

coalitions, emerge as critical challenges for the child. Predicting what one's social environment will be as an adult and modifying phenotypic trajectories of the hormonal, neurological, and psychological mechanisms that comprise "internal working models" seems extraordinarily complex, and unlikely to favor early canalization of reproductive strategy. A more flexible system that allows inclusion of input throughout childhood and adolescence would have advantages over one primarily contingent on conditions during infancy (cf. Belsky 2002; Draper & Harpending 1982; Quinlan & Flinn 2003).

To evaluate the exciting new ideas about the adjustment of reproductive strategies in middle childhood proposed by Del Giudice, it would be useful to have research designed to specifically evaluate causal relations among the key proximate mechanisms. Comparisons with other primates will help identify what aspects of human adrenarche are shared or derived. Analyses of patterns of attachment and adrenarche in apes would be most interesting. Longitudinal studies of human child development that monitor DHEA(S) levels in naturalistic context could provide detailed data on links among hormone levels, family environment, affiliative bonds, and long-term outcome measures.

Attachment strategies across sex, ontogeny, and relationship type

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Abstract: We propose that middle childhood female ambivalent attachment, given the adaptive problem of uncertainty of future investment, is designed to evoke immediate investment from current caregivers, rather than new investment sources. We suggest greater specificity of strategic attachment solutions to adaptive problems that differ by sex, time, and relationship type.

The target article represents a major theoretical contribution on several fronts. First, it highlights evolutionary functional accounts as indispensable for any comprehensive theory of attachment (as initially envisioned by Bowlby [1969/1982], but neglected by many subsequent attachment theorists). Second, it focuses on sex differences in adaptive problems and the resultant attachment-related strategic solutions as males and females enter the arena of mate competition. And third, it provides an elegant theoretical integration of the evolutionary psychological work on sex differences in mating strategies with important dimensions of individual differences – something urgently needed, but relatively neglected by much previous work in evolutionary psychology (Buss & Greiling 1999). In this commentary, we build upon these important advances, and propose some directions for exploring additional attachment differences across time, sex, and adaptive problem domain.

Evolution by selection tends to produce domain-specific and context-specific adaptations. It is theoretically problematic to assume that the attachment strategy as an adaptive response to environmental cues at one point during development will be adaptive if implemented in interactions in relationships later in life. To the degree that mother–infant attachment bonds serve functions that differ from those of friendship bonds and mateship bonds, and to the degree that they differ by sex, we expect selection to favor specificity of strategic solutions by relationship type, sex, and life phase.

It is reasonable to hypothesize that the sex differences in relative frequencies of insecure attachment styles that emerge at middle childhood are a result of sex differences in adaptive problems faced recurrently over deep evolutionary time during this stage of development. Del Giudice provides a compelling functional account for the shift in males towards an avoidant attachment style, but notes that the function of the female skew towards an ambivalent attachment style at this age is "less clear" (sect. 7.1.2, para. 2). If we focus on the finding that girls of parents who provide only inconsistent and unpredictable investment are the ones who tend to develop ambivalent attachment styles, we can conceptualize their ambivalent attachment psychology during middle childhood as a solution to the adaptive problems predicted by their parent-specific and kin-specific input.

The ambivalent attachment style is characterized by extreme dependence, emotional instability, and a desire to exert influence over the caregiver (sect. 2.2). These strategies, perhaps effective in eliciting as much investment as possible from parents, are unlikely to succeed in establishing strong alloparental bonds if directed toward same-sex peers during middle childhood. There is evidence that female–female friendships during childhood are shorter and more fragile than male–male friendships (Benenson & Christakos 2003). If female friendships at this age lack the stability to endure until reproductive age, it strains credulity that they function as precursors to lasting alloparental bonds. Exhibiting high dependence and emotional instability toward female friends could easily backfire, as mechanisms that caused individuals to invest in non-kin who deplete resources, but who are unable or unlikely to reciprocate, would be selected against (Trivers 1971). From this perspective, we would not predict that attitudes and characteristics associated with ambivalent attachment at middle childhood would result in behavior that successfully initiates or maintains same-sex peer relationships.

If we instead hypothesize that this strategy is designed to be directed towards parents or kin, a functional hypothesis presents itself. In an environment in which male parental investment is inconsistent or nonexistent, such as that associated with ambivalent attachment, females who waited longer to reproduce, or who attempted to obtain all the necessary investment from their future mate, would have been out-competed by females who began reproducing early and who attempted to extract resources and investment from kin (Belsky 1997a; 1999; Hoier 2003; Quinlan 2003). Moreover, the earlier a female reproduces, the more likely she is to receive grandparental assistance and resources. Given cues to low or unstable male parental investment, one adaptive solution would be to reproduce early and maintain high levels of dependence upon close kin.

Because kin are usually already invested in the survival and reproductive success of their genetic relatives, we hypothesize that the care-eliciting strategies associated with ambivalent attachment directed specifically toward kin have the best chance of successfully extracting investment for a female's offspring. In contrast, similar strategies directed toward peers may result in alienation. In an environment in which male parental investment is unreliable or unlikely to be forthcoming, reproducing early capitalizes on as much grandparental investment as possible while these extended kin are still alive and can invest. Whereas securely attached individuals expect consistent support from family members, insecurely attached females may do best to focus on obtaining as much support as possible during middle childhood, because they cannot rely on it for the future.

Building on the theoretical advances proposed by Del Giudice, we have focused on functional explanations for the female switch to ambivalent attachment patterns during middle childhood. We suggest that this domain-specific approach will yield a psychological harvest for each sex, life stage, and relationship type. To the degree that sex-specific adaptive problems are associated with different types of dyads such as mateships, friendships, and kinships, we expect that selection will favor

sex-specific, relationship-specific, and life-stage-specific strategic solutions.

