

The Family Environment in Early Childhood Has a Long-Term Effect on Self-Esteem:  
A Longitudinal Study From Birth to Age 27 Years

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### Abstract

A better understanding is needed of the factors that shape the development of individual differences in self-esteem. Using a prospective longitudinal design, this research tested whether the family environment in early childhood predicts self-esteem in later developmental periods. Data came from a nationally representative U.S. sample of 8,711 participants, who reported on their self-esteem biannually from age 8 to 27 years. Moreover, during the participants' first 6 years of life, biannual assessments of their mothers provided information on the quality of the home environment (covering quality of parenting, cognitive stimulation, and physical home environment), quality of parental relationship, presence of father, maternal depression, and poverty status of the family. The analyses were conducted using nonlinear regression analyses of age-dependent correlation coefficients, which were controlled for the effects of child gender and ethnicity. The results suggested that the family environment in early childhood significantly predicted self-esteem as the children grew up. Although the effects became smaller with age, the effects were still present during young adulthood. The largest effects emerged for quality of home environment. Moreover, the results suggested that the effects of home environment, presence of father, and poverty are enduring, as indicated by a non-zero asymptote in the time course of effects from age 8 to 27 years. Finally, quality of home environment partially accounted for the effects of the other predictors. The findings suggest that the home environment is a key factor in early childhood that influences the long-term development of self-esteem.

*Keywords:* self-esteem, early childhood, family environment, long-term development, longitudinal

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Self-esteem is a relatively enduring characteristic of individuals across large parts of the life course. As early as 1890, William James pointed to the stability of individual differences in self-esteem by noting that “there is a certain average tone of self-feeling which each one of us carries about with him” (James, 1890, p. 306). Longitudinal research supports the notion that self-esteem has a strong trait component that is comparable to other key personality characteristics (Donnellan, Kenny, Trzesniewski, Lucas, & Conger, 2012; Kuster & Orth, 2013; Wagner, Lüdtke, & Trautwein, 2016). Moreover, individual differences in self-esteem are already relatively stable during childhood (Cole et al., 2001; Trzesniewski, Donnellan, & Robins, 2003).

Intriguing questions, however, are related to the factors that shape the emergence of individual differences in self-esteem early in life. Findings from behavioral genetic studies indicate that both genetic and environmental factors account for variance in self-esteem, although the influence of environmental factors may be slightly larger than the influence of genes (McGuire, Neiderhiser, Reiss, Hetherington, & Plomin, 1994; Neiss, Sedikides, & Stevenson, 2002; Neiss et al., 2005). Research suggests that the family environment is an important environmental factor influencing the development of self-esteem during the first years of life (Harter, 2012a; Thompson, 2008). However, as yet there is almost a complete lack of research tracking the influence of the early childhood environmental factors on the long-term development of self-esteem.

Therefore, the goal of the present research was to systematically test for the effects of central characteristics of the family environment during early childhood (defined as the first six

years of life) on self-esteem in later developmental periods, based on prospective longitudinal data. Even if factors such as quality of care during early childhood explain self-esteem in preschoolers and first graders, are the effects of early childhood still present in adolescents and young adults? Or is the impact of these factors transient and no longer observable once children have grown up?

Although this research focuses on early childhood factors, it is relevant to personality psychology. A complete understanding of individual-difference constructs, such as self-esteem, requires knowledge about the factors that shape the emergence of individual differences. Moreover, if the influence of early childhood factors is enduring and still visible in adulthood—a hypothesis tested in the present research—then identifying influential factors during early childhood has important implications. According to the cumulative continuity principle, individual differences in personality characteristics become more stable, and less easy to change, as children grow up and become adults (for empirical findings, see Roberts & DelVecchio, 2000; Trzesniewski et al., 2003). Thus, if early childhood is consequential for later self-esteem, effective prevention measures (i.e., aimed at preventing low self-esteem in the population) should seek to improve the conditions in which children grow up.

### **Family Environment in Early Childhood and Self-Esteem:**

#### **Theoretical Perspectives and Empirical Findings**

Although developmental processes in early childhood are embedded in the larger social, economic, and cultural environment (Bronfenbrenner & Morris, 2006), with regard to the first years of life, the literature suggests that the family environment has a strong influence on the development of self-esteem (Harter, 2012a; Thompson, 2008).

#### **Quality of the Home Environment**

The present research uses a measure of the child's home environment, covering quality of parenting, cognitive stimulation, and quality of the physical home environment. Several theoretical perspectives suggest that parenting influences the development of children's self-esteem. Attachment theory (Bowlby, 1969, 1973, 1980) posits that a child's secure attachment to the caregiver leads to the development of a positive internal working model of the self, that is, the representation that the self is valuable and deserving of love and care from close others (Bretherton & Munholland, 2008; Marvin & Britner, 2008). Given that responsive, reliable, and appropriate parenting behavior by caregivers is the most important predictor of attachment security (Cassidy, 2008), attachment theory suggests that parenting has an impact on the development of children's self-esteem. In fact, research studies support the notion that secure attachment to mothers and fathers fosters young children's self-esteem (Verschueren & Marcoen, 1999; Verschueren, Marcoen, & Schoefs, 1996).

Similarly, symbolic interactionism suggests that during early childhood the child's experiences in the relationship with his or her parents influences the development of self-esteem (Cooley, 1902; Mead, 1934). This theory states that self-knowledge, including self-evaluation, has its origin in the social reactions of others to the self. Thus, individuals construe themselves based on experiences of how others see them; Cooley (1902) coined the term looking-glass self to describe this phenomenon. Given that during the first years of life, a large portion of a child's social interactions occur with the primary caregiver, the theory of symbolic interactionism suggests that the quality of parent-child interaction has an important influence on the early development of self-esteem.

Finally, sociometer theory (Leary, 2004, 2012; Leary & Baumeister, 2000) also suggests that parental behavior shapes the emerging self-esteem of a child. According to this theory, self-

esteem is part of a psychological system that serves the goal of monitoring the need for social inclusion and that evolved because it increased the individual's chances of survival and reproduction. Sociometer theory proposes that a person's self-esteem reflects—in an automatic and preconscious way—his or her self-perceived likelihood of being included in desired relationships (Leary & Baumeister, 2000). Given the centrality of the parent-child relationship during early childhood, a young child's sense of relational value might depend significantly on the degree to which his or her parents regard the relationship with the child as valuable and important. More generally, longitudinal research supports the notion that being valued by others contributes to self-esteem development (Gruenenfelder-Steiger, Harris, & Fend, 2016; Reitz, Motti-Stefanidi, & Asendorpf, 2016; Srivastava & Beer, 2005).

Empirical research tends to confirm that the quality of parenting is associated with children's self-esteem. In a longitudinal study with a sample of children aged 7 to 12 years, child-reported parental warmth predicted an increase in children's self-esteem; however, parent-reported parental warmth did not show significant effects on change in children's self-esteem (Brummelman et al., 2015). In a longitudinal study with children and adolescents aged 5 to 18 years and two waves separated by five years, parental support tended to predict higher self-esteem at the second wave, whereas parents' use of harsh punishment tended to predict lower self-esteem (Amato & Fowler, 2002). In a longitudinal study with adolescents, self-esteem of participants increased if fathers supported their children's autonomy and relatedness (Allen, Hauser, Bell, & O'Connor, 1994). In another longitudinal study with adolescents, an authoritarian parenting style was associated with a more negative self-esteem trajectory compared to a non-authoritarian style (Heaven & Ciarrochi, 2008). In addition, research suggests that extremely adverse forms of caregiving and parenting, such as maltreatment and abuse, are

particularly detrimental for the development of children's self-esteem (Kim & Cicchetti, 2004; Ritter, Stewart, Bernet, Coe, & Brown, 2002).

With regard to cognitive stimulation and physical home environment (i.e., the other aspects included in the measure of home environment used in the present research, besides quality of parenting), few studies have tested for effects on children's self-esteem. In a longitudinal study with a sample of Mexican American, Mexican, and Puerto Rican children, cognitive stimulation predicted children's self-esteem in the academic domain at age 8 to 10 years, but not at age 11 to 13 years, and, moreover, did not predict their global self-esteem (Schmitz, 2006). In another longitudinal study, parental support of children's homework (e.g., by promotion of representational thinking) did not predict changes in self-esteem (Murray et al., 2006). In a study with a sample of adolescents, the physical home environment was cross-sectionally correlated at medium to large effect size with self-esteem (Thomas & Raj, 1985). Overall, however, little evidence is available regarding the question of whether cognitive stimulation and the physical home environment influence children's self-esteem.

### **Quality of the Parental Relationship**

Another central characteristic of the family environment is the quality of the relationship between the parents. Research suggests that the quality of the parental relationship influences healthy development among children, including the development of their self-esteem (Amato, 1986; Davies, Harold, Goeke-Morey, & Cummings, 2002; Siffert, Schwarz, & Stutz, 2012). Moreover, research on the spillover hypothesis indicates that the quality of the parents' relationship is related to the quality of their parenting behavior (Krishnakumar & Buehler, 2000), consistent with theoretical accounts of the family system (Cox & Paley, 2003) and of the link between marital conflict and coparenting (Margolin, Gordis, & John, 2001; McHale, 1995). For

example, mothers and fathers who are in a satisfying relationship with each other show more responsiveness and warmth towards their children (Cox, Owen, Lewis, & Henderson, 1989). In contrast, parents who are in a distressing marriage may have reduced cognitive and emotional resources when interacting with their children, which might have consequences for the development of children's self-esteem. Using longitudinal data from a sample of children aged 9 to 12 years, Siffert et al. (2012) directly tested whether parenting mediated the self-esteem effects of the parental relationship. The findings suggested that relationship conflicts among parents reduced the quality of their parenting behavior, which in turn led to lower levels in children's self-esteem.

