PSYCHOLOGY AND COGNITIVE SCIENCES
Openventio PUBLISHERS

ISSN 2380-727X Open Journal http://dx.doi.org/10.17140/PCSOJ-2-114

Review

*Corresponding author
Robert Eme, PhD
Department of Clinical Psychology
Illinois School of Professional Psychology at Argosy University
Schaumburg Campus
1000 N. Plaza Drive
Schaumburg IL 60173, USA
Tel. 847-969-4943
E-mail: reme@argosy.edu

Volume 2 : Issue 2
Article Ref. #: 1000PCSOJ2114

Article History
Received: April 25th, 2016
Accepted: July 29th, 2016
Published: July 29th, 2016

Citation
Eme R. Evolutionary roots of the sex difference in the prevalence of severe anti-social behavior: A literature review. *Psychol Cogn Sci Open J.* 2016; 2(2): 49-53. doi: 10.17140/PCSOJ-2-114

Evolutionary Roots of the Sex Difference in the Prevalence of Severe Anti-Social Behavior: A Literature Review

Robert Eme, PhD*

Department of Clinical Psychology, Illinois School of Professional Psychology at Argosy University, Schaumburg Campus, 1000 N. Plaza Drive, Schaumburg, IL 60173, USA

ABSTRACT

It has been well-established that males exceed females in the most severe manifestations of anti-social behavior. The biological and environmental causes of this sex difference has received considerable attention. However, the evolutionary roots of this behavior has received far less attention. This review presented the evolutionary perspective on the reasons for the sex difference in severe anti-social behavior utilizing a life-history framework approach which is a branch of evolutionary theory that addresses the way organisms allocate time and resources to the various activities that comprise their life cycle.

KEYWORDS: Evolutionary theory; Anti-social behavior; Life-history framework.

ABBREVIATIONS: EDP: Evolutionary Developmental Psychopathology; LHS: Life-History Theory.

INTRODUCTION

Tremblay[1] observed that of all the risk factors for the development of anti-social behavior, the sex of the child (i.e., maleness) is by far the most robust predictor. Indeed, the most pernicious forms of anti-social behavior such as chronic physical aggression, violence, and life-course persistent anti-social behavior are engaged in almost exclusively by males.[2] The explanation of this massive sex difference from the perspective of evolutionary developmental psychopathology (EDP) takes two forms: *proximate* and *ultimate.*[3] EDP is a branch of evolutionary psychology which is commonly defined as the application of the principles of Darwinian evolution to explain contemporary human behaviors and psychological traits.[3] *Proximate* explanations focus on present processes/causes of how a behavior or organism functions. *Ultimate* explanations focus on the past evolutionary forces that helped shape the proximate processes.[4,5] For example, take a behavior such as the cry of a human infant. The *ultimate* explanation of this behavior is that it was selected by evolution because it elicited maternal care and thus increased the likelihood that the infant would survive. A *proximate* explanation is that circumstances such as cold, hunger, physical separation from the mother triggers this behavior. In other words, *ultimate* evolutionary explanations are concerned with *why* a behavior exists. Present *proximate* explanations are concerned with *how* a behavior works.

Until recently this evolutionary perspective has received relatively little attention.[6] Therefore there is a need to look beyond the proximal biologically-based mechanisms explanations for the massive sex difference in the severest forms of anti-social behavior, which was recently and comprehensively reviewed,[2] and to consider their distal ultimate mechanisms.[7] There are of course environmentally-based learning processes that contribute to the sex difference. For a recent discussion of these processes the interested reader should consult the work of Russell and colleagues.[8]

ISSN 2380-727X Open Journal http://dx.doi.org/10.17140/PCSOJ-2-114

The paper will begin by briefly presenting the two cornerstone concepts of Darwinian evolution, *natural selection* and *adaptation*, that are essential for understanding the application of evolutionary theory to the study of psychopathology.[3] It will then draw upon Del Giudice's life-history framework for explaining the ultimate causes of the massive sex difference in the severest forms of anti-social behavior.[3,9-11]

