to make because of these difficulties. A family's income on its own may be an imperfect measure of social or economic disadvantage. Despite the use of multiple indicators, our latent economic construct still captures only part of the difficulties that may be encountered by disadvantaged children and their families.

As mentioned earlier in this chapter, the majority of studies investigating how social disadvantage is associated with young children's emotional and behavioural problems have been conducted in the United States. This is not surprising given that in the United States, economic inequalities are pronounced (Caminada & Goudswaard, 2001; Moss, 2000) and economic mobility for those in poverty is among the lowest (Belle & Doucet, 2003). Whereas the essence of US antipoverty policies is to indirectly approach poverty reduction by providing poor families with education and support services, European interventions seek to provide social insurance programs (e.g., universal health care) and programs that directly raise incomes of poor families (e.g., minimum wage) (McLoyd, 1998; Moss, 2000). Associations between social disadvantage and children's adjustment problems also exist in publicly funded health-care systems (Propper, Rigg, & Burgess, 2007). In this thesis, we aimed to extend previous findings on how social disadvantage is associated with emotional and behavioural problems to a non-American sample.

Home environment

The Home Observation for Measurement of the Environment (HOME) Inventory (Caldwell & Bradley, 1984) currently distinguishes itself as the most widely used, validated measure of home environments of young children. Lower quality home environments as measured by the HOME scales have been found to be associated with children's maladjustment (Bradley, 1993, 1994; Evans, 2006; Evans, Wells, & Moch, 2003). Additionally, although evidence is less clear for very young children, these HOME scores appeared to predict

children's adjustment problems independently of indicators of family social disadvantage (Bradley, Corwyn, Burchinal, McAdoo, & Coll, 2001). The information needed to score the HOME Inventory is obtained partly through an interview with the care giver. Interview data have been criticized for their exclusive reliance on participant's reporting, which may be liable to distortions such as social desirability and inaccuracy of recall (Holtgraves, 2004; Lytton, 1971). An additional methodological draw-back is that associations with care giver-reported measures of children's mental health outcomes are rendered subject to mono-method bias (Evans, Wells, Chan, & Saltzman, 2000). The above issues may be addressed by the development of a home rating scale that relies exclusively on observation.

In chapter 2.1, we presented the development and psychometric testing of such an observational instrument for the assessment of young infants' home environments. Given evidence that early childhood is a key period in which interventions can provide strong foundations for future healthy development (Bricker, Davis, & Squires, 2004; Feeney-Kettler, Kratochwill, Kaiser, Hemmeter, & Kettler, 2010), the aim was to observe home environments of children in their first few months of life. Furthermore, we deemed it important to observe children's home environments at young ages because the quality of home environments may change as children mature and become more capable of managing their environment (Bradley, 1994). By the age of six months, many children al already able to provoke encouragement and attention from their parents, suggesting mutual influence (Bradley, 1993, 1994; Zeanah, Boris, & Larrieu, 1997). Thus for older children, observed associations between home environments and developmental outcomes may partially reflect their capability of eliciting more adequate provision of developmentally advanced play materials, whereas this is less likely for very young children.

On the basis of exploratory factor analysis, observational items conceptually relevant for child development were decomposed into "physical environment", "play and learning environment", and "social-emotional environment". These three factors were taken to represent meaningful summary measures of children's experiences in their home environments. However, this three factorial solution should not be taken to imply that these environments cannot be further decomposed into other separate environments. For example, the physical environment may be decomposed into components representing the interior and exterior of the home. However, exploratory factor analysis in chapter 2.1 showed a three and not a four factorial solution. Furthermore, a confirmatory factor model for this physical home environment showed a good fit to the data (chapter 3.1).

Although observation methods for assessing young infants' home environments have a number of important strengths, certain limitations have to be addressed. Due to the exclusively observational context, the number of indicators used to represent each home environment domain was limited. This will not necessarily influence the instrument's validity but will certainly influence its precision. For example, an exclusively observational

context excluded certain areas of an infant's experiences such as what learning experiences care givers provided to their children outside the home. However, there is research indicating that those learning activities inside the home are more likely than those outside the home (e.g., museum visits, library use) to explain the association between social disadvantage and children's developmental outcomes (Duncan & Brooks-Gunn, 2000).

The social emotional involvement items had relatively low variability (7 out of 8 items < 3% negative answer), unlike the physical home items and the learning environment items (all items > 5% negative answer). These findings point to the relative difficulty of observing the social emotional involvement of the care giver during a short home visit. Consequently, in chapter 2.2, we did not include the social-emotional environment as a predictor but rather considered it as a covariate in the same sense the family background characteristics were used. By including questionnaire data on care givers' disciplinary strategies in chapter 3.1, we went beyond observation of the emotional responsiveness of the caregiver in the home to capture the associations between parental practices on children's emotional and behavioural problems.

