Sex Differences in Attachment Emerge in Middle Childhood: An Evolutionary Hypothesis

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ABSTRACT—***J. Bowlby's (1969/1982) theory of attachment, focused as it was on the survival function of attachment behaviors that the ethology of the time emphasized, led to the expectation that there would be no sex differences in patterns of attachment. Modern evolutionary thinking, however, building on insights of life history theory, parental investment theory, and sexual selection, yields an alternative prediction—that adaptive sex differences in attachment should emerge in middle childhood and be present in adults, consistent with sexual differentiation of reproductive strategies. This article reviews the theoretical basis of this expectation, including the recent proposal that a hormonally driven reorganization of attachment occurs at the beginning of middle childhood. Available data and various methodological issues involved in empirically testing the proposed model are discussed. It argues that life history theory offers a powerful organizing principle for understanding the emergence of individual differences, providing developmental researchers with exciting opportunities for empirical discovery and theoretical synthesis.***

KEYWORDS—*attachment; evolution; sex differences; middle childhood; romantic attachment*

Evolutionary biology lies deep in the DNA of attachment theory. Based as it was on John Bowlby's brilliant integration of the psychology and ethology of his time (Bowlby, 1969/1982, 1973, 1980), attachment theory revolutionized the study of parent–child relationships and has served ever since as a foundation for much developmental thinking (see Cassidy & Shaver, 2008). The evolutionary theory that proved so central to Bowlby's insights, however, exerted little impact on developmental psychology until the 1990s, when evolutionary models of reproductive strategies and attachment patterns advanced by Belsky, Steinberg, and Draper (1991), Belsky (1997a, 1999), and Chisholm (1993, 1996, 1999) recast attachment theory in modern evolutionary perspective (see Simpson & Belsky, 2008). By incorporating insights from life history theory (see below), Belsky et al. (1991) and Chisholm (1993) argued that children use attachment security in the first years of life as a cue of local ecological risk and uncertainty, thereby influencing the development of reproductive strategies. Insecure children, especially insecure-avoidant ones (see below), were expected to follow a trajectory of early reproduction and physical maturation; short-term, uncommitted relationships with partners; low parental investment; and increased opportunism and risk taking. Secure children, in contrast, would follow reproductive strategies involving later reproduction, longer term couple relationships, higher parental investment, and a more trusting, mutually beneficial approach to close interpersonal relationships. To date, researchers have provided empirical support for many predictions derived from this evolutionary framework (reviewed in Del Giudice, 2009a; Simpson & Belsky, 2008).

At the same time, there is growing consensus that both parent–infant bonds and long-term couple relationships in adults involve the activity of the attachment motivational system. The evidence for this proposition comes from two main sources. First, the behavioral and psychological dynamics of adult bond formation, separation, and loss show striking similarities with those observed in children (Feeney, 1999; Hazan & Zeifman, 1999). Second, neurobiological studies have revealed substantial overlap in the neurochemical and neuroanatomical substrates involved in both types of relationships (e.g., Carter, 1998; Insel & Young, 2001; Pedersen et al., 2005). Of course, couple relationships are not *identical* to parent–child attachments, and

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other motivational systems (such as sexual attraction) play crucial roles in adult relations. Nevertheless, it would seem that in our phylogenetic history, the system mediating parent–infant proximity has been co-opted (at least in part) to serve as a mechanism promoting long-term couple bonding in an adult context.

From the perspective of modern evolutionary thinking, then, the attachment system in humans evolved for two related but distinct adaptive reasons: *survival* (i.e., eliciting care and protection from parents early in development) and *reproduction* (i.e., regulating pair bonding and the development of reproductive strategies). Whereas Bowlby's (1969/1982) original account of the evolution of attachment focused entirely on survival, the life history models of Belsky et al. (1991) and Chisholm (1993) highlighted the reproductive-fitness value of the attachment system (see also Kirkpatrick, 1998). This distinction is of special importance to the primary focus of this article—the emergence of sex differences in attachment following the infant, toddler, and preschool years.[1] Whereas a focus on survival does not predict sex differences in the organization of attachment patterns, consideration of reproduction does: Because the rules governing male and female mating differ (Trivers, 1972), we should accordingly expect sex differences in attachment. Where classical attachment theory does not predict (nor explain) any such sex differences, life history theory implicitly leads us to expect them, even if neither Belsky et al.'s (1991) nor Chisholm's (1993) models reflect this implication.

In this article, we briefly sketch the evolutionary rationale for sex differences in attachment patterns and review Del Giudice's (2009a) psychobiological hypothesis of a hormonally driven transition at the beginning of middle childhood that engenders them. Before drawing some general conclusions, we review the available evidence on the emergence of sex differences in attachment in children, outlining a number of methodological issues involved in adequately subjecting the proposed model to empirical scrutiny.

LIFE HISTORIES AND THE SEXES

Life history theory is a branch of evolutionary biology that deals with the strategies organisms use to allocate their limited time and energy to the various activities composing their life cycle (see Hill, 1993; Kaplan & Gangestad, 2005; McNamara & Houston, 1996). It is essentially concerned with finding the optimal solution to various trade-offs, the most important of which are between *somatic effort* (growth, maintenance, and learning) and *reproductive effort* and, within reproductive effort, between *mating* (finding and attracting mates) and *parenting* (investing resources in already-born offspring). From another perspective, we can summarize the crucial decisions involved in a life history (or reproductive) strategy by the trade-offs between *current* and *future reproduction*, and between *quality* and *quantity of offspring*.

At the core of Belsky et al.'s (1991) evolutionary theory of socialization was the contention that attachment relationships in the first years of life provided human children with important ecological cues of risk and uncertainty, cues that could be used to shape the development of their reproductive strategies as they matured.[2] When the environment (both physical and social) is safe and predictable, it is optimal to invest in later reproduction and high parenting effort, thus leading to a reproductive strategy centered on raising few, high-quality (high-investment) children; this is the "secure" strategy. On the other hand, when risk and uncertainty increase, the optimal strategy is one involving earlier reproduction, higher mating effort, and less parental investment in a higher number of children; this is the basic "insecure" strategy (see Chisholm, 1993; Hill, 1993; Quinlan, 2007). Whereas Belsky et al. did not specifically include couple attachment in the traits affected by reproductive strategy choices, its role in promoting long-term couple stability makes it a crucial factor in regulating parenting effort and investment. Moreover, their notion of opportunistic versus trusting interpersonal orientations is also not unrelated to couple attachment, especially considering the relational and sexual correlates of avoidant-dismissing styles (see below).