NATURAL SELECTION

Natural selection is the cornerstone concept that explains why evolution occurs. Its occurrence is governed by three mechanisms. First, individuals in a population must differ from one another in their physical or behavioral traits. Second, some of these difference traits must affect an individual's ability to successfully reproduce. Third, the traits must be heritable, i.e., capable of being transmitted to the next generation. This combination of heritable variation and differential reproduction based on this variation results in traits becoming more common in a population (i.e. they are *selected* for because of their positive effects on reproductive success or *fitness*). A special case of natural selection is *sexual selection* which posits that differences between the sexes in physical and behavioral traits can occur because these traits facilitate reproductive success either by making individuals compete more effectively with rivals or by making individuals more attractive to potential mates.[12,13]

ADAPTATION

Natural and sexual selection produce incremental modifications in various traits that enhance survival and reproductive success. These traits, which can be both physical and psychological, are termed *adaptations*. Psychological adaptations, which govern mental and behavioral processes are termed *psychological mechanisms*. Each mechanism has been designed by natural/sexual selection to address adaptation to specific domains of the physical and social world since what is adaptive can differ markedly depending upon the domain. Importantly, all adaptations have costs as well as benefits. Hence for a trait to be adaptive it does not have to be cost free, but it only needs to have an overall positive result for enhancing fitness. Also, although specific adaptations have proven successful in the past, they may not be as successful in the current environment.

Lastly, it is important to note that although evolutionary explanations of behaviors such as violence are sometimes thought to be at odds, or in competition with learning explanations involving environmental and cultural explanations, evolutionarily-based psychological mechanisms are quite sensitive to learning, environmental and learning contexts as they interact with and are shaped by such factors.[14,15]

LIFE-HISTORY STRATEGIES THEORY

Life-history strategies theory (LHS) is a branch of evolutionary theory that addresses the way organisms allocate time and resources to the various activities that comprise their life cycle. Because all organisms live in a world of limited resources, all the activities that contribute to an organism's evolutionary fitness will typically involve both benefits and cost and thus inevitably engender trade-offs between different choices. Natural selection favors organisms that organize activities that optimize resource allocation. Different allocation decisions result in different life-history *strategies.* Strategy in the context of LHS refers to an organism's phenotype, resulting from the integration of a suite of morphological, physiological, and behavioral traits that have enhanced fitness. Note therefore that *strategy* used in the evolutionary sense does *not* refer to conscious planning in pursuit of a goal, but to the suite of traits that evolved to maximize *fitness*.[4] Thus in the evolutionary sense, for example, unconscious organisms such plants are understood to have evolved strategies in the same sense as humans have. These different strategies can be described at the broadest level of analysis by a single dimension from *fast* to *slow*. Because the fast-slow continuum applies to differences not only between species but also to individual differences within a species, individual differences in various behaviors and traits can be understood as reflecting variation on the fast-slow continuum.

FAST-SLOW CONTINUUM

As previously indicated, all life-history strategies involve trade-offs. Thus, in the fast-slow continuum of life-history variation, there is the *slow* strategy of slow growth and late reproduction that correlates with long life span, low juvenile mortality, higher parental investment but with fewer offspring of higher quality. In contrast, the *fast* strategy of fast growth and early reproduction correlates with larger numbers of offspring, reduced parental investment in each but shorter life-span and increased juvenile mortality. Fast life-history strategies tend to be high risk as they focus on maximizing mating opportunities and thus typically involve more risky and aggressive behaviors than slow life-history strategies. Thus, these strategies make it optimal to discount future rewards and favor short-term gains over long term benefits that can be gained by engaging in risky behaviors. In contrast, the *slow* strategy that favors future reproduction must maximize the chances of survival and remaining healthy and thus is risk aversive. Furthermore, the difference in trade-offs in sexual reproduction for males and females in most species (which will subsequently be discussed) results in men pursuing a *fast* life strategy and women pursuing a *slow* life strategy. This difference in strategies in turn helps explain the sex difference in the severest forms of anti-social behavior.

SEX DIFFERENCES IN LIFE-HISTORY TRADE-OFFS

First, by way of prologue, recall that the evolutionary goal of reproductive success is measured in terms of the number of offspring who survive to adulthood and who themselves reproduce.[16] Therefore, the fundamental asymmetries in sexual reproduction will dictate the different strategies the sexes use to achieve this goal. These asymmetries involve the long period