Furthermore, this observational context may have the disadvantage of providing only snapshots in time. For instance, despite evidence suggesting that children's home environments are relatively stable (Bradley et al., 1989), the tidiness of the home may fluctuate over time. In addition, one cannot rule out that associations of the early environment with later development result from the fact that the early environment tends to be highly correlated with later environment (Bradley, 1994). The observation of young infants' home environments may then be a less critical target for research and intervention than the later environment. Unlike previous research supporting unique effects of the very early environment (Bradley & Caldwell, 1980, 1982), the Generation R Study obtained data on home environments only once and the unique contribution of the early environment could not be determined.

Because of cultural differences, it cannot be assumed that environmental factors have the same meaning and lead to the same developmental outcomes in majority and minority children (Bradley, 1994). Weaker associations between lower quality home environments and children's developmental problems in minority relative to majority children may be partly attributed to potential cultural bias in assessment instruments (McLoyd, 1998). Despite strong main effects of national origin on children's outcomes, we found no evidence to suggest that the quality of home environments as assessed by the modified HOME Inventory differently predicted children's behavioural or emotional problems for majority and minority families.

Childhood psychiatric disorders

For the purpose of efficient estimation of prevalence rates of psychiatric disorders in chapter 4, children were recruited on the basis of their behavioural ratings on the Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2000) for more in-depth diagnostic assessment. Dimensional and categorical approaches exist in child psychiatry and none of these have been proven to be superior to the other. Empirically-derived checklist measures such as the CBCL have largely contributed to the psychiatric research by identifying subgroups of children at the extreme of the distribution of normative emotions and behaviours. Furthermore, they have identified clusters of symptoms that connect to specific DSM diagnostic categories (e.g., CBCL DSM-oriented scales). However, such dimensional checklist approaches usually lack the symptom specificity (e.g., onset, frequency, duration) that enables researchers to determine psychiatric diagnoses (Egger & Angold, 2006). Despite widespread agreement that extremity on such behavioural dimensions may be considered pathological, it is recognized that psychiatric disorders do not categorically begin and end at such extremes or cut points (Achenbach, 1990/1991; Egger & Angold, 2006).

Clinical evaluation and intervention require a categorical approach to psychopathology. That is, they require that the mental health professional decides whether to treat or not to treat a child. Structured diagnostic interviews using the DSM nosology take such a categorical approach to psychopathology. These interviews are developed to proceed to following questions contingent upon parental yes or no response and, as such, highlight possible problem areas for in-depth pursuit. This in-depth pursuit includes the identification of syndromes characterized by severity, persistence, as well as impairment (Egger & Angold, 2006).

An objection to the DSM diagnostic system arises from the concern that its diagnostic criterion fails to draw the appropriate boundaries between disorders (Angold, Costello, & Erkanli, 1999). Furthermore, comorbidity of disorders is generally regarded to be the rule rather than the exception for children and adults with psychiatric diagnoses. Indeed, a certain amount of overlap is built into the DSM diagnostic system. For example, while irritability or one of its constituent characteristics such as temper outburst is considered a mood symptom and is present in the criteria of childhood depressive disorder and dysthymia, it is also one of the main symptoms of oppositional defiant disorder (Stringaris, 2011). However, if the DSM diagnostic system would consider only non-overlapping criteria, it would ignore many important symptoms (Angold et al., 1999). In DSM-5, whole new disorders are included. For example, DSM-5 includes a new category of disruptive mood dysregulation disorder to diagnose children with frequent temper outbursts occurring against the background of a persistent irritable mood. Any of these shifts in the DSM will obviously outdate its former version and also the assessment tools that are based on it.

Advanced statistical techniques

Over the past decades, proposed methods for testing hypotheses about mediation have grown in sophistication (Baron & Kenny, 1986; Hayes, 2009; Preacher & Hayes, 2008). An example is the rise of structural equation modelling (SEM), which has the advantage of not only examining direct effects, but also indirect effects through one or more intervening variables (Kline, 2011). In examining these effects, SEM allows for simultaneous tests of all the associations between constructs, while taking into account a set of control variables. Consequently, specific indirect effects as estimated with SEM represent the unique ability of each variable to mediate the association between the determinant and outcome. Furthermore, structural equation models go beyond ordinary regression models by incorporating multiple independent as well as dependent variables. This may be particularly useful in the case of dependent variables that are known to have a considerable amount of interrelatedness, such as emotional and behavioural syndromes (McConaughy & Achenbach, 1994). Constructs in SEM may be observed or latent. Unlike observed constructs, latent constructs are not directly measured but indicated by observed variables. Through the use of latent constructs, structural equation modelling allows for modelling of the measurement error that is often associated with observed variables.

