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MATERNAL CHRONOLOGICAL AGE, PRENATAL AND PERINATAL HISTORY, SOCIAL SUPPORT, AND PARENTING OF INFANTS

Marc H. Bornstein, Diane L. Putnick, Joan T. D. Suwalsky, and Motti Gini

Child and Family Research, National Institute of Child Health and Human Development, National Institutes of Health, Department of Health and Human Services

Abstract

The role of maternal chronological age in prenatal and perinatal history, social support, and parenting practices of new mothers ($N = 335$) was examined. Primiparas of 5-month-old infants ranged in age from 13 to 42 years. Age effects were zero, linear, and nonlinear. Nonlinear age effects were significantly associated up to a certain age with little or no association afterward; by spline regression, estimated points at which the slope of the regression line changed were 25 years for prenatal and perinatal history, 31 years for social supports, and 27 years for parenting practices. Given the expanding age range of first-time parents, these findings underscore the importance of incorporating maternal age as a factor in studies of parenting and child development.

Keywords

Maternal age; maternal practices; parenting; social support

When angels inform the 99-year-old Abraham that his 90-year-old wife will soon give birth, Sarah overhears and “laughed to herself saying, ‘After I have grown old, and my husband is old, shall I have pleasure.’”

(Genesis 18:12)

Contemporary Demographic Trends in Maternal Age

The mean age for first births in the United States is 25.1 years and rising (Martin et al., 2003). This overall gradient reflects two trend lines. First, the rate of teenage motherhood is waning slightly, although the United States has the highest percentage of teen (15-19) births among industrialized nations (421,626 in 2003; Hamilton, Martin, & Sutton, 2004). Second, waxing numbers of older adult women are delaying conception, thus expanding the age range for first-time parenthood (Hamilton et al., 2004). According to the *National Vital Statistics Reports* (Martin et al., 2003), birth rates for women 25-39 increased by about 1-2% each year from 1991 to 2001, and births to women aged 35-39 and 40-44 years reached record highs in 2002, rising 31% and 43%, respectively, since 1990.

Correspondence to: Marc H. Bornstein, Child and Family Research, National Institute of Child Health and Human Development, National Institutes of Health, Suite 8030, 6705 Rockledge Drive, Bethesda MD 20892-7971, U.S.A. Marc_H_Bornstein@nih.gov.

These demographic changes are ascribable to several factors. An array of youth sex education programs that stress both abstinence and contraception, welfare reform, the rise of a more religious and conservative generation, and an economic climate with more opportunities for women may contribute to the slight decline in the teen birthrate (McKay & Carrns, 2004). Similarly, multiple factors operate at the other end of the age continuum. The aging of the baby boom generation translates into greater absolute numbers of older women than in previous decades (Ventura, Martin, Curtin, & Mathews, 1997). Delayed marriage, the pursuit of advanced education, careerism, and high rates of divorce all postpone childbearing (Barber, 2001), and advances in birth control and assisted reproductive technologies have made it possible to delay pregnancy (Borini et al., 2004; Golombok, 2002; Lee et al., 2004; Paulson & Sachs, 1998).

These demographic trends, in turn, raise questions about what effects obtain between *maternal age* and central issues related to first-time parenting, *viz.* prenatal and perinatal status, social support, and parenting practices, the main concerns of this study. It is noteworthy in this connection that maternal chronological age at birth uniquely predicts educational and psychosocial outcomes in children at age 18 over and above process variables like childrearing practices and the home environment (Fergusson & Woodward, 1999).

Parenting Theory and Parental Chronological Age

It is unlikely that maternal age bears a uniform relation to parenting or to child development as is commonly supposed. Rather, maternal age is likely associated in different ways with different domains of parenting and parenting outcomes. First, it could be that maternal age bears no fixed relation to parenting. For example, Papoušek and Papoušek (2002) proposed a theory of “intuitive parenting” that predicts, once an individual becomes a parent, that some parenting cognitions or practices likely proceed automatically. Other theoreticians have likewise contended that selected features of parenting might be unconscious and habitual (Bugental & Goodnow, 1998; Kuczynski, 1984). For example, parents, regardless of age, unwittingly address infants using child-directed speech. This general view of no age-by-caregiving association is also consistent with a trait conceptualization of parenting (Holden, 1997).

Alternatively, it could be that age bears a linear relation to parenting. If, on the one hand, aging generally affects physical health adversely (Mirowsky, 2002), then pregnancy and prenatal and perinatal outcomes will be at increasing risk in aging mothers. If, on the other hand, aging is attended by increasing maturity, experience, and understanding, then features of parenting that are sensitive to accruing experience in the world or to knowledge will likely show positive relations to age (Cowan, 1988; Fergusson & Woodward, 1999). For example, financial and social “capital” that are so important to parenting and family development (Coleman, 1988) normatively increase with age. When other demographic and psychosocial factors are controlled, increased maternal age is linearly related to greater satisfaction with parenting, to greater time commitment to parenting, and to more optimal observed parenting (Ragozin, Basham, Crnic, Greenberg, & Robinson, 1982).

Yet a third line of argument predicts curvilinear relations between age and parenting. Rossi (1980) proposed a “timing-of-events” model of parenting that predicts parabolic relations between age and parenting. Having a child very early *or* very late might equally represent age-inappropriate “off-time” versus age-appropriate “on-time” variations in the life course (Helson, Mitchell, & Moane, 1984; Hogan & Astone, 1986; Lowenthal, Thurner, & Chiriboga, 1976; Neugarten, 1968; Neugarten, Moore, & Lowe, 1965). For example, Waldron, Weiss, and Hughes (1998) found minimum health problems associated with an age at first birth of 27 years.

Given these several possible associations, it is probable that the impact of chronological age on childbearing and childrearing is specific to specific domains of parenting or outcome (Bornstein, 2006). To ensure a comprehensive understanding of the links between age and parenting, multiple outcomes must be examined individually (as we do here). For this study, we recruited a large sample of new first-time mothers over a wide range of age, and we hypothesized that maternal age would bear no relation to some aspects of parenting (e.g., basic caregiving necessary for the survival of the infant), a linear relation to others (e.g., certain types of birthing complications monotonically increase with maternal age), and a curvilinear relation to still others (e.g., adolescents are known to provide less sensitive parenting, but there is little reason to expect age to relate systematically to parenting sensitivity among adult mothers). We explored whether there was a linear relation with maternal age or whether a curvilinear function using spline regression was more appropriate to variables in each of three general domains of mothers’ parenting young infants.

Maternal Chronological Age, Childbearing, and Childrearing

The first months with a newborn child constitute a period of critical adjustment in multiple domains of parenting (Bornstein, 2002). During this time, there is heightened awareness of a plethora of biological and medical perinatal concerns (Leach, 1997; Spock & Needlman, 2004). New parents also look to support systems not only for help and information but for self-definition in their new role and for information-finding (Cochran & Neigo, 2002; Crockenberg, 1981, 1988). Primiparas for the first time also confront the necessity and responsibility of actually caring for their infant themselves (Bornstein, 2002; Stern, 1985). As a consequence, we studied maternal chronological age in relation to each of these three domains: prenatal and perinatal history, social support, and parenting practices.

Prenatal and perinatal history

Significant biomedical risks and physical conditions attend bearing and caring for a child at both ends of the feasible age continuum (Abel, Kruger, & Burd, 2002; Callaghan & Berg, 2003; Mirowsky, 2002). Mothers younger than 20 are at increased risk for preterm birth (Ekwo & Moawad, 2000), anemia, renal disease, febrile complications, and seizures during labor, and they smoke cigarettes during pregnancy more often and secure prenatal care less often than do older women (Ventura et al., 1997). Conceiving in one’s 20s lowers the risk of fetal loss from spontaneous abortion, ectopic pregnancy, and stillbirth, with equally greater risks of these difficulties at ages 15 and 37 (Andersen, Wohlfahrt, Cristens, Olsen, & Melbe, 2000). Pregnancy-related hypertension and low birth weight are lowest among women

between 25 and 29 and highest among women in under-20 and over-40 age brackets (Ventura et al., 1997). Mothers 30 years or older are more likely than mothers under 30 to experience miscarriages, stillbirths, and ectopic pregnancies as well as labor and delivery complications, such as Cesarean sections and newborns who require intensive care (Berkowitz, Skovron, Lapinski, & Berkowitz, 1990; Gilbert, Nesbitt, & Danielson, 1999). Rates of chromosomal disorders and prematurity to older mothers are much greater than those to younger mothers (Berkowitz et al., 1990; Holding, 2002; Snijders, & Nicolaidis, 1996; Tough et al., 2002) as are congenital malformations (Stein & Susser, 2000) and multiple births (Mange & Mange, 1999; Russell, Petrini, Damus, Mattison, & Schwarz, 2003). For women over 50, these problems multiply (Salihu, Shumpert, Slay, Kirby, & Alexander, 2003).

On the positive side, however, younger mothers are healthier on average, and older mothers are more likely to adhere to good diets, gain weight appropriately, begin prenatal care earlier in pregnancy, and eschew licit and illicit substances during pregnancy. Facing the demanding tasks of childrearing, younger parents may be more resilient, but older parents' experience and knowledge are greater, and their economic situation is usually better and more stable. All told, we expected that biological and social advantages and disadvantages vis-à-vis age would be balanced.

Social support

Social support refers to the tangible and psychological resources available to individuals through their relationships with family, friends, neighbors, work associates, and others (Cutrona & Suhr, 1990). Crockenberg (1988, p. 141) described social support as emotional, instrumental, or informational help. Both informal support systems (e.g., extended family and friends) and formal ones (e.g., schools, child care, parent education programs, written materials, and professionals) influence adult functioning generally (Cohen & Wills, 1985) and parenting specifically, especially in the first months of a baby's life (Cochran & Niego, 2002; Cotterell, 1986; Crockenberg, 1988; Jennings, Stagg, & Connors, 1991).