ISSN 2380-727X Open Journal http://dx.doi.org/10.17140/PCSOJ-2-114

of gestation for women, the larger investment in pregnancy and lactation, and the shorter window for reproductive success that ends with menopause. In contrast, men can potentially sire many offspring in a very short time and for a more extended period of time. For example, it is estimated that Moulay Ismail the Bloodthirsty (1672-1727) of Morocco fathered 888 children.[17] This fundamental asymmetry dictates the trade-offs that both sexes make between mating and parenting investment to maximize reproductive fitness. Namely, males with the higher potential rate of reproduction tend to invest more in competing for mates than in parenting, and females with the lower rate of reproduction tend to invest more in parenting than in competing. This occurs because members of the sex with the higher reproduction rate can rejoin the mating pool more quickly than can members of the opposite sex and thus can have more offspring if they compete for mates rather than parent. For women however, who can usually have one only one child at a time, there is far less benefit from mating with multiple partners and much more from parental investment in their more limited number of offspring. This is especially true because women (historically and thus evolutionarily) have been more necessary for the survival of their children than men. Since males on average have benefited more from greater efforts in mating than parenting compared to females, this increased the intensity of the mating effort which in turn increased sexual selection for physical and psychological traits involved in male-male competition that enhanced reproductive success. The physical traits which enhanced reproductive success include the sex difference in physical size, upper-body musculature, and higher metabolic rates and the psychological traits include risk taking, dominance seeking, and physical aggression.[6,12-14,18,19] Thus men have competed intensely for top rank in a dominance hierarchy, as the payoff in a high mating effort eclipses the risks involved in competitions that can involve serious injury and death.[9]

For females, intrasex competition for mates also occurs, taking the form of relational aggression such as gossip or other strategies for disrupting the social networks of competitors.[20] However, it does not typically take the form of engaging in risky behaviors (unless it would be necessary for protecting offspring from harm) because the costs of engaging in these behaviors outweigh the benefits of increased reproductive success.[20] Thus, it is vital that she stays alive. If she dies the offspring in whom she has already invested will likely die with her. It is the critical dependence of the young on her for their survival that means that she must stay away from danger and the possibility of injury or death.[17]

In summary, although an outcome of death or severe injury as a result of violent intrasex competition is not appealing to either sex, the trade-off in reproductive success measured in terms of surviving offspring favors males.[20] For the male, although severe injury or death obviously markedly diminishes or removes the possibility of reproductive success, the reproductive success he has achieved to date remains uncompromised as he can rely on the offspring's mother to insure their survival.[20] For the female however, severe injury or death has consequences that are much more dire for reproductive success. Not only is the possibility of future offspring precluded, but the survival of existing offspring is placed in much greater jeopardy. In short, for a child "the consequences of losing a mother very early in life are catastrophic".[20]

This sex difference in life-history trade-offs in reproduction has set the stage for explaining the sex difference in anti-social behavior.

ULTIMATE EVOLUTIONARY EXPLANATION FOR THE SEX DIFFERENCE IN THE SEVEREST FORMS OF ANTI-SOCIAL BEHAVIOR

A crucial understanding of the evolutionary developmental psychopathological perspective (EDP) on anti-social behavior involves the recognition that the core concept of *adaptation* has different meanings for EDP and developmental psychopathology.[9] In EDP, as previously discussed, *adaptation* refers to traits that evolved because of their effects on survival and reproductive success. In contrast, in developmental psychopathology, *adaptive* refers to traits/behaviors that enhance an individual's well being, cooperation, social integration. Hence, given these different notions of adaptation, the result can be that evolutionarily adaptive behaviors (i.e., fitness enhancing) can result in *maladaptive* outcomes from the perspective of developmental psychopathology. In other words, evolutionarily adaptive *psychological mechanisms* may yield *maladaptive* outcomes (i.e., mental disorder) at an individual level even when the mechanisms are functioning "normally" from an evolutionary perspective.[3,9]

This is theorized to happen in four ways.[3,9] First, evolutionarily adaptive traits may increase vulnerability to dysfunction. All evolutionarily adaptive traits, no matter how well designed, are vulnerable malfunctions, breakdowns, and failures. For example, some configurations of personality traits within the adaptive range (e.g., schizotypy or autistic-like personality) may become especially vulnerable to mental disorder when coupled with deleterious genetic mutations or brain-damaging infections. Second, traits that were adaptive in ancestral environments may result in a mental disorder in current environments. For example, it has been hypothesized that some forms of psychopathy were adaptive in ancestral environments because they allowed psychopaths to increase their reproductive success by exploiting others. However, in the current environment, the anti-social behavior characteristic of psychopathy is correctly regarded as a mental disorder. Third, evolutionarily adaptive traits may yield individually maladaptive outcomes. This can occur because a trait that is evolutionarily adaptive when averaged across *all* individuals may be maladaptive in a *particular* individual. For example, defense mechanisms, which of necessity have been designed by natural selection to yield a high rate of false positives (mistakenly activated when no threat is present) in order to avoid catastrophic false negatives (failure to activate when