However, structural equation modelling has been criticized due to its inability of providing a solution to some problems of causal and measurement analysis (Fergusson, 1995; Sánchez, Budtz-Jorgensen, Ryan, & Hu, 2005). The directionality of the arrows shown in a model represent the hypothesis that the researcher has generated regarding causality and, often, is not tested with SEM. The models presented in the literature often include cross-sectional rather than prospective data and, as such, cannot establish temporal sequence. Although prospective study designs do establish temporal sequence, the problem of reverse causality makes estimation potentially difficult. Repeated measures are essential to inferring causality but have been rarely included in SEM.

Generally, the utility of structural equation models is highly dependent upon the skill of the researcher to solve modelling problems in a theoretically meaningful way. Consequently, it has been argued that SEM is a confirmatory tool rather than an exploratory tool (Sánchez et al., 2005). Furthermore, its utility depends on the process of data collection. Researchers are often placed in the situation of having to make various assumptions to bridge the gap between the conceptual theory and the quality and quantity of the data available to test such theories. The process of data collection as well as the process of testing and interpreting structural equation models may omit some variables which are of theoretical relevance. Any one of several models might fit the data just as well and it is ultimately up to the researcher to decide which of these models is more substantively sound. Researchers may lose focus on the conceptual theory and models may become overly complex.

Overall, any attempt to construct compelling models needs to confront such problems of measurement, estimation, and interpretation. Providing that researchers have a well specified theoretical framework on which to base their model and that data of sufficient quality and quantity exist to test the theory, then structural equation modelling may provide a powerful means of hypothesis testing. Under these circumstances, structural equation models may be viewed as modest approximations of the complex reality they represent.

Potential bias in epidemiological studies

Selection bias

The initial response rate in the Generation R Study was estimated at 61%. Selection bias may occur in the presence of selective participation, either at the start of the study or during follow-up. The validity of the study may be harmed when associations between determinants and outcomes differ between those participants who are included in the study and those who are not. As is often the case in follow-up studies, participants included in the Generation R Study are more often higher educated and more often of Western national origin than the source population (i.e., all pregnant women with an expected delivery date between 2002-2006, living in the study area in Rotterdam). In this thesis we repeatedly indicated that those lost to follow-up were more often lower educated, more often had lower income, and were more often of non-Western national origin than those who participated. Thus, selection seemed to occur toward well-functioning families with higher social status. Whereas techniques were applied in this thesis to impute missing data on mediators and covariates, participants with missing data on the determinant or outcome variables were often excluded from the separate studies. However, this selective drop out does not necessarily need to affect the validity of our regression models with regard to children's emotional and behavioural problems. The extent to which the associations between determinants and outcomes differs between those included and those not included in the study is however difficult to ascertain. Research on other birth cohort studies has shown that although attrition affects prevalence rates, associations between risks and outcome are maintained (Nohr, Frydenberg, Henriksen, & Olsen, 2006; Wolke et al., 2009).

Information bias

Recall bias and misclassification represent the two major types of information bias. In the Generation R Study, a maternal history of childhood maltreatment was determined using a validated but retrospective questionnaire. Retrospective reports of child maltreatment may be influenced by recall bias (Brewin, Andrews & Gotlib, 1993). Studies show that this

recall bias primarily involves underreporting – that is, individuals who experienced childhood maltreatment fail to report this maltreatment in adulthood (Fergusson, Horwood & Woodward, 2000; Hardt & Rutter, 2004). Underreporting of maltreatment in our study would have led to an underestimation of the prevalence and correlates of maltreatment. Of particular concern is the possibility that, compared with non-depressed individuals, depressed individuals may be more likely to recall negative experiences such as maltreatment. Under these circumstances, the association between a mother's maltreatment history and adult psychopathology would have been overestimated. Although the impact for our findings could not be tested directly, we were able to show that maternal reports of maltreatment were associated with both maternal and paternal reports of emotional status. There is evidence indicating that despite the uncertainty regarding the estimated rates of retrospectively reported maltreatment, associations of retrospectively reported maltreatment with adult psychopathology are generally robust and valid (Brewin et al., 1993; Fergusson et al. 2000). Furthermore, the fact that a well-validated questionnaire was used and that most other information in the Generation R Study was prospectively collected may be expected to minimize some of the problems of retrospective recall.

Differential misclassification occurs when misclassification of the outcome is related to the exposure status and vice versa. It has been found that the detection rate of child behavioural disorders is lower among Moroccan and Turkish immigrant parents than among non-immigrant parents (Zwirs, Burger, Buitelaar, & Schulpen, 2006). Similar processes may be at hand when interviewing immigrant families about their family situation. Again, the impact for our findings could not be tested directly. However, our use of structured observations may have limited information bias on the part of the associations of home environments.

