

Modeling, Simulating, and Simplifying Links Between Stress, Attachment, and Reproduction

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Abstract

John Bowlby's use of evolutionary theory as a cornerstone of his attachment theory was innovative in its day and remains useful. Marco Del Giudice's paper extends Belsky et al's. and Chisolm's efforts to integrate attachment theory with more current thinking about evolution, ecology, and neuroscience. His analysis would be strengthened by (1) using computer simulation to clarify and simulate the effects of early environmental stress, (2) incorporating information about non-stress related sources of individual differences, (3) considering the possibility of adaptive behavior without specific evolutionary adaptations, and (4) considering whether the attachment construct is critical to his analysis.

One of the key innovations in Bowlby's attachment theory was to replace Freud's drive theory with a motivational model based on control systems theory. Concerned that this might seem like replacing one bit of magic with another, he turned to evolutionary theory to explain how an infant could be endowed with an attachment control system. Citing many examples he argued that evolution shapes not only physical structures but also species learning abilities. Attachment is not an instinct or a preprogrammed blueprint ready to be activated by critical experiences. It is capacity to construct a behavioral system through the interaction of species specific learning abilities with information available in the organization of what he called an average expectable caregiving environment. This was an innovative solution to a difficult problem and continues to serve well despite the fact that Bowlby's emphasis

on the value of attachment behavior as an adaptation to predation pressure today seems more "classical" than modern (Waters 2008).

Modeling Stress and Adaptation.

Early exposure to environmental stress is central to Del Giudice's analysis. Yet he says little about what constitutes relevant stress and, more importantly, how its characteristics over time might bear on the costs and benefits of different reproductive strategies and patterns of parental investment. Simply put, the effectiveness of behavioral strategies depends on context. Imagine a behavioral ecologist examining avian foraging strategies without considering the implications of foraging for food that is plentiful or spare, concentrated or dispersed, consistently or intermittently available, etc. In the case of early experience, attachment, and reproduction, it

seems likely that the costs and benefits of any particular strategy would depend very much on the incidence, persistence, duration, mortality risk, and other parameters of the environmental stress as well as on key features of a species' life history strategy. Formalizing the properties of a stressful environment as computational models and using simulation to investigate the costs and benefits of different mating and parental strategies through a wide range of such parameters would enrich Del Giudice's analysis, exploring the robustness of his hypotheses and predictions and possibly highlighting some interesting circumstances that deserve special attention. There are a number of existing approaches that might be adapted for this purpose, for example simulations concerned with: the evolution of protection periods (Bullinaria 2008); the growth of social complexity (Doran 1994); and simulation of secure-base behavior (Petters 2006a).

Attachment Patterns Without Stress.

In light of Del Giudice's emphasis on the role of stress in shaping attachment patterns, it is useful to consider that individual differences can arise without stark ecological stressors. A dismissing or preoccupied adult or an avoidant or resistant baby is not necessarily one whose experience has been pathological. Temperament, garden-variety diversity in caregiving experiences, and idiosyncratic interpretations of personal experience guarantee, even in benign environments, a rich diversity of attachment patterns within individuals and across time. This point is underlined in computational experiments (e.g., Petters, 2006b) in which distinct attachment styles can arise merely from the action of positive feedback loops acting upon small random differences in the environment. Del Giudice's analysis would be considerably strengthened if it were expanded to address conceptually and in terms of physiological mechanisms, how, in light of these non-stress related sources of individual differences, the attachment system's sensitivity to stress could be tuned so it is neither insensitive to significant stressors nor overly responsive to minor perturbations.

The Adaptationist Fallacy.

In Del Giudice's analysis, the effects of early environmental stress on attachment include effects on attachment related physiology. These are interesting and testable hypotheses. However, it is worth keeping in mind that adaptive behavior does not always imply an underlying "adaptation". As Bowlby (1969) argued, attachment relations can be repre-

sented at a variety of levels, from the organization of underlying physiological systems, to reactive fixed action patterns, to mental representations (internal working models) and natural language (Bowlby 1969). Accordingly, adaptive behavior might also be explained by cognitive processes - allowing early experience to shape mental representations and social perception in ways that impact adaptively on courtship, mating and parenting. Nor are these two routes to decision making independent or mutually exclusive. Designing computer simulations which integrate lower level reactive mechanisms with simple reasoning processes (e.g., Petters 2006a, chapter 4) seems a promising approach to exploring the roles of evolved adaptations and rational adaptive behavior.

Is Attachment Critical to The Argument?

As Del Giudice notes, there are two distinct traditions in attachment assessment - one based on infant observation and adult interviews and the other based on adult self report questionnaires. Both traditions are inspired by Bowlby's theoretical work and both use similar terminology to describe the constructs they measure, describing individuals as secure versus anxious or insecure, and as anxious, avoidant, ambivalent, etc. Both approaches have produced useful empirical results. However, measures from the two traditions do not yield correlated scores and have rather different patterns of stability and change, different behavioral correlates, and different relevance to courtship, marriage, and parenting (Waters et al., 2002). Although acknowledging some of the difficulties here, Del Giudice tends to treat similarly named measures as if they were interchangeable. This is too much to expect readers to track and undermines the conceptual and empirical foundations of key elements in his analysis. In addition, the correlations underlying links between types of insecure attachment and traits such as aggressive/self-aggrandizing or fearful, passive, and withdrawing, etc. are typically very small or inflated by considerable method variance. Such low correlations, and the fact that they represent data from different measures and different age groups, substantially attenuate the empirical link between attachment and the patterns of mating and parental behavior at the heart of Del Giudice's analysis. We wonder whether the link between early stress and later reproductive behavior might be better argued by having early experience directly affect approach and avoidance systems - without mediation through attachment.

Conclusion

Del Giudice's analysis of links between early stressful environments, attachment, and reproduction illustrates some of the advantages, and some of the difficulties, of coordinating current attachment theory with current ideas about evolution, ecology, and life history strategies. There is no doubt that John Bowlby would have appreciated such efforts and looked forward, as we do, to further advances along these lines.

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