### **Presence of Father**

A relevant objective characteristic of the family environment is whether the father is present (i.e., lives in the same household as mother and child). A father may be absent for diverse reasons such as divorce and separation, death, illness, work abroad, or because the mother was never in a committed relationship with him. Cross-sectional data suggest that the absence of the father correlates with lower self-esteem among children and adolescents (Hendricks et al., 2005; Luo, Wang, & Gao, 2011; but see Covell & Turnbull, 1982). When the father is absent, this can be associated with burden for the mother, such as emotional distress, higher demands with regard to parenting, care, and support of children, as well as economic difficulties (Barber & Eccles, 1992; Lamb, 2010). All of these problems might interfere with the quality of the mother-child relationship, suggesting that absence of the father might indirectly influence the development of the child's self-esteem through effects on caregiving quality (Barber & Eccles, 1992; Lamb, 2010). In contrast, if the father is present, involvement of fathers in parenting may allow mothers to have close and warm relationships with their children while

pursuing career goals. Thus, paternal involvement possibly increases the fulfillment and satisfaction among both parents, which may be beneficial for the parent-child relationship of both mother and father (Lamb, 2010).

### **Maternal Depression**

Another characteristic of the family environment is the mental health of parents. In particular, research has focused on depression among mothers (Goodman et al., 2011; Miller, Warner, Wickramaratne, & Weissman, 1999). In a longitudinal study with a sample of children and their mothers, maternal depression when the children were 10 years of age had a negative effect on their self-esteem 2 years later, controlling for prior levels of self-esteem (Orth, Robins, Widaman, & Conger, 2014). Theory suggests that maladaptive parenting and disturbed child-mother attachment might be mediating mechanisms that account for the effects of maternal depression on children's self-esteem (Cummings & Davies, 1994). For example, if the mother frequently experiences depressive symptoms such as sadness, hopelessness, irritable mood, poor concentration, disturbed sleep and fatigue, these conditions may interfere with sensitive and responsive caregiving and effective stimulation of learning.

### **Poverty**

Finally, poverty is a characteristic of the family environment that influences many developmental processes (Conger, Conger, & Martin, 2010; Conger & Donnellan, 2007; Edin & Kissane, 2010). Poverty may lead to a variety of stressors for the family, including emotional distress, marital conflict, and disturbed parent-child interactions and, consequently, might impair children's self-esteem development (Conger & Donnellan, 2007; Edin & Kissane, 2010; Whitbeck et al., 1991). Consistent with this hypothesis, a cross-sectional study with families including adolescent boys suggested that family economic hardship indirectly predicted lower

adjustment among adolescents (as indicated by self-esteem and other measures) through its negative effect on skillful parenting (Conger et al., 1992). Likewise, a cross-sectional study with parents and their adolescent children indicated that the negative effect of the family's financial strain on adolescents' self-esteem was mediated by lower levels of supportive parenting (Mayhew & Lempers, 1998). More generally, research suggests that low socioeconomic status accounts for small but significant differences in people's self-esteem (Orth, Maes, & Schmitt, 2015; Orth, Trzesniewski, & Robins, 2010; Twenge & Campbell, 2002).

### **Conclusions From Previous Research**

To summarize, research suggests that all of the characteristics of the family environment reviewed above predict self-esteem among children and adolescents. Overall, research suggests that factors such as marital quality, parent's mental health, presence of fathers, and absence of poverty predict healthy self-esteem among children, at least partially, because these factors influence whether parents can provide a beneficial home environment for their children. More precisely, many of these factors influence the quality of mothers' and fathers' parenting behavior, the degree to which parents stimulate the cognitive development of children, and the degree to which parents can provide appropriate play materials and a safe and organized home environment. All of these factors might contribute to the development of children's self-esteem.

However, it is important to note that many studies on the relation between children's family environment and self-esteem were cross-sectional, strongly limiting the conclusions that can be drawn (e.g., Kernis, Brown, & Brody, 2000; Laible & Carlo, 2004; Mayhew & Lempers, 1998; Neiderhiser, 1994; Raboteg-Saric & Sakic, 2014). Moreover, whereas many studies examined the family environment during middle childhood and adolescence, only a few studies are available on the family environment during early childhood. Finally, with regard to the

effects of parental behavior, a limitation of many studies is that parental behavior was assessed on the basis of reports from children and adolescents, but not on reports from the parents themselves or third-party informants (e.g., Bulanda & Majumdar, 2009). This design characteristic is problematic as it is likely that children's perceptions of parental behavior show inflated associations with their self-esteem because of shared method variance (e.g., evaluative bias that is present in both measures).

### **Does the Family Environment in Early Childhood**

#### **Have An Enduring or Transient Effect on Self-Esteem?**

The present research uses longitudinal data to test whether the family environment, as assessed during the first years of life, predicts children's self-esteem in later developmental periods. An important methodological issue is that the typical two-wave longitudinal study design is not suitable to evaluate whether early childhood factors influence the long-term development of individual characteristics such as self-esteem (Fraley, Roisman, & Haltigan, 2013). Rather, it is necessary to collect information on the age-dependent strength of association using multiple waves of data. The reason is that the association between predictor and outcome at any two waves—for example, a correlation of .20 between quality of caregiving at age 3 years and self-esteem at age 10 years—may be explained by completely different models of the influence of early experiences. Fraley et al. (2013; see also Haltigan, Roisman, & Fraley, 2013; Raby, Roisman, Fraley, & Simpson, 2015; Roisman & Fraley, 2013) distinguish between the revisionist model and the enduring effects model. The revisionist model is based on the assumption that the influence of early childhood factors slowly fades because early experiences are successively “overwritten” by new experiences (e.g., Kagan, 1996), predicting that the effect ultimately becomes zero. In contrast, the enduring effects model—although acknowledging that

the effect becomes smaller as the child grows up because of new experiences—is based on the assumption that early experiences may still influence the individual after years or even decades (e.g., Sroufe, Egeland, & Kreutzer, 1990), predicting that the effect does not approach zero but a non-zero value. If only two waves of data are available, any observed correlation can be explained by both the revisionist and enduring effects model, although the models make dramatically different predictions about the long-term influence of early experiences. However, if information on the pattern of correlations across different ages is available, then these data can be used to test whether the revisionist or the enduring effects model is better able to explain the pattern of correlations.

Regarding self-esteem, the theoretical perspectives reviewed earlier suggest that the family environment during early childhood might have an enduring effect. Of particular importance is attachment theory (Bowlby, 1969, 1973, 1980). If children develop an internal working model of the self in response to their experiences with caregivers during the first years of life (Bretherton & Munholland, 2008; Marvin & Britner, 2008) and if internal working models are relatively stable as children grow up, quality of caregiving in early childhood might have an enduring effect on people's self-esteem even into adulthood. In fact, research suggests that individual differences in attachment security—and, consequently, individual differences in internal working models of the self—are relatively stable from infancy to adulthood (Fraley, 2002). Thus, quality of caregiving in early childhood might influence self-esteem across long periods or even across the whole life span, because these early experiences have shaped how the individual feels about the self when interacting with others.

Therefore, in the context of the present research, the question is not only whether the family environment in early childhood predicts self-esteem in later developmental periods, but

also whether characteristics of the family environment have an enduring effect or, as Fraley and colleagues (2013, p. 109) put it, whether they “leave an immutable mark on people’s lives.” A possible way to assess whether the pattern of age-dependent correlations between early experiences and an outcome is better explained by the revisionist or enduring effects model is to test whether the correlation asymptotically approaches zero or a non-zero value. This test can be conducted by specifying the mathematical function of age-dependent change in the correlation, including the asymptotic value as one of the parameters of the function (for a similar approach to assessing the long-term stability of self-esteem, see Kuster & Orth, 2013). Put differently, the strength of association between early experiences and an outcome can be examined as a function of the age at which the outcome is measured. As shown by Fraley and colleagues (2013), the pattern of change in age-dependent correlations follows the mathematical function of exponential decay. The reason for why the effect decays exponentially is the autocorrelation of variables over time (for examples of modeling the stability of constructs across increasing length of time intervals, see Fraley, 2002; Fraley & Roberts, 2005). The parameters of the function can be estimated using nonlinear regression analysis (e.g., Ratkowsky, 1990). More detailed information on the analyses will be provided in the Results section.

### The Present Research

The goal of the present research was to test whether the family environment in early childhood predicts the development of self-esteem in later developmental periods and whether there is evidence for an enduring effect of the family environment. The present study extends previous research in several ways.

First, there is almost a complete lack of empirical information on the extent to which the family environment during the first years of life shapes the long-term development of self-

esteem. The present research examines the predictive effects of five central characteristics of the early childhood family environment, i.e., quality of home environment, quality of parental relationship, presence of father, maternal depression, and poverty status of the family. Second, the research uses a prospective longitudinal design including a large number of assessments from birth to age 27 years, which increases the validity of conclusions. Third, the present research uses data from both the children (i.e., the target participants) and their mothers. Whereas self-esteem was assessed using self-reports of the children, information on the family environment in early childhood was drawn from assessments of the mothers. Thus, any observed association between children's family environment and their later self-esteem cannot be attributed to shared method variance because predictor and outcome variables are based on data from different sources of information (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003; Podsakoff, MacKenzie, & Podsakoff, 2012).

Fourth, the analyses are based on data from a large and nationally representative U.S. sample of participants, increasing the validity of the findings. With regard to the present research, an important advantage of examining a nationally representative sample is that most variables are likely to be distributed similarly to their distribution in the population (reflecting the heterogeneity within the population), which provides for valid estimates of the associations between variables. In contrast, for example, if the variances of variables were restricted due to selective sampling (as is often possible in convenience samples), correlations between the variables could be biased.

Fifth, the present research tests whether quality of home environment is the key factor of the family environment in early childhood, mediating the effects of the other factors examined in this study. It is important to note that the present research does not provide a causal test of the

mediation effects, because the mediator (i.e., quality of home environment) and predictors (i.e., other factors, such as quality of parental relationship and poverty) were assessed concurrently (i.e., in early childhood). Thus, the mediation analyses are based on the assumption—which is not tested in the present research—that quality of parental relationship, presence of father, maternal depression, and poverty influence the quality of the home environment provided by parents. However, as reviewed above, theoretical perspectives and prior empirical studies support this assumption. Moreover, the mediation analyses provide information about whether the effects of predictors are reduced when the mediator is controlled for. Nevertheless, the mediation analyses should be considered only as a first step in examining whether the quality of the home environment accounts for the long-term effects of other characteristics of the family environment.