Mono-method bias

One of the most likely causes of method bias results from the fact that the predictor and outcome variables are obtained from the same source or rater. There may be a tendency on the part of some individuals to present themselves in a favourable light, regardless of their true feelings about the topic. This tendency is problematic, because it inflates the true associations between two or more variables. In addition, associations may be inflated by current affective state. In this thesis, we minimized mono-method bias by collecting measures of home environments and child outcomes from different sources. The quality of children's home environments was observed by trained research assistants whereas mothers and fathers each rated on their children's emotional and behavioural problems. In addition, we used children's self-reports of emotional and behavioural problems. Hypothesized associations of parental psychopathology and parenting were largely consistent across different informants on child emotional and behavioural problems.

CLINICAL AND SCIENTIFIC IMPLICATIONS

Young children constitute an important group to policy makers and intervention designers. As mentioned earlier, associations between social disadvantage and children's developmental problems may occur when children are as young as age 3 and 5 years. By investigating the relative usefulness of observational scales to assess infants' home environments and questionnaire data on family social disadvantage for the prediction of children's emotional and behavioural problems, the findings presented in chapter 2.2 may have implications for early prevention programmes. The learning environment as observed with the modified HOME Inventory seemed to add information to the prediction of children's emotional problems over and above indicators of social disadvantage. However, as mentioned previously, the effect size describing the strength of this independent association of the learning environment with children's emotional problems was relatively small. Given that collecting data on social disadvantage indicators such as education and income is substantially less time-consuming and laborious than performing home visits, we suggest that, on the basis of the results reported in chapter 2.2, there is little point in adding these home observations to screening programs.

Notwithstanding its relatively small effect size, the observed independent association of the learning environment with children's emotional problems is potentially important in understanding how social disadvantage likely impacts child development. Clearly, the observed learning environment was not redundant to indicators of social disadvantage, but rather added information about the environment. Thus, according to the above findings, this measure of the learning environment may help delineate what is happening early in the life course and may lead to better targeted interventions. The multiple mediation analyses presented in chapter 3.1 suggest that interventions that focus solely on components of social disadvantage may not adequately address the family processes that underlie the associations of social disadvantage with poor child outcomes. Rather, policies that increase the quality of children's learning environments at home may be expected to enhance emotional functioning among socially disadvantaged children. The results also pointed to maternal depressive symptoms and harsh parenting as mediators of the associations of economic disadvantage with both children's emotional and behavioural problems, arguing for interventions that are multi-factorial but still family-centred in their approach.

However, the answer to why social disadvantage is harmful for children's emotional and behavioural development does not exclusively lie with the quality of home environments, paternal psychopathology or harsh parenting. Other proximal variables, such as access to health care, nutrition, and neighbourhood characteristics may also be at work in explaining these associations of social disadvantage (Bradley & Corwyn, 2002). Future research may identify other mediators that underpin the direct effect of social disadvantage that

remained in our multiple mediation model. Importantly, the fact that social disadvantage, potential mediators and children's outcomes were all assessed at different points in time should not be taken to imply that the associations obtained between the variables are necessarily unidirectional. For instance, a less-optimal home environment may lead to maternal depressive symptoms but the reverse could also be true. Further, the relations between family social disadvantage, maternal depressive symptoms, children's home environment, and child outcomes cannot be attributed solely to environmental influences, but genetic factors may also contribute to these constructs (Bradley & Corwyn, 2002; McLoyd, 1998). Obviously, our model as presented in chapter 3.1 is but one plausible simplification of the complex reality it represents.

Also from the study presented in chapter 3.2, several recommendations can be made for intervention and prevention. Findings from this study suggest that policies to improve the mental health (even if not qualifying for a clinical diagnosis) and parenting of mothers, but also the mental health and parenting of fathers may help interrupt, at least partially, the tendency of the risk of childhood maltreatment to be transmitted to the next generation. Parent training, one of the more robust evidence-based treatments in medicine, may minimize risk of psychopathology in children further (Forehand, Merchant, Long, & Garai, 2010). Additional research must be conducted to more comprehensively delineate the processes by which maternal histories of childhood maltreatment affect psychopathology in offspring and to achieve effective and efficient targeted intervention and prevention programs for young children and their families.

CONCLUSION

In conclusion, the established pathways through which social disadvantage influences the emotional and behavioural development of children suggest some recommendation for policy intervention. That is, policy attention may profitably focus on the quality of children's learning environment at home as well as on parental psychopathology and parenting.

Multiple measures of family social disadvantage, such as low family income and low maternal educational level, were prospectively associated with children's emotional and behavioural problem scores. Furthermore, these measures were strongly associated with the quality of young infants' home environments as observed with the modified HOME Inventory. Nevertheless, the observed provision of learning materials in the homes of young infants appeared an independent, albeit weak, predictor of children's emotional problems. Given that the modified HOME Inventory added only little to the prediction of children's emotional problems above and beyond indicators of social disadvantage, there is little point in adding to screening costs. However, findings from this thesis suggest

that interventions that focus solely on the components of social disadvantage may not adequately address problems in the family processes that emerge as a result of social disadvantage. Policies that increase the quality of children's learning environments at home, but also the mental health and parenting practices of care givers, may be expected to change the social disadvantage gradient in child adjustment.