Bronfenbrenner (1979, 1986) contended that parents' informal and formal support systems constitute key influences in their childrearing. Several authorities have documented a positive association between social support and adjustment to parenthood for adult as well as adolescent mothers (Chase-Lansdale, Brooks-Gunn, & Zamsky, 1994; Jacobson & Frye, 1991; Oyserman, Radin, & Saltz, 1994; Unger & Wandersman, 1985). At 1 month postpartum, adolescent mothers with high instrumental support reportedly have a greater sense of competency in the maternal role (Mercer, Hackley, & Bostrom, 1984); and more childcare support is associated with higher quality interactions between mothers and babies (Levine, Garcia-Coll, & Oh, 1985). In particular, support from the baby's father is positively associated with self-esteem and maternal efficacy, and negatively associated with life stress, in adolescent mothers (Shapiro & Mangelsdorf, 1994). Levitt, Weber, and Clark (1986) found that emotional and childcare supports from a spouse, but not from other family members, were associated with more positive maternal affect. Mothers' social support moderates the effects of daily hassles of parenting (Crnic & Greenberg, 1990), and socially supported mothers are less harried, feel less overwhelmed, have fewer competing demands

on their time, and as a consequence are more available to their babies. We expected increasing maternal age to be related to more in-home support and younger age to be related to more extended family support (as the family rallies around younger mothers to help out).

Parenting practices

In general, the “maternal maturity hypothesis” states that younger mothers are less likely to provide appropriate parenting or an optimal home environment (Hofferth, 1987). Comparisons of adolescent and adult mothers indicate, in general, that parenthood at very young ages is associated with less skilled childrearing and poorer environments (Becker, 1987; Berlin, Brady-Smith, & Brooks-Gunn, 2002; Black et al., 2002; Coley & Chase-Lansdale, 1998; Fergusson & Woodward, 1999; Moore & Brooks-Gunn, 2002). Wolfe (1987) reported that younger parents are less likely to engage in positive parenting (i.e., praising and hugging), and teenage mothers are less verbal, sensitive, and responsive to their infants (Barratt & Roach, 1995; Culp, Applebaum, Osofsky, & Levy, 1988; Culp, Osofsky, & O’Brien, 1996; Moore & Brooks-Gunn, 2002). Berlin et al. (2002) examined links between maternal childbearing age and parenting behaviors: Teenage mothers were less supportive, more detached, more intrusive, and more negative/hostile with their infants than older mothers, above and beyond the effects of race/ethnicity, education, family type, family income, and child sex and age.

Effects of age on parenting practices appear less straightforward among older mothers. Age is often conceived of as a marker for maturity, perspective, and patience (Cowan, 1988). On the positive side, older adult parents tend to possess more life experience and information, and may feel more psychologically ready to assume the responsibilities of childrearing (Cowan & Cowan, 1998). Bornstein, Hahn, Suwalsky, and Haynes (2003) found that maternal age related positively to parenting knowledge and satisfaction. Older mothers reportedly interact with their children in more positively affectionate, stimulating, sensitive, and verbal ways (Jones, Green, & Krauss, 1980; Ragozin et al., 1982). On the negative side, parents who delay first births may lack the capacity and stamina to meet the demands of caregiving, given that physical fitness and health generally decline with age (Mirowsky, 2002). In consequence, we expected specific sets of age relations to specific parenting practices.

Methodological Considerations

Studies of age and parenting warrant several key methodological precautions. First, it is important to recognize that sociodemographic (SES and education) and ethnic or racial factors are often confounded in studies of associations between parental age and childbearing or -rearing. For example, women who have children at an early age are less likely to be well educated and more likely to come from low SES (Baldwin & Cain, 1981; Elster, McAnarney, & Lamb, 1983; Haveman, Wolfe, & Wilson, 1997; Luster & Dubow, 1990; Upchurch & McCarthy, 1990), disadvantaged minority groups (Luker, 1997), and single-parent homes (Butler, 1992; Sandefur, McLanahan, & Wojtkiewicz, 1992). They are also more likely to have lower aspirations, lower measured cognitive ability, and more schooling problems. Many studies compare the parenting practices of teenage mothers with

those of (significantly) older mothers who may not constitute a reasonable comparison group. Studies that include comparisons between racial, ethnic, and SES groups point to the importance of considering parenting within its own context (Berlin et al., 2002; Bornstein, 1991; Whiteside-Mansell, Bradley, Owen, Randolph, & Cauce, 2003). Thus, maternal age at childbirth may relate to parenting for reasons only incidentally associated with age *per se*, and co-occurring factors need to be accounted for, as we do here, to clarify relations between age *per se* and parenting.

Second, chronological age, the variable we studied, is only one of several ways to index age (physical, psychological, and social age being three others) and may not always be the most relevant indicator (Birren & Cunningham, 1985). Paulson and Sachs (1998) opined that the best parents are, not those of a certain age, but those who share characteristics of being loving, caring, and committed. Moreover, chronological age has sometimes been referred to as a “social address” that may mean little by itself. However, chronological age is identified with conditions that exist in direct functional relations with observed developmental changes (Wohlwill, 1970). Maternal chronological age is the variable that is most frequently collected and controlled in studies of parenting and child development. Chronological age is also the most commonly used variable of its ilk in medicine, epidemiology, and demography.

Third, the majority of studies addressing the role of maternal age have compared the parenting of adolescent to adult mothers in between-groups designs. Normally, dichotomizing a variable in analysis discards important information and undermines the power to detect effects (Cohen, 1988; MacCallum, Zhang, Preacher, & Rucker, 2002). Moreover, the adolescent-adult dichotomization at a particular age is *ad hoc* and usually made *a priori*. By contrast, far fewer studies explore potential effects of maternal age across a continuous spectrum of age and into older ages for first-time mothers, as we do here. Recruiting over an age range enlarges the sample and enhances statistical power. The use of a continuum also permits finer grained analyses of age effects and examination of potential nonlinear age functions, as we do here (Bell, 1992).

The Present Study

With these considerations in mind, we undertook a study of prenatal and perinatal history, social support, and parenting practices of first-time mothers who ranged in age from 13 to 42 years. SES, maternal employment and education, ethnic and racial variation, and infant age, development, and behavior were controlled (either statistically or by design) so as to unconfound maternal age effects on parenting and family context. To segregate maternal age further, we included additional covariates of maternal personality, intelligence, and social desirability of responding. In this study, we also used multiple measures and sources of information, all improvements over most previous studies. Finally, the sample we recruited was balanced with respect to child gender so that potential variations with maternal age in mothers with daughters and in mothers with sons could be examined (Fagot, 1995; Leaper, 2002).

Method

Participants

European American first-time mothers ($N = 335$) of healthy 5-month-old infants participated in a 2-hour visit in their homes. Families were recruited through mass mailings and newspaper advertisements from the greater Washington, DC, metropolitan area. Mothers averaged 28.27 years of age ($SD = 6.13$) but ranged from 13.91 to 42.48 years of age at the time of the study. Most (87.46%) mothers were married. Family socioeconomic status (SES; Hollingshead, 1975, *Four-Factor Index of Social Status*; see also Bornstein et al., 2003) varied across nearly the full range of social class with a mean of 48.37 ($SD = 13.80$, *range* = 14 - 66). In terms of education, 24.48% of the sample had completed high school or less, 21.19% partial college or specialized training, 29.85% a standard four-year college degree, and 24.48% had started or completed a graduate or professional degree. At the time of the study, 56.72% of mothers were working outside the home, and those who were employed ($n = 190$) worked an average of 32.85 hours/week ($SD = 11.85$). Our sample was sociodemographically heterogeneous, but we recruited an otherwise homogenous group because mothers of different ethnic, racial, and cultural groups parent differently (Bornstein, 1991; Harkness & Super, 2002; Reis, Barbera-Stein, & Bennett, 1986); specifically, ethnicity is related to parenting attitudes toward childrearing, knowledge of child development, and perceived social support as well as family structure and social network variables (Contreras, Mangelsdorf, Rhodes, Diener, & Brunson, 1999).

A percentage of mothers reported having had fertility problems (e.g., delayed conception: 16.42%) or having lost one or more pregnancies prior to the baby's birth (20.97%; comparable to Fretts, Schmittiel, McLean, Usher, & Goldman, 1995). The vast majority of mothers (98.20%) had received regular prenatal care throughout their pregnancy, and 89.82% had attended a childbirth class prior to the baby's arrival. Most mothers (83.79%) received some kind of medication during delivery (e.g., neuromuscular block, Demerol); and 72.75% of babies were delivered vaginally.

At birth 99.10% of the children were term, and all were healthy at the time of the study (none of the three preterm or postterm children emerged as a univariate or multivariate outlier, so all were retained in analyses). 154 children (46%) were girls. Infants were 5 months old at the time of the data collection ($M = 163.22$ days, $SD = 6.14$, *range* = 141 - 195). Our study focused on the early infancy period. Prenatal and perinatal history is most relevant in early parenting, and social supports have been found to be highly pertinent to parenting at that time (Crockenberg, 1981, 1988; Cutrona & Suhr, 1990). By 5 months of age, the baby's scope of apperception includes both the dyad and the environment, infants look to the environment and reach out and grasp, and they often also share the lead in turn-taking exchanges (Bornstein & Tamis LeMonda, 1990; Cohn & Tronick, 1987).

Procedures

In the 2 weeks before the home visit, mothers completed a demographic questionnaire asking for background information about the infant, mother, father, and family. Each infant-mother dyad was visited in the home by a single researcher, and an hour-long video/

audiotape record of the dyad's naturalistic behavior was made. In all cases, the mother was told that the researcher was interested in observing the infant's usual activities at a time when s/he was expected to be awake and when the mother was at home and solely responsible for his or her care. On average, infants were awake and alert 99.66% of the recorded time. No other people were present in the home during the visit. The mother was asked to go about her normal routine and to disregard the researcher insofar as possible. After a conventional period of acclimation to the camera and the presence of the researcher (McCune-Nicolich & Fenson, 1984; Stevenson, Leavitt, Roach, Chapman, & Miller, 1986), filming commenced. The researcher did not talk to the mother or interact with or react to the infant during the filming.

Prenatal and Perinatal History

The demographic questionnaire covered pregnancy and birth, the mother's perceptions of the baby's adjustment, and social supports. Three questions asked whether or not the mother planned the pregnancy, experienced pregnancy problems or complications, and experienced any birthing problems or complications during labor and delivery. Each of these items was scored (0) *No* or (1) *Yes*.