But there is a crucial point that neither Belsky et al. (1991; Belsky, 1997a, 1999) nor Chisholm (1999) adequately addressed: Males and females face different trade-offs in their reproductive strategies. In fact, life history strategies often show marked sex differences, for reasons explained by Trivers (1972), *parental investment theory*, and its subsequent elaborations (see Kokko & Jennions, 2008). In addition, life-history-related traits can be shaped by *sexual selection*, that is, natural selection due to the behavioral consequences of sexual reproduction: same-sex competition for mates and between-sex mate choice (see Andersson, 1994; Geary, 1998, 2002). Human males, compared with females, typically engage in stronger same-sex competition in order to attract mates, tend to invest more in mating than in parenting effort, and are more inclined to entertain short-term sexual relationships with many partners rather than committing to long-term, monogamous couple relationships.

IMPLICATIONS FOR ATTACHMENT THEORY: A DEVELOPMENTAL DILEMMA

What are the implications of sex differences in reproductive strategies for attachment theory? As we have noted already, the

[1]We choose to adopt the term *sex* instead of *gender*, as it is more accurate in indicating biological sex, which is the measured variable in all of the empirical literature we cite. As in some theoretical approaches, *gender* implies a person's self-image in relation to sex roles and stereotypes, we preferred to avoid confusion by not adopting it.

[2]Although we use an "as–if" intentional language for simplicity of exposition, when we say that organisms "decide" or "use environmental cues" we do *not* imply conscious deliberation, or even conscious awareness. The strategic processes we describe could, in principle, be mediated by purely physiological mechanisms.

attachment system has two basic functions: (a) eliciting care and protection from parents and (b) regulating the dynamics of adult pair bonding and reproductive strategies. In both children and adults, there are striking individual differences in attachment-related behaviors, so we can identify and measure attachment *patterns* or *styles*. Indeed, we can further distinguish *insecure* attachment styles along two dimensions that, in the most general terms, we can label *anxiety* and *avoidance* (Brennan, Clark, & Shaver, 1998). Attachment anxiety involves intensified signaling of need and distress, constant preoccupation with the presence and availability of attachment figures, and a tendency to "clingy," dependent behavior. For the purpose of this brief review, we will treat the attachment labels of *ambivalence* and *preoccupation* as synonymous with high anxiety. Avoidance, on the other hand, involves self-reliance, reduced signaling of need and distress, and a distancing, detached attitude toward parents or partners; here we treat avoidance as synonymous with *dismissiveness* (for a detailed treatment of the various classification schemes, see Crowell, Fraley, & Shaver, 1999; Solomon & George, 1999).

In children, avoidance is related to aggression, externalizing disorders, and inflated self-esteem, whereas anxiety is related to passivity, victimization, and internalizing disorders (e.g., Card & Hodges, 2003; Cassidy, 1988; Finnegan, Hodges, & Perry, 1996; Troy & Sroufe, 1987). In adults, avoidance is related to low commitment in romantic relationships and a more promiscuous, sexually unrestrained orientation. Anxiety, on the other hand, predicts a mix of impulsive sexual attitudes, early age of intercourse (especially in women), and intense desire for intimate, committed relationships; in addition, anxious women tend to engage in a range of behaviors (including unwanted sex) in order to keep their partners close (reviewed in Del Giudice, 2009a).

These empirical findings all come from research on *romantic attachment*, which researchers usually assess with self-report questionnaires focused on one's behavior, attitudes, and feelings and behavior toward romantic partners. The other tradition of attachment research in adults is that based on the Adult Attachment Interview (AAI), which is focused on the "state of mind" toward early relationships with parents rather than on current behavior. Romantic questionnaires and the AAI show only small to moderate correlations with one another, usually below .30 (e.g., Roisman et al., 2007; Shaver, Belsky, & Brennan, 2000); they also seem to predict somewhat different variables, with romantic attachment being more related to sexual and couple-related behavior, and interviews being more strongly associated with parenting behavior. Attachment theorists have discussed in detail the nature of the relationship between romantic attachment and attachment "state of mind," with many crucial issues still unresolved (see Shaver & Mikulincer, 2002, and subsequent commentary). In this brief article, we choose to concentrate mainly on romantic attachment because of its direct relevance to reproductive strategies.

Patterns of attachment exist cross-culturally and likely represent evolved, adaptive strategies that respond optimally to different ecological circumstances (Belsky, 1997a, 1999; Chisholm, 1996; Main, 1990). However, avoidant and anxious strategies serve different purposes in children and adults; attachment behavior in adults, but *not* in infants and young children, is expected to show sex-related differences. A *developmental dilemma* would appear to characterize the attachment system: In order to be adaptive for the individual, it should work in a sexually undifferentiated way in early childhood and in a sexually dimorphic manner in adulthood, at least in the context of couple relationships. Yet when does this developmental change take place—if it does—and how is it accomplished?

SEX DIFFERENCES IN ROMANTIC ATTACHMENT

Early studies clearly supported the idea that, in infants and young children, there are no sex differences in avoidance or anxiety[3] (e.g., van IJzendoorn, 2000). This view was consistent with Bowlby's (1969/1982) classical model emphasizing the survival function of attachment and is more or less the default expectation in attachment research—for children and adults alike. Indeed, researchers have found no sex differences in adults when using interview-based assessments of attachment "state of mind" (reviewed in van IJzendoorn & Bakermans-Kranenburg, 1996, 2009). In contrast, research on adult romantic attachment often reveals the presence of sex differences, with men reporting greater avoidance and less anxiety than women. Schmitt et al.'s (2003) cross-cultural study of 62 cultural regions provided the first large-scale data on sex differences in avoidant attachment, with an overall effect size[4] of $d = .18$. Intriguingly, the magnitude of sex differences was strongly moderated by ecological factors such as mortality and pathogen load, a result consistent with an evolutionary interpretation (see above).