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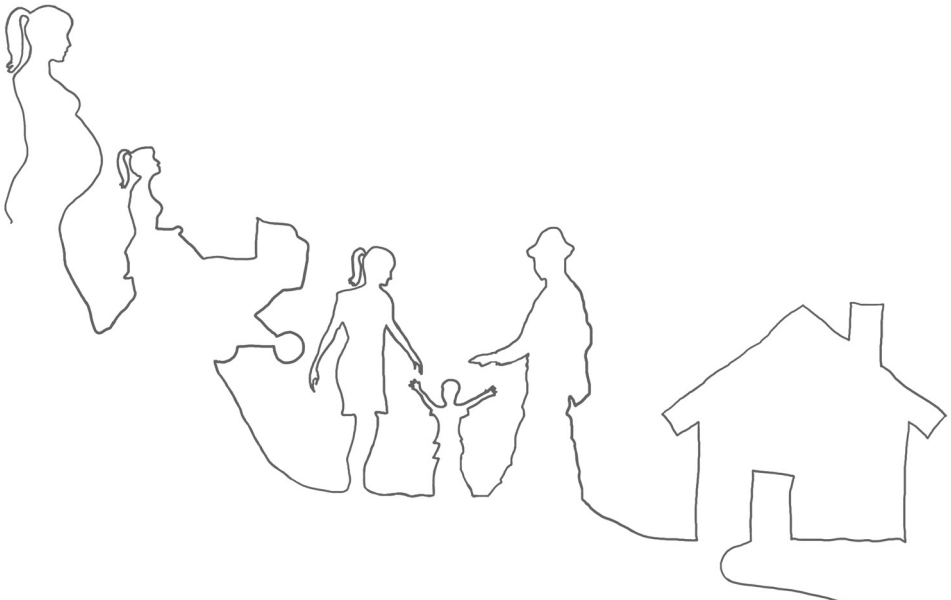
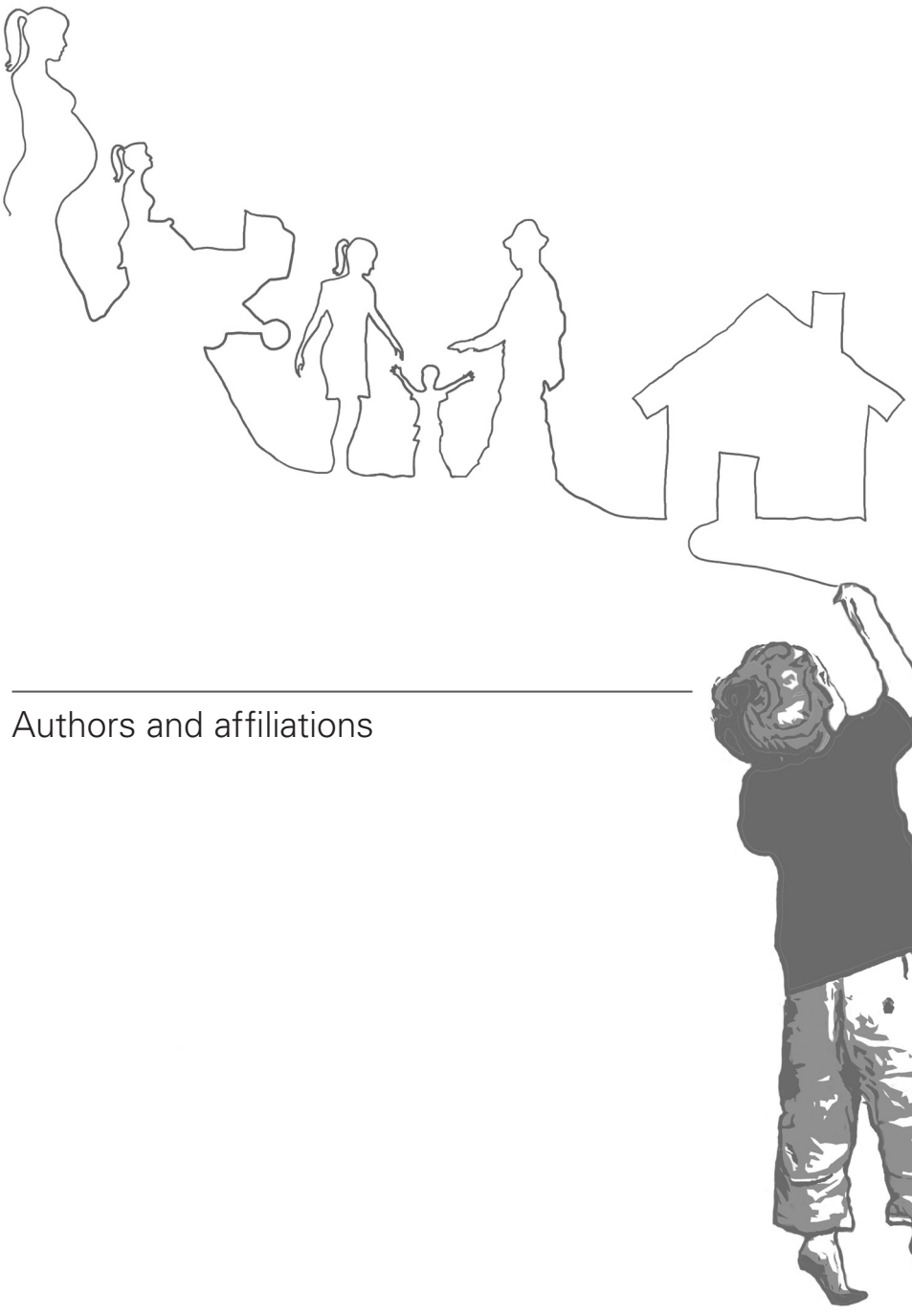