Several questions asked about the mother's perceptions of her baby's adjustment in the first month of life. One was a global rating of the baby's ability to "settle in" and adjust to feeding, sleeping, people, and routines, rated on scale from (1) *very easy adjustment* to (5) *very difficult adjustment*. Next, we developed 10 questions to assess common problem behaviors experienced by infants. Mothers checked whether (1) or not (0) the baby had experienced each of these behaviors in the first month at home. The behaviors were excessive vomiting, prolonged or frequent diarrhea or constipation, pronounced lack of interest in being fed or active refusal to eat, excessive demand to be fed, frequent waking and crying at night, excessive sleeping during the day, frequent and intense crying generally, lack of interest in things going on around him or her when awake and alert, noticeable stiffening, turning away, or crying when picked up or handled, and pronounced clinging when picked up or intense crying when put down. Responses to the 10 items were summed to create a scale of the mother's perception of her baby's difficult behaviors in the first month.

Social Support

The degree of social support received from 9 different sources was used to form three scales: in-home, extended family, and community support. The 9 sources of support were the baby's father; the maternal grandmother; the paternal grandmother; other relatives; the baby's pediatrician; friends and neighbors; another significant person; an organized course, class, or group; and books or other written materials. Each item was rated on a 5-point scale from (0) *not used* or *of little or no help* to (4) *very helpful*. A principal components analysis with varimax rotation provided support for 3 scales that accounted for 51.3% of the variance in the items. Rotated loadings ranged from .50 to .79, but one item, pediatrician support, loaded secondarily on the expected principal component. In-Home support was the mean of support from the baby's father and books or other written materials. Extended Family support was computed as the mean of support from maternal grandmother, paternal grandmother, and

other relatives. Community support was computed as the mean of support from the baby's pediatrician, friends and neighbors, another significant person, and an organized course, class, or group.

Parenting Practices

Practice domains—Videotapes were coded using mutually exclusive and exhaustive coding systems and real-time observation coding procedures. (Details of the video/audiorecording, data coding, and scoring are available from the first author.) Coders were first trained to reliability on consensus coding, and between 17% and 24% of the sample (depending on the domain) were coded independently to obtain reliability. For all behaviors that were continuously coded, *kappa* (κ ; Cohen, 1960, 1968) was used as the index of coder reliability; for time-sampled behaviors, the *Intra-Class Correlation* (*ICC*; McGraw & Wong, 1996) was used.

Six maternal parenting domains were identified, encompassing the primary parenting tasks and abilities required of the mother of a young infant: nurturing, physical encouragement of motor skills, social interaction, didactic exchange, provision of the material environment, and speech. These domains were referenced by eleven behavioral and context indicators.

Mother *nurture* was the mean standard aggregate of the following three indicators. (1) Feed/burp/wipe was the sum of the durations of two practices: the total length of the time the mother fed her infant and burped or wiped her infant, $\kappa = .92$. (2) Bathe/diaper/dress/groom/other was the sum of the durations of five practices: the total length of time the mother bathed the infant, checked or changed the infant's diaper, dressed the infant, groomed the infant, and attended to the infant's other health needs, $\kappa = .88$. (3) Hold was the total length of time the mother supported some or all of her infant's weight with her body, $\kappa = .93$.

Mother *physical* was made up of a single indicator: the mean proportion of consecutive 10-min intervals in which the mother physically encouraged her infant to sit, stand, roll, crawl, or step, *ICC* = .61.

Mother *social* was the mean aggregate of the following three indicators. (1) Encourage attention to mother was the mean standard aggregate of the number of times and total duration the mother attempted to draw her infant into face-to-face interaction with herself, $\kappa = .71$. (2) Social play was the mean standard aggregate of the number of times and total duration the mother directed verbal or physical behavior to her infant for the purpose of amusing the infant (i.e., to elicit a smile, positive vocalization, laughter, or motoric excitement), $\kappa = .73$. (3) Express affection was the mean standard aggregate of the number of times and total duration the mother expressed affection or positive evaluation to her infant either physically or verbally, $\kappa = .66$.

Mother *didactic* was made up of a single indicator. Encourage attention to objects was the mean standard aggregate of the number of times and total duration the mother physically moved her infant or an object so that her infant could see or touch it or verbally referred to an object-related event or activity, $\kappa = .73$.

Mother *material* was the mean aggregate of the following two indicators. (1) Quantity of objects was the mean standard aggregate of the variety (the number of different objects within infant reach), density (the mean number of objects within infant reach per consecutive 5-min time unit), and consistency (the number of consecutive 5-min time units in which any object was within infant reach) of toys, books, and household objects that were within the infant's reach, $ICC = .94$. (2) Quality of objects was the mean standard aggregate of responsiveness of the objects, number of highly responsive objects, and proportion of highly responsive objects within reach of the infant, $ICC = .87$.

Mother *language* was made up of a single indicator. Speech to child was the mean standard aggregate of the number of times and total duration the mother spoke to the infant, $\kappa = .69$.

Emotional availability—The third edition of the Emotional Availability Scales (EAS; Biringen, Robinson, & Emde, 1998) was used to assess two maternal measures of emotional availability: Sensitivity and Structuring. Maternal Sensitivity refers to the parent's global ability to be warm and emotionally connected with her child. Qualities such as responsiveness to the child, accurate reading of cues, efforts to soothe when the child is distressed, and appropriate and authentic positive affect are key aspects of sensitivity. Sensitivity was evaluated on a 9-point scale; 1 indicates *highly insensitive* and 9 indicates *highly sensitive*. Maternal Structuring refers to the degree to which the parent appropriately and successfully structures the child's environment, following the child's lead and regulating the child's mood. Structuring was evaluated on a 5-point scale ranging from 1 *non-optimal structuring* in which the parent provides no structuring or is unsuccessful in structuring the interaction for the child to 5 *optimal structuring* demonstrated by an appropriate degree of structuring combined with successful attempts. Sensitivity and Structuring were coded in half-point intervals. Twenty percent of the sample was double-coded; $ICCs = .92$ for Sensitivity and $.89$ for Structuring.

Potential Covariates

To isolate the effects of maternal age *per se*, several sociodemographic variables obtained from the demographic questionnaire were evaluated as potential covariates: infant age, birth weight, and birth length, weekly hours of maternal employment, and family socioeconomic status. In addition, we controlled for the following.

Maternal personality—Ten of the 16 subscales of the *Jackson Personality Inventory* (JPI; Jackson, 1976) were self-administered. Following the factor solutions reported for 8 independent samples ($Ns = 86$ to 740) using the JPI (Paunonen & Jackson, 1996), three principal components and one JPI subscale were used as measures of personality in mothers. In the current sample, one principal component, Openness, accounted for 76.6% of the variance in two subscales (breadth of interest and innovation), both with unrotated loadings of $.88$; a second principal component, Neuroticism, accounted for 53.3% of the variance in three subscales (interpersonal affect, anxiety, and conformity) with unrotated loadings of $.69$, $.78$, and $.71$, respectively; and a third principal component, Extraversion, accounted for 65.2% of the variance in two subscales (social participation and self-esteem), both with unrotated loadings of $.80$. The subscale, organization, was used as a single indicator of

Conscientiousness. Internal consistency (α) was .88 for Openness, .83 for Neuroticism, .93 for Extraversion, and .77 for Conscientiousness.

Maternal verbal intelligence—Mothers were administered the *Peabody Picture Vocabulary Test-Revised* (PPVT-R Form L; Dunn & Dunn, 1981) with up to 175 vocabulary words. Standard scores with a possible range of 40 to 160 ($M = 100$, $SD = 15$) were obtained based on maternal age. The PPVT-R measures receptive vocabulary and has been shown to predict intelligence and scholastic achievement. The median split-half reliability coefficient for 828 adults in the standardization sample was .82.

Maternal social desirability—The *Social Desirability Scale* (SDS; Crowne & Marlowe, 1960) uses 33 *True* or *False* items to assess adults' tendency to respond to questions in a socially desirable fashion. Test-retest reliability for the SDS was .89. The SDS was used as a control on all maternal self-reports.

Infant communicative competence—Infant distress communication consisted of the mean aggregate of two indicators: (1) the mean standard aggregate of the frequency and duration of negative facial expression and (2) the mean standard aggregate of the frequency and duration of distress vocalization, $\kappa = .70$. Infant nondistress vocalization consisted of the mean standard aggregate of the frequency and duration of nondistress vocalizations, $\kappa = .70$.

Evaluation of the visit—On average, mothers were in view of their infants 93.95% of the home observation. As a check on the validity of observed maternal and infant behaviors, mothers and researchers completed evaluations of the visit. On 8-point (0-7) graphic rating scales, randomly ordered with respect to valence and recoded in ascending order, mothers rated themselves as comfortable with being filmed, $M = 5.23$, $SD = 1.48$, and rated their infants and themselves as having engaged in typical behavior, $M = 5.62$, $SD = 1.74$, and $M = 5.11$, $SD = 1.74$, respectively. Furthermore, the researchers rated the mothers as relaxed, $M = 5.25$, $SD = 1.55$, and the infants as alert, $M = 5.20$, $SD = 1.85$, and calm/happy, $M = 4.93$, $SD = 1.76$. These variables were included as potential covariates for all scales derived from the mother-child interaction.

Results

Preliminary Data Analyses

Prior to data analysis, univariate distributions of the dependent variables and potential covariates were examined for normalcy, homogeneity of variance, outliers, and influential cases; transformations were applied to resolve problems of non-normalcy (see Fox, 1997; Tabachnick & Fidell, 1996); residuals were examined for influential points in preliminary regressions of each measure on maternal age; and the distance of each case to the centroid was evaluated to screen for multidimensional outliers (Bollen, 1987). Didactic exchange and infant nondistress vocalization were reexpressed using cube root transformations; social interaction and infant distress communication using the log; the physical domain, community, extended family, and in-home support, and the Hollingshead scale using the square root; EA Sensitivity and Structuring and JPI Conscientiousness using the second power; and the child's age in days using a squared reciprocal. JPI Neuroticism was adjusted

to remove the effect of the mothers' social desirability bias. Analyses were conducted on the transformed data; for clarity, however, descriptive statistics are presented in the variables' original metrics.

