
By: Keller, Carrie Keywords: fetal programming, attention-deficit hyperactivity disorder, psychopathology, mental disorders, prenatal stress

In 2011, fetal researcher Vivette Glover published "Annual Research Review: Prenatal Stress and the Origins of Psychopathology: An Evolutionary Perspective," hereafter, "Prenatal Stress and the Origins of Psychopathology," in the Journal of Child Psychology and Psychiatry. In that article, Glover explained how an evolutionary perspective may be useful in understanding the effects of fetetal programming. Fetal programming is a hypothesis that attempts to explain how factors during pregnancy can affect fetuses after birth. Researchers associate exposure to prenatal stress, or stress experienced before birth, with an increased likelihood of some mental disorders. Glover states that such outcomes may be traced back to a fetus's response to stress during pregnancy, and that those outcomes may have been beneficial in the past. By taking an evolutionary approach toward understanding mental disorders, Glover provided insights for studying the lasting effects of maternal stress during pregnancy on children's mental health.

In "Prenatal Stress and the Origins of Psychopathology," Glover reviewed existing research about the effects of prenatal stress on the development of children's mental disorders. Glover published the article while working at the Institute of Reproductive and Developmental Biology at Imperial College in London, England. She was also the director of the Fetal and Neonatal Stress Research Group, in which Glover studied fetuses' and newborns' responses to stress and how to reduce the lasting effects of those responses. Existing evidence showed that fetal behavior could be linked to the pregnant woman's mental health or emotions, which could cause lasting effects for the fetus into childhood through fetal programming.

Fetal programming is the process during pregnancy in which changes in the fetal environment during critical periods of development cause long-term physiological or behavioral effects on the child after birth. For example, if a woman is stressed or anxious throughout pregnancy, the child is more likely to exhibit symptoms of a number of mental disorders later in life, such as anxiety or attention-deficit hyperactivity disorder, also known as ADHD. While Glover states that the idea of fetal programming was supported at the time of the article's publication, she also explored the idea that evolution could drive such programming. Symptoms of disorders like ADHD may have once been beneficial for survival, and prenatal stress may have helped prepare offspring for the stressful environment of primitive times. While symptoms of such disorders are no longer considered beneficial to individuals living in modern times, Glover's evolutionary perspective provides a possible explanation for why certain mental disorders are so prevalent in modern society.

There are six sections in "Prenatal Stress and the Origins of Psychopathology." In the first section, Glover lays out basic concepts of evolution that are necessary for understanding her theories on evolution and mental disorders. In the next section, Glover explains how fetal exposure to prenatal stress may affect a number of health outcomes after the neonate is born and develops into a child. Continuing in the article, she then describes how some of those outcomes may have been adaptive in the distant past. In the following sections, she addresses challenges in identifying the exact effects of fetal exposure to prenatal maternal stress. In the final section, Glover explores the impacts of using an evolutionary approach to understand mental disorders and acknowledges the potential impacts for further research.

In the first section, "Evolution and Psychopathology," Glover describes how evolution may affect psychopathology, or the study of mental disorders. She starts by describing the importance of genetic variation and natural selection in the process of evolution. Evolution is the process in which existing species adapt over time through a number of factors. Natural selection plays a role in driving evolution and is the natural process by which those organisms that are best suited to survive in their environment can reproduce to pass their traits on to their offspring. Through natural selection, a species changes over time until its members have the genetic traits that enable them to best survive in their environment. Glover writes that natural selection has shaped human behaviors, including emotions and cognition. While in the fetal stage, mammals respond to the fetal environment to become better prepared for the environment into which they will be born. Since the genes for a number of mental disorders are so common, Glover writes that the symptoms associated with the disorders likely were beneficial for mammals in past environments.
In the next section, “Types of Prenatal Stress Associated with Altered Child Outcome,” Glover outlines how fetal exposure to prenatal stress may affect the mental, behavioral, and cognitive functions of a child. Glover cites existing literature linking various forms of prenatal stress to specific health outcomes for children. For example, scientists have linked extreme stressors such as acute disasters with the development of schizophrenia, which is a chronic mental disorder affecting one’s thoughts, feelings, and behavior. However, Glover notes that it is also possible that exposure to the right amount of prenatal stress may be beneficial in stressful situations. For example, some symptoms of anxiety, such as increased vigilance, may be useful when the child is faced with stress later in life.