Chapter 6

Summary / Samenvatting



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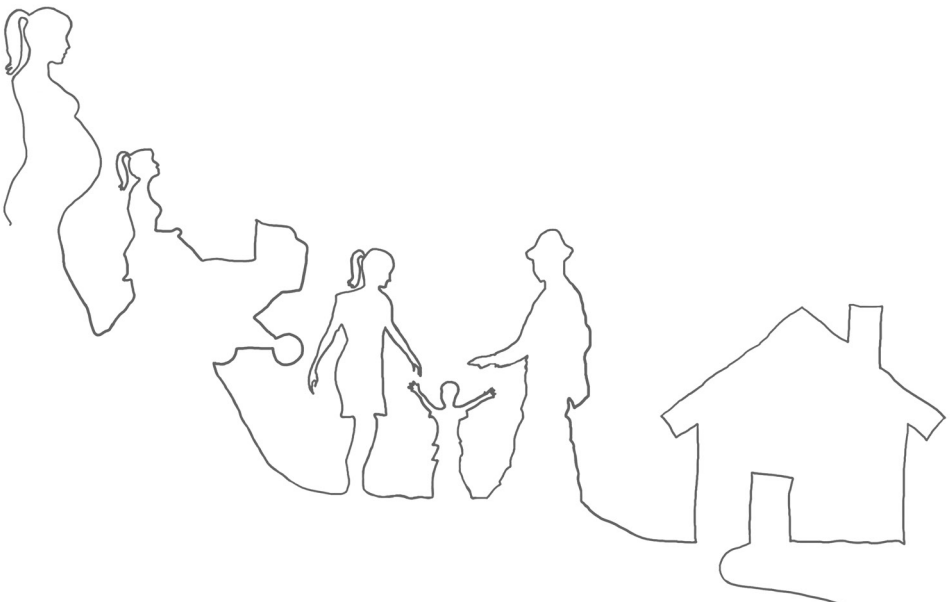
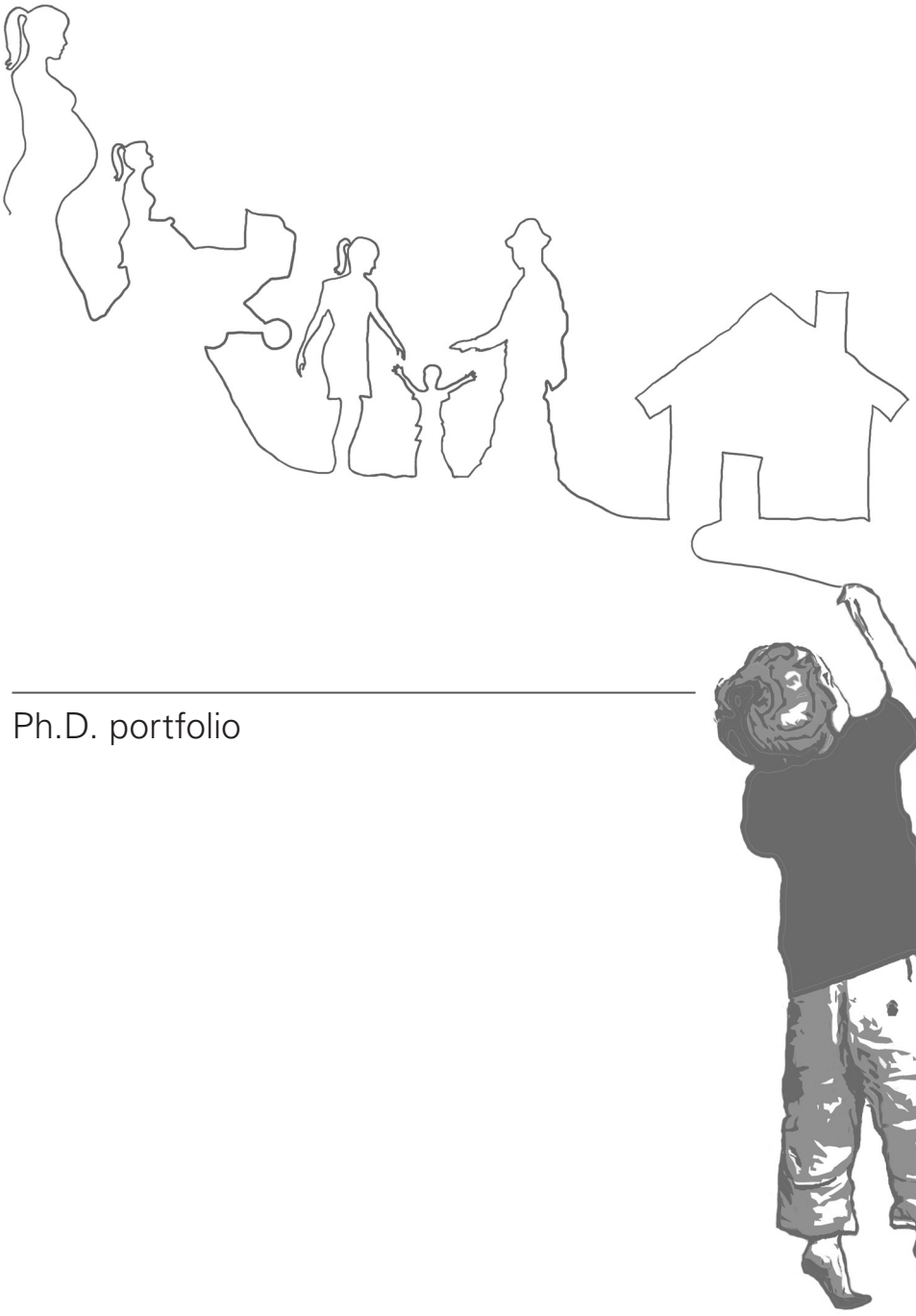