In the analyses, associations between family environment and later self-esteem were controlled for the effects of child gender and ethnicity. A large body of research suggests that there are small but consistent differences in self-esteem across gender (Kling, Hyde, Showers, & Buswell, 1999; Major, Barr, Zubek, & Babey, 1999; Zuckerman, Li, & Hall, 2016) and ethnicity (Erol & Orth, 2011; Gray-Little & Hafdahl, 2000; Orth et al., 2010). Controlling for gender and ethnicity helps rule out alternative accounts of the association between family environment and self-esteem. For example, it is possible that variables such as quality of home environment, presence of father, and poverty differ across ethnic groups; therefore, it is important to control for the possibility that correlations between family environment and self-esteem result from ethnic differences in these variables.<sup>1</sup>

## Method

The present research used anonymized data from an archival data set and therefore was exempt from approval by the Ethics Committee of the author's institution (University of Bern, Faculty of Human Sciences), in accordance with national law.

## **Participants**

The data used come from the National Longitudinal Survey of Youth 1979 (NLSY79).<sup>2</sup> The NLSY79 is a nationally representative longitudinal study of a cohort of Americans born 1957–1964 and of the children born to the female participants of this cohort. These children are the target participants of the present research (for information on the study and access to the data, see <https://www.nlsinfo.org>). Information on the children has been collected since 1986, using biannual assessments that included interviews and self-reports of the mothers, behavior observation of the interaction between mothers and children, and assessments of the children. Moreover, since 1994 the NLSY79 has assessed children who have reached 15 years of age with separate interviews. Data on children are available for a total of 14 assessments between 1986 and 2012.

The present research uses data from both the mothers and their children. Information on the family environment in early childhood is drawn from the mothers' assessments, whereas information on self-esteem is drawn from the children's assessments. The NLSY79 data are organized by waves, but the present research focuses on another metric of time, that is, age. Consequently, the data for the present research had to be restructured and organized by the children's age. The exact age at the time of the assessments was used for restructuring. To assess the family environment, data were used from those waves at which the children were between 0 and 6 years of age (more precisely, younger than age 6.00 years). Given that the assessments were conducted biannually, up to three waves provided relevant data. For constructing the family

environment variables, the information from relevant assessments was aggregated by computing means across waves. Data on the children's self-esteem were available for waves at which children were age 8 years and older. In the analyses, because associations between predictors and self-esteem were tested only if they were based on samples of 100 cases or more (for further information on missing data, see below), the maximum age examined was 27 years. In the present research, participants were excluded if they did not provide data on self-esteem at any of the assessments between age 8 and 27 years.

The sample consisted of  $N = 8,711$  individuals (49% female). Of the participants, 47% were White (non-Hispanic), 32% were Black, and 21% were Hispanic. On average, participants were born in 1986 ( $SD = 6.1$  years; range = 1970 to 2001).

### **Missing Data**

It is important to note that the analyses are based on sample sizes that are lower than the overall sample size for several reasons. (a) First, the number of assessments available for each child varies widely, resulting from a complex pattern of planned missing data due to wave-specific budgetary deficits in the NLSY79. For example, in 1998 children aged 21 years and older were not surveyed, and in 2000 about 40% of the Black and Hispanic oversamples were not assessed. (b) Second, assessments were conducted every two years, but age is examined in 1-year steps, which is possible because the data have been restructured from the metric of waves (e.g., self-esteem assessed in 1986, 1988, etc.) to the metric of age (e.g., self-esteem at age 8 years, 9 years, etc.). Examining age in 1-year instead of 2-year steps is useful because it provides for greater precision of the age metric, but comes at the cost of cutting the sample size (i.e., the number of cases on which correlations are based) in half. (c) Third, the number of assessments available decreases with increasing age of the participants, due to the design of the NLSY79.

When children were first assessed at the 1986 wave, all children born up to this year were included in the study. For example, children who were 8 years old in 1986 were 34 in 2012 (i.e., the most recent assessment available), possibly providing data until age 27 years (i.e., the maximum age examined in the present research). In contrast, children who were born later provided more data at young ages than at older ages. For example, children born in 1996 provided self-esteem data at most until age 16 years, so data from age 17 to 27 years were missing by design. Importantly, all of the reasons for missing data described above are not a concern with regard to the quality of the data. Therefore, even if some participants provided data at only a few assessments, all available data were used for the analyses.

Clearly, however, data can be missing for additional reasons, for example because participants could not be located or did not want to continue participating in the NLSY79. Therefore, to investigate the potential impact of attrition, individuals who did and did not participate in at least one of the two most recent waves of data collection (2010 and 2012) were compared on demographic variables, family environment during early childhood, and self-esteem. Among individuals who did not participate in 2010 or 2012, quality of home environment was lower ( $d = -0.06$ ), the father was more absent ( $d = -0.22$ ), poverty was more frequent ( $d = 0.18$ ), and self-esteem was higher at age 12 years ( $d = 0.10$ ) and lower at age 16 years ( $d = -0.11$ ). However, differences in gender, ethnicity, quality of parental relationship, maternal depression, and self-esteem at all other ages from 8 to 27 years were nonsignificant. Given that all of these differences were small or nonsignificant, nonrepresentativeness due to attrition was not a serious concern in the present research.

### **Measures of Family Environment (Age 0 to 6 Years)**

As reported above, the measures of the family environment were constructed by aggregating the information from those assessments at which the children were between age 0 and 6 years. Table 1 shows the intercorrelations among measures of the family environment.

**Quality of home environment.** At each wave, the NLSY79 includes a measure of the quality of the home environment: the Home Observation Measurement of the Environment–Short Form (HOME-SF). The short form was developed by the NLSY79 investigators in collaboration with the authors of the original measure (for the original HOME, see Caldwell & Bradley, 1984). The measure assesses aspects such as quality of parenting (e.g., warmth and responsiveness, avoidance of restriction), cognitive stimulation (e.g., stimulation of learning, provision of appropriate play materials), and quality of the physical environment (e.g., safe and organized home environment). The data are collected in semi-structured interviews that include the mother and the child. The measure includes multiple items from two different sources of information, that is, interview responses of mothers and direct observations by interviewers. The precise items included in the measure depend on the child's age; the NLSY79 distinguishes between (a) children aged 0 to 3 years, (b) children aged 3 to 6 years, (c) children aged 6 to 10 years, and (d) children aged 10 years and older. The present research uses assessments from the first two categories (covering ages 0 to 6 years). For children below age 3, the measure included 18 items. Example items are: "Child gets out of house 4 times a week or more" (self-report of mother), "Mom often talks with child while working" (self-report of mother), "Mom showed physical affection to child" (observation of interviewer), and "Mom provided appropriate toys/activities to child" (observation of interviewer). For children between ages 3 to 6 years, the measure included 25 items. Example items are: "Child helped to learn numbers at home" (self-report of mother), "Non-harsh discipline if child hits" (self-report of mother; this variable

aggregates responses to 10 individual items), “Mom answered child’s questions or requests verbally” (observation of interviewer) and “Home is minimally cluttered” (observation of interviewer). The validity of the measure has been supported in a large body of research (Bradley & Caldwell, 1980; Bradley et al., 1989; Elardo, Bradley, & Caldwell, 1977; Elardo, Bradley, & Caldwell, 1975; for reviews, see Mott, 2004; Elardo & Bradley, 1981). Across several studies, interrater reliability has been reported as approximately 90% (for a review, see Elardo & Bradley, 1981). Moreover, the internal consistency has been estimated as .89 for the full HOME (Elardo et al., 1975). In the NLSY79, the sum scores of the HOME-SF are standardized within each year of age (for children below 1 year; for children between 1 and 2 years; and so on), using a standard score mean of 100 and a standard deviation of 15. Thus, the scores can be compared across age. In the sample used in the present research, the mean was 96.4 and the standard deviation was 14.3, averaged across assessments.

**Quality of parental relationship.** The quality of the parental relationship was assessed by asking mothers about their happiness with their relationship/marriage. Responses were measured on a 3-point scale (1 = *not too happy*, 2 = *fairly happy*, 3 = *very happy*), with  $M = 2.65$  and  $SD = 0.49$  averaged across assessments. Data on quality of the parental relationship were used only for those waves at which the father lived in the same household as the mother and child (see below); this restriction is required to ensure that the mother’s report is about the relationship/marriage with the father of the child and not about the relationship with another partner. In the NLSY79, the measure was used at 12 of the 14 waves (more precisely, the measure was not included in the 1986 and 1990 waves).

**Presence of father.** At each wave, interviewers assessed whether the father of the child lived in the same household as the mother and child. Presence of father was coded as 0 = *no* and

1 = yes, with  $M = 0.70$  and  $SD = 0.42$  averaged across the assessments during the child's first six years of life.

**Maternal depression.** Depressive symptoms were used as an indicator of mental health problems of the mother (other indicators of the mother's mental health are not available in the NSLY79; no indicators of the father's mental health are available in the NSLY79). Depressive symptoms among mothers were assessed with a 7-item version of the Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977). The items were: "I did not feel like eating; my appetite was poor," "I had trouble keeping my mind on what I was doing," "I felt depressed," "I felt that everything I did was an effort," "My sleep was restless," "I felt sad," and "I could not get 'going.'" The CES-D is a frequently used self-report measure for the assessment of depressive symptoms in non-clinical, sub-clinical, and clinical populations, and its validity has been repeatedly confirmed (Eaton, Smith, Ybarra, Muntaner, & Tien, 2004). Participants were instructed to assess the frequency of their reactions during the past week. Responses were measured on a 4-point scale (0 = rarely, none of the time, one day, 1 = some, a little of the time, one to two days, 2 = occasionally, moderate amount of the time, three to four days, 3 = most, all of the time, five to seven days), with  $M = 0.64$  and  $SD = 0.56$  averaged across assessments. Depressive symptoms were assessed only in the 1992 and 1994 waves, which strongly decreases the number of children for whom information is available during the first six years of life. Despite this limitation, maternal depression was included in the present analyses because of its strong relevance for the research question. To partially remedy the limitation, depressive symptoms were aggregated across the first seven years of the children's lives, which increases the number of children for whom information on this variable is available (however, all other

family environment variables were restricted to the first six years of life). In the present sample, coefficient alpha was .80, averaged across assessments.