More recently, Del Giudice (2010)[5] performed a meta-analysis of romantic attachment based on 112 samples from various countries. In discussing the magnitude of sex differences in adult romantic attachment, Del Giudice (2009b) had noted that community-based studies tend to show more consistent patterns of sex differences than do those based on college-student samples (mostly composed of *psychology* students), which exhibit smaller and less consistent effects of sex. One reason for this may lie in the restricted nature of college samples, a problem that may be further compounded by the sex-atypical profiles of males enrolled in psychology courses. Systematic meta-analysis confirms this observation: The largest sex differences appear in community studies (29 samples, $N = 7{,}566$; average ds = −.18

[3]Some minor differences have been found on another dimension, that of disorganization, with male infants showing higher degrees of disorganized behavior than females (see David & Lyons-Ruth, 2005).

[4]Cohen's d is a standardized measure of difference between means; $d = .18$ corresponds to men scoring .18 *SD* above women on measures of avoidant attachment. Here, positive values indicate higher scores in males.

[5]Detailed meta-analytic results are available from the corresponding author.

and .16 for anxiety and avoidance, respectively, corresponding to a bivariate effect size[6] of D = .28); smaller effects in the same direction are found in college samples (73 samples, N = 26,676; ds = −.06 and.08; bivariate D = .12), and virtually no sex differences are observed in Web-based studies (10 samples, N = 30,805; ds = .01 and −.06; bivariate D = .07). All effect sizes are significantly different from zero at $p < .05$, except for the sex difference in avoidance (d = .01) observed in Web samples. The contrasting result from Web-based studies might be attributable to self-selection bias in Web participants.

In addition to sample type, effect sizes vary across world regions: Sex differences are largest in Western and Southern Europe (Ds = .33 and .34, respectively), followed by the Middle East (D = .28), East Asia (D = .26), and Oceania (D = .24); the smallest differences exist in North America (D = .10). The small sex differences in North America may, however, be a function of the very high proportion of college samples coming from that region; indeed, North American community samples show larger sex differences, similar to those measured in other regions (D = .26).

THE JUVENILE TRANSITION

Del Giudice (2009a) has argued that the sex differences in romantic attachment, expected in adulthood on the basis of evolutionary analysis but not present in infancy, emerge in middle childhood as part of an evolved psychobiological process that enables the child to function in a sex-differentiated world. His revision of Belsky et al.'s (1991; Belsky, 1999) and Chisholm's (1996, 1999) life history models of attachment and reproductive strategies aims to explain sex differences in attachment in light of parental investment and sexual selection, as well as describe the developmental course leading from infant attachment styles to mature, sexually differentiated strategies. In anticipation of adult sex differences, the model predicts sex differences in insecure styles, with males tending to higher avoidance and females showing higher anxiety at moderate levels of environmental stress, but increasing avoidance in high-stress conditions. In adults, avoidance is thought to be part of a low-investment, low-commitment strategy, one generally more advantageous for males (a hypothesis consistent with the anthropological and biological evidence that human paternal investment is facultative and highly variable both within and between populations; Geary, 2005). Anxiety, on the other hand, may be a way to secure and extract investment from both kin and mates, especially when the prospect is one of limited partner investment (in line with the anthropological model of humans as "cooperative breeders"; Hrdy, 2005). Thus, romantic attachment in adults seems to be a crucial component of reproductive strategies, ultimately influencing the levels of investment offered (and requested) by an individual in his or her relationships with mates and kin.

The change from no sex differences in attachment in infancy to such sex differences in adulthood is accomplished, according to Del Giudice (2009a), by a partial reorganization of the attachment system at the beginning of middle childhood, around 7 years of age (with substantial individual and geographic variation). In middle childhood, children begin to compete for social status in the peer group and intensify their practice of adult, sexually differentiated behaviors and abilities (such as fighting, parenting, and foraging) during social play. In this respect, middle childhood is the human equivalent of primate *juvenility* (see Bogin, 1999; Geary, 1998). During the juvenile years, individuals also begin to establish their social roles, with long-lasting consequences for development (reviewed in Weisfeld, 1999), and this implies heightened same-sex competition for status. At this developmental juncture, then, one can anticipate the emergence of the first major manifestations of sexual selection on the relevant behaviors. And indeed, there is evidence that at the beginning of middle childhood insecure patterns become sex biased, with boys showing more avoidance and girls showing more anxiety, thus mirroring the adult distribution of romantic styles (Del Giudice, 2008; see below). In view of the fact that, as we have already noted, avoidant attachment is related to traits such as aggression and inflated self-esteem, we can interpret avoidance as part of a status-seeking strategy for young (insecure) males adopting a life history strategy centered on mating effort, early reproduction, and selfish risk-taking. The possible role of anxiety for girls is, to be honest, less clear, although dependent and closeness-oriented behaviors may turn out to be advantageous in female group relationships (Del Giudice, 2009b). Some researchers have suggested that anxious attachment in girls may relate to relational and indirect aggression, which would make evolutionary sense in the context of female peer competition; unfortunately, up to now attachment research has concentrated almost exclusively on overt, physical aggression, so this possibility has yet to be tested empirically (see Campbell, 2009; Del Giudice, 2009b).

But even if there is a theoretical argument for a transition from no sex differences to sex differences in attachment, the developmental process question remains—via what mechanism? Del Giudice's (2009a) answer is that there exists, at the neurobiological level, a "switching" mechanism and that *adrenarche* is central to it. Adrenarche is an endocrine maturational event also known as "adrenal puberty" (Auchus & Rainey, 2004; Ibanez, Dimartino-Nardi, Potau, & Saenger, 2000; McClintock & Herdt, 1996). At about 5–8 years, the adrenal glands of both sexes start to secrete increasing quantities of adrenal androgens[7]; these have little effect on physical development but can be converted

[6]The Mahalanobis distance (D) is a multivariate generalization of Cohen's d with the same basic interpretation: It represents the distance between two groups expressed in multivariate standard deviations. See Del Giudice (2009c) for detailed discussion. Here, D is calculated taking into account the average correlation between anxiety and avoidance (r = .32).