ISSN 2380-727X Open Journal http://dx.doi.org/10.17140/PCSOJ-2-114

perhaps lethal threat is present), can become mental disorders in current environments when they take the form of panic attacks, excessive anxiety, and phobias. Fourth, traits that were adaptive in ancestral environments may be expressed at maladaptive levels in current environments. For example, impulsivity involving a quick response to danger may have increased chances for survival. However, in the current environment, the extreme expression of impulsivity characteristic of Attention-Deficit/Hyperactivity Disorder is correctly regarded as a mental disorder. This last theory provides the most cogent explanation for the sex difference in the severest form of anti-social behavior, as the following discussion will delineate.

SEX DIFFERENCE IN THE SEVEREST FORMS OF ANTI-SOCIAL BEHAVIOR

Even though fast life-history traits involving risky behaviors have been evolutionarily adaptive for males within a certain range as they facilitate success in male-male competition for mates, these traits may become maladaptive in an individual if they exceed the limits of that range. Indeed, an extreme expression of an otherwise adaptive trait, is the definition of psychopathology from the perspective the discipline of *Developmental Psychopathology,* the dominant paradigm in the study of the origins and maintenance of psychopathology.[21] There is a robust consensus that almost no forms of mental disorder constitute clearly demarcated, qualitatively distinct categories. Virtually all disorders are conceptualized as representing an extreme expression of a normally distributed trait or traits. Fast life-history strategies characterized by impulsive, exploitative, or aggressive tendencies which have been evolutionarily adaptive for males can become maladaptive when they are expressed at an extreme level as adaptations to current environments that are *hostile* and *unpredictable* and then generalized to more benign contexts.[3,22]

Evolutionary developmental psychopathology posits a developmental calibration of slow *versus* fast life-history strategies as a response to various environmental factors.[3] *Hostile* environments characterized by violence, harsh parenting, death of other individuals within the environment, etc., tend to trigger fast life-history risky strategies emphasizing present gain and discounting future goals since the very nature of the environment suggests that a future orientation is irrelevant. Similarly, *unpredictable* environments characterized by erratic neighborhood conditions, fluctuating economic conditions, changes in family composition, etc., also tend to elicit fast life-history risky strategies for the same reasons as those cited for a *hostile* environment. Namely, since in environments that fluctuate unpredictably and randomly there can be no reliable forecast of the future, short-term risky strategies are more adaptive.

SUMMARY

In sum, there is a large sex difference favoring males in fast life-history evolutionary strategies involving risky, aggressive behaviors. The sex difference in these strategies continues to the present time since the human species has only recently (in evolutionary time) emerged from the ancestral environment in which these strategies were adaptive. Therefore, these strategies, even though it is possible that they are becoming less adaptive (e.g., see previous discussion on psychopathy), by and large tend to be conserved.[23] Furthermore, since males are much more likely to engage in a fast life-history strategy for evolutionary reasons, they are much more likely to engage in risky, aggressive behaviors in hostile and unpredictable environments for which they continue to be somewhat adaptive. These behaviors become maladaptive when they are expressed in an extreme form in other less pathological environments. Therefore, the large sex difference in the severest forms of anti-social behavior represents the continuation into the present of the large sex difference of fast life-history strategies since it is precisely these aggressive, risky strategies that are triggered by hostile, unpredictable environments that are important determinants of anti-social behavior.

REFERENCES

1. Tremblay R. Developmental origins of disruptive behavior problems: The 'original sin' hypothesis, epigenetics and their consequences for prevention. *J Child Psychol Psychiatry*. 2010; 51: 341-367. doi: 10.1111/j.1469-7610.2010.02211.x

2. Eme R. Sex differences in the prevalence and expression of externalizing spectrum disorders. In: Beauchaine T, Hinshaw S, eds. *Oxford Handbook of Externalizing Spectrum Disorders*. New York, USA: Oxford University Press; 2016: 239-266.

3. Del Giudice M, Ellis B. Evolutionary foundations of developmental psychopathology. In: Cicchetti D, ed. *Developmental Psychopathology*. 3rd ed. New York, USA: Wiley; 2016: 1-58.