**Poverty status of the family.** For each wave, the NLSY79 includes information on the poverty status of the family, which is based on the poverty income guidelines updated yearly by the U.S. Department of Health and Human Services. A family is defined as living in poverty if the family income is lower than the income specified in the guidelines, accounting for family size. Poverty status is coded as 0 = *no* and 1 = *yes*, with  $M = 0.27$  and  $SD = 0.41$  averaged across assessments during the child's first six years of life.

### **Measures of Self-Esteem (Age 8 to 27 Years)**

**Self-Perception Profile for Children (SPPC).** For children between age 8 and 14 years, the NLSY79 includes the 6-item global self-worth scale of the Self-Perception Profile for Children (SPPC; Harter, 2012b), a frequently used and well-validated measure of self-esteem (Donnellan, Trzesniewski, & Robins, 2015). The SPPC was administered by interviewers who read the questions to the children and recorded their responses. The SPPC uses a two-step response format. In the first step, children were asked which of two statements described them better (e.g., "Some kids are often unhappy with themselves" vs. "Some kids are pretty pleased with themselves"). In the second step, children were asked to indicate whether the statement was "sort of true" or "really true" for them. The responses were then coded on a 4-point scale ranging from 1 to 4 (higher values indicate higher self-esteem), with  $M = 3.39$  and  $SD = 0.58$  averaged across assessments. In the present sample, coefficient alpha was .72, averaged across assessments.

**Rosenberg Self-Esteem Scale (RSE).** When children became 15 years and older, they were moved to the Young Adults section of the NLSY79 (young adults are interviewed with

separate questionnaires). In this section, self-esteem is assessed with the 10-item Rosenberg Self-Esteem Scale (RSE; Rosenberg, 1965), another frequently used and well-validated measure of global self-esteem (Donnellan et al., 2015; Robins, Hendin, & Trzesniewski, 2001). The RSE was administered in self-report questionnaires without the presence of an interviewer. An example item is “On the whole, I am satisfied with myself.” Responses were measured on a 4-point scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*), with  $M = 3.27$  and  $SD = 0.43$  averaged across assessments. In the present sample, coefficient alpha was .87, averaged across assessments.

### Statistical Analyses

As described above, the NLSY79 uses different measures of self-esteem for children aged 8 to 14 years versus 15 years and older. Because the assessments using the SPPC and RSE did not overlap (i.e., no participant provided data on both measures at the same assessment), it was not possible to compute the correlation between the two measures in the NLSY79 sample. Fortunately, however, the literature suggests that the SPPC and RSE provide valid assessments of the same construct, that is, global self-esteem (for a review, see Donnellan et al., 2015). Moreover, research suggests that the SPPC and RSE are closely correlated. For example, in the study by Donnellan, Trzesniewski, Conger, and Conger (2007) the two scales correlated at .74 and in the study by Ferrier and Martens (2008) at .75. Thus, the evidence suggests that the two measures can be used to track self-esteem at all ages from middle childhood to young adulthood.<sup>3</sup>

However, given that the reliability estimates differed for the SPPC and RSE, the degree of measurement error should be controlled for in the analyses when comparing coefficients across the two measures. As reported above, in the present research coefficient alpha was

estimated as .72 for the SPPC and .87 for the RSE—values that correspond to reliability estimates reported in the literature. For example, according to the review by Donnellan et al. (2015), the internal consistency of the SPPC is typically in the .70s to .80s, whereas the internal consistency of the RSE is rather in the .80s to .90s. For these reasons, the correlation coefficients examined in this research will be corrected for measurement error in the self-esteem scale used. Correcting for measurement error can be done by dividing the correlation by the square root of the product of the reliabilities of the variables (Cohen, Cohen, West, & Aiken, 2003). Because the formula requires information on the reliability of both measures involved in the correlation, as well as for reasons of completeness, the correlations will also be controlled for measurement error in the measures of the family environment. Thus, the correlation coefficients examined in this research are estimates of the correlation that would result if the measures were free from measurement error.

For the measures of the family environment, the following reliability estimates were used. For the full HOME, the literature suggests a reliability of .90, as reported above. Given that the short form of the HOME is about half as long as the full HOME, the reliability should be adjusted using the Spearman–Brown formula (Long, 2004), resulting in an estimate of .82. For quality of parental relationship, no direct estimate of reliability is available given that it is based on a single item. However, the literature suggests that single items measuring constructs that are highly schematized—that is, constructs that can readily be reported by lay persons—often have a reliability in the .70s (Lucas & Donnellan, 2012; Robins et al., 2001; Woods & Hampson, 2005). Therefore, the present research uses a reliability estimate of .75 for the single item of quality of parental relationship. For the CES-D, a reliability estimate of .80 will be used, corresponding to coefficient alpha in the present sample, as reported above. The variable presence of father was

based on objective data and, consequently, no correction for measurement error was required.

Finally, in the variable poverty status of the family, which was based on family income, measurement error is likely to be very small.<sup>4</sup> Therefore, no correction for measurement error was used for this variable.

The analyses of age-dependent correlation coefficients were based on nonlinear regression analyses (Ratkowsky, 1990), using the SPSS 23 program (SPSS, 2015). Correlation coefficients were computed for all ages available in the NLSY79, but only if the correlation could be based on data from at least 100 cases. Using a minimum sample size ensures that the correlations are estimated with sufficient precision, which increases the validity of the findings on patterns of age-dependent correlations. In computing these correlation coefficients, missing data were handled by pairwise exclusion. All correlations were controlled for the effects of child gender and ethnicity (using two dummy variables for Black and Hispanic participants).

The mediation analyses were conducted using the Mplus 7.4 program (Muthén & Muthén, 2012). The indirect effect (i.e., mediation effect) was tested using the bias-corrected bootstrap 95% confidence interval based on 1,000 replications, following the recommendations of Shrout and Bolger (2002). As in the correlation analyses, all effects (i.e., direct and indirect effects) were controlled for bias due to measurement error, using the reliability estimates noted above.<sup>5</sup> Moreover, all effects were controlled for child gender and ethnicity.

## Results

Table 2 shows the correlations and corresponding sample sizes on which the analyses were based. The average sample size used for computing the correlations was large, ranging from 675 (quality of parental relationship) to 1,240 (presence of father) across measures of family environment; only two percent of the correlations were based on sample sizes below 200

and only six percent on sample sizes below 300. The goal of the analyses was to test for systematic patterns of change in the correlation between family environment in early childhood and self-esteem, as a function of age at which the participant's self-esteem was assessed (i.e., from age 8 to 27 years). As discussed in the Introduction, the pattern of age-dependent correlations follows an exponential decay function, allowing for a non-zero asymptote (Fraley, 2002; Fraley & Roberts, 2005; Fraley et al., 2013; Kuster & Orth, 2013). The function tested in the present research corresponded to the following equation:

$$r = a + (c - a) \times e^{-b \times (\text{age} - 8)}. \quad (1)$$

Here,  $r$  represents the outcome (i.e., the correlation between family environment and self-esteem),  $a$  represents the asymptote,  $c$  is the intercept at age 8 years,  $e$  is a mathematical constant, and  $b$  represents the rate of decay (i.e., how quickly the correlation decays). For an illustration of the function, see Figure 1.

The function accounts for two important theoretical assumptions. First, the function allows for a non-zero asymptote  $a$ , that is, the function does not require that the correlation approaches zero with increasing age (though the empirical results may suggest that  $a$  is zero). Second, the magnitude of the correlation either continuously decreases with age or, if  $a = c$ , is constant across age. The term "age – 8" is needed to locate the intercept  $c$  at age 8 years (i.e., the youngest age at which self-esteem data are available in the NLSY79; if age = 8 then the exponent equals 0, and given that  $e$  raised to the power of 0 equals 1,  $r$  equals  $c$  at age 8). Moreover, when age becomes large, the exponent approaches negative infinity; given that  $e$  raised to the power of negative infinity equals 0,  $r$  approaches  $a$  as age becomes large.

Thus, estimation of the function yields three parameters: the asymptote  $a$ , the rate of decay  $b$ , and the intercept  $c$  at age 8 years. Although all three parameters are needed to fit the function closely to the data, in the present context the important parameters are the asymptote  $a$  and the intercept  $c$ . The asymptote  $a$  is important because it allows testing whether the age-dependent correlation approaches zero (which would correspond to  $a = 0$ ) or a non-zero value (which would be reflected if  $a$  differs significantly from 0). Figure 1 shows two graphs that correspond to these two possibilities. The intercept  $c$  is important because it indicates the size of the correlation at an early age, and comparing  $a$  and  $c$  helps to interpret the nature of the age-dependent change of the correlation. In contrast, the precise value of  $b$  is less important with regard to substantive interpretations.

Although all models yielded proper estimates of  $b$  (i.e., with positive values as is typical for exponential decay), in none of the models did  $b$  differ significantly from 0, which is likely due to the relatively low number of correlations examined (i.e., up to 20 correlations from age 8 to age 27 years). Moreover, when all three parameters were estimated simultaneously, the precision of the parameters was low in all models, suggesting that estimating all three parameters simultaneously is asking too much of the data. Importantly, however, parameter  $b$  is needed to fit the model to the data (i.e., it is not an option to omit it from the model or to constrain it to a fixed value across variables). For these reasons, the following test strategy was used. A first model with all parameters was run. Then, in a second model,  $b$  was fixed to the estimate from the first model, which allowed estimating  $a$  and  $c$ . If  $a$  did not differ significantly from 0, this parameter was dropped from the model and a third model was tested that included only parameters  $b$  and  $c$ .