Analytic Plan

First, zero-order Pearson or point-biserial correlations were computed, as appropriate, between maternal age and prenatal and perinatal history, social support, and parenting practices. Next, the possibility that maternal age would be curvilinearly related to any variables was explored in quadratic regression analyses. Examination of scatter plots with lowess smoothers at .50 tension between maternal age and each variable showed either no relations, linear relations, or linear relations up to a certain age (generally in the mid to late 20s) after which trend lines appeared to reach an asymptote. As the latter is not strictly a curvilinear pattern (i.e., there is no downward trend at the upper end of the age distribution), we performed a family of spline regressions to identify nonlinear relations.

Spline regression is a method for fitting separate regression lines in segments of a sample (Marsh & Cormier, 2001). The segments are defined by "knots," the points on the independent variable (in this case, maternal age) where the regression line changes slope. Spline regression can be used to estimate the location of one or more knots as well as to test whether there is a significant change in the slope above and below a specified knot location. In this study spline regression was used to determine the point on the maternal age continuum where the slope changed (i.e., the location of a single knot in the regression line). For dichotomous dependent variables, logistic spline regression was used. Next, the average knot ages for prenatal and perinatal history, social supports, and parenting practices, respectively, were used in regression (or logistic regression) analyses to determine whether there was a significant difference in the slopes when the distribution was segmented at the knot age.

Finally, we investigated whether maternal age predicted parenting practices over and above prenatal and perinatal history and social supports in mothers younger than the knot age (that is, over the range where parenting practices related to maternal age). Prenatal and perinatal history variables that were significantly associated with each parenting practice were entered as a block into a regression analysis with maternal age. If maternal age remained a significant predictor of the parenting practice after controlling for prenatal and perinatal variables, a second block of social support variables that were significantly associated with each parenting practice was entered. Through this procedure, we ascertained whether maternal age is a key variable in parenting practices vis-à-vis infants or whether the association of maternal age with parenting practices is driven by prenatal and perinatal history and/or social supports. We also explored all possible 2-way interactions between maternal age and prenatal and perinatal history and/or social supports as a means of assessing whether maternal age interacted with prenatal and perinatal history or social support variables, further explaining the relation between maternal age and parenting practices.

Potential covariates included maternal weekly hours of employment, personality, verbal intelligence, and social desirability, family socioeconomic status, infant age, birth weight,

birth length, distress and nondistress communication, and evaluations of the visit (for variables that were collected from the interaction). As expected, maternal age was correlated with the Hollingshead Index, $r(333) = .70, p < .001$, and with maternal verbal intelligence, $r(265) = .49, p < .001$. In controlling for these variables, it was not appropriate to remove the variance associated with maternal age that was due to a natural confound (e.g., younger mothers did not have an opportunity to complete their education, thereby reducing their verbal intelligence scores and their ability to obtain high-yield employment). Therefore, both socioeconomic status and maternal verbal intelligence were residualized for their association with maternal age, resulting in age-adjusted scores. Potential covariates were only used when they shared at least 5% of their variance with one of the dependent variables and were statistically and conceptually significant. Given the sample size, using statistical significance as the only criterion for controlling a covariate would result in partialling variables that accounted for as little as 1% of the variance. Infant distress communication was negatively related to maternal Sensitivity, $r(333) = -.24, p < .001$.

Zero-order Relations between Maternal Age and Prenatal and Perinatal History, Social Supports, and Parenting Practices

Table 1 presents the pervasive zero-order correlations between maternal age at the 5-month visit and prenatal and perinatal history, social supports, and parenting practices. Four of the five prenatal and perinatal history variables were significantly associated with maternal age: Older mothers were more likely to have planned their pregnancy, experienced birthing complications, and reported that their babies had, overall, more difficulty adjusting, but exhibited fewer specific difficult behaviors in the first month. Two of the three social supports were significantly associated with maternal age: Older mothers reported less extended family and more in-home social support. Finally, one maternal behavioral domain and both *Emotional Availability Scales* were significantly associated with maternal age: As maternal age increased, so did the frequency and duration of speech to the infant maternal Sensitivity, and maternal Structuring. Correlations were similar in mothers of girls and boys; the average absolute difference in correlations between girls and boys was .06 (range = .01 - .15); no correlation pairs were significantly different.

Quadratic Relations between Maternal Age and Prenatal and Perinatal History, Social Supports, and Parenting Practices

A series of regression analyses tested whether a quadratic (curvilinear) function explained additional variance in the continuously distributed prenatal and perinatal history, social support, and parenting practice variables over and above linear relations with maternal age. The quadratic function was significant for mothers' perceptions of babies' difficult behaviors, $F(2, 329) = 4.69, p < .05$; community social support, $F(2, 331) = 4.09, p < .05$; in-home social support, $F(2, 331) = 7.72, p < .01$; the material parenting domain, $F(2, 332) = 10.87, p < .001$; EAS Sensitivity, $F(2, 332) = 8.33, p < .01$, and EAS Structuring, $F(2, 332) = 7.59, p < .01$. On examination of the scatter plots, however, the only true 1-shaped curve was for the material domain. The other distributions followed patterns characterized by linear associations in younger mothers and then a flattening of the trend line in older mothers (see the correlations for younger and older mothers in Table 1), which prompted exploration of spline regression to better represent the observed functions.

For each variable that was significantly linearly associated with maternal age, the location of a single knot was estimated using nonlinear least squares regression (Marsh & Cormier, 2001). Only those variables that were linearly associated with maternal age in the full sample were used to demonstrate that the correlations observed in the full sample are generally not consistent across the full range of maternal age. Start values for the intercept and slopes were set at 0, and the start value for the knot age was set at 28 years based on visual examination of the scatter plots. The knots for the prenatal and perinatal history variables were estimated at a mean of 25.28 years ($SD = 2.69$; $range = 22.13$ to 28.11). The knots for the social support variables were estimated at a mean of 31.26 years ($SD = 2.96$; $range = 29.17$ to 33.35). The knots for the three parenting practices that were significantly associated with maternal age were estimated at an average of 26.92 years ($SD = 1.77$; $range = 25.75$ to 28.96). (Subscales of the language domain were not used to compute the average knot age.) Table 1 also presents the estimated knot ages and 95% confidence intervals for the variables that were significantly correlated with maternal age. The change in slopes was tested at the average knot estimates for each set of practices. For younger mothers, ns ranged from 89 to 90 for prenatal and perinatal history, and were 212 for social supports and 116 for parenting practices. For older mothers, ns ranged from 242 to 244 for prenatal and perinatal history, and were 122 for social supports and 219 for parenting practices. Using these cut-points is not meant to imply that these specific ages are developmentally important. Rather, they serve as a guideline for illustrating the more important underlying nonlinear distributions.

Using the knot ages of 25 years for prenatal and perinatal history, 31 years for social supports, and 27 years for parenting practices, regression models were computed using maternal age and a dummy variable as predictors. The dummy variable was designed to test whether there was a significant change in the slope for mothers younger than and older than the knot age (Marsh & Cormier, 2001). Half of the prenatal and perinatal history variables had a significant change in slope at 25 years of age: Whether or not their pregnancy was planned and mothers' perceptions of their babies' difficult behaviors exhibited significant slope changes at 25 years of age. The slopes for birthing complications and mothers' perceptions of their babies' adjustment did not differ in mothers older and younger than 25 years. The slope for in-home support, but not for extended family support, changed significantly at 31 years of age. Although the slopes of the maternal language domain did not significantly differ, the frequency of maternal speech differed in mothers older and younger than 27 years. There were also significant changes in the slopes for maternal Sensitivity and Structuring. In all cases, the slopes for younger mothers were steeper than the slopes for older mothers.

Predicting Parenting Practices

Regression analyses were used to test whether maternal age remained significantly associated with the maternal language domain and its indicators and with maternal Sensitivity and Structuring when controlling for prenatal and perinatal history. No social support variables were related to these parenting practices, so they were not employed in the analyses. The age range in this analysis was restricted to mothers younger than 27 years of age ($n = 116$) because that was the average age at which the trend lines flattened for these

parenting practices. The prenatal and perinatal history variables that were associated with the language domain and the duration of speech to child were whether or not the pregnancy was planned, *Point-Biserial* r s (114) = .22 and .23, p s = .05, respectively, and perception of the baby's difficult behaviors, r (113) = -.20, p = .05, and r (114) = -.23, p = .05, respectively. Only planned pregnancy was related to the frequency of speech to the child, *Point-Biserial* r (114) = .20, p = .05. Maternal Sensitivity and Structuring were significantly associated with whether or not the pregnancy was planned, *Point-Biserial* r s (114) = .25 and .25, p s = .01, respectively, and perception of babies' difficult behaviors, r s (113) = -.28 and -.32, p s = .01, respectively.

After controlling for prenatal and perinatal history variables, maternal age was no longer significantly associated with the maternal language domain, β = .20, $F(1, 111) = 3.54$, *ns*, or the duration of speech to the child, β = .17, $F(1, 111) = 1.62$, *ns*. However, maternal age was still significantly associated with the frequency of speech to the child, β = .24, $F(1, 111) = 2.45$, p = .05, and with maternal Sensitivity, β = .28, $F(1, 114) = 7.56$, p = .01, and Structuring, β = .31, $F(1, 114) = 9.88$, p = .01. No two-way interactions were significant.

Discussion

In line with our suppositions, maternal chronological age appears to bear different relations to different domains of parenting. We begin by considering the parenting variables that showed no relations to maternal age.

Age-Independent Parenting

One measure of prenatal and perinatal history and one social support measure bore no relation to maternal age in our data. Pregnancy complications, which might be expected to increase with maternal age, did not. Because complications were assessed with a dichotomous (yes/no) variable, the detailed nature of any complications that did occur may be masked. Furthermore, almost all mothers in our sample received regular prenatal care and education which normally mitigate such complications. The lack of association between maternal age and extent of reported community support, which tapped into the mother's reliance on the medical community and educational materials, is also probably a reflection of the consistent level of prenatal care afforded this particular sample.

In line with Papoušek and Papoušek's (2002) notions of intuitive parenting, several specific parenting practices – nurturant, physical, and social – also bore no relation to maternal age. Nurturant behavior assesses those parenting activities that meet the physical needs of the infant and without which the infant's survival is at risk. Feeding, bathing, and clothing ensure the baby's health and well-being. Holding provides the infant protection. Physical parenting supports and promotes a baby's strength and the attainment of basic motor skills. Social practices include those that tap the mother's engaging the baby's attention one-on-one and establishing an emotionally positive connection with the baby. That social bond is, in turn, also crucial for the infant's protection and survival. Thus, these three areas of maternal practice are fundamental to the health, safety, and survival of the infant and are no less necessary if a mother is 13, 23, 33, or 43 years of age. It is not surprising, but

reassuring, that first-time mothers of all ages engage in a repertoire of practices that apparently meet the fundamental needs of their newborn offspring.