About the author

ABOUT THE AUTHOR

Jolien Rijlaarsdam was born on 27th of January, 1984 in Dordrecht, the Netherlands. After completing her pre-university education at 'Johan de Witt-Gymnasium', she pursued her studies at 'Tilburg University' in the field of Clinical Psychology. After graduation in 2007, she was employed as a psychological assistant by the Yulius Center for Mental Health in her native city. She also conducted research for the associated Expert Group on Suicide Prevention. In 2008, Jolien was admitted to the Ph.D. program of the Department of Child and Adolescent Psychiatry and Psychology of the Erasmus Medical Center in Rotterdam. Her doctoral research was conducted as part of the Generation R Study, a population-based cohort from fetal life onwards. In the course of her Ph.D. studies, Jolien obtained a Master of Science Degree in Epidemiology from the Netherlands Institute for Health Sciences. In April 2013, Jolien received a grant to continue her research at the Department of Child and Adolescent Psychiatry and Psychology of the Erasmus Medical Center in Rotterdam.



Ph.D. portfolio

Ph.D. PORTFOLIO

Name Ph.D. Student: Jolien Rijlaarsdam

Erasmus MC Department: Child and Adolescent Psychiatry/Psychology

Research School: NIHES

Ph.D. Period: 2008-2012

Promotors: Prof.dr. H. Tiemeier and Prof.dr. F. C. Verhulst

Supervisor: Dr. G. W. J. M. Stevens

	Year	Workload (ECTS)
1. Ph.D. training		
Research Skills		
M.Sc. Epidemiology, Netherlands Institute for Health Sciences (NIHES)	2008-2010	
Core Curriculum		
Study Design		4.3
Classical Methods for Data-Analysis		5.7
Methodological Topics in Epidemiologic Research		1.4
Modern Statistical Methods		4.3
Public Health Research Methods		5.7
Erasmus Summer Programme		
Principles of Research in Medicine		0.7
Methods of Public Health Research		0.7
Health Economics		0.7
Genome Wide Association Analysis		1.4
Conceptual Foundation of Epidemiologic Study Design		0.7
Case-Control Studies		0.7
Introduction to Public Health		0.7
Methods of Health Services Research		0.7
Principles of Genetic Epidemiology		0.7
Primary and Secondary Prevention Research		0.7
Introduction to Decision-making in Medicine		0.7
Advanced Short Courses		
Advanced Diagnostic Research		1.4
Courses for the Quantitative Researcher		1.4
Diagnostic Research		1.1
Repeated Measurements in Clinical Studies		1.4
Missing Values in Clinical Research		0.7
Maternal and Child Health		0.9