The results of the analyses are reported in Table 3 and Figure 2. For all variables of the family environment, parameter  $c$  differed significantly from 0. For three variables, parameter  $a$

differed significantly from 0. The largest intercept and the largest asymptote emerged for the correlation of self-esteem with quality of home environment. At age 8 years, the model-implied correlation was .25 (closely corresponding to the observed correlation, which was .26). The model suggested that the correlation with quality of home environment quickly decayed and approached a non-zero asymptote estimated as .16 (see also Figure 2A). Although the absolute value of the intercept was much lower for poverty status (−.11) when compared to quality of home environment, the findings suggested that the correlation between self-esteem and poverty status approached an asymptote of −.10, that is, the correlation was almost constant across middle childhood, adolescence, and young adulthood (Figure 2E). For presence of father, the model suggested that the correlation was relatively low (.07) already at age 8 years, and approached an asymptotic value of .04 (Figure 2C). In contrast, for the variables quality of parental relationship and maternal depression, the analyses suggested that the correlations approach zero in the long term, although at age 8 years the correlations were at about small to medium values (.12 and −.18, respectively; Figures 2B and 2D).

Readers might ask whether a linear function—which is simpler and more familiar than the exponential decay function tested above—would fit the data as well as exponential decay. From a theoretical perspective, a linear age-dependent decrease of the correlation is not a plausible model because it does not correspond to theoretical models of the underlying causal mechanisms that may have produced the data (Fraley et al., 2013; Roisman & Fraley, 2013). Moreover, the linear function implies that the correlation eventually changes its sign (e.g., drops below 0 for a variable that initially had a positive correlation with self-esteem) and that the absolute value of the correlation eventually even becomes larger than 1 (e.g., drops below −1 for a variable that initially had a positive correlation with self-esteem), which is not meaningful. In

contrast, the exponential decay function is theoretically plausible and matches all of the assumptions described above (i.e., the magnitude of the correlation continuously decreases with age and asymptotically approaches a value that is either 0 or a non-zero value). Moreover, empirically, the present data suggest that a linear model did not fit the data as well as the exponential decay model. For all family environment variables, the variance explained by exponential decay was larger than the variance explained by the linear function, except for maternal depression for which the  $R^2$  values were identical for the two models (for quality of home environment,  $R^2$  was .223 for exponential decay versus .097 for the linear function; for quality of parental relationship,  $R^2$  was .065 versus .058; for presence of father,  $R^2$  was .039 versus .019; for maternal depression,  $R^2$  was .200 versus .200; and for poverty status of family,  $R^2$  was .002 versus .001). Thus, the empirical findings on the linear model support the notion that the age-dependent decline in correlations between conditions in early childhood and later self-esteem corresponds to an exponential decay function. In the Discussion section, I will elaborate on why exponential decay is the mathematical function that captures the time course of enduring and transient effects and on the equivalence of the present approach and the approach of Fraley et al. (2013) in this regard.

The final set of analyses tested whether quality of home environment mediated the effects of the other factors of the family environment examined in this study, that is, quality of parental relationship, presence of father, maternal depression, and poverty status of family. For these variables, the effects on self-esteem were decomposed into an indirect effect (i.e., the effect that was mediated by quality of home environment) and a direct effect (i.e., the effect that remained when the indirect effect through quality of home environment was controlled for). Thus, for each

effect of the predictors on self-esteem from age 8 to 27 years a mediation model was tested (MacKinnon, Fairchild, & Fritz, 2007; Shrout & Bolger, 2002).

Table 4 shows the direct and indirect effects from the mediation models. For all constructs, most of the indirect effects were significant, whereas most of the direct effects were nonsignificant, suggesting that quality of home environment accounted for the effects of the other factors of the family environment. Moreover, when averaged across the available assessments of self-esteem (see the bottom row in Table 4), the resulting coefficients suggest that the indirect effects accounted for large proportions of the total effects (the total effect is the sum of the direct and indirect effect). For example, the indirect effect of quality of parental relationship accounted for 50% of the total effect (i.e., .05 divided by .10). Likewise, the indirect effects accounted for large proportions of the total effects of presence of father (83%), maternal depression (36%), and poverty status of family (64%). These findings are consistent with the hypothesis that quality of home environment is the key factor of the family environment during early childhood that predicts the long-term development of self-esteem in later developmental periods and that mediates, at least partially, the effects of other factors of the family environment.

### **Discussion**

Using a prospective longitudinal design, this research tested whether the family environment in early childhood predicts self-esteem in later developmental periods. Data came from a large and nationally representative U.S. sample of participants, who reported on their self-esteem biannually from age 8 to 27 years. Moreover, during the participants' first six years of life, biannual assessments of their mothers provided information on the quality of the home environment, quality of parental relationship, presence of father, maternal depression, and

poverty status of the family. The analyses were conducted using nonlinear regression analyses of age-dependent correlation coefficients, which were controlled for the effects of child gender and ethnicity. The results suggested that the family environment in early childhood significantly predicted self-esteem as the children grew up. Although the effects became smaller with age, the effects were still present during young adulthood. The largest effects emerged for quality of home environment. Moreover, the results suggested that the effects of home environment, presence of father, and poverty are enduring, as indicated by a non-zero asymptote in the time course of effects from age 8 to 27 years. Finally, quality of home environment partially accounted for the effects of the other predictors. The findings suggest that the home environment is a key factor in early childhood that influences the long-term development of self-esteem.

### **Implications of the Findings**

Researchers have long been interested in the question of which factors shape the emergence of individual differences in self-esteem and whether experiences in early life influence the long-term development of self-esteem (e.g., Demo, 1992; Harter, 1999; Trzesniewski, Donnellan, & Robins, 2013). However, longitudinal studies on the topic have been rare and there has been a complete lack of longitudinal research tracking the influence of the early childhood family environment on self-esteem in adolescence and adulthood. The present research suggests that the family environment in early childhood is consequential for people's self-esteem.

The findings suggest that the home environment that parents provide to their children (including the quality of their parenting behavior, the stimulation of learning, and the degree to which the physical home environment is safe and organized) is a crucial characteristic of the family environment with regard to self-esteem development. First, quality of home environment

showed the largest effect on self-esteem across the age range tested in this research, compared to the effects of other characteristics of the family environment. Second, the results suggested that the effect of quality of home environment may be enduring, that is, the effect does not disappear as children grow up and become adults. Third, quality of home environment accounted for large portions (i.e., 36–83%) of the effects of the other characteristics of the family environment examined in this research. These three findings are consistent with the theoretical perspectives reviewed in the Introduction, in particular with perspectives on parenting and the quality of parent-child interactions, as provided by attachment theory (Bowlby, 1969, 1973, 1980) and symbolic interactionism (Cooley, 1902; Mead, 1934). These theories suggest that parent-child interactions in the first years of life might shape the child's self-esteem through its influence on the development of preconscious representations of the self. The common proposition is that the quality of social interactions with caregivers becomes embodied in the self-concept, which may influence the child's self-esteem over long periods and, possibly, across the life course.

The effects of other characteristics of the family environment—i.e., the quality of the parental relationship, presence of father, maternal depression, and poverty status of the family—were smaller than the effect of quality of home environment. Nevertheless, these effects are relevant given that the results are consistent with the assumption that these effects are mediated by quality of home environment. In fact, as reviewed in the Introduction, theory and evidence suggest that all of these characteristics may influence the quality of the home environment that parents provide to their children (Conger & Donnellan, 2007; Cummings & Davies, 1994; Lamb, 2010; Margolin et al., 2001). This is important from a practical perspective because the hypothesized causal chain from a predictor (e.g., poverty) via the mediator (home environment) to the outcome (self-esteem) can be altered not only by targeting the predictor but also the

mediator (MacKinnon et al., 2007). To give an example, if the home environment mediates the effects of poverty of the family, then negative effects of poverty on children's self-esteem could be prevented, or at least reduced, by interventions that improve the quality of the home environment in families that are in poverty. It is important to note that the mediation effects of the home environment were partial, but not complete, and that direct effects of the other characteristics of the family environment remained after accounting for the effect of the home environment. Nevertheless, improving the quality of home environment might significantly reduce the negative impact of factors such as poor quality of the parental relationship, absence of father, maternal depression, and poverty.

An important finding of the present research is that several characteristics of the early childhood family environment—more precisely, quality of home environment, presence of father, and poverty status of family—may have enduring effects on self-esteem, as indicated by the non-zero asymptotic value of the effects. Moreover, although the asymptotic values for quality of parental relationship and maternal depression did not differ significantly from zero, it should be noted that even for these predictors the model-implied curve of effects did not reach values close to zero during the observed age range (i.e., until age 27 years; see Figure 2). Thus, the present research provides evidence for the “legacy of early experiences in development” (Fraley et al., 2013, p. 109). As reviewed by Fraley et al. (2013; see also Roisman & Fraley, 2013), researchers have long debated the question of whether early childhood experiences have lasting effects or not (e.g., Kagan, 1996; Lewis, 1998; Simpson, Collins, & Salvatore, 2011; Sroufe et al., 1990). Clearly, the answer to this question may vary across different outcomes, such as personality, psychopathology, and academic competence. However, with regard to self-esteem, the present findings support the enduring effects model of the influence of the family

environment during early childhood. Thus, these early experiences might contribute to the relatively large continuity of individual differences in self-esteem across the life course (Donnellan et al., 2012; Kuster & Orth, 2013; Wagner et al., 2016). Put differently, according to Fraley and Roberts' (2005) conceptual framework the early childhood family environment might be a constant factor influencing self-esteem.

The present research tested for predictive effects of presence versus absence of fathers. It should be noted, however, that the findings are mute with regard to family situations other than heterosexual families, for example with regard to families in which the child is raised by two mothers (the NLSY79 does not include sufficient information on different family situations). Thus, the findings do not allow evaluating whether it is the presence of the father or, more generally, the presence of a second parent that accounts for the effect of the variable tested in this research. A cautious interpretation is that presence of two parents (vs. presence of only the mother) has a predictive effect on later self-esteem, even if the long-term effect was very small. Thus, the findings should not be interpreted as suggesting that growing up in a heterosexual family is better for children's self-esteem than growing up in other two-parent family situations.