Linear Relations with Maternal Age

For parenting that was age-sensitive, we found both linear relations and deduced a two-phase model of parental development with age, involving a linear phase of growth with age to about 30 years followed by a static phase of continuity, or constancy, after about 30 years. Linear relations between maternal age and two measures of prenatal and perinatal history emerged. The linear correlation with birth complications, although not large, suggests that, even with excellent prenatal care, older mothers experience increasing physical stress during delivery. Mothers' perceptions of their babies' maladjustment during the first month were also positively and linearly correlated with maternal age. Because all of the babies in the sample were born at term and all were healthy, this finding suggests that mothers' construal of the prenatal and perinatal period changes with age. With their own increasing maturity, mothers may perceive infants as more difficult, or they may have more difficulty coping with the normative challenges associated with newborns' adjustment. It could be also that older mothers are more discriminating observers and detect aspects of behavior that younger mothers fail to notice.

Support from extended family was greatest among the youngest mothers and decreased with increasing maternal age. Youth may be particularly detrimental to parenting role performance because parenting occurs prior to the time a woman (or couple) is developmentally prepared (Moore & Brooks-Gunn, 2002). Having a child early, young mothers may lack internal resources and need more help with parenting and childrearing. Adolescent fathers are less likely than older fathers to live with the mother and child and to provide adequate support (Jaffee, Caspi, Moffitt, Taylor, & Dickson, 2001; Lerman, 1993). Extended family members are likely to be more involved and supportive of young mothers who have little or no spousal support.

Research consistently shows that maternal age is positively associated with richer, more responsive, and more abundant talk to infants and toddlers (e.g., Berlin et al., 2002; Field, 1981; Osofsky & Osofsky, 1970; Rowe, Pan, & Ayoub, 2005), as we found here. Why do older mothers communicate more and use more diverse vocabulary with their children? Rowe et al. (2005) hypothesized that older mothers may hold different beliefs about child development than younger mothers, and may have more experience communicating in general, prompting them to talk more with their children. Significant differences have emerged between adolescent and older mothers in parenting knowledge (MacPhee, 1981; Ruchala & James, 1997), which in turn relates to maternal vocabulary use with children (Bornstein, Haynes, & Painter, 1998).

Nonlinear Relations with Maternal Age

Approximately half of dependent variables in this investigation bore a nonlinear relation to maternal age. Although the knot locations for each group of variables ranged over several years, trend lines rather consistently shifted between 26 and 31 years. Starting in adolescence and continuing through the mid-20s, greater maternal age confers some direct

benefits to the mother-infant relationship, although those benefits do not continue to accrue to mothers in their 30s and beyond. This two-stage pattern characterized spousal social support, the frequency of maternal speech directed to infants, as well as two aspects of maternal behavior that are thought to reflect the quality of the emerging emotional relationship between mother and infant—maternal Sensitivity and Structuring. By their 30s, most mothers have achieved the nuclear family structure and support system characteristic of Western families. Mothers who perceive the infant's father as providing social support have better mental and physical health than those with less support (Cohen & Wills, 1985), and they have infants who fare better (Unger & Wandersman, 1985). García Coll, Hoffman, Van Houten, and Oh (1987) reported lower levels of maternal responsiveness and involvement among adolescent, as compared to adult, mothers of 4-month-old infants. Using data from the Early Head Start Research and Evaluation Project, Berlin et al. (2002) compared teenage mothers to adult mothers in terms of their parenting interactions in the home when children were 14 months of age: Controlling for several demographic characteristics, teenage mothers were less supportive, more detached, and more intrusive than adult mothers.

Only one variable in this study, maternal provision of the material environment, demonstrated an 1-shaped relation with maternal age; there was a range in the middle of the age distribution where mothers provided more exploratory opportunities for their infants, with mothers both younger and older providing significantly fewer. Several investigations have reported that children of young mothers are exposed to a less adequate environment, including fewer materials for exploration, as was true in the current sample (Moore & Brooks-Gunn, 2002). However, finding that the same environmental circumstance obtained in families with older mothers was unexpected and challenges explanation.

Age-by-Parenting Relations

Our data make it clear that parental characteristics that are indexed by chronological age must be explored separately. Linear as well as nonlinear age effects both argue against popular wisdom that adolescent and late childbearing represent unique and respectively homogeneous categories of parenting. Rather, mothers appear to be heterogeneous where age effects in parenting are concerned. That is, linear relations across the early part of the age continuum and across the entire age continuum indicate that the nature of parenting vis-à-vis age is not monolithic.

What factors might underlie this heterogeneity? Many characteristics of the individual change (incrementally) during the second and third decades of the life span, as individuals solidify a self-concept, locus of control, and self-esteem (Arnett, 2004), as their cognitive complexity increases (Keating, 1990; Whitman, Borkowski, Schellenbach, & Nath, 1987), and as they amass various kinds of capital (Coleman, 1988). Some of these changes are especially salient during the adolescent years, as teenagers gain a sense of identity, develop ego strength, autonomy, and independence, and mature cognitively, socially, and emotionally (Chase-Lansdale, Wakschlag, & Brooks-Gunn, 1995; Hauser, 1991; Osofsky, Hann, & Peebles, 1993; Wakschlag, Chase-Lansdale, & Brooks-Gunn, 1996). Thus, teenage mothers increasingly benefit from life experiences as their intellectual ability, educational attainment,

and socioemotional functions all mature and so they are more and more likely to have an interest in being a parent and to command the resources to parent.

Although a comprehensive theory of women's adult development does not yet exist (Roberts & Newton, 1987), life-span developmental theory (Smith & Baltes, 1999) suggests that, during their early 20s, adults begin to shift their "center of gravity" from their family of origin to their own home base, and during their 30s adults typically develop roots and settle down (Gould, 1978; Levinson, Darrow, Klein, Levinson, & McKee, 1978; Roberts & Newton, 1987). Walter (1986, 1989) found that women who time the birth of their first child in their early 20s took on the role of parent well before the resolution of their own separation/individuation vis-à-vis family of origin (Daniels & Weingarten, 1982). Ego strength and maturity are both associated with responsiveness and reciprocity toward infants (Cowan & Cowan, 1992). Newberger (1980), Sameroff and Feil (1985), and Demick (2002) have each discussed stage theories of parents' capacity to think about and rear children in increasingly abstract and sophisticated ways. Compared to adults, teenagers may have difficulty in conceptualizing parenthood as a complex, multifaceted task that involves reciprocal interactions with a child, planfulness, and the like (Bornstein, 2006). A simplified stance toward parenting could help to explain, in part at least, some differences between younger and older mothers. Flick (1985) found that level of parental awareness increased with age in mothers ranging from just 15 to 20 years. Adolescent mothers possess less precise knowledge about child development and more negative attitudes about parenting than do adult mothers (Field, Widmayer, Stringer, & Ignatoff, 1980; Roosa, 1983; Roosa & Vaughan, 1984; Sommer et al., 1993).

Our data indicate that, for some parenting outcomes, the benefits of maternal maturity reach an asymptote at around 30 years of age. In the early stages of parenting infants at least, first-time mothers of 43 years do not differ systematically from first-time mothers of 33 years. Why the shift around 30 years of age? William James (1890), and more recently Costa and McCrae (1988; McCrae & Costa, 1994), have contended that personality traits tend to stabilize at age 30. Neugarten (1968, p. 98) also argued that people develop an executive facet to personality in middle age that is characterized by increased "self-awareness, selectivity, manipulation and control of the environment, mastery, competence" and a "wide array of cognitive strategies." According to Neugarten, achievement of executive personality increases one's capacity to navigate complex environments and multiple pressures in both personal and interpersonal experiences. Perhaps the features of parenting stabilize once certain personality and cognitive functions mature (see also Block, 1971).

Limitations

Of necessity, we employed a cross-sectional (as opposed to longitudinal) approach in this study – no one can become a first-time parent more than once, and age is not manipulable. The "developmental function" defines the form of a relation between the level observed to occur in some specified psychological construct over the course of development and chronological age (Wohlwill, 1970, 1973). We assume that corresponding functions for different individuals have some overall communality and that we have defined modal or prototype functions characteristic of parents. In other words, had a 20-year-old mother in our

sample delayed parenthood for 20 years, we would expect her to resemble 40-year-old mothers in our sample. It is impossible with this type of study to distinguish between true age effects and those that may be ascribable to cohort or period differences in the sample, and for this reason, caution needs to be exercised applying these findings to the experiences of individuals as they progress through adulthood (Shaw, Krause, Chatters, Connell, & Ingersoll-Dayton, 2004). That said, the causal order we have assumed between age and parenting outcomes seems tenable.

In terms of representativeness, in this study we evaluated only mothers, and those who participated were all non-clinical, came from families that were European American and mostly intact, and were reporting on their normal firstborn infant at one age. This sampling is by no means invalid, but it may have implications for the generalizability of the findings in the sense that different patterns of results could emerge in mothers of multiple children of different ages or special-needs children, single or divorced mothers, or mothers from clinical samples or different ethnic or cultural groups, just as studying fathers or other caregivers might yield different patterns of results. On this logic, we intentionally limited this initial study ethnically. We allowed maternal SES, education, and occupation to vary (although we took those demographic factors into account). In addition, a principal component of the bioecological model of development (Bronfenbrenner & Morris, 1998) includes time; the same factors might have similar or different implications depending on different temporal factors (age of child, historical period, and the like). All these variables constrain the generalizability of the findings.

Future Directions and Conclusions

Our results regarding the “knot ages” obtained through spline regressions have implications for research in parenting and child development, especially how such findings might attenuate relations between parenting variables when a sample includes both younger and older mothers as defined by our “knot ages.” Our results also point to the importance of including parent age in parent-child studies and studies of child outcome: If, for example, Sensitivity predicts infant-parent attachment security as well as other aspects of children’s cognitive, emotional, and social functioning, and Sensitivity in mothers below the knot age is itself changing and is lower than in mothers above it, Sensitivity may have changing effects for child outcomes. Perhaps our differentiated findings also help to clarify unsystematic relations between parent age and parenting and child development in the extant literature. Our results also revise a “timing of events” approach to parenting by showing that relations between maternal chronological age and different domains of early parenting are complex and nuanced. Last, our data suggest a need for research and policy approaches to move away from a focus that stereotypes teenage mothers as being an “at-risk” population, and towards a more general recognition of the diverse linkages between maternal age *qua* a continuous variable and parenting or child development.