[7]Adrenal androgens include dehydroepiandrosterone (DHEA), dehydroepiandrosterone sulfate (DHEAS), and androstenedione (A4).

into testosterone or estrogen directly in the brain by appropriate enzymes, and have some neuromodulatory effects of their own, including on psychological functioning (see Adkins-Regan, 2005; Labrie et al., 2005; McClintock & Herdt, 1996). Thus, adrenal androgens can be *behaviorally* active and affect the regulation of the stress and attachment systems by inducing sexual differentiation. Moreover, the hypothesized coupling of attachment and sex hormones in middle childhood would allow for genetic effects on attachment patterns, due to genotypic differences in the sex hormone pathways; there is already evidence that, in contrast with infant attachment, adult attachment patterns show moderate heritability (Brussoni, Lang, Livesley, & Macbeth, 2000), with some patterns being directly linked to specific alleles (Caspers et al., 2008). This is not meant to imply, however, that true environmental influences are not operative. Certainly suggestive of them and consistent with Belsky et al.'s (1991) theoretical model is recent evidence showing that lower quality maternal and paternal investment and higher marital conflict during the early childhood years predict earlier adrenarche in boys and girls in first grade (around 6–7 years of age), and earlier puberty in girls in fifth grade (around 10–11 years; Ellis & Essex, 2007).[8]

The central notion we are advancing, then, is that the passage from early to middle childhood is a hormonally mediated turning point—a *juvenile transition*—during which environmental and genetic factors are integrated to redirect the individual's reproductive strategy in a sexually differentiated way (Del Giudice, Angeleri, & Manera, 2009). Although the implications for attachment are profound, we can apply this thinking to behavioral domains beyond attachment. Indeed, we expect different reproductive strategies to be implemented across a broad suite of co-varying traits, including attachment, sexuality, dominance-seeking and aggression, trust and cooperation, and risk taking (Belsky et al., 1991; Chisholm, 1999; Figueredo et al., 2006; Wolf, van Doorn, Leimar, & Weissing, 2007). Life history theory, coupled with the notion of a juvenile transition, provides a powerful framework for understanding (a) the logic of individual variation in crucial personality and social domains and (b) the developmental course of sexual and individual differentiation in those aspects of development.

To conclude, we want to stress that, from this life history perspective, it makes little sense to ask whether attachment in infants is "the same" as attachment in older children and in adults. In our framework, the motivational-behavioral system of attachment works differently at different life history stages and can undergo many changes and reorganizations mirroring its changing adaptive function during an individual's life course. Thus, some aspects of infant attachment may turn out to be *ontogenetic adaptations* (transient phenotypes whose adaptive role is limited to an early developmental stage; Bjorklund, 1997), whereas others may show stronger continuity over the life span (for a fuller discussion of these issues, see Del Giudice, 2009a).

[8]The fact that Ellis and Essex's (2007) elegant study did not include attachment measurements in middle childhood means that it was not positioned to determine whether attachment mediates the effects of parenting on adrenarche in middle childhood, as the present line of theorizing assumes.

TESTING THE MODEL: EXTANT EVIDENCE AND METHODOLOGICAL ISSUES

However intriguing the theory under consideration of the emergence of sex differences in attachment middle childhood in the service of reproductive fitness goals, there remains the question of empirical evidence. Do the data reveal sex differences in attachment in middle childhood, as we implied above? Recently, Del Giudice (2008) reported that studies of children as old as 6 usually fail to discern sex differences in attachment, whereas nearly all of the available studies of children aged 7–11 presenting separate statistics by sex show remarkable sex-biased distributions of insecure styles (Corby, 2006; Del Giudice, 2008; Del Giudice & Angeleri, 2009; Finnegan et al., 1996; Granot & Mayseless, 2001; Karavasilis, Doyle, & Markiewicz, 2003; see Kerns, Abraham, Schlegelmilch, & Morgan, 2007, for an exception). These sex differences emerge with both attachment questionnaires and doll-play tasks; however, and again paralleling adult findings (van IJzendoorn & Bakermans-Kranenburg, 1996, 2009), they are not evident when attachment interviews focused on past experiences with parents are used in middle childhood (Ammaniti, van IJzendoorn, Speranza, & Tambelli, 2000).

Given the still limited database and the modest sample sizes of some investigations, it is clear that we need more work on sex differences, including meta-analyses, before we can draw strong conclusions about the presence—or absence—of sex differences in attachment in middle childhood. Of interest, nevertheless, are the results of one recent meta-analysis including 10 studies of children aged 6–14 years using separation–reunion tasks, doll-play narratives, and interviews, but excluding questionnaire-based findings (Bakermans-Kranenburg & van IJzendoorn, 2009). Results revealed significant sex differences in avoidance, but these differences emerged only in doll-play tasks; Bakermans-Kranenburg and van IJzendoorn (2009) interpreted this as a failure to discern reliable sex differences in this age group. Unfortunately, their analysis did not include questionnaire studies, which invariably detect large sex differences (Corby, 2006; Del Giudice & Angeleri, 2009; Finnegan et al., 1996).

However important this first effort to meta-analytically address the theoretically—not just empirically—important issue of sex differences in middle childhood, we remain of the view that its approach was overly general and could not properly test the evolutionary model under consideration (see also Del Giudice, 2009b, for more detailed criticism of Bakermans-Kranenburg & van IJzendoorn's, 2009, meta-analysis). Perhaps more than anything, it highlights two crucial methodological issues that future research should take into account when testing the present model.

The first, most obvious issue concerns age, which matters a lot to the model under consideration. The hypothesis is not that all children from age 6 onward should show uniform sex differences; rather, sex differences should emerge *at the time of adrenarche*. Thus, although we can use age to delineate when, on average (and with a large enough sample), sex difference in attachment should become evident, we must appreciate that age is only a rough marker of the central psychobiological process driving the postulated emergence of sex differences in attachment. Much more than age, evidence of adrenarche should demarcate when sex differences should and should not be evident. It is not difficult to imagine that a meta-analysis of studies of 6- to 14-year-olds might fail to detect sex differences in attachment if children are not distinguished in terms of their maturational status. Given ethnic and geographic differences in the timing of sexual maturation, it will be important for studies not to group together children who are maturing at different rates just because they are the same chronological age. Of note in this regard is that in Bakermans-Kranenburg and van IJzendoorn's (2009) meta-analysis of sex differences in attachment in middle childhood, three of the younger samples (Gilissen, Bakermans-Kranenburg, van IJzendoorn, & Linting, 2008: 7-year-olds; Gloger-Tippelt & Konig, 2007: 6-year-olds; Pannebakker, 2007: 7-year-olds) came from the Netherlands and Germany, where recent evidence indicates puberty is attained as much as 1 year later than it is in the United States or in Southern Europe (Parent et al., 2003). This raises the possibility that had the meta-analysis taken such variation in maturational timing into consideration, along with variation in children's age, the null conclusion might have been different.