Co-regulation of stress in uterus and during early infancy mediates early programming of gender differences in attachment styles: Evolutionary, genetic, and endocrinal perspectives

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Abstract: According to evolutionary, genetic, and endocrinal perspectives, gender differences are modulated by the interaction between intra-uterine stress, genetic equipments, and the availability of the facilitating environment during the newborn period. The social message of fitness over obstacles during socialization and the discussion of secure/non-secure attachment styles should take into consideration the brain functions, which are altered differently in response to intra- and extra-uterine stress in each gender.

Sexual selection is governed by social selection, and social regulation should also be taken into account. The “helper” hypothesis raised by Del Giudice is exactly this kind of mechanism. Del Giudice’s characterization of the stress-stricken male as being more aggressive, more dominant, and more competitive may be considered as the early selection of boys to raise the cutoff point of survival, leaving only the highly fit individuals for adult stages when same-sex competition determines the odds for reproduction. This is buttressed by a series of studies in the obstetric literature from this decade, indicating the greater vulnerability of male fetuses as compared to female fetuses (Anderson & Doyle 2008; Deulofeut et al. 2007; Ingemarsson 2003; Jones et al. 2005; Pressler & Hepworth 2002).

Evolutionary logic may also explain the observed phenomenon. Ingemarsson (2003) offers a view of the fetus as basically female. The masculinization process is regarded as an excess process that brings an additional set of risks to the fetuses’ development. This could be interpreted similarly to the evolutionary Handicap Principle, according to which, excessive survival risks characterizing animals convey a social message of fitness over obstacles (Cellerino & Jannini 2005).

It may be argued that males have a genetic disadvantage because they are equipped with two distinct sex determination chromosomes (XY) instead of the parity backup that exists in females, who have two of the same kind of sex determination chromosomes (XX). Ingemarsson (2003) claims that in comparison with the X chromosome, the Y chromosome has degenerated through evolution and includes only a small number of genes, all of which are heterozygote. Having only one copy of each gene means that every “bad” allele is expressed.

A mediating factor for the gender genetic differences may be stress (Als 1986; Als et al. 1994; 2004; Heckman et al. 2005). Phillips (2007) claims that antenatal stress has life-long effects that vary among men and women, and suggests the possibility of gender dimorphic environmental fetal programming. Davis and Emory (1995) show gender dimorphic stress reaction in healthy, full-term infants prior to extensive socialization.

Therefore, I suggest that these differences found in the response to stress are constructed and programmed in utero and continue to develop differently during the socialization

process, so that the factor of stress, as suggested by Del Giudice, only secondarily affects gender differences, interacting after birth with this early programming. Meaney and Szyf (2005) examined this issue with an animal model and found that increased levels of pup licking/grooming by rat mothers in the first week of life alter the DNA structure at a glucocorticoid receptor gene promoter in the hippocampus of the offspring. These effects are far more robust in females, suggesting that girls may be better equipped genetically but may also have a greater vulnerability to non-supportive environmental signals, and that this is the manner in which the non-secure girl develops an anxious attachment style, as claimed by Del Giudice.

Findings from Francis et al.’s (2002) animal studies are in accordance with the above. Francis et al. found that in the central nucleus of the amygdala and bed nucleus of the stria terminalis (which encompasses discrete, anatomically separate populations of oxytocin and vasopressin receptors; Huber et al. 2005), oxytocin receptors binding – which decreases anxiety and stress, and facilitates social encounters, maternal care, and the extinction of conditioned avoidance behavior – was increased in adult females, but not adult males, that had received high levels of maternal licking and grooming as pups. Conversely, amygdala vasopressin receptor binding – which is involved in modulating fear and aggression – was increased in males, but not females, that had received high levels of maternal licking and grooming. This further explains the manner in which the non-secure boy, in order to appear robust in the environment, develops – as suggested by Del Giudice – an avoidant attachment style.

The attachment styles may be understood not as gender differences so much as differences in the gender construct of society and its interaction with the genetic fetal equipment for dealing with intra- and extra-uterine stress, leading female offspring to be better fitted to deal with social pressure by seeking bonding and male offspring to be better fitted to deal with social pressure by avoiding collision. Therefore, finally, the gender effect could be explained by socialization: It could be that mothers care for boys and girls differently, according to certain social gender roles, as well as certain cues coming from the infant which are already formatted in utero.

The social context of my assumptions suggests that the interplay of sex hormones and stresses is an interfering factor in the aromatization process of masculinization, whereas Del Giudice refers to sex hormones as mitigating stress. In the face of contradicting results and theories, the concept of *co-regulation* may be considered (Als 1986; Goldstein Ferber 2008; Hofer 1994). That is, in situations of good co-regulation between neurobehavioral subsystems in utero and in the newborn period, a boy may benefit from the interplay between these subsystems, including the development of the sex hormones; whereas, in cases where such a co-regulation state is lacking, especially in the deregulation of the development of the hypothalamic-pituitary-adrenal (HPA) responses, the interplay may turn into an interfering process and result in difficulties as early as during gestation.

Additional perspectives suggest that within a regulatory process in early parental interactions, with the offspring’s cues already shaped in utero, the dyadic reciprocal regulation between the child and his or her parents in these early interactions (Archer 1996; Cho et al. 2007) may determine (1) whether the boy or the girl develops a secure attachment style, and (2) whether the boy or the girl develops his or her gender’s typical disadvantage in attachment style (i.e., either avoidant or anxious).

Therefore, I suggest that the level of fitness between the gender-type cues shaped during gestation, the ability of the parents to reciprocate with those cues, and the social interest the parent represents, work in feedback circuits. Having said that, it seems that socialization and the development of attachment styles are processes provided with windows of