Continuing in the article, Glover outlines the outcomes of prenatal stress exposure and their possible adaptive value. First, Glover describes how symptoms of ADHD may have been beneficial in primitive times. People with ADHD are often more easily distracted, which may have been useful for noticing sounds that indicated danger, such as that of an approaching predator. ADHD is also characterized by impulsive behavior, which may have encouraged primitive individuals to explore new places. Another condition increased by prenatal stress is anxiety, characterized by increased vigilance to danger, which may have been useful for individuals to avoid threats. Glover states that an evolutionary perspective on anxiety explains why many people in modern society develop phobias of creatures such as spiders because they were once a much greater threat to survival.

Continuing in the same section, Glover explains how prenatal stress may cause certain changes in cognition, changes in reproductive behavior, and changes in the sex ratio, which is the ratio of males to females in a population, discussing how those changes may have had possible beneficial qualities in the past. Glover states that decreased cognitive function is an effect of prenatal stress. While decreased cognitive performance may have led to different ways of thinking among primitive individuals, which could have been advantageous under the varying conditions of earlier societies. Reproductive behavior is another outcome altered by prenatal stress. While the effects of prenatal stress on sexual orientation has not been tested in human populations, Glover notes that researchers have observed prenatally stressed male mice to prefer to engage in sexual behaviors with more males than females. While she concedes that there is little evidence linking prenatal stress with altered reproductive behavior in humans, Glover states that other scientists have suggested from an evolutionary standpoint that homosexuality may be beneficial in sustaining social ties, especially during times of stress. Lastly, the sex ratio may also be altered in times of environmental stress. Since a population may be maximized with a greater number of females than males because one male can mate with multiple females, females with children in the population may invest more in raising their female children than their male ones. Glover states that researchers have found increased prenatal stress to be associated with lower male to female sex ratio at birth in humans.

In the following sections, “Prenatal Versus Postnatal Effects” and “Variety of Outcome,” Glover addresses some challenges in identifying the lasting effects of prenatal stress. First, she states that the distinction between prenatal and postnatal factors is especially difficult to make in humans. That is sometimes due to early rearing methods which either maximize or lessen the effects of exposure to prenatal stress, a complicated distinction to make. However, Glover claims that there is still evidence that prenatal stress does affect child psychopathology independent of postnatal factors. Additionally, she notes that another obstacle in identifying the lasting effects of prenatal stress is that it does not affect all children in the same way, due to children’s different genes, and most children exhibit no outcomes at all. All in all, the effects at least somewhat depend on the genetic makeup of the child and the pregnant woman. In other words, the same exposure to prenatal stress could cause different effects for different individuals due to their genetics.

In the final section, “Implications for Future Research,” Glover discusses the significance of an evolutionary approach to understanding the origins of mental disorders. She writes that an evolutionary approach may provide further insights into the nature of some of the most common mental disorders and may have important implications for treatment of such disorders. For example, if the adaptive value of increased anxiety is for protection, then it may be the case that anxiety is generally associated with over alertness, which would be useful to know in studying the nature of anxiety.

By writing “Prenatal Stress and Origins of Psychopathology,” Glover provided researchers with new insights as to how mental disorders may have originated from fetal programming with evolutionary origins. The article has been cited largely by researchers studying the causes of mental disorders, the effects of fetal programming, and methods supporting healthy early childhood development. Though the scientific community generally supported the concept of fetal programming at the time of its publication in 2011, the article introduced a new way of analyzing fetal programming and mental health. By pointing to the evolutionary origins of mental disorders, Glover also offered a possible explanation as to why certain mental disorders continue to persist throughout generations of populations.

By outlining an evolutionary framework for the analysis of the effects of fetal programming on mental health, Glover has outlined a new way of analyzing child mental disorders. In doing so, she contributed to leading research about fetal programming in a new direction and has furthered the understanding about the effects of prenatal stress. The impacts of her work may include new interventions in fetal programming responses to stress, leading to better mental health in children.
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