The second issue we need to consider when evaluating research on sex differences in attachment concerns the methods used to assess attachment patterns. Adult data indicate that the different instruments used to assess attachment yield different patterns of sex (and individual) differences. Although space precludes more detailed treatment, several researchers have concluded that past-focused interviews and present-focused romantic questionnaires measure different facets of the attachment construct, with none of the methods qualifying, no matter what the prevailing biases of the field, as the "gold standard" (e.g., Bernier & Dozier, 2002; Carnelly & Brennan, 2002; Roisman et al., 2007). Rather than indicating that sex differences in attachment are unreliable, discrepancies in findings resulting from diverse assessment methods may turn out to be informative and theoretically meaningful. For example, the degree of discontinuity in attachment patterns across the life span may depend strongly on how one measures them; indeed, evidence suggests, perhaps paradoxically, that parent–child attachment in middle childhood (as assessed by questionnaires and doll-play narratives) might correlate more strongly with adult romantic attachment than with infant attachment patterns. On the other hand, interview-based measures focused on past relationships may turn out to show high consistency from childhood to adulthood. How and when these facets of attachment become differentiated, and how they relate to each other (and to behavior) over the life span, are worthy topics for research and may reveal previously unsuspected developmental patterns. The bottom line, though, is that just as conclusions about continuity in development may depend on the measurements made, so, too, might conclusions regarding sex differences in attachment. Rather than concluding that there are no such reliable differences in middle childhood, it remains our considered opinion that not only does theory suggest that these should emerge and evidence indicate that they can be detected, but that embracing the null is, for the time being, premature and perhaps even counterproductive.

CONCLUSION

Attachment theory was forged in the furnace of evolutionary theory, a perspective on all living things, humans included, but one that all too often seems of little relevance to contemporary students of child development. It is still difficult to detect much impact of evolutionary thought on the discipline of developmental psychology as a whole (but see, e.g., Ellis & Bjorklund, 2005), in marked contrast to its ever-expanding impact on so many other fields of psychological science. This is paradoxical, as never more than today has evolutionary biology addressed issues central to child development, most notably concerning plasticity and genotype–environment interactions (Belsky, 1997b, 2005; Belsky & Pluess, 2009; Boyce & Ellis, 2005; Wolf, van Doorn, & Weissing, 2008); indeed, the study of organismic development is becoming a major foundation of the new theoretical synthesis in evolution (see West-Eberhard, 2003). In this article, we have tried to show again how evolutionary thought can illuminate conundrums in human development, while recasting old questions, accounting for existing data, and yielding new empirical insights. Embracing such a perspective could fertilize the continued development of attachment theory and research, enabling scholars to gain a functional and integrative understanding of how—and why—attachment patterns correlate with developmental outcomes as diverse as aggression, sexuality, cooperation, and psychopathology (Cassidy & Shaver, 2008).

Of course, novel perspectives also bring forth new methodological challenges. The hypothesis that attachment undergoes a phase of reorganization during the juvenile transition is a complex one, integrating different levels of analysis and generating nuanced (yet testable) predictions. This will require triangulation of multiple data sources and a sophisticated, interdisciplinary approach; in this article we have outlined only some of the methodological issues facing researchers in this area. Future research may support, reject, or (perhaps most likely) correct and refine the model we present here; regardless of the outcome, we will surely gain a deeper appreciation of attachment's role in the life of children and adults and its functional relationships with the rest of behavior. Of equal importance, we will also broaden our

understanding of what it means to grow up as a male or a female of our species.

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Attachment and Life History Theory: A Rejoinder

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ABSTRACT—***M. Del Giudice and J. Belsky (this issue) derive several provocative hypotheses from the application of life history theory to attachment, especially concerning the emergence of sex differences in insecurity in middle childhood. This commentary highlights the significant gaps in research knowledge that must be addressed before the merits of their proposals can be evaluated. It also examines the multiple meanings and functions of "attachment" as this term applies to child–parent and adult affectional relationships, and their association. Their ideas certainly deserve further exploration, especially in the broader context of elucidating the life-span implications of early attachment within the framework of life history theory.***

KEYWORDS—*attachment; life history theory; sex differences*

Attachment theory views parent–child relationships from both ontogenetic and phylogenetic perspectives. The conceptual generativity of this approach is reflected in Del Giudice and Belsky's contribution (this issue), which enlists life history theory to derive provocative hypotheses concerning the emergence of sex differences in attachment in middle childhood. There are many strengths to their analysis, including its theoretical scope, the derivation of testable hypotheses, their careful attention to methodological issues, and their frank acknowledgment of the limitations and contradictory findings in existing evidence. Equally importantly, their analysis frames two fundamental questions for attachment theory. What is attachment? What is it for?

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Del Giudice and Belsky argue that attachment is concerned with both child–parent bonds and romantic couple relationships because each is important to reproductive success. By contrast, developmental attachment theorists have taken care to distinguish early caregiving attachments and adult romantic relationships because they have distinct evolutionary functions, motivational qualities, interpersonal dynamics, and relevant behavioral systems (e.g., Ainsworth, 1989; Bernier & Dozier, 2002; Sroufe, Egeland, Carlson, & Collins, 2005). According to these theorists, the romantic and sexual concerns of adult peer affiliations differ markedly from the caregiving system underlying the affectional bonds between dependent children and their parents. In accord with Bowlby (1969/1982), they have also viewed infant–parent attachment as an ontogenetic adaptation enabling the survival of young children to maturity but having no more enduring evolutionary function (Bjorklund, 1997), even though early security or insecurity has consequences for later developmental functioning (Thompson, 2008). Del Giudice and Belsky argue instead that the biologically adaptive processes mediating infant–parent attachment are consistent with the adaptive processes underlying couple bonding in adulthood.

