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Evolution and Human Behavior

journal homepage: www.elsevier.com/locate/ens

Determining the roles of father absence and age at menarche in female psychosocial acceleration

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ABSTRACT

Paternal investment theory and psychosocial acceleration theory hold that father absence and stressful experiences, respectively, accelerate reproductive development. Accumulating evidence is consistent with these theories yet important questions remain. In this study, we use a two-part structural equation model and data from 342 female undergraduates to address two of these questions: First, what is the role of father absence in female psychosocial acceleration, controlling potentially confounding aspects of environment and family structure? Second, to what extent does age at menarche mediate environmental and family structure effects on sexual debut? Findings indicated that many aspects of environment and family structure could be summarized with two factors—socio-economic status (SES) and fragmented family structure. We found that among those who had experienced sexual debut, exposure to temporary father departure (one year or more) in the context of an intact family hastened menarche, which in turn accelerated sexual debut. However, this type of father absence did not predict experience of sexual debut (or not). Fragmented family structure (which also implies some degree of father absence) appeared to increase the likelihood that participants had experienced sexual debut, but did not predict age at menarche or age at sexual debut among who had debuted. SES was not associated with any aspects of reproductive development, controlling for fragmented family structure and age. We discuss our findings in relation to paternal investment theory, psychosocial acceleration theory, and life history theory. We then lay out future directions for researchers aiming to clarify the role of environment in reproductive trajectories.

1. Introduction

Paternal investment theory (Draper & Harpending, 1982) and psychosocial acceleration theory (Belsky, Steinberg, & Draper, 1991) have guided studies of human development for more than twenty years. Accumulating evidence is generally consistent with these theories yet important questions remain (for reviews, see Belsky, 2012; Webster, Graber, Gesselman, Crosier, & Schember, 2014). This study addresses two such questions. First, what are the effects of father absence on age at menarche and sexual debut, controlling a broad suite of potentially confounding aspects of environment and family structure? Second, to what extent does age at menarche mediate environmental and family structure effects on age at sexual debut? To address these questions, we review the principles of life history theory and their application to human development, discuss psychosocial acceleration theory and the role of paternal investment, and test whether father absence has indirect effects on female sexual debut, through pubertal timing. Importantly, we control for a suite of theoretically relevant covariates (e.g., socio-economic status, adverse experiences, presence of unrelated

males, and mother's age at first birth) to address potential confounding. Finally, we present our findings and discuss implications for future research.

1.1. Life history theory

Life history theory (LHT) originated in evolutionary biology and explained variation between species in terms of fitness trade-offs faced by organisms (e.g., offspring quantity vs. quality, mating vs. parenting effort, and current vs. future reproduction), the most prominent of which stem from the costs of reproduction (Stearns, 1976, 1989). As a consequence of these trade-offs, species such as elephants, for instance, tend to reproduce late, have relatively few offspring, engage in extensive parenting, and have longer lifespans; while species such as fish reproduce early, have many offspring, engage in little to no parenting, and live short lives. Species with life histories similar to fish have been called *fast* life history strategists, while species more like elephants have been called *slow* life history strategists. According to LHT, we should expect to find fast strategists in environments characterized by higher

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<https://doi.org/10.1016/j.evolhumbehav.2018.03.009>

Received 11 August 2017; Received in revised form 18 March 2018; Accepted 24 March 2018
1090-5138/ © 2018 Published by Elsevier Inc.

mortality, while slow strategists should typically experience lower mortality. The adaptive logic is that investment in few offspring and extensive parenting is less likely to facilitate genetic transmission when mortality risk is high, whereas this investment contributes to fitness in safe and predictable environments via increased offspring competitiveness. Indeed, while elephants face relatively low extrinsic (e.g., due to low predation) and intrinsic mortality (e.g., due to fewer health problems such as cancer; Gaughran, Pless, & Stearns, 2016), fish such as salmon experience higher mortality due to predation and lesser somatic effort (Groot & Margolis, 1991).

1.1.1. Paternal investment theory

Applied to humans, LHT explains individual differences (i.e., variation between people) in terms of the same sort of trade-offs used to explain variation between species (Hill & Kaplan, 1999). Draper and Harpending (1982) developed paternal investment theory in the first application of LHT to individual differences in human development. This theory holds that paternal investment accounts for variety in the reproductive strategies individuals follow throughout life. More specifically, it predicts that paternal investment is a key influence on pubertal timing (see also Ellis, 2004) and that father absent females whose mothers bear the majority of the parenting responsibilities “will perceive that male parental effort is not crucial to reproduction and will be less coy and reticent, will engage in sexual activity earlier and with less discrimination, and will form less stable pair bonds.” (p. 259)

1.1.2. Psychosocial acceleration theory

Belsky et al. (1991) extended upon Draper and Harpending (1982) by proposing psychosocial acceleration theory. According to this theory, generally stressful childhood environments (e.g., characterized by marital discord, greater parent experience of stress, inadequate resources, and harsh parenting) accelerate psychosocial development, such that individuals who are stressed early tend to experience insecure attachment, earlier pubertal timing and sexual debut, and eventually more unstable adult pair bonds. According to both of these applications of LHT to humans, there is some plasticity in human reproductive development such that early environmental cues trigger greater allocation of resources to early reproduction and mating effort at the expense of somatic and parental effort. That is, human life history strategy (LHS) development is partly an instance of *conditional adaptation*, where one or more adaptations are executed contingent upon environmental conditions (Ellis, Figueredo, Brumbach, & Schlomer, 2009).

