

Evolutionary Psychology

Series Editors: Todd K. Shackelford · Viviana A. Weekes-Shackelford

David C. Geary

Daniel B. Berch *Editors*

Evolutionary Perspectives on Child Development and Education



Springer

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Evolutionary Perspectives on Child Development and Education

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Preface

The chapters in this volume stem from a fall 2013 conference on evolutionary approaches to educational issues. The conference was funded by the American Educational Research Association and cosponsored by the Evolution Institute and brought together anthropologists, biologists, educational researchers, and psychologists to present, discuss, and vet research and ideas on how an evolutionary approach can enhance educational outcomes and inform educational policies. Our focus was not simply on the three *Rs* (reading, writing, and arithmetic) but also on the social dynamics and relationships that emerge in classroom and educational settings. Given that the bulk of education occurs during development, we decided to expand the scope of the volume to include broader developmental issues, not simply educational ones, and thus invited a few other scholars to contribute chapters. The result, we believe, is a unique and informative collection that highlights the contributions, debates, and promises of an evolutionary framing of children's development and their success in school.

The volume is organized into three parts. The first part includes five chapters that broadly focus on children's natural exploratory behaviors and play and the implications for their cognitive and academic development. Bjorklund and Beers open with an introduction to evolutionary developmental psychology and the implications for our understanding of how evolution has shaped children's natural learning biases. They then use this approach to illustrate how well-intended attempts to accelerate young children's academic learning may misfire and cause unintended and deleterious consequences. Lancy's chapter reinforces Bjorklund and Beer's approach by nicely illustrating children's self-directed learning in traditional societies. He makes a cogent argument that adult-directed teaching in these contexts is rare and the concept itself is foreign to adults in these societies. Gray argues that Lancy's observations about child-directed learning should be taken to heart and used in modern educational settings, that is, that this approach is sufficient for children to learn the three *Rs* needed to be successful in the modern world.

Pellegrini's chapter focuses on children's play and exploration with objects. He proposed that these activities are not simply a way to learn about objects and how they can be used, but may also contribute to behavioral and cognitive flexibility as well as facilitate children's social development. He also cautions that "play" as defined by ethologists does not necessarily have the same meaning as "play" in the context of an educational goal, and thus the outcomes of these activities may differ. Toub and colleagues close the first part with a thoughtful discussion of how children's bias to engage in play can be used in educational settings to facilitate their learning of the three *Rs*. Their guided play may also help to reconcile debate within evolutionary educational psychology, specifically, the amount of adult-directed learning needed to acquire evolutionarily novel academic competencies.

The second part includes three chapters that focus on children's social relationships and the evolutionary functions of their social behavior. Hawley opens with a discussion of eight myths or incorrect assumptions most people make about evolutionary approaches to human behavior. As with Pellegrini, she notes that part of the problem is that biologists and psychologists often use the same terms, such as altruism, but mean different things. She aptly explains the differences and then discusses how children's social behavior, even behavior that many would consider prosocial, is really about gaining social influence and access to material resources. These implicit goals can be achieved by being "nice" or being a bully, but work best with a mix of prosocial and bullying behaviors. Volk focuses on the latter and details the social functions and benefits of bullying, aspects of this behavior that only make sense in evolutionary context—this of course is not the same as condoning the behavior, only more fully understanding it. He correctly notes that bullying is not confined to children and adolescents and can take many forms and lead to better control of many different types of resources, from social dominance to material goods.

The second part closes with Shaw tackling the related question of "fairness," specifically, the moral framing of how resources are divided among group members (e.g., equal amounts for everyone or proportional amounts based on contributions). The two previous chapters make it clear that differential and unequal access to resources is the norm and yields benefits to more dominant individuals. The moral stance that everyone should receive an identical and equal share of resources makes sense from the perspective of those who would otherwise get fewer resources. The issue goes deeper than this, however. Even people (children and adults) who have control over how resources are distributed often opt for an equal distribution, especially when there is an audience. There must then be some benefit that outweighs the loss of foregone (shared) material resources. Shaw makes an intriguing case that at least part of the benefit derives from social dynamics, more precisely, signaling that one is not attempting to gain the favor of specific others in an attempt to form a friendship or larger alliance with them. The shifting of friendships and wider alliances has clear implications for the balance of social power within a group and thus is a potential source of conflict. In this view, it is not surprising that people try not to trigger this conflict by distributing resources "unfairly."

The third part brings us back to learning and cognition, but now focuses on specific, evolved biases in how people process and remember information and how these biases can help or hinder learning in formal school settings. Geary and Berch provide a broad overview of these issues and focus on differences between evolved abilities, such as language, and non-evolved abilities that are built from them, such as reading. The distinction gets at the core of current debate in evolutionary educational psychology, that is, whether the cognitive biases and behaviors (e.g., play and exploration) that allow children to flesh out and adapt evolved abilities to local conditions are sufficient for learning the myriad of non-evolved competencies that children are expected to learn in modern schools. These of course are issues covered in the first part of the volume. The question remains to be resolved, and whatever the final answer, the active debate highlights the vibrancy of this emerging field.