Both views are consistent with life history theory, which holds that early experience conveys important cues concerning ecological support and predictability. But they differ in the association between early attachment and adult reproductive strategy. How, then, is early attachment relevant to later sexual maturity and reproductive strategy?

Considerable evidence indicates that early adversity—including parent–child conflict, poverty, and deprivation—is associated with earlier sexual maturity in girls (see Ellis, 2004; Simpson & Belsky, 2008). Although none of this research used measures of child–parent attachment security, Del Giudice and Belsky argue that the security of attachment is likely to be a reliable barometer of environmental adversity and thus should be predictive of the same outcome (see also Belsky, Steinberg, & Draper, 1991; Chisholm, 1996). But the evidence on attachment security as an index of environmental support or stress is mixed. The association between parental sensitivity and the security of attachment is modest (De Wolff & van IJzendoorn, 1997), and

parenting quality can exacerbate or buffer other sources of stress for young children (e.g., relational security in a context of economic deprivation). Attachment security is also dynamic, changing over time in response to changes in parent–child interaction and stressful circumstances, and thus reflects both developmental history and current experience in caregiving relationships (Sroufe et al., 2005; Thompson, 2006). Attachment security is a barometer of much more than just early adversity, and we need considerably more research to elucidate the association between early stress, attachment security, and pubertal maturation.

The association between early child–parent attachment and adult reproductive strategy also requires more thought. In this regard, we can distinguish at least two aspects of adult reproductive strategy. The first, which Del Giudice and Belsky emphasize, concerns intimacy and commitment in couple relationships. They analyzed studies using measures of adult romantic attachment to suggest modest sex differences in insecurity that raise the "developmental dilemma" of how these emerge ontogenetically. No studies, however, document a significant association between attachment security in infancy and adult romantic attachment. The second aspect of adult reproductive strategy concerns parental investment, manifested in responsiveness to offspring and commitment to their well-being. Assessments of adult attachment "states of mind" in the Adult Attachment Interview (AAI) are significantly associated with both responsiveness to infants' attachment signals and the security of attachment in offspring (van IJzendoorn, 1995). Thus far, relevant research has failed to identify sex differences in adult attachment on the AAI (Hesse, 2008; van IJzendoorn & Bakermans-Kranenburg, 1996), so there is no developmental dilemma to be resolved. Interestingly, modest evidence exists for a longitudinal association between infant attachment classification and adult "states of mind" on the AAI, especially when ecological stresses remain consistent over time (Waters, Weinfield, & Hamilton, 2000). The question, therefore, of how early child–parent attachment is associated with adult reproductive strategy is complex, depending on how we conceptualize and assess differences in adult reproductive strategy. Considerably more research is needed, but viewing parental investment as an adaptive correlate of early attachment is probably a stronger conceptual avenue to follow.

In light of these considerations, it is difficult to know whether Del Giudice and Belsky's provocative hypotheses offer promising leads. Further research may clarify whether early adversity influences female pubertal maturation in association with attachment security (the latter as a causal influence or an index of early stress) or independently of it (such as through the effects of stress on the duration of childhood immaturity; see Ellis, 2004), and whether similar processes occur in males. Moreover, despite our reliance on a common vocabulary (*attachment*, *security*, *avoidance*) to describe child–parent relationships, adult romantic relationships, and adult states of mind concerning attachment, these are very different affectional bonds with different relational and motivational characteristics, and future development of theory and research must clarify their association. If early attachment security is indeed an ontogenetic adaptation, then the "developmental dilemma" that Del Giudice and Belsky profile is a nonissue because there is no reason to expect an association between infant attachment security and adult romantic attachment. If early security inaugurates lifelong evolutionary adaptations, then it is important to understand its ontogenetic significance for adult romance and parental investment. In short, these provocative ideas certainly merit further exploration.

Beyond framing questions about the nature of attachment and its function, Del Giudice and Belsky also highlight important issues concerning attachment in the context of life history theory. Life history theory is concerned with the cumulative construction of complex behavioral adaptations from early environmental cues, and attachment theory offers a complementary but different portrayal of the interaction of early and later experience in the development of complex relationships. Besides the different scope of their applications, these approaches differ in their regard for the potential of later experiences to reorganize the developmental impact of early adaptations, with attachment researchers having learned during the past quarter century of research how much early and later relational experiences are jointly important (e.g., Sroufe et al., 2005). In the intersection of these dual formulations concerning the impact of early experience, we might hope that a relational view of life-span development that encompasses both species-typical formative influences and developmentally dynamic relational effects will emerge.

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Stretched Until It Snaps: Attachment and Close Relationships

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ABSTRACT—***M. Del Giudice and J. Belsky (this issue) suggest that males and females tend to follow different reproductive strategies associated with different types of insecure attachments. It is clear that gender differences in reproductive strategies and in close relationships may exist. However, there is no support for gender differences in attachment behaviors and representations in the current evidence base. The authors propose to consider attachment and close relationships as horses of different colors and to examine their potentially gendered association as independently assessed constructs.***

KEYWORDS—*gender; attachment; life span; Strange Situation; Adult Attachment Interview*

John Bowlby emphasized that the attachment behavioral system is distinct from the sexual or parenting behavioral systems. In fact, by sharply differentiating between the attachment and sexual systems, Bowlby heretically deviated from the prevailing psychoanalytic ideas and turned himself into the first evolutionary psychologist after Charles Darwin (Bowlby, 1990). He was greatly inspired by the theoretical and empirical work of Harry Harlow, who in rhesus monkeys clearly distinguished between the sexual, parental, peer, and attachment affectional systems, which differ in origin, function, and effects (Harlow & Harlow, 1965; for validation, see Suomi, 2005; Suomi, Van der Horst, & Van der Veer, 2008). Attachment theory is about attachment relationships and attachment representations across the life span; it is not about sexual relationships or about any other type of social relationship.