In future developmental research, the possible associations between maternal age (perhaps in several construals) and parenting cognitions and practices need routinely to be separated from the possible influences of other (often confounded) sociodemographic variables and vice-versa. Research designs that incorporate these refinements will provide more valid

insights for family science and obstetrics and pediatrics as well as parent education and social policy (Walter, 1986, 1989). Practically speaking, our results provide welcome news to older mothers today who know full-well that Sarah was well-equipped to bear and care for her young Isaac.

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References

- Abel EL, Kruger M, Burd L. Effects of maternal and paternal age on Caucasian and Native American preterm births and birth weights. *American Journal of Perinatology*. 2002; 19:49–54. [PubMed: 11857096]
- Andersen AN, Wohlfahrt J, Cristens P, Olsen J, Melbe M. Maternal age and fetal loss: Population based register linkage study. *British Medical Journal*. 2000; 320:1708–1712. [PubMed: 10864550]
- Arnett, JJ. *Emerging adulthood*. New York: Oxford; 2004.
- Baldwin, W., Cain, VS. The children of teenage parents. In: Furstenberg, FF., JrLincoln, R., Menken, J., editors. *Teenage sexuality, pregnancy, and childbearing*. Philadelphia: University of Pennsylvania Press; 1981. p. 265-279.
- Barber JS. Ideational influences on the transition of parenthood: Attitudes toward childbearing and competing alternatives. *Social Psychology Quarterly*. 2001; 64:101–127.
- Barratt MS, Roach MA. Early interactive processes: Parenting by adolescent and adult single mothers. *Infant Behavior and Development*. 1995; 18:97–109.
- Becker PT. Sensitivity to infant development and behavior: A comparison of adolescent and adult single mothers. *Research in Nursing and Health*. 1987; 10:119–127. [PubMed: 3647533]
- Bell RW. Continuously distributed random variables in factorial designs. *Experimental Aging Research*. 1992; 18:47–50. [PubMed: 1446695]
- Berkowitz GS, Skovron ML, Lapinski RH, Berkowitz RL. Delayed childbearing and the outcome of pregnancy. *New England Journal of Medicine*. 1990; 322:659–664. [PubMed: 2304491]
- Berlin LJ, Brady-Smith C, Brooks-Gunn J. Links between childbearing age and observed maternal behaviors with 14-month-olds in the Early Head Start Research and Evaluation Project. *Infant Mental Health Journal*. 2002; 23:104–129.
- Biringen, Z., Robinson, JL., Emde, RN. *Emotional Availability Scales*. 3rd. Department on Human Development and Family Studies, Colorado State University, Fort Collins, CO.; 1998. Unpublished manual
- Birren, JE., Cunningham, WR. Research on the psychology of aging: Principles, concepts and theory. In: Birren, JE., Schaie, KW., editors. *Handbook of the psychology of aging*. 2nd. New York: Van Nostrand Reinhold; 1985. p. 3-34.
- Black MM, Papas MA, Hussey JM, Dubowitz H, Kotch JB, Starr RH Jr. Behavior problems among preschool children born to adolescent mothers: Effects of maternal depression and perceptions of partner relationships. *Journal of Clinical Child and Adolescent Psychology*. 2002; 31:16–26. [PubMed: 11845646]
- Block, JH. *Lives through time*. Berkeley: Bancroft Books; 1971.
- Bollen KA. Outliers and improper solutions. *Sociological Methods and Research*. 1987; 15:375–384.
- Borini A, Bonu MA, Cotichio G, Bianchi V, Cattoli M, Flamigni C. Pregnancies and births after oocyte cryopreservation. *Fertility and Sterility*. 2004; 82:601–605. [PubMed: 15374702]
- Bornstein, MH., editor. *Cultural approaches to parenting*. Hillsdale, NJ: Erlbaum; 1991.
- Bornstein, MH. Parenting infants. In: Bornstein, MH., editor. *Handbook of parenting: Vol. 1. Children and parenting*. 2nd. Mahwah, NJ: Erlbaum; 2002. p. 3-43.

- Bornstein, MH. Parenting science and practice. In: Sigel, IE, Renninger, KA, Damon, W., Lerner, RM., editors. Handbook of child psychology: Vol. 4. Child psychology and practice. 6th. New York: Wiley; 2006. p. 893-949.
- Bornstein, MH., Hahn, CS., Suwalsky, JTD., Haynes, OM. Socioeconomic status, parenting, and child development: the Hollingshead Four-Factor Index of Social Status and the Socioeconomic Index of Occupations. In: Bornstein, MH., Bradley, RH., editors. Socioeconomic status, parenting, and child development. Mahwah, NJ: Erlbaum; 2003. p. 29-82.
- Bornstein MH, Haynes OM, Painter KM. Sources of child vocabulary competence: A multivariate model. *Journal of Child Language*. 1998; 25:367–393. [PubMed: 9770912]
- Bornstein MH, Tamis-LeMonda CS. Activities and interactions of mothers and their firstborn infants in the first six months of life: Covariation, stability, continuity, correspondence, and prediction. *Child Development*. 1990; 61:1206–1217. [PubMed: 2209190]
- Bronfenbrenner U. Contexts of child rearing: Problems and prospects. *American Psychologist*. 1979; 34:844–850.
- Bronfenbrenner U. Ecology of the family as a context for human development: Research perspectives. *Developmental Psychology*. 1986; 22:723–742.
- Bronfenbrenner, U., Morris, PA. The ecology of developmental processes. In: Lerner, RM., Damon, W., editors. Handbook of child psychology: Vol. 1. Theoretical models of human development. 5th. New York: Wiley; 1998. p. 993-1028.
- Bugental, DB., Goodnow, JG. Socialization processes. In: Eisenberg, N., editor. Handbook of child psychology: Vol. 3. Social, emotional, and personality development. New York: Wiley; 1998. p. 389-462.
- Butler AC. The changing economic consequences of teenage childbearing. *Social Service Review*. 1992; 66:1–31.
- Callaghan WM, Berg CJ. Pregnancy-related mortality among women aged 35 years and older, United States 1991-1997. *Obstetrics and Gynecology*. 2003; 102:1015–1021. [PubMed: 14672479]
- Chase-Lansdale PL, Brooks-Gunn J, Zamsky ES. Young African-American multigenerational families in poverty: Quality of mothering and grandmothering. *Child Development*. 1994; 65:373–393. [PubMed: 8013228]
- Chase-Lansdale PL, Wakschlag LS, Brooks-Gunn J. A psychological perspective on the development of caring in children and youth: The role of the family. *Journal of Adolescence*. 1995; 18:515–556.
- Cochran, M., Niego, S. Parenting and social networks. In: Bornstein, MH., editor. Handbook of parenting: Vol. 4. Applied Parenting. 2nd. Mahwah, NJ: Erlbaum; 2002. p. 123-148.
- Cohen J. A coefficient of agreement for nominal scales. *Education and Psychological Measurement*. 1960; 20:37–46.
- Cohen J. Weighted kappa: Nominal scale agreement with provision for scaled disagreement or partial credit. *Psychological Bulletin*. 1968; 70:213–220. [PubMed: 19673146]
- Cohen, J. Statistical power analysis for the behavioral sciences. New York: Academic Press; 1988.
- Cohen S, Wills TA. Stress, social support, and the buffering hypothesis. *Psychological Bulletin*. 1985; 98:310–357. [PubMed: 3901065]
- Cohn JF, Tronick EZ. Mother-infant face-to-face interaction: The sequence of dyadic states at 3, 6, and 9 months. *Developmental Psychology*. 1987; 23:68–77.
- Coleman JS. Social capital and the creation of human capital. *American Journal of Sociology*. 1988; 94:95–120.
- Coley RL, Chase-Lansdale PL. Adolescent pregnancy and parenthood: Recent evidence and future directions. *American Psychologist*. 1998; 53:152–166. [PubMed: 9491745]
- Contreras JM, Mangelsdorf SC, Rhodes JE, Diener ML, Brunson L. Parent-child interaction among Latina adolescent mothers: The role of family and social support. *Journal of Research on Adolescence*. 1999; 9:417–439.
- Costa PT Jr, McCrae RR. Personality in adulthood: A six-year longitudinal study of self-reports and spouse ratings on the NEO Personality Inventory. *Journal of Personality and Social Psychology*. 1988; 54:853–863. [PubMed: 3379583]