4. Daly M. Interpersonal conflict and violence. In: Buss D, ed. *The Handbook of Evolutionary Psychology.* 2nd ed. Hoboken, NJ, USA: Wiley; 2016: 669-683.

5. Eisner M, Malti T. Aggressive and violent behavior. In: Lamb M, Lerner R, eds. *Handbook of Child Psychology and Developmental Science*. 7th ed. New York, USA: Wiley; 2016: 795-841.

6. Byrd-Craven J, Geary D. An evolutionary understanding of sex differences. In: Ryan M, Branscombe N, eds. *The Sage Handbook of Gender and Psychology.* New York, USA: Sage Publications; 2013: 100-114.

7. Leckman J. Understanding developmental psychopathology: How useful are evolutionary perspectives. In: Cicchetti D, ed. *Developmental Psychopathology.* 3rd ed. New York, USA: Wiley; 2016: 138-165.

8. Russell M, Robins S, Odgers C. Developmental perspectives: Sex difference in anti-social behavior from childhood to adulthood. In: Gartner R, McCarthy B, eds. *The Oxford Handbook of Gender, Sex, and Crime*. New York, USA: Oxford University

ISSN 2380-727X Open Journal http://dx.doi.org/10.17140/PCSOJ-2-114

Press; 2014.

9. Frankenhuis W, Del Giudice M. When do adaptive developmental mechanisms yield maladaptive outcomes? *Dev Psychol.* 2012; 48: 628-642. doi: 10.1037/a0025629

10. Del Giudice M. An evolutionary life-history framework for psychopathology. *Psychol Inq*. 2014; 25: 261-300. doi: 10.1080/1047840X.2014.884918

11. Del Giudice M. A tower unto heaven: Toward an expanded framework for psychopathology. *Psychol Inq.* 2014; 25: 393-413. doi: 10.1080/1047840X.2014.925339

12. Geary D. *Male, Female: The Evolution of Human Sex Differences*. 2nd ed. Washington, DC, USA: American Psychological Association; 2010.

13. Geary D. Evolution of vulnerability. New York, USA: Academic Press; 2016.

14. Martel M. Sexual selection and sex differences in the prevalence of childhood externalizing and adolescent internalizing disorder. *Psychol Bull.* 2013; 139: 1221-1259. doi: 10.1037/a0032247

15. Martel M. Application of an integrated evolutionary psychological framework to psychopathology. *Psychol Inq.* 2014; 25: 352-354. doi: 10.1080/1047840X.2014.897199

16. Campbell A. The evolutionary psychology of women's aggression. *Philos Trans R Soc Lond B Biol Sci.* 2013; 368(1631): 20130078. doi: 10.1098/rstb.2013.0078

17. Campbell A, Cross C. Women and aggression. In: Shackelford T, Weekes-Shackelford V, eds. *The Oxford Handbook of Evolutionary Perspectives on Violence, Homicide, and War.* New York, USA: Oxford University Press; 2012: 197-216.

18. Archer J. Does sexual selection explain human sex differences in aggression? *Behav Brain Sci.* 2009; 32: 249-231. doi: 10.1017/S0140525X09990951

19. Kruger D, Fitzgerald C. Evolutionary perspectives on male-male competition, violence, and homicide. In: Shackelford T, Weekes-Shackelford V, eds. *The Oxford Handbook of Evolutionary Perspective on Violence, Homicide, and War*. New York, USA: Oxford University Press; 2012: 153-172.

20. Campbell A. Women's competition and aggression. In: Buss D, ed. *The Handbook of Evolutionary Psychology*. 2nd ed. Hoboken, NJ, USA: Wiley; 2016: 684-703.

21. Hinshaw S. Developmental psychopathology as a scientific discipline. In: Beauchaine T, Hinshaw S, eds. *Child and Adolescent Psychopathology*. 2nd ed. Hoboken, NJ, USA: Wiley; 2013: 3-28.

22. Da Silva D, Rijo D, Salekin R. The evolutionary roots of psychopathy. *Aggress Violent Behav.* 2015; 21: 85-96. doi: 10.1016/j.avb.2015.01.006

23. Leckman J. Understanding developmental psychopathology: How useful are evolutionary perspectives. In: Cicchetti D, ed. *Developmental Psychopathology*. 3rd ed. New York, USA: Wiley; 2016: 138-165.