

Nature, Nurture, and Human Behavior; an Endless Debate

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Editorial

Abstract

This editorial aims at addressing the endless debate concerned with the extent to which particular aspects of behavior are a product of either nature (inherited i.e. genetic), nurture (acquired i.e. learned), or their interaction. In spite of the philosophical conflict between nativists who adopt an extreme hereditary position i.e. attributing everything to biological factors (nature) and environmentalists who believe that the way we are brought up (nurture) totally governs the psychological aspects of our childhood development through learning, it is hardly today to accept either of these extreme positions. There are simply too many “facts” on both sides of the argument which are inconsistent with an “all or none” view. So instead of asking whether the child development is down to nature or nurture, the question has been reformulated to “How much?” i.e., considering the fact that both heredity and environment influence the person we become, which is the more important? This is really the individualized question that needs to be answered. Lastly but by no means least, sorting out what is the cause and what is the effect is no mere academic matter. If we are really trying to help people’s lives, it is essential to get it right.

Keywords: Nature; Nurture; Family adversities; Genes and environmental interaction; Parental discord, Pediatric mental disorders

Introduction

Nature is what we think of as pre-wiring and is influenced by genetic inheritance and other biological factors while nurture is generally taken as the influence of external factors after conception i.e. the product of exposure, experience, and learning on an individual. The nature-nurture debate is concerned with the relative contribution that both influences human behavior [1]. Different branches of psychology often take a one versus the other approach. For example, biological psychology tends to stress the importance of genetics and biological influences while behaviorism, on the other hand, focuses on the impact that the environment has on behavior [2].

The nature versus nurture debate is one of the oldest issues in psychology. The debate centers on the relative contributions of genetic inheritance and environmental factors to human development. Some philosophers such as Plato and Descartes suggested that certain things are inborn, or that they occur naturally regardless of environmental influences. **Nativists** take the position that all or most of our behaviors and characteristics are the result of inheritance. Advocates of this point of view believe that humans are nothing but the result of evolution. Genetic traits handed down from parents influence the individual differences that make each person unique [2].

At the other end of the spectrum are the environmentalists – also known as empiricists. Their basic assumption is that at birth the human mind is a tabula rasa (a blank slate) and that this is gradually “filled” as a result of experience and learning (e.g. behaviorism) [1]. Theorists such as Watson (1930) [3] believed that people could be trained to do and become anything, regardless of their genetic background. For example, when an infant forms an attachment it is responding to the love and attention it has received, language comes from imitating the speech of others, and cognitive development depends on the degree of stimulation in the environment and, more broadly, on the civilization within which the child is reared.

On the other hand, examples of an extreme nature positions in psychology include Bowlby’s (1969) theory of attachment [4], which views the bond between the mother and her child as being an innate process that ensures survival. Likewise, Chomsky (1965) [5] proposed language is gained through the use of an innate language acquisition device. Another example of nature is Freud’s theory of aggression as being an innate drive (called thanatos) [1]. In contrast Bandura’s (1977) social learning theory [6] states that aggression is learnt from the environment through observation and imitation. This is seen in his famous Bobo doll experiment (Bandura, 1961) [7]. Also, Skinner (1957) [8] believed that language is learnt from other people via behavior shaping techniques.

Nature and nurture interaction

It is widely accepted now that heredity and the environment do not act independently. Instead of defending extreme nativist or environmentalist views, most psychological researchers are now interested in investigating the ways in which nature and nurture interact. In psychopathology, this means that both a genetic predisposition and appropriate environmental triggers are required for a mental disorder to develop. This realization is especially important given the recent advances in genetics. The Human Genome Project, for example, has stimulated enormous interest in tracing types of behavior to particular strands of DNA located on specific chromosomes. If these advances are not to be abused then there will be a need of more general understanding of the fact that biology interacts with both the cultural context and the personal choices that people make about how they want to live their lives. There is no neat and or a simple way of unraveling these different and reciprocal influences on human behavior [1].