- Cotterell JL. Work and community influences on the quality of child rearing. *Child Development*. 1986; 57:362–374.
- Cowan, PA. Becoming a father: A time of change, an opportunity for development. In: Bronstein, P., Cowan, CP., editors. *Fatherhood today: Men's changing role in the family*. Oxford: Wiley; 1988. p. 13-35.
- Cowan, CP., Cowan, PA. When partners become parents: The big life change for couples. New York: Basic Books; 1992.
- Cowan, P., Cowan, CP. New families: Modern couples as new pioneers. In: Mason, MA, Skolnick, A., Sugarman, SD., editors. *All our families: New policies for a new century*. London: Oxford University Press; 1998. p. 169-192.
- Crnic KA, Greenberg MT. Minor parenting stresses with young children. *Child Development*. 1990; 61:1628–1637. [PubMed: 2245752]
- Crockenberg SB. Infant irritability, mother responsiveness, and social support influences on the security of infant-mother attachment. *Child Development*. 1981; 52:857–865. [PubMed: 7285658]
- Crockenberg, S. Social support and parenting. In: Fitzgerald, HE, Lester, BM., Yogman, MW., editors. *Theory and research in behavioral pediatrics*. Vol. 4. New York: Plenum Press; 1988. p. 141-174.
- Crowne DP, Marlowe D. A new scale of social desirability independent of psychopathology. *Journal of Consulting Psychology*. 1960; 24:963–968.
- Culp RE, Appelbaum MI, Osofsky JD, Levy JA. Adolescent and older mothers: Comparison between prenatal maternal variables and newborn interaction measures. *Infant Behavior and Development*. 1988; 11:353–362.
- Culp AM, Osofsky JD, O'Brien M. Language patterns of adolescent and older mothers and their one-year-old children: A comparison study. *First Language*. 1996; 16:61–75.
- Cutrona, CE., Suhr, JA. The transition to parenthood and the importance of social support. In: Fisher, S., Cooper, CL., editors. *On the move: The psychology of change and transition*. New York: Wiley; 1990. p. 111-125.
- Daniels, P., Weingarten, K. *Sooner or later: The timing of parenthood in adult lives*. New York: W. W. Norton and Co.; 1982.
- Demick, J. Stages of parental development. In: Bornstein, MH., editor. *Handbook of parenting: Vol. 3. Status and Social Conditions of Parenting*. 2nd. Mahwah, NJ: Erlbaum; 2002. p. 389-413.
- Dunn, LM., Dunn, LM. *Peabody Picture Vocabulary Test-Revised Manual*. Circle Pines, MN: American Guidance Service; 1981.
- Ekwo EE, Moawad A. Maternal age and preterm births in a black population. *Pediatric Perinatal Epidemiology*. 2000; 2:145–151.
- Elster AB, McAnarney ER, Lamb ME. Parental behavior of adolescent mothers. *Pediatrics*. 1983; 71:494–503. [PubMed: 6340043]
- Fagot, BI. Parenting boys and girls. In: Bornstein, MH., editor. *Handbook of Parenting: Vol. 1. Children and Parenting*. 2nd. Mahwah, NJ: Erlbaum; 1995. p. 163-183.
- Fergusson DM, Woodward LJ. Maternal age and educational and psychosocial outcomes in early adulthood. *Journal of Child Psychology and Psychiatry*. 1999; 43:479–489.
- Field, T. Infant arousal, attention, and affect during early interactions. In: Lipsitt, L., Rovee-Collier, CK., editors. *Advances in infancy research*. Vol. 1. Norwood, NJ: Ablex; 1981. p. 58-100.
- Field TM, Widmayer SM, Stringer S, Ignatoff E. Teenage, lower-class, black mothers and their preterm infants: An intervention and developmental follow-up. *Child Development*. 1980; 51:426–436. [PubMed: 7398450]
- Flick, LH. The developmental nature of parental awareness in adolescent mothers. Paper presented at the annual conference of the American Nurses Association; San Diego, CA. 1985 Dec.
- Fox, J. *Applied regression analysis, linear models, and related methods*. Thousand Oaks, CA: Sage; 1997.
- Fretts RC, Schmittiel J, McLean FH, Usher RH, Goldman M. Increased maternal age and risk of fetal death, 1961-1993. *New England Journal of Medicine*. 1995; 333:953–957. [PubMed: 7666913]

- García Coll CT, Hoffman J, Van Houten LJ, Oh W. The social context of teenage childbearing: Effects on the infant's care-giving environment. *Journal of Youth and Adolescence*. 1987; 16:345–360. [PubMed: 12280674]
- Gilbert WM, Nesbitt TS, Danielson B. Childbearing beyond age 40: Pregnancy outcome in 24,032 cases. *Obstetrics and Gynecology*. 1999; 93:9–14. [PubMed: 9916947]
- Golombok, S. Parenting and contemporary reproductive technologies. In: Bornstein, MH., editor. *Handbook of parenting: Vol. 3. Status and social conditions of parenting*. 2nd. Mahwah, NJ: Erlbaum; 2002. p. 339-360.
- Gould, R. *Transformations: Growth and change in adult life*. New York: Simon & Schuster; 1978.
- Hamilton, BE., Martin, JA., Sutton, PD. *National Vital Statistics Reports*. Vol. 53. Hyattsville, MD: National Center for Health Statistics; 2004. Births: Preliminary data for 2003.
- Harkness, S., Super, CM. Culture and parenting. In: Bornstein, MH., editor. *Handbook of parenting: Vol. 2. Biology and ecology of parenting*. 2nd. Mahwah, NJ: Erlbaum; 2002. p. 253-280.
- Hauser, ST. *Adolescents and their families*. New York: Free Press; 1991.
- Haveman, R., Wolfe, B., Wilson, K. Childhood poverty and adolescent schooling and fertility outcomes: Reduced-form structural estimates. In: Duncan, G., Brooks-Gunn, J., editors. *Consequences of growing up poor*. New York: Sage; 1997. p. 419-460.
- Helson R, Mitchell V, Moane G. Personality patterns of adherence and nonadherence to the social clock. *Journal of Personality and Social Psychology*. 1984; 46:1078–1096.
- Hofferth, SL. The children of teen childbearers. In: Hofferth, SL., Hayes, CD., editors. *Risking the future: Adolescent sexuality, pregnancy and childbearing*. Washington, DC: National Academy Press; 1987. p. 174-206.
- Hogan DP, Astone NM. The transition to adulthood. *Annual Review of Sociology*. 1986; 12:109–130.
- Holden, GW. *Parents and dynamics of child rearing*. Boulder, CO: Westview Press; 1997.
- Holding S. Current status of Holland's theory of careers: Another perspective. *Career Development Quarterly*. 2002; 36:24–30.
- Hollingshead, AB. Unpublished manuscript. Yale University; 1975. The four-factor index of social status.
- Jacobson S, Frye K. Effects of maternal social support on attachment: Experimental evidence. *Child Development*. 1991; 62:572–582. [PubMed: 1914626]
- Jackson, DN. *Jackson Personality Inventory Goshen*. NY: Research Psychology Press; 1976.
- Jaffee SR, Caspi A, Moffitt TE, Taylor A, Dickson N. Predicting early fatherhood and whether young fathers live with their children: Prospective findings and policy reconsiderations. *Journal of Child Psychology and Psychiatry*. 2001; 42:803–815. [PubMed: 11583253]
- James, W. *Principles of psychology*. New York: Holt; 1890.
- Jennings K, Stagg V, Connors R. Social networks and mothers' interactions with their preschool children. *Child Development*. 1991; 62:966–978.
- Jones FA, Green V, Krauss DR. Maternal responsiveness of primiparous mothers during the postpartum period: Age differences. *Pediatrics*. 1980; 65:579–584. [PubMed: 7360548]
- Keating, DP. Adolescent thinking. In: Feldman, SS., Elliot, GR., editors. *At the threshold: The developing adolescent*. Cambridge, MA: Harvard University Press; 1990. p. 54-91.
- Kuczynski L. Socialization goals and mother-child interaction: Strategies for long-term and short-term compliance. *Developmental Psychology*. 1984; 20:1061–1073.
- Leach, P. *Your baby and child: From birth to age five*. New York: Knopf; 1997.
- Leaper, C. Parenting girls and boys. In: Bornstein, MH., editor. *Handbook of parenting: Vol. 1. Children and Parenting*. 2nd. Mahwah, NJ: Erlbaum; 2002. p. 189-225.
- Lee DM, Yeoman RR, Battaglia DE, Stouffer RL, Zelinski-Wooten B, Fanton JW, Wolf DP. Live birth after ovarian tissue transplant. *Nature*. 2004; 428:137–138. [PubMed: 15014485]
- Lerman, RI. A national profile of young unwed fathers. In: Lerman, RI., Ooms, T., editors. *Young unwed fathers: Changing roles and emerging policies*. New York: Wiley; 1993. p. 27-51.
- Levine L, Garcia-Coll CT, Oh W. Determinants of mother-infant interaction in adolescent mothers. *Pediatrics*. 1985; 75:23–29. [PubMed: 3966042]

- Levinson, D., Darrow, C., Klein, E., Levinson, M., McKee, B. The seasons of a man's life. New York: Knopf; 1978.
- Levitt MJ, Weber RA, Clark MC. Social network relationships as sources of maternal support and well-being. *Developmental Psychology*. 1986; 22:310–316.
- Lowenthal, MF., Thurner, M., Chiriboga, D. Four stages of life. San Francisco: Jossey-Bass; 1976.
- Luker, K. Dubious conceptions: The politics of teenage pregnancy. Cambridge, MA: Harvard University Press; 1997.
- Luster T, Dubow E. Home environment and maternal intelligence as predictors of verbal intelligence: A comparison of preschool and school-age children. *Merrill-Palmer Quarterly*. 1990; 38:151–175.
- MacCallum RC, Zhang S, Preacher KL, Rucker DD. On the practice of dichotomization of quantitative variables. *Psychological Methods*. 2002; 7:19–40. [PubMed: 11928888]
- MacPhee, D. Unpublished manuscript. University of North Carolina; 1981. Manual: Knowledge of infant development inventory.
- Mange, EP., Mange, AP. Basic human genetics. Sunderland, MA: Sinauer Associates; 1999.
- Marsh, LC., Cormier, DR. Spline regression models. Thousand Oaks, CA: Sage; 2001. Sage University Paper Series on Quantitative Applications in the Social Sciences 07-137
- Martin, JA., Hamilton, BE., Sutton, PD., Ventura, SJ., Menacker, F., Munson, ML. Births: Final data for 2002. *National Vital Statistics Reports*. Vol. 52. Hyattsville, MD: National Center for Health Statistics; 2003.
- McCrae RR, Costa PT. The stability of personality: Observation and evaluations. *Current Directions in Psychological Science*. 1994; 3:173–175.
- McCune-Nicolich, L., Fenson, L. Methodological issues in studying early pretend play. In: Yawke, TD., Pellegrini, AD., editors. *Child's play: Developmental and applied*. Hillsdale, NJ: Erlbaum; 1984. p. 81-124.
- McGraw KO, Wong SP. Forming inferences about some intraclass correlation coefficients. *Psychological Methods*. 1996; 1:30–46.
- McKay, B., Carrns, A. *The Wall Street Journal*. 2004 Nov 17. As teen births drop, experts are asking why; p. B1-B2.
- Mercer RT, Hackley KV, Bostrom A. Social support of teenage mothers. *Birth Defects: Original Article Series*. 1984; 20:245–290.
- Mirowsky J. Parenthood and health: The pivotal and optimal age at first birth. *Social Forces*. 2002; 81:315–349.
- Moore, MR., Brooks-Gunn, J. Adolescent parenthood. In: Bornstein, MH., editor. *Handbook of parenting: Vol. 3. Status and social conditions of parenting*. 2nd. Mahwah, NJ: Erlbaum; 2002. p. 173-214.
- Neugarten, BL. The awareness of middle age. In: Neugarten, BL., editor. *Middle age and aging*. Chicago: University of Chicago Press; 1968. p. 93-98.
- Neugarten BL, Moore JW, Lowe JC. Age norms, age constraints, and adult socialization. *American Journal of Sociology*. 1965; 70:710–717.
- Newberger, CM. The cognitive structure of parenthood: Designing a descriptive measure. In: Selman, R., Yando, R., editors. *Clinical developmental research: New directions for child development*. San Francisco: Jossey-Bass; 1980. p. 45-67.
- Osofsky, JD., Hann, DM., Peebles, C. Adolescent parenthood: Risks and opportunities for mothers and infants. In: Zeanah, CH., Jr, editor. *Handbook of infant mental health*. New York: Guilford Press; 1993. p. 106-119.
- Osofsky HJ, Osofsky JD. The adolescent mother: Factors related to their children's development. *American Journal of Orthopsychiatry*. 1970; 40:825–834. [PubMed: 5529544]
- Oyserman D, Radin N, Saltz E. Predictors of nurturant parenting in teen mothers living in three generational families. *Child Psychiatry and Human Development*. 1994; 24:215–230. [PubMed: 8082418]
- Papoušek, H., Papoušek, M. Intuitive parenting. In: Bornstein, MH., editor. *Handbook of parenting: Vol. 2. Biology and ecology of parenting*. 2nd. Mahwah, NJ: Erlbaum; 2002. p. 183-203.