THE EVOLUTIONARY GENDER HYPOTHESIS

Nevertheless, Bowlby (1984) also acknowledged the overlap between attachment, parenting, and sexual behavior, even labeling this overlap a "commonplace" (p. 233). In his view, the associations between the attachment and sexual systems should be empirically demonstrated instead of (psychoanalytically) postulated. Gender differentiation in reproductive strategies certainly exists (e.g., Hrdy, 2009). Although attachment theory does not argue in favor of or against gender differences in attachment strategies, Del Giudice's (2009) hypothesis that such differences would emerge in middle childhood as part of an evolved psychobiological process that enables the child to function in a sex-differentiated world is inconsistent with the current empirical evidence.

The hypothesis involves two different questions: The first issue concerns emerging gender differences in attachment strategies, and the second issue relates to predictions from attachment proper to social relationships in general, and sexual relationships more specifically. In searching for empirical evidence, we should keep in mind that the concept of attachment has a rather precise definition: to seek proximity in times of distress to a protective person deemed to be stronger or wiser (Bowlby, 1984). This definition does not cover romantic relationships between adult partners in at least two important ways: Romantic relationships imply some basic form of equality, and they imply some sexual attraction between peers, two components conspicuously absent in Bowlby's definition, even though Bowlby considered attachment to be relevant to the entire life span, from the cradle to the grave. Attachments may have predictable consequences for romantic relationships or for social relationships in general, but they belong to distinct realms of human functioning.

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CHILD DEVELOPMENT PERSPECTIVES

THE EMPIRICAL EVIDENCE

The first question is an empirical one: Do males in middle childhood indeed begin to follow a more avoidant attachment pathway resulting in more dismissing attachments in adult males? And correspondingly, do females choose a more resistant attachment trajectory resulting in more preoccupied adult attachments? Recently we finished a meta-analysis on "The First 10,000 Adult Attachment Interviews" (Bakermans-Kranenburg & van IJzendoorn, 2009a). In the combined sample of nonclinical mothers, 25% were classified as dismissing, 58% as secure, and 17% as preoccupied. The corresponding distribution of adult attachment representations in the combined sample with fathers was 28% dismissing, 58% secure, and 15% preoccupied. Clearly, these differences are negligible.

For children between 6 and 16 years, we found a combined attachment distribution of 37% avoidant, 49% secure, and 14% resistant attachments for boys. For girls the distribution was 22% avoidant, 64% secure, and 14% resistant attachments (Bakermans-Kranenburg & van IJzendoorn, 2009b). Differences between boys and girls were significant for the secure (fewer boys) and the avoidant (more boys) attachment classifications, but not for the resistant attachment classification. The female part of the evolutionary hypothesis for middle childhood and adolescence—that females enter a more resistant attachment trajectory than boys do—is therefore unsupported by the evidence.

After dividing the studies according to their assessment procedures (doll-play narratives; behavioral observations of separation and reunion; modified Adult Attachment Interviews [AAIs]), we found that gender differences were present only in the set of studies using narratives. We speculated that narrative assessments might be more vulnerable to content-based "macho" accounts, and to gender differences in verbal fluency (Bakermans-Kranenburg & van IJzendoorn, 2009b). Of course, with a few exceptions, attachment research has long neglected the important developmental stages of middle childhood and early adolescence, resulting in a dearth of thoroughly validated attachment assessment procedures for these age periods.

ATTACHMENT REPRESENTATIONS VERSUS CLOSE RELATIONSHIPS

In our meta-analysis on the first 10,000 AAIs, we deliberately restricted ourselves to studies conducted with the AAI, leaving out studies on attachment styles (George, Kaplan, & Main, 1985; Hesse, 2008). Within the framework of attachment theory, the core concept of attachment as Bowlby originally defined it is in terms of seeking (literally or mentally) proximity to a protective attachment figure. The AAI is the "gold standard" for assessing the participant's *current* mental representation of past and current attachment experiences, with critical emphasis on the *coherence* of the participant's discourse.

Other measures are much better suited to other types of relationships and behavioral systems. For example, assessing close relationships between equal (romantic) partners or friends can be accomplished with the Experiences in Close Relationships (ECR; see Brennan, Clark, & Shaver, 1998; but see below). Del Giudice and Belsky report reliable gender differences in a meta-analysis on romantic relationship studies in student and community samples around the world. This may be an important finding, but in our view it is not pertinent to the evolutionary gender hypothesis for attachment.

Researchers should not reduce the differences between the AAI and the ECR to differences in method only (as we did previously; see Bakermans-Kranenburg & van IJzendoorn, 2009a), or to their alleged focus on the past (AAI) versus the present (ECR or the ECR–R; see Mikulincer & Shaver, 2007) as Del Giudice and Belsky emphasize. Close relationship questionnaires simply measure a construct different from attachment. Importantly, these questionnaires address issues of emotionally intimate social relationships in general, with items like "I worry a lot about my relationships," "I feel comfortable depending on others," "I do not often worry about being abandoned," or "I am nervous when partners get too close to me." These are general statements about intimate social relationships, including peer friendships, mating, and romantic relationships. No wonder that in a recent meta-analysis including more than 900 individuals, Roisman et al. (2007, p. 678) found a "trivial to small overlap" (r = .09) between the AAI and intimate relationship questionnaires.

The ultimate test of the evolutionary hypothesis on attachment-related gender differences in reproductive strategies is whether it can predict gendered ways of relating to peers and in particular to (potential) mates on the basis of past or current attachment behavior or representations. As Del Giudice and Belsky suggest, avoidant children may follow a trajectory of early reproduction and uncommitted relationships; secure children, in contrast, may follow reproductive strategies involving later reproduction and a more mutually beneficial approach to close relationships. Their prediction for resistantly attached children is less clear. This is exactly the empirical hypothesis that we should and can test with independent measures for attachment strategies on the one hand (such as the Strange Situation Procedure or AAI) and measures for close relationships, in particular reproductive and mating strategies, on the other. Notably, biological and behavioral indices (including age at menarche and frequency of sexual intercourse in adolescence) may be more specific and valid measures of reproductive and mating strategies than questionnaires on close relationships covering the broad construct of social relatedness.

In sum, gender differences in close relationships may be present, but gender differences in attachment patterns of behavior and attachment representations are absent in the current evidence base. We propose to consider attachment and close relationships as horses of different colors and to examine their potentially gendered association as independently assessed constructs.