A perfect example of nature and nurture interaction is perfect pitch which is the ability to detect the pitch of a musical tone without any reference. Researchers have found that this ability tends to run in families and believed that it might be tied to a single gene. However, they have also discovered that possessing the gene alone is not enough to develop this ability. Instead, musical training during early childhood is necessary to allow this inherited ability to manifest itself [2].

Pediatric mental disorders and genes' influence (nature)

Variance is a measure of how much a trait varies between people in the population being studied while heritability is a term that refers to the proportion of the variance explained by genetic factors. Most psychological traits have been found to have a heritability of around 50%. This means that genetic differences between individuals account for roughly half of the observed variance in a given population. Over recent years, behavioral geneticists have made the dramatic claim that shared family environment has little if any effect on most psychological traits; family resemblances are almost all attributable to shared genes rather than shared environment. Conduct problems are one likely exception to this rule, with most studies showing a relatively small genetic contribution to this sort of behavior and documented that shared environment is the main reason for these problems running in families. At the opposite extreme, liability to autism may have a heritability of over 90% [9].

It is worthy to mention that pediatric mental disorders are often observed in association with other malformations and as a feature of well-defined genetic syndromes. As an example, there are many reported neuropsychiatric and behavioral disorders associated with 22q11.2 micro-deletion syndrome [DiGeorge syndrome (DS), velocardiofacial syndrome (VCFS), and conotruncal anomaly face syndrome] that include elevated rates of shyness, disinhibition, autism spectrum disorders, psychosis, severe attentional difficulties, executive dysfunction, behavioral phenotype reflective of non-verbal learning disabilities, concomitant language deficits, and socio-emotional concerns [10,11]. People with 22q11.2 micro-deletion syndrome are missing a sequence of about 3 million DNA building blocks (base pairs) on one copy of chromosome 22 in each cell. Researchers have determined that the loss of a particular gene on chromosome 22, *TBX1*, is probably responsible for many of the syndrome's characteristic signs (such as heart defects, a cleft palate, distinctive facial features, hearing loss, and low calcium levels). Some studies suggested that a deletion of this gene may contribute to behavioral problems as well. The loss of another gene, *COMT*, in the same region of chromosome 22 may also help to explain the increased risk of behavioral problems and mental illness. The loss of additional genes in the deleted region likely contributes to the varied features of 22q11.2 deletion syndrome [12]. This region contains 30 to 40 genes. Zaky et al (2015) a [13] reported Fluorescence In Situ Hybridization (FISH) documented microdeletion 22q11.2 in 2 out of 16 FISH examined cases with neurodevelopmental disorders (12.5%); one was diagnosed at the age of 11 years and the other at the age of 9 years with concomitant congenital heart disease and hypocalcaemia in both cases and mild intellectual disability in one of them and specific learning disorder (dyslexia, dyscalculia) in the other.

Pediatric mental disorders and environmental influence (nurture)

Family adversities

Many known family factors are associated with an increase in the rate of one or more of pediatric mental disorders. So, it is too easy to fall into the trap of assuming that such association implies causation. On the other hand, many pediatric mental disorders are associated with well documented family adversities but whether this means reverse causality; none can tell for sure. Nevertheless, what we can definitely say is that when both coexist; it could go either ways or there

might be an operating third factor (confounder) behind both pediatric mental disorders and family adversities [14].

It is well known that children or adolescents who came from disadvantaged and or disharmonious families are more likely to be attending poor schools, playing with disruptive peers, and are more often truants, why? Is this because a disadvantaged family environment directly fosters truancy or is the family disadvantage simply a marker for poor neighborhood schools that foster truancy? Unfortunately, adverse factors tend to cluster within each of the child's social world. At home, for example, overcrowding is linked to unemployment, poverty, parental mental illness, and a host of other possible risk factors. This means that it is very hard to tell if an association is causal [14].

On the other hand, a child with uncontrolled Attention Deficit Hyperactivity Disorder (ADHD) can lead to frequent parental criticism, coldness, anger, punitiveness, and disengagement. Accordingly, child's hyperactivity could evoke significant parental negativity leading to more damage of the child's development. On the other hand, stimulant medications that will reduce the child's hyperactivity eventually increase parental warmth and the quality time the child and his family could spend together [15].