- Paulson, R.J., Sachs, J. *Rewinding your biological clock: Motherhood late in life*. New York: W. H. Freeman; 1998.
- Paunonen SV, Jackson DN. The Jackson Personality Inventory and the five-factor model of personality. *Journal of Research in Personality*. 1996; 30:42–59.
- Ragozin A, Basham R, Crnic K, Greenberg M, Robinson N. Effects of maternal age on parenting role. *Developmental Psychology*. 1982; 18:627–634.
- Reis J, Barbera-Stein L, Bennett S. Ecological determinants of parenting. *Family Relations*. 1986; 35:547–554.
- Roberts P, Newton PM. Levinsonian studies of women's adult development. *Psychology and Aging*. 1987; 2:154–163. [PubMed: 3077317]
- Roosa MW. A comparative study of pregnant teenagers' parenting attitudes and knowledge of sexuality and child development. *Journal of Youth and Adolescence*. 1983; 12:213–223. [PubMed: 12312161]
- Roosa MW, Vaughan L. A comparison of teenager and older mothers with preschool age children. *Family Relations*. 1984; 33:259–265.
- Rossi AS. Life-span theories and women's lives. *Signs: Journal of Women in Culture and Society*. 1980; 6:4–32.
- Rowe ML, Pan BA, Ayoub C. Predictors of variation in maternal talk to children: A longitudinal study of low-income families. *Parenting: Science and Practice*. 2005; 5:285–310.
- Ruchala P, James DC. Social support, knowledge of infant development, and maternal confidence among adolescent and adult mothers. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*. 1997; 26:685–689.
- Russell RB, Petrini JR, Damus K, Mattison DR, Schwarz RH. The changing epidemiology of multiple births in the United States. *Obstetrics and Gynecology*. 2003; 101:129–135. [PubMed: 12517657]
- Salihu HM, Shumpert MN, Slay M, Kirby RS, Alexander GR. Childbearing beyond maternal age 50 and fetal outcomes in the United States. *Obstetrics and Gynecology*. 2003; 102:1006–1014. [PubMed: 14672478]
- Sameroff, A.J., Feil, L.A. Parental concepts of development. In: Sigel, I., editor. *Parental belief systems: The psychological consequences for children*. Hillsdale, NJ: Erlbaum; 1985. p. 83-105.
- Sandefur GD, McLanahan S, Wojtkiewicz RA. The effects of parental marital status during adolescence on high school graduation. *Social Forces*. 1992; 71:103–121.
- Shapiro JR, Mangelsdorf SC. The determinants of parenting competence in adolescent mothers. *Journal of Youth and Adolescence*. 1994; 23:621–641. [PubMed: 12346482]
- Shaw BA, Krause N, Chatters LM, Connell CM, Ingersoll-Dayton B. Emotional support from parents early in life, aging, and health. *Psychology and Aging*. 2004; 19:4–12. [PubMed: 15065927]
- Smith, J., Baltes, P.B. Life-span perspectives on development. In: Bornstein, M.H., Lamb, M.E., editors. *Developmental psychology: An advanced textbook*. 4. Mahwah, NJ: Erlbaum; 1999. p. 47-72.
- Snijders, R.J.M., Nicolaidis, K.H. *Ultrasound markers for fetal chromosome defects*. New York: Parthenon; 1996.
- Sommer K, Whitman TL, Borkowski JG, Schellenbach C, Maxwell S, Keogh D. Cognitive readiness and adolescent parenting. *Developmental Psychology*. 1993; 29:389–398.
- Spock, B., Needlman, R. *Dr Spock's baby and child care*. 8th. New York: Simon & Schuster; 2004.
- Stein Z, Susser M. The risks of having children in later life: Social advantage may make up for biological disadvantage. *British Medical Journal*. 2000; 320:1681–1682. [PubMed: 10864522]
- Stern, D. *The interpersonal world of the infant*. New York: Basic Books; 1985.
- Stevenson MB, Leavitt LA, Roach MA, Chapman RS, Miller JF. Mothers' speech to their 1-year-old infants in home and laboratory settings. *Journal of Psycholinguistic Research*. 1986; 15:451–461. [PubMed: 3772834]
- Tabachnick, B.G., Fidell, L.S. *Using multivariate statistics*. New York: Harper Collins College; 1996.
- Tough SC, Newburn-Cook C, Johnston DW, Svenson LW, Rose S, Belik J. Delayed childbearing and its impact on population rate changes in lower birth weight, multiple births, and preterm delivery. *Pediatrics*. 2002; 109:399–403. [PubMed: 11875131]

- Unger D, Wandersman L. Social support and adolescent mothers: Action research contributions to theory and application. *Journal of Social Issues*. 1985; 41:29–45.
- Upchurch DM, McCarthy J. The timing of a first birth and high school completion. *American Sociological Review*. 1990; 55:224–234.
- Ventura SJ, Martin JA, Curtin SC, Mathews TJ. Report of Final Natality Statistics, 1995. *Monthly Vital Statistics Report*. 1997; 45(11, Supplement 2–3):73.
- Wakschlag LS, Chase-Lansdale PL, Brooks-Gunn J. Not just “ghosts in the nursery”: Contemporaneous intergenerational relationships and parenting in young African American families. *Child Development*. 1996; 67:2131–2147. [PubMed: 9022234]
- Waldron I, Weiss CC, Hughes ME. Interacting effects of multiple roles on women’s health. *Journal of Health and Social Behavior*. 1998; 39:216–236. [PubMed: 9785695]
- Walter, CA. *The timing of motherhood*. Lexington, MA: D.C. Heath Co; 1986.
- Walter CA. The timing of motherhood: The challenge to social workers. *Child and Adolescent Social Work*. 1989; 6:231–244.
- Whiteside-Mansell L, Bradley RH, Owen MT, Randolph SM, Cauce AM. Parenting and children’s behavior at 36 months: Equivalence between African American and European American mother-child dyads. *Parenting: Science and Practice*. 2003; 3:197–234.
- Whitman TL, Borkowski JG, Schellenbach CJ, Nath PS. Predicting and understanding developmental delay in children of adolescent mothers: A multidimensional approach. *American Journal of Mental Deficiency*. 1987; 92:40–56. [PubMed: 2441600]
- Wohlwill JF. The age variable in psychological research. *Psychological Review*. 1970; 77:49–64.
- Wohlwill, JF. *The study of behavioral development*. Oxford: Academic Press; 1973.
- Wolfe, DA. *Child abuse: Implications for child development and psychopathology*. Newbury Park, CA: Sage; 1987.

Table 1

Correlations with maternal age in the full sample and in younger and older mothers (split at the knot age), estimated knot ages with 95% confidence intervals, and tests of change in slope at the knot age.

Variables	<i>r</i> with mother age ^d			Estimated knot age	95% C. I. for knot age	<i>F</i> for change in slope ^d
	Full Sample	Younger Mothers	Older Mothers			
<i>Prenatal and Perinatal History</i>						
Planned pregnancy ^b	.44***	.30**	.09	26.79	23.05-30.53	7.43**
Pregnancy complications	.06	-.13	.05	-	-	-
Birth complications ^b	.18***	.18	.08	22.13	12.24-32.01	.63
Perception of baby's adjustment	.17**	.05	.02	28.11	20.42-35.81	1.07
Perception of baby's difficult behaviors	-.27***	-.32***	-.06	24.08	19.28-28.88	8.06**
<i>Social Supports</i>						
Community	.08	-.00	.13	-	-	-
Extended family	-.25***	-.20**	.09	33.35	28.60-38.11	2.55
In-home	.35***	.38***	.01	29.17	25.19-33.14	7.46**
<i>Parenting Practices</i>						
Nurture	.04	-.04	.01	-	-	-
Physical	.10	-.08	.02	-	-	-
Social	.10	.02	-.02	-	-	-
Didactic	-.01	-.21*	-.04	-	-	-
Material	.01	.19*	-.15*	-	-	-
Language	.43***	.28**	.13	28.96	23.00-34.91	2.59
Frequency	.38***	.29**	.09	28.45	23.87-33.02	5.71*
Duration	.45***	.27**	.16*	28.96	21.97-35.94	1.89
Sensitivity ^c	.35***	.37***	.02	26.05	22.34-29.75	13.01***
Structuring	.36***	.41***	.05	25.75	21.78-29.73	11.54***

Note.

^dThe sample was split at the average knot age of 25 years for prenatal and perinatal history, 31 years for social supports, and 27 years for parenting practices.

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^bBecause this variable is dichotomous, a point-biserial correlation is reported instead of a Pearson's correlation, and Wald's statistic is reported instead of an F .

^cThe knot age estimate, confidence interval, and F test reported are controlling for infant distress communication.

* p .05.

** p .01.

*** p .001.