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Evolving Attachment Theory: Beyond Bowlby and Back to Darwin

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ABSTRACT—***In our reply to M. H. van IJzendoorn and M. J. Bakermans-Kranenburg (this issue) and R. A. Thompson (this issue), we highlight 2 challenges that attachment researchers face today: (a) closing the gap between the developmental and social psychological traditions and (b) connecting attachment theory to the broader field of evolutionary psychology. We contend that an evolutionary life history approach can contribute to both goals and argue that attachment researchers should consider moving beyond some of Bowlby's original formulations in order to permit further advancement of the field. Finally, we review van IJzendoorn and Bakermans-Kranenburg's criticism of the hypothesis that sex differences in attachment arise in middle childhood; we conclude that the claim that the hypothesis has been falsified is premature and that more research is necessary, thereby making our evolutionary-inspired view potentially useful for the time being.***

KEYWORDS—*attachment; evolution; sex differences; middle childhood; romantic attachment*

The thoughtful commentaries on our article vividly illustrate two crucial issues currently confronting attachment theory: the persisting theoretical gap between developmental and social-psychological approaches to human attachment (Cassidy & Shaver, 2008) and the incomplete integration of attachment theory with modern evolutionary biology (Simpson & Belsky, 2008).

Whereas once attachment theory was virtually the only evolution-based approach to make its way into mainstream psychology, now there are evolutionary theories of mating, parenting, and social relations. These raise exciting opportunities for integration, but they also raise questions about treating attachment theory as an independent body of knowledge (Simpson & Belsky, 2008). We believe that the life history approach holds the key for resolving both issues, providing basic tools to model and understand (a) the functional integration of different motivational-behavioral systems, including attachment, (b) the life span development of those systems, and (c) the transitions in their functioning and adaptive role (Del Giudice & Belsky, in press).

Merging attachment theory with a general, life-history-based theory of development will require revising some classical constructs and moving beyond Bowlby and some of his original formulations. Bowlby's contribution is of course substantial and indisputable, but he obviously had no access to the wealth of neurobiological data we now possess, or to the theoretical tools of modern evolutionary biology. There is simply no reason to remain constrained by early definitions, or to keep evaluating new theories for consistency with Bowlby's original ideas. Consider the idea of attachment as seeking proximity to a protective person deemed to be stronger or wiser. This definition is clearly modeled on parent–child relationships and seems to exclude romantic bonds from the domain of attachment theory. Yet from an evolutionary perspective there is no such contradiction—many of the same emotional mechanisms and behavioral goals (such as proximity, closeness, and comfort) can serve different biological functions at different developmental stages (e.g., eliciting care and protection vs. promoting couple stability and sexual exclusivity). Although only adult couple relationships involve sexual attraction and reciprocity, the crucial question is whether they also involve an attachment *component*—an empirical issue that depends on the neurobiological, behavioral, and emotional correlates of attachment in children and adults.

Because romantic attachment appears to have a *specific* function in the context of couple relationships—promoting long-term bonding, cooperative parenting, and (ultimately) parental investment (e.g., Del Giudice, 2009a, 2009b; Jackson & Kirkpatrick, 2007)—one should expect discordance between attachment styles measured at different ages and for different relationships. That some *aspects* of early attachment may be ontogenetic adaptations does not preclude a later role for the attachment system in mating and pair bonding (Del Giudice, 2009a). This chal-

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lenges van IJzendoorn and Bakermans-Kranenburg's claims of a "gold standard" for measuring attachment and undermines the view that valid measures of attachment must systematically relate to the Strange Situation or the Adult Attachment Interview.

Thompson's commentary in this issue highlights (a) the relationship between environmental stress and attachment and (b) the interplay of mating and parenting. Concerning the former, parents not only mediate or buffer external stressors ("macro"-environment), but are themselves a source of potential stress and risk for the child ("micro"-environment); a comprehensive theory of emotional development must integrate these two levels (Belsky, Steinberg, & Draper, 1991; Del Giudice, 2009a). Further, the fact that children differ in their susceptibility to environmental factors (Belsky, Bakermans-Kranenburg, & van IJzendoorn, 2007; Belsky & Pluess, 2009; Belsky et al., 2009; Pluess & Belsky, 2010) likely explains the modest relation between sensitivity and attachment security (Belsky, 2009; De Wolff & van IJzendoorn, 1997). As for mating and parenting, we agree that distinguishing the two is crucial, but this does *not* mean they are functionally independent. A life history theoretic perspective suggests otherwise (Belsky, 2007; Belsky et al., 1991). For example, romantic attachment strongly predicts couple stability and commitment, and couple stability is one of the best predictors of paternal investment across cultures (see references in Del Giudice, 2009a).

Regarding the specific proposition that sex differences in attachment emerge in middle childhood, we advanced the hypothesis as still tentative and highlighted some of its current weak spots, while stressing the need for more research. Despite this, van IJzendoorn and Bakermans-Kranenburg conclude that our hypothesis is "inconsistent with the current empirical evidence" (p. 109). This is puzzling, given that they exclude from consideration the strong sex differences found with self-report questionnaires in middle childhood yet still chronicle the predicted sex differences in avoidance. They also concur that there is a dearth of attachment research in middle childhood; indeed, only two studies using separation–reunion procedures (with a total of 39 boys) could be included in their meta-analysis (Bakermans-Kranenburg & van IJzendoorn, 2009). Why does this not suggest, instead, that the sex-difference hypothesis remains viable and intriguing as a topic of further research? Finally, we feel obliged to note that the Experiences in Close Relationship (Brennan, Clark, & Shaver, 1998) and similar attachment questionnaires are often phrased to refer specifically to couple relationships, not to close relationships in general. In particular, all the studies included in the meta-analysis described in our article assessed attachment to romantic partners.

We thus remain convinced of the heuristic value of an evolutionary life history approach, and hope that more developmentalists will embrace this perspective. The time is ripe for new theories of development, on a scale undreamed of even by a pioneer like Bowlby. Thanks to his legacy, attachment researchers are ideally positioned to contribute to this enterprise. Let us not miss this opportunity.

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