Research Skills (continued)

Biomedical English Writing and Communication, Erasmus Medical Center	2011	4.0
Factor Analysis and Structural Equation Modelling: An Introduction Using Stata and Mplus, London, UK.	2011	1
New Features Mplus version 7, Utrecht University	2012	0.6
Mplus User Meeting, Utrecht University	2012	0.3

Workshops, Meetings, and Symposia

Research Meetings, The Generation R Study Group	2008-2012	1
ABCD Study Symposium, VUmc, Amsterdam. Een gezonde start voor een gezond leven	2008	0.3
Generation R Study Symposium. Imaging and Early Brain Development	2008	0.3
ZonMw Projectleiders Bijeenkomst Jeugd (workshop Opvoed en opgroei ondersteuning, vroegsignalering).	2008	0.3
Ph.D. day, Erasmus MC	2008	0.3
Symposium 40 Years Epidemiology, Erasmus MC	2009	0.3
ZonMw Projectleiders Bijeenkomst Jeugd: Opbrengsten vijf jaar jeugdonderzoek (workshop Vroegsignalering in praktijk. Van administrative last tot aanwinst).	2010	0.3
Symposium Geestkracht	2011	0.3
Symposium Standardized Assessment of Child Psychopathology: New Developments. Erasmus MC Rotterdam	2011	0.3
ZonMw Projectleiders Bijeenkomst Jeugd: Inspiratie door Participatie (workshop Participatie: van theorie naar praktijk & Kruip in de huid van de gebruiker).	2011	0.3

International Conferences

The International Federation of Psychiatric Epidemiology (IFPE), Vienna, Austria. Oral communication: "Predicting behavioural problems in toddlers with home observations in the Generation R Study"	2009	1
Biennial meeting of the Society for Research in Child Development (SRCD), Montreal, Canada. Poster presentation: "Infant home environment and child behaviour"	2011	0.6
Conference of the Life History Research Society, Richmond, Surrey, UK. Oral communication: "Transgenerational effects of maternal history of child abuse in a general population sample"	2012	1

Supervising Master's Theses

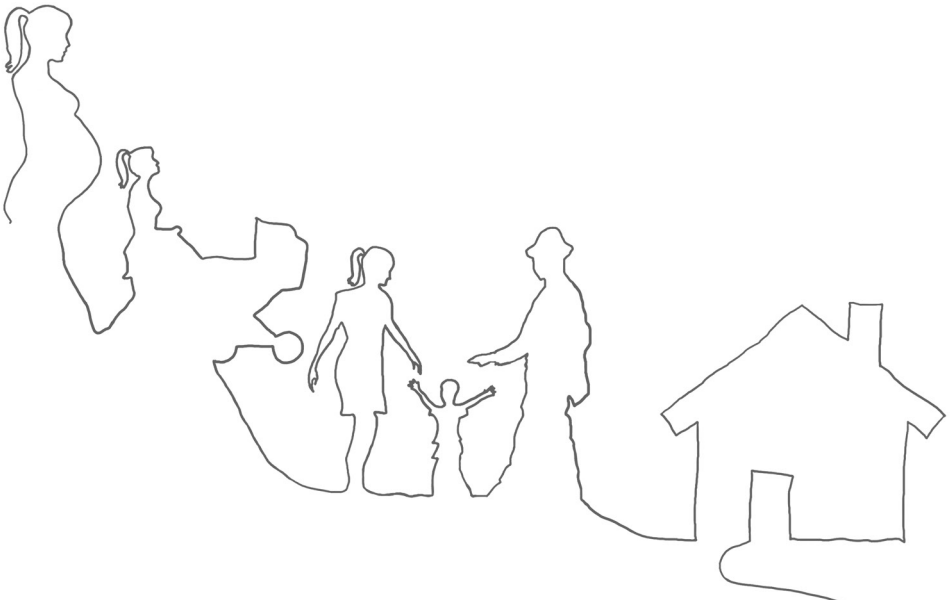
Sanne Abel. Thesis topic: Home environment and overweight.	2009-2010	3
Danielle Pol. Thesis topic: Prenatal maternal stress and child internalising behaviour problems.	2010-2011	3
Mona Vasen. Thesis topic: Maternal prenatal parenting attitudes and child problem behaviour.	2011	3

Tutoring

Sid Morsink & Dilan Yesil. Short Review topic: The prevalence of psychiatric disorders in preschool and young school-age children.	2011

Training Students		
Diagnostic Interview Schedule for Children (DISC)	2009-2012	3

Note. 1 ECTS (European Credit Transfer System) is equal to a workload of 28 hours.



Acknowledgements / Dankwoord

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