### **Statistical Approaches to Test for Enduring Versus Transient Effects**

Although the present research builds on conceptual and empirical work by Fraley and colleagues (2013; see also Haltigan et al., 2013; Raby et al., 2015; Roisman & Fraley, 2013), a different statistical approach was used to test for enduring versus transient effects of early childhood factors. Whereas Fraley et al. (2013) employed structural equation modeling of individual-level data, the present research used nonlinear regression analyses of sample-level data. One reason for using a different approach was the complex pattern of missing data, which did not correspond to the typical data structure when using structural equation modeling (see the

description in the Method section). For example, in the present research age was examined in 1-year steps, although each participant provided data at most every second year (e.g., at age 8, 10, 12, etc. or at age 9, 11, 13, etc.). Another reason for using the present approach was that the nonlinear regression analyses focus explicitly on the time course of the effect size across age, providing a direct estimate of the asymptotic value of the effect, and that the estimated function can be readily depicted in graphs (as shown in Figures 1 and 2).

Importantly, the mathematical function used in the present approach—i.e., exponential decay, allowing for a nonzero asymptote—is identical to the mathematical function implied by the approach used by Fraley et al. (2013). Although each single path in the structural equation models of Fraley and colleagues is a linear effect (see Figures 2 and 4 in Fraley et al., 2013), the time course of the *total* effect (i.e., the sum of all direct and indirect effects) of the early childhood predictor on the outcome follows an exponential decay function. For example, with regard to the revisionist model, Fraley et al. (2013) state: “Notice that the correlations between early experience and later outcomes . . . decay in an exponential fashion, approaching zero in the limit” (p. 111; the statement refers to Figure 3 in Fraley et al., 2013). Thus, although the two approaches are quite different as to statistical procedures used, they are equivalent in the mathematical function of the time-dependent decline of the effects of early childhood predictors. For this reason, the two approaches generally converge in conclusions about whether an effect is enduring or transient. When using the approach of Fraley and colleagues, researchers reach their conclusion by comparing the fit of the enduring effects versus the revisionist model. If the enduring effects model has a better fit than the revisionist model, then this means that the total effect of the early childhood predictor on the outcome will never reach zero, but approaches a nonzero asymptote; if the revisionist model has a better fit, then this means that the total effect

asymptotically approaches zero. The present research directly tests whether there is evidence for a nonzero asymptote of the effect. The important point in this context is that the two approaches test the same phenomenon and will generally lead to converging conclusions.

Moreover, it should be noted that the present approach accounts—as does the approach of Fraley and colleagues—for the autocorrelation (or, more precisely, the degree of rank-order stability) of a construct over time. Consider a situation in which the caregiving environment influences an outcome at an early age, but in which the effect is transient. If the rank-order stability of the outcome is not perfect (i.e., below 1; the typical situation), then every effect will asymptotically approach 0. For example, if the rank-order stability of a construct is .85 for a one-year interval, the stability across two years will be  $.85 \times .85 = .72$ , across 10 years  $.85^{10} = .20$ , across 20 years  $.85^{20} = .04$ , and across 30 years  $.85^{30} = .01$ , declining exponentially and approaching zero in the limit (see the paths denoted by the letter *c* in Figure 2 in Fraley et al., 2013). Thus, an enduring effect cannot solely be explained by the effect being carried forward by the stability of the outcome. An enduring effect requires that the factor still influences the outcome in later developmental periods (for example, because the effect has become embodied in the individual).

Another similarity between the two approaches is that both use significance testing for determining whether there is evidence for an enduring effect or not. Whereas Fraley et al. (2013) use chi-square difference testing to compare the fit of the enduring effects and revisionist model, the present approach tests whether the asymptote differs significantly from zero. If sample size becomes large, both approaches will tend to show significant effects in favor of enduring effects. The reason is that in the approach of Fraley and colleagues, the enduring effects model is less parsimonious than the revisionist model (i.e., the enduring effects model has fewer degrees of

freedom because it includes additional paths) and will therefore show better fit when the sample size is large, even if the difference in fit is very small and theoretically irrelevant (MacCallum, Browne, & Cai, 2006). In the present approach, even small asymptotic values will be significant when sample size becomes large. For these reasons, it is crucial to evaluate effect sizes, regardless of which approach is used. When using the approach of Fraley and colleagues, the key effect size is the direct path from the predictor to the outcome measured at later time points (see the paths denoted by the letter *b* in Figure 2 in Fraley et al., 2013), which can be readily interpreted when expressed as a standardized coefficient. In the present approach, the key effect size is the estimate of the asymptote, which can also be readily interpreted because it is expressed in the metric of a standardized correlation coefficient. As an example, in the present research the asymptotic value of the effect of presence of father was statistically significant, but the effect size was only .04. Consequently, the conclusion should be that the effect is very small and not important, even if there is evidence that the effect is enduring.

The statistical approach used in the present research might also prove useful in other fields of research. It is possible that there are additional research situations in which the approach of Fraley et al. (2013) is difficult to implement and the present approach provides for a straightforward and flexible way to test whether an effect is enduring or transient. Even if one method has already been introduced in the literature, it is generally useful to have additional options for addressing a specific research question. Clearly, the present approach allows testing the time course of the effect of any environmental factor (including events and life transitions), in any developmental period, and on any outcome. For example, the approach could be used to study the effect of life transitions, such as the beginning of a romantic relationship in adolescence or adulthood. Moreover, if sufficient repeated assessments are available, the

approach can also be used to test whether any kind of treatment—for example, a developmental, clinical, or organizational intervention—has an enduring or transient effect (Fraley et al., 2013). Finally, the present approach could be used with meta-analytic data on the strength of an effect, which is a research situation in which no individual-level data are available and the approach used by Fraley and colleagues would not be feasible. Frequently, for theoretical or practical reasons, it is important to know whether an effect is enduring or whether it is transient and will ultimately disappear.

### **Limitations and Future Directions**

The naturalistic, non-experimental study design limits the conclusions with regard to the causality of the relations between family environment in early childhood and later self-esteem. For example, it is possible that third variables that were not controlled for might have biased the observed effects (Finkel, 1995). In particular, future research should seek to control for genetic effects among parents and children that might influence both the family environment created by the parents (such as quality of parenting, parental conflicts, and so on) and the self-esteem of their offspring (Plomin, Reiss, Hetherington, & Howe, 1994). Unfortunately, the NLSY79 dataset does not allow controlling for genetic effects. However, using data from adopted and non-adopted children, Neiderhiser (1994) examined the relation between family environment in early childhood and self-esteem at age 9 and 10 years, but did not find evidence that genetic effects accounted for the relations. Moreover, the conclusions of the present research have been strengthened by controlling for the children's gender and ethnicity, which helped rule out the possibility that the observed effects resulted from gender and ethnic differences in family environment and self-esteem. Another limitation with regard to causal inference is that the analyses did not examine change in self-esteem, e.g., by controlling for the initial level of self-

esteem (i.e., measured at the same time as the predictors). However, to control for initial levels, it would be necessary to have information on children's self-esteem during their first six years of life. At present, it is unclear whether self-esteem can be measured in a reliable and valid way before about age 8 years (Donnellan et al., 2015). Nevertheless, in future research it would be useful to control for an early childhood proxy of self-esteem.

A limitation of the NLSY79 is that self-esteem is assessed with different measures at ages 8 to 14 years (with the SPPC) versus age 15 years and older (with the RSE). Although the literature suggests that both measures provide valid assessments of the construct (Donnellan et al., 2015), in future research on the long-term effects of the family environment self-esteem would ideally be assessed with the same measure at all ages. A further limitation is that the model of the time-dependent decline of early childhood effects did not allow for discrete drops in the effect size. For example, if all participants were to experience the same life transition at the same age (e.g., moving away from their parents) and, consequently, were to be exposed to many new influences that were not present before the transition, it is possible that the effect size would decline abruptly, deviating from the predicted exponential curve. However, given that there is always some degree of variability in the timing of life transitions, it is likely that transitions in adolescence and young adulthood influence the time course of effects of the early childhood environment at most in minor ways.

A limitation of the mediation analyses is that all factors of the family environment were assessed concurrently (i.e., in early childhood). Consequently, the present analyses do not test for the hypothesized temporal sequence of the predictors and the mediator and, consequently, do not allow for causal conclusions about the links between the predictors and the mediator (e.g., Cole & Maxwell, 2003). The mediation analyses are useful because, as reviewed in the Introduction,

prior research provides relatively strong evidence that the quality of the parental relationship, presence of father, maternal depression, and poverty influence children's self-esteem at least partially through their effect on the home environment provided by parents. Thus, there is a theoretical and empirical basis for the hypothesized mediation. Nevertheless, future research should examine the temporal sequence of the processes in much more detail. It is important to emphasize that the present research is only a first step in understanding the pathways that may account for the effects of the early childhood family environment. This limitation is particularly relevant with regard to maternal depression. As noted in the Method section, because of the low number of observations, depressive symptoms were aggregated across the first seven years of children's lives, instead of the first six years as was done for the other family environment variables. Thus, for some children the last assessment of maternal depression may have occurred after the last assessment of the home environment. However, given that the present research does not examine single assessments in early childhood, but only data that are aggregated across several years, the measure of maternal depression should be a sufficiently valid estimate of the degree of maternal depression across the years of early childhood. In addition, it should be noted that the mediating pathways might be even more complex because some of the predictors might be linked in a cascading way (cf. Masten & Cicchetti, 2010; Masten et al., 2005). For example, poverty might elicit depression and relationship conflicts among parents, which in turn might impair the quality of the home environment, which in turn might affect children's self-esteem. Nevertheless, the present mediation analyses provide useful information because they indicate that the effects of quality of parental relationship, presence of father, maternal depression, and poverty status of the family are strongly reduced (i.e., by 36 to 83%) when the effect of quality of home environment is statistically controlled for.