1.2. Are father absence effects confounded?

Consistent with paternal investment theory, many studies have found evidence suggesting father absence accelerates female reproductive development. For instance, > 30 studies have tested whether father absence is associated with earlier menarche and in a recent meta-analysis, researchers found that father absence and age at menarche were reliably linked (weighted average effect size of $r = -0.14$; Webster et al., 2014). As noted by Webster et al. (2014), one limitation of their study is that it did not address potential confounding of father absence effects. Belsky et al. (1991) suggested that father absence might hasten menarche by removing cues to inbreeding risk. However, an alternative explanation is that physiological stress associated with divorce and growing up in single parent homes hastens menarche by lowering metabolism and increasing adiposity. Indeed, Draper and Harpending (1982) noted that father absence effects might be attributable to stressful aspects of environments and family structures common to father absent girls. Confounding of father absence effects by stressful experiences is consistent with (a) psychosocial acceleration theory (Belsky et al., 1991), (b) research linking adverse experiences to age at menarche (Ellis & Garber, 2000; Graberc, Brooks-Gunn, & Warren, 1995), and (c) research linking adverse experiences to earlier sexual

debut (James, Ellis, Schlomer, & Garber, 2012; Wight, Williamson, & Henderson, 2006) and greater numbers of sexual partners (Belsky, Schlomer, & Ellis, 2012; Richardson, Dariotis, & Lai, 2017; Richardson, Sanning, et al., 2017).

A second notable limitation of the Webster et al. (2014) meta-analysis is that father absence has been operationalized in so many ways that the authors could not identify a meaningful way to code and test for measurement differences. Though most studies have focused on divorce and abandonment, some also attended to paternal death as well as temporary father departure (e.g., due to military service or other labor migration; Shenk, Starkweather, Kress, & Alam, 2013). Within these types of father absence, measures are further bifurcated into categorical variables vs. years of father absence, father absence before or after one or more arbitrary age cut-offs, and father absence with or without stepfather or mother presence (Shenk et al., 2013; Webster et al., 2014). In Western societies, divorce is associated with reductions in paternal investment, though fathers are typically required by law to continue allocating time and money to children. In the case of temporary father departure, fathers may be physically absent for periods of a year or more but remain otherwise invested. Death and abandonment typically imply permanent absence though in some cases families do not experience severe financial strain (e.g., in the context of life insurance payouts after death). More studies are needed to parse out how father absence effects differ by type.

Ultimately, studies that assess multiple types of father absence as well as control for a broad suite of environmental and family structure facets are needed. Such studies can help address potential confounding as well as produce a clearer picture of the role of family structure in psychosocial acceleration. To set the stage for the current study, below we identify several additional facets of environment and family structure that are of theoretical importance and/or have been linked to age at menarche or sexual debut.

1.2.1. Family structure facets

In addition to father absence, several other aspects of family structure have been linked to age at menarche and sexual debut, including biological relatedness of parents (i.e., biological vs. step or adoptive), sibship size, and birth order (Chasiotis, Keller, & Scheffer, 2003; Davis & Friel, 2001; Matchock & Susman, 2006; Mendle et al., 2006; Morris, Jones, Schoemaker, Ashworth, & Swerdlow, 2010). Morris et al. (2010) found evidence suggesting that age at menarche increased with number of siblings and sibling size. In contrast, Matchock and Susman (2006) did not detect birth order effects, instead reporting that the absence of a biological father as well as the presence of half and step-brothers was associated with earlier menarche, while the presence of sisters within the home was associated with delayed menarche. These findings suggest possible roles of the unrelated males and sisters in the timing of menarche, though Mendle et al. (2006) found that controlling for the mother's age at menarche eliminated the association between daughter's age at menarche and presence of an unrelated male.

1.2.2. Mother effects

Davis and Friel (2001) found that mother-child relationship, level of mother-child interaction, and mother's attitudes about sex were associated with age of sexual debut regardless of family structure. Moreover, Eshbaugh (2008) found that adolescents were more likely to have had sex prior to age 16 if their mother was a teenager at the time of the birth of her first child. Interestingly, this effect was most pronounced for sons of teenage mothers, compared with daughters. Further, De Genna, Larkby, and Cornelius (2011) found that daughters of teen mothers were significantly more likely to engage in early sexual behavior, and early puberty for adolescent females was strongly related to early sexual behaviors. As noted by Belsky (2012), more studies that assess mothers' ages at first childbirth in addition to parental presence

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