Nairne highlights one such bias; specifically, that our attentional and memory systems are attuned to detecting and remembering living things and things that potentially signal contagion. These are things, including potential predators and prey, that had clearly had significant consequences during our evolutionary history. The chapter and Nairne's work generally also nicely highlights the value added by an evolutionary perspective, in this case, informing controlled experiments on human memory and discovering a strong bias that eluded atheoretical memory researchers for more than a century. Sinatra and Danielson touch on another evolved bias that ironically interferes with people's learning about and deep understanding of evolution. People certainly have an interest in the natural world, as demonstrated by Nairne's work and discussed by Geary and Berch, but the evolution of this interest is utilitarian. We have evolved to attend to other species, because they are usable as food or to be avoided as potential predators, but these implicit folk-biological biases are not the same as scientific biology. Sinatra and Danielson do a masterful job of highlighting how our folk-biological biases actually interfere with the scientific understanding of evolution; the same interference is common for folk physics and scientific physics and no doubt for folk psychology and scientific psychology.

Sweller's chapter nicely integrates decades of research on cognitive load theory with evolutionarily informed instructional approaches. It has been known for some time that working memory constraints limit the ease and rate of learning in school, and Sweller and his colleagues have been at the forefront of designing and testing educational approaches to effectively deal with this constraint. In their chapter, they explicitly discuss how cognitive load theory and associated empirical findings fall neatly into place when set up in evolutionary context; specifically, when applied to evolutionarily novel learning as contrasted with fleshing out evolved cognitive domains. Kauffman and Wilson close the third part with description of their novel work with the Regents Academy; specifically, using evolutionary principles that foster social cooperation to create a learning environment for students at risk for dropping out of high school. They demonstrate that broadening the conceptualization of schooling as a social as well as academic environment can substantively improve the academic and social competencies of at-risk students.

Evolutionary Perspectives on Child Development and Education pulls together the latest theoretical contributions and research reviews of many of the leaders in the intersections between evolution, development, and education. The volume provides a compelling case for how an evolutionary perspective can fruitfully inform our understanding of children's development and their schooling in traditional and modern contexts.

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David C. Geary is currently a curators' professor in the Department of Psychological Sciences and the Interdisciplinary Neuroscience Program at the University of Missouri. His work spans a broad range of topics from children's mathematical cognition and development to the evolution of sex differences. He's written four sole authored books, *Children's Mathematical Development* (1994), *Male, Female* (1998, 2nd edition, 2010), *Origin of Mind* (2005), and *Evolution of Vulnerability* (2015), and one coauthored book, *Sex Differences* (2008) and is coediting the five-volume *Mathematical Cognition and Learning* series, the first two volumes of which have been released: *Evolutionary Origins and Early Development of Number Processing* (2015) and *Development of Mathematical Cognition: Neural Substrates and Genetic Influences* (2016). In addition, he has published about 250 journal articles and chapters and has had extensive funding from the National Institutes of Health and the National Science Foundation for his empirical research. He served on the president's National Mathematics Advisory Panel from 2006 to 2008 and chaired the learning processes task group and was appointed by President Bush to the National Board of Advisors for the Institute of Education Sciences, US Department of Education (2007–2010). Geary is a fellow of the American Association for the Advancement of Science, received a National Institutes of Health MERIT Award, is a corecipient of the G. A. Miller Award from the American Psychological Association, and has been a visiting scholar at the Chinese University of Hong Kong and the Institute of Advanced Study, Durham University.

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evolutionary perspectives on education. He is senior editor of the book *Why Is Math So Hard for Some Children?* and senior editor of the five-volume *Mathematical Cognition and Learning* series. He is also the lead founder of the international Mathematical Cognition and Learning Society. Among other honors, Berch received the NIH Award of Merit, was elected fellow of the American Psychological Association's Division of Experimental Psychology, served as an ex officio member of the US Department of Education's National Mathematics Advisory Panel commissioned by President George W. Bush, and was elected to the Evolution Institute's Scientific Advisory Board (and chairs its Education Subcommittee). He is coauthor (with David Geary) of an article entitled "Evolutionary Approaches to Understanding Children's Academic Achievement" published in Wiley's online reference work, *Emerging Trends in the Social and Behavioral Sciences*.

Part I
Development, Play, and Exploration
in Early Learning

Chapter 1

The Adaptive Value of Cognitive Immaturity: Applications of Evolutionary Developmental Psychology to Early Education

David F. Bjorklund and Courtney Beers

Few educated people today would argue with the proposition that humans' hegemony over the Earth is a result of their enhanced intelligence and that this intelligence evolved from cognitive abilities of our great-ape ancestors over the course of the last 5–7 million years (Tomasello, 2014). Moreover, *Homo sapiens*, more than any other species, transmit nongenetic information from one generation to the next via processes of learning, in many cases acquiring information and concepts that have no deep evolutionary history (Geary, 2005). Stated slightly differently, humans are the most educable of species (Bjorklund, 2007a), and this education, occurring within a cultural milieu, happens throughout life beginning in infancy. Although it is adults who produce the most useful artifacts, establish and run cultural institutions, and whose cooperation and competition permit the continuation and advancement of society, the intellectual and social abilities used to achieve these outcomes develop over infancy and childhood and also evolved over the course of many millennia. From this perspective, children's universal cognitive abilities were subject to the forces of natural selection, just as the cognitive abilities of adults were. According to the *cognitive immaturity hypothesis* (Bjorklund, 1997, 2007b; Bjorklund & Green, 1992), infants' and young children's cognitive and perceptual abilities are well-suited for their particular time in life and are not simply incomplete versions of the adult form.

Humans, more so than any other species, take a long time to reach maturity (Bogin, 1999). Although primates in general have extended juvenile periods, this trend is exaggerated in *Homo sapiens*. The closer a species' common ancestor is

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