Another limitation is that the data examined in this research came from a single country (i.e., the United States). Thus, it is unclear whether the findings would hold in samples from other cultures (Arnett, 2008; Henrich, Heine, & Norenzayan, 2010). In fact, although research suggests that the general pattern of self-esteem development replicates across many cultural contexts (Bleidorn et al., 2016; Robins, Trzesniewski, Tracy, Gosling, & Potter, 2002), it is possible that the relative importance of self-esteem predictors depends on cultural characteristics such as individualism versus collectivism (Heine, Lehman, Markus, & Kitayama, 1999; Markus & Kitayama, 1991; Sedikides, Gaertner, & Toguchi, 2003). For example, the autonomy and independence of individuals is a more strongly valued cultural goal in Western countries than in East Asian countries (Markus & Kitayama, 1991), which likely leads to cultural differences in parenting behavior. Given that discipline, control, and encouragement of autonomy are important dimensions of parenting, it is possible that the impact of specific parenting behaviors on children's self-esteem depends on the cultural value placed on independence. Future research should therefore test the cross-cultural validity of the present findings.

The present research used a measure of the home environment, covering quality of parenting, cognitive stimulation, and quality of the physical home environment. Given that the theoretical perspectives reviewed in the Introduction suggest that quality of parenting might be the central factor with regard to the development of children's self-esteem, it would be highly interesting to examine the long-term effects of parenting more closely. Consequently, future research should use measures of parenting that ideally would allow distinguishing between different dimensions of parenting such as warmth, responsiveness, consistent versus harsh discipline, and encouragement of autonomy (Bornstein, 2007; Simons & Conger, 2007). Another interesting possibility would be to employ measures of family social climate. For example, the

Family Environment Scale (Moos & Moos, 1976) distinguishes between three broad factors in family social climate, namely the relationship dimension (including aspects such as cohesion, expressiveness, and a low level of conflict), personal growth (including aspects such as orientation towards achievement, cultural activities, and morality-religiousness), and system maintenance (including aspects such as organization and control).

Important strengths of the present research include the large and nationally representative sample, the prospective longitudinal design from birth to age 27 years, the availability of up to 14 assessments, the inclusion of subjective and objective measures of family environment, and the use of different sources of information on family environment and self-esteem (i.e., interviews with mothers vs. self-reports of children, which helped to rule out the hypothesis that the effects were artificially inflated by shared method variance). Taken together, these methodological characteristics significantly increased the robustness and validity of the findings.

In conclusion, the present research contributes to our understanding of self-esteem by suggesting that the family environment during the first years of life influences the development of individual differences in self-esteem and that these effects are, at least to a certain degree, enduring. Knowledge about the factors that shape individual differences in self-esteem is critically important because a growing body of evidence suggests that people's self-esteem has consequences for their well-being and success in life domains such as peer and romantic relationships, education, work, and health (Kuster, Orth, & Meier, 2013; Marshall, Parker, Ciarrochi, & Heaven, 2014; Orth, Robins, & Widaman, 2012; Sowislo & Orth, 2013; Trzesniewski et al., 2006; for a review, see Orth & Robins, 2014). The present findings have significant implications because they suggest that interventions aimed at improving the family environment in early childhood are worthwhile and may benefit the development of self-esteem.

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### Footnotes

<sup>1</sup> The supplemental materials report the correlations between the covariates (i.e., gender and ethnicity) and measures of family environment and self-esteem in the present sample (Table S1). Although many of the correlations were small and nonsignificant, the pattern of correlations is meaningful. For example, the correlations show that female participants reported lower self-esteem in early adolescence, whereas the gender difference is nonsignificant in middle childhood and young adulthood. Moreover, Hispanic participants showed lower self-esteem during childhood and adolescence, whereas Black participants showed higher self-esteem during late adolescence. Also, for Black participants compared to other ethnic groups, the family environment is particularly problematic, as indicated by medium-sized effects in quality of home environment and poverty status. The fact that the covariates were correlated with the family environment and, moreover, that the correlations with self-esteem differed across age supports the decision to include gender and ethnicity as covariates in the analyses.

<sup>2</sup> Data from the NLSY79 have been used in numerous publications (for an overview, see <https://nlsinfo.org/bibliography-start>). However, previous publications using data from the NLSY79 did not examine the research questions of the present article (i.e., questions about the influence of the family environment in early childhood on the development of self-esteem). Thus, there is no conceptual overlap between the present research and previous publications using the same data.

<sup>3</sup> Although the data of the NLSY79 do not allow computing the correlation between the SPPC and RSE, indirect information about the overlap of the measures can be gained by assessing stability coefficients (i.e., rank-order stabilities) of self-esteem across the change in measures from age 14 to 15 years. These data are reported in the supplemental materials (Table

S2). Stability coefficients are computed for two-year intervals (but not 1-year intervals) because the NLSY79 assessments were conducted every two years and because stability coefficients must be based on the same set of individuals. First, the results suggest that stability of self-esteem increases during middle childhood and adolescence, corresponding to findings from previous research (Alsaker & Olweus, 1992; Trzesniewski et al., 2003). Second, the results suggest that stability coefficients are lower at the age where the change in measures occurs (see the coefficients for the age 13–15 interval and age 14–16 interval) than the estimates before and after the change in measures. Nevertheless, the stability coefficients are sufficiently high across the change in measures, supporting the conclusion that the two measures can be used to track self-esteem from middle childhood to young adulthood.

<sup>4</sup> As described above, poverty status was based on the poverty income guidelines of the U.S. Department of Health and Human Services and the family income. Although self-reports of income were used, the assessment procedure suggests that measurement error was kept to a minimum, given that the income variable was not based on a single item but rather on a comprehensive set of possible sources of income including more than 15 items. For example, respondents reported on income from working (with items on, e.g., wages, salaries, tips, business); income from transfers from the government (with items on, e.g., unemployment compensation, supplemental security income, other welfare payments); income from nongovernment sources (with items on, e.g., child support, alimony); and income from other sources (with items on, e.g., scholarships, interest, rent). Using a comprehensive set of items reduces the likelihood that specific sources of income are ignored, suggesting that the precision of measurement is high.

<sup>5</sup> In the mediation analyses, measurement error was controlled for by modeling the measures as single indicators of latent variables and constraining the residual variances of the latent variables on the basis of the reliability estimates noted in the Method section. For example, for quality of parental relationship the residual variance was fixed at 25% of the total variance of the measure, corresponding to the reliability estimate of .75.

Table 1

*Intercorrelations Among Characteristics of the Family Environment in Early Childhood*

Variable	1	2	3	4	5
1. Quality of home environment	—				
2. Quality of parental relationship	.24*	—			
3. Presence of father	.34*	.17*	—		
4. Maternal depression	-.24*	-.25*	-.19*	—	
5. Poverty status of family	-.45*	-.15*	-.50*	.26*	—

\*  $p < .05$ .

Table 2

*Correlations Between Characteristics of the Family Environment in Early Childhood and Later Self-Esteem*

Age (years)	Quality of home environment		Quality of parental relationship		Presence of father		Maternal depression		Poverty status of family	
	r	n	r	n	r	n	r	n	r	n
8	.26*	1,414	.13*	492	.05	1,425	-.18*	400	-.09*	1,351
9	.19*	1,224	.03	420	.06	1,232	—	—	-.10*	1,163
10	.23*	967	.18*	227	.06	978	—	—	-.09*	905
11	.20*	748	.11	163	.13*	755	—	—	-.18*	699
12	.18*	2,742	.20*	1,659	.07*	2,764	-.09*	1,445	-.14*	2,657
13	.18*	2,764	.03	1,694	.03	2,776	-.12*	1,267	-.12*	2,681
14	.15*	1,368	.18*	837	.03	1,379	-.20*	756	-.07*	1,331
15	.17*	2,937	.08*	1,782	.09*	2,946	-.13*	1,535	-.14*	2,834
16	.18*	1,871	.10*	1,046	.06*	1,888	-.07	1,093	-.13*	1,802
17	.23*	1,196	.09	646	.03	1,203	-.14*	768	-.11*	1,158
18	.15*	1,109	.04	688	.03	1,117	-.08*	847	-.06	1,099
19	.10*	962	.11*	577	.03	962	-.17*	423	-.14*	929
20	.08*	930	-.05	551	-.07	934	.02	445	-.02	905
21	.14*	966	.06	471	.05	964	-.00	444	-.11*	920
22	.14*	885	.03	286	.09*	891	-.15*	309	-.13*	834
23	.25*	764	.11	264	.04	766	—	—	-.11*	722
24	.11*	555	.07	224	-.06	559	—	—	-.10*	542
25	.11*	485	.17	128	.10*	481	—	—	-.16*	457
26	.15*	428	—	—	.06	428	—	—	-.10	373
27	.27*	360	—	—	.09	359	—	—	-.10	335
Mean	.17	1,234	.09	675	.05	1,240	-.11	811	-.11	1,185

*Note.* The table shows partial correlations between family environment in early childhood and self-esteem from age 8 to 27 years, corrected for measurement error and controlling for gender and ethnicity. The minimum sample size used for computing the correlations was 100; a dash indicates that the sample size of the correlation was lower than 100.

\*  $p < .05$ .

Table 3

*Parameter Estimates for Age-Dependent Exponential Decay of the Correlations Between Characteristics of the Family Environment in Early Childhood and Later Self-Esteem*

Family environment variable	Asymptote (a)	Rate of decay (b)	years (c)	Intercept at age 8
Quality of home environment	.16*	.33	.25*	
Quality of parental relationship	—	.03	.12*	
Presence of father	.04*	.17	.07*	
Maternal depression	—	.06	-.18*	
Poverty status of family	-.10*	.05	-.11*	

*Note.* A dash indicates that the asymptote did not differ significantly from 0 and therefore was fixed at 0 in the final model.

\*  $p < .05$ .

Table 4

*Direct Effects and Indirect Effects (Mediated by Quality of Home Environment) of Quality of Parental Relationship, Presence of Father, Maternal Depression, and Poverty Status of Family in Early Childhood on Later Self-Esteem*

Age (years)	Quality of parental relationship		Presence of father		Maternal depression		Poverty status of family	
	Direct effect	Indirect effect	Direct effect	Indirect effect	Direct effect	Indirect effect	Direct effect	Indirect effect
8	.03	.07*	-.02	.07*	-.10	-.06*	.04	-.11*
9	-.02	.06*	-.01	.05*	—	—	-.01	-.08*
10	.10	.06*	.02	.06*	—	—	.02	-.11*
11	.10	.05*	.06	.05*	—	—	-.09	-.07*
12	.17*	.05*	.03	.05*	-.04	-.05*	-.08*	-.08*
13	-.02	.06*	-.02	.05*	-.07	-.05*	-.07*	-.09*
14	.15*	.03*	.01	.04*	-.16*	-.03*	-.01	-.07*
15	.05	.05*	.06*	.04*	-.09*	-.04*	-.09*	-.06*
16	.07	.05*	.01	.05*	-.04	-.05*	-.06*	-.07*
17	.03	.07*	-.03	.06*	-.09	-.06*	-.03	-.10*
18	-.01	.05*	.02	.05*	-.03	-.05*	-.01	-.07*
19	.09	.03*	.00	.03*	-.15*	-.02	-.13*	-.03
20	-.07	.04*	-.08	.03*	.04	-.03*	.01	-.04*
21	.01	.04*	.01	.04*	.06	-.04*	-.06	-.05*
22	.03	.04*	.06	.04*	-.12	-.03*	-.08	-.05*
23	.08	.07*	-.02	.07*	—	—	-.02	-.10*
24	.05	.03	-.10	.04*	—	—	-.06	-.04
25	.14	.02	.06	.03	—	—	-.13*	-.03
26	—	—	.04	.03	—	—	-.03	-.05
27	—	—	.03	.06*	—	—	.01	-.09*
Mean	.05	.05	.01	.05	-.07	-.04	-.04	-.07

*Note.* The table shows standardized coefficients, controlling for measurement error and for the

effects of gender and ethnicity. A dash indicates that the sample size was lower than 100.

\*  $p < .05$ .

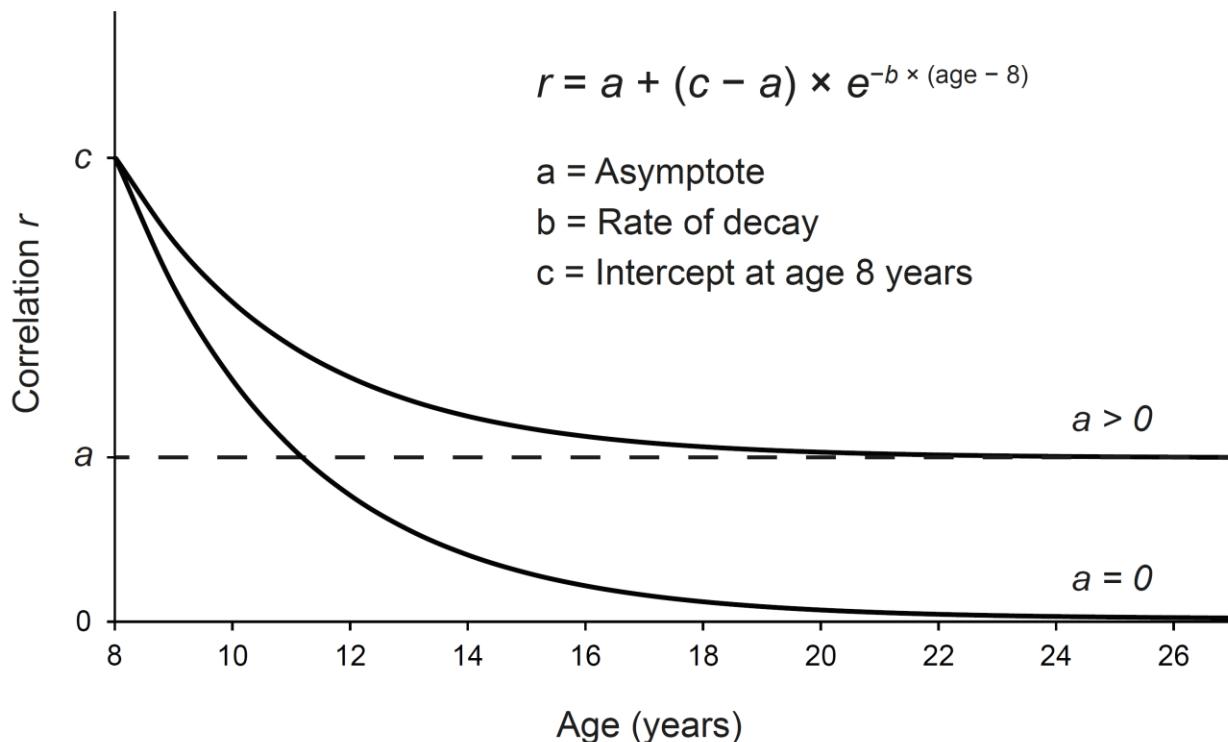
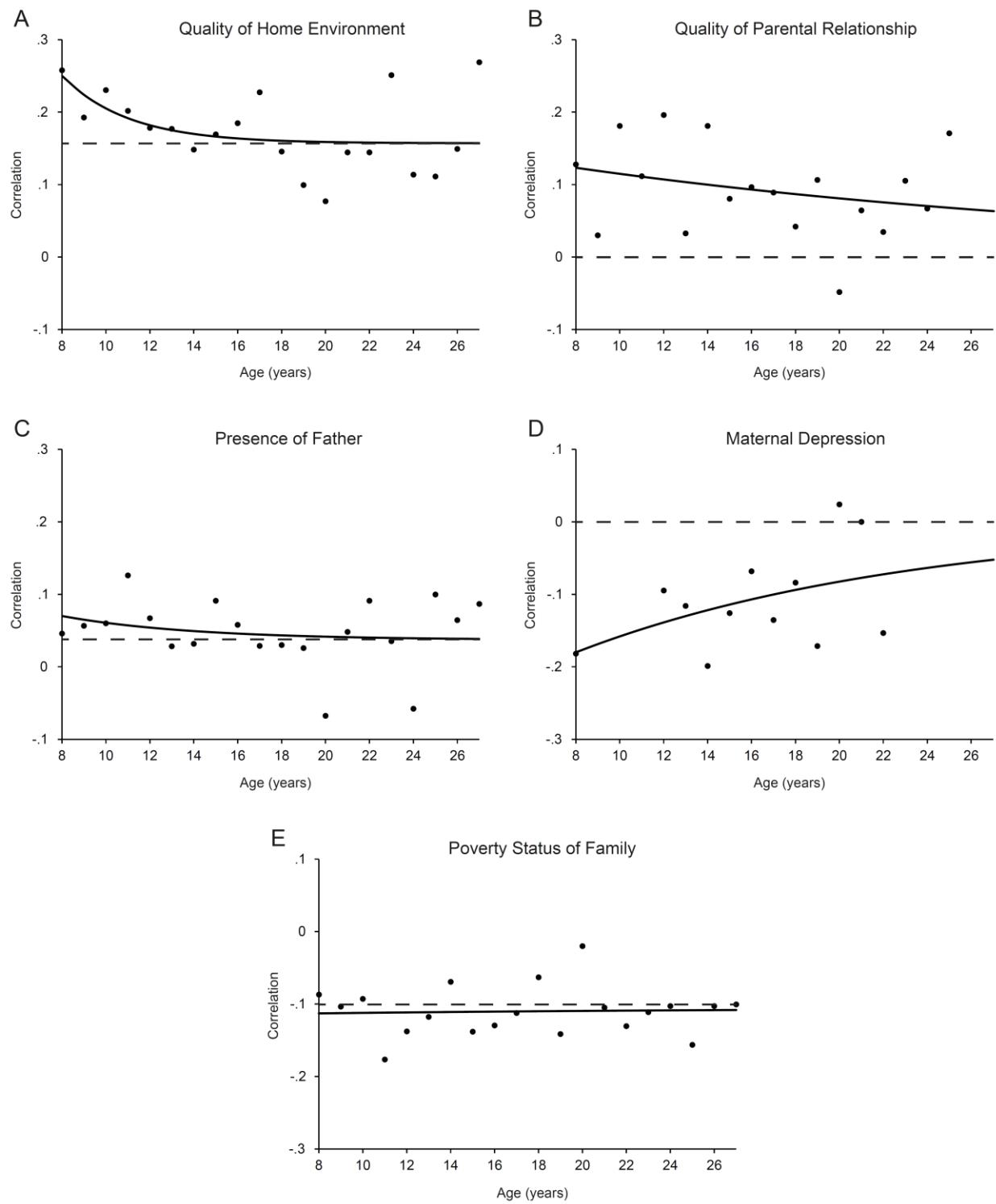


Figure 1. The figure illustrates the exponential decay model used for testing systematic patterns of age-dependent change in the correlation  $r$  between family environment in early childhood (age 0 to 6 years) and later self-esteem (age 8 to 27 years). The figure also shows the equation used in the analyses. The model includes three parameters, namely, the asymptote  $a$ , the rate of decay  $b$ , and the intercept  $c$  at age 8 years. Importantly, the model allows testing whether the age-dependent correlation approaches zero (which would correspond to  $a = 0$ ) or a non-zero value (which would be reflected by  $a$  differing significantly from 0).



*Figure 2. Correlations between characteristics of the family environment in early childhood (quality of home environment, quality of parental relationship, presence of father, maternal depression, and poverty status of family) and self-esteem from age 8 to 27 years. The figure*

shows the model-implied change of the correlations (continuous lines), the asymptote of the curve (dashed lines), and observed correlations. The correlations are corrected for measurement error and controlled for gender and ethnicity. For quality of home environment, presence of father, and poverty status of family, the asymptote differed significantly from zero (Panels A, C, and E). For quality of parental relationship and maternal depression, the asymptote did not differ significantly from zero (Panels B and D).