Family adversities could be shared or non-shared. Shared or common environment refers to environmental factors that affect the whole family as poverty, damp housing, or air pollution while non-shared or unique environment refers to environmental influences that are not shared by relatives living together as being knocked down by a bus, or having a best friend who is a drug addict. In general, a grossly under-stimulating or neglectful family environment may be rare, but it may have a marked impact on all or most of the children in the household. Children are particularly influenced by the experiences that they do not share with their siblings; when parents pay more attention to one sibling than another, this is more wounding than when both siblings get less parental attention than the "average child" [16].

On the other hand, children often find separations and losses very upsetting. They can result in short term and or long term distress. Long term distress is much more important risk factor for future development of psychiatric disorders. It is striking that long term psychiatric problems are more likely to follow the loss of a parent through divorce than through death. This suggests that the antecedents and consequences of a loss are more important than the loss itself. Hence, the antecedent parental discord is much more important risk factor for subsequent psychosocial poor outcome than the divorce itself [13].

Parental discord, angry arguments, hostility, and criticism are related to conduct disorder in boys, and to emotional disorders in both sexes. The discord might be a risk factor in itself or may represent a marker for the presence of other risk factors as poverty, lack of rules, or poor supervision. The absence of warmth in family relationships is not as relevant as a predictor for poor outcome as the presence of discord as family discord is so often connected with poor discipline. Children may learn that aversive behaviors are a particularly effective way of getting parental attention. By time, children appear to have internalized the parents' mode of interaction "repeating the same pattern in other relationships. After divorce, parents tend to feel anxious, depressed, angry, rejected, and incompetent during the first year after divorce with these responses diminishing in the second year. Inconsistent parenting of children is frequent, especially for sons by mothers. Mothers may be greatly harassed by their sons, who may

blame them for the loss of their fathers. In addition, practical difficulties for the mother after divorce are huge [17].

Children both at home and at school, show similar changes after divorce. Their social interactions become markedly disrupted. There is much aggression, opposition, fearfulness with a need to seek help from, and proximity to, adults. Children become more negative and less positive to adults. Younger children usually hope desperately for a reconciliation even if pre-divorce life had been characterized by severe discord with great fear that the father might be replaced through re-marriage. Later follow up shows that though most of the children become well-functioning individuals but the divorce had a big effect on their lives with obsessive concerns about the chances of the same thing happening again. If parents re-marry, the children have to make further adjustments. Older children frequently do not show good relationships with stepfathers compared to younger children. On average, boys are more distressed by the divorce while girls are more distressed if their mothers re-marry [13,17].

Bereavement is another risk factor for subsequent development of pediatric mental disorders. The death of a parent is typically followed by a brief period of considerable distress that progressively diminishes. Distress may show itself through emotional symptoms, conduct problems, or a mixture of the two. Severe depressive withdrawal is rare in children. A year later, overt distress is generally much less evident, although other manifestations, such as disinterest in school, may persist. A weak link with depression in subsequent adult life is controversial. Long term adverse effects on psychosocial outcome seem likely to stem not from the bereavement itself, but from indirect consequences such as poverty, chronic depression in the other parent, or negative experiences with a step parent [18].

Any child lives in interlacing and intermingled circuits in which his family is the most close and intimate one followed by his community mainly the school environment, and then comes the society he and his family live in. The most important relation of all for any child is his relation with his mother. Such relation starts even before his birth and ends with his death not even with hers. This intimate and lengthy relation leaves deep imprints in his future life as an adult. If it is healthy, it will lead to the development of a healthy mature adult with self-actualization and multiple social, academic, and occupational achievements. Nevertheless, if this relation is negative and/or abusive as in cases of Factitious Disorder Imposed by Another, it will lead definitely to many adverse childhood experiences, social, environmental, and cognitive impairment, adoption of health risky behavior, with many possible diseases, disabilities, and social problems, and might even end with the victim child's early death [19].

Since pain and illness activate a child's drive to stay close to an attachment figure, being admitted alone to hospital is a particularly stressful sort of separation experience. Over the course of several days or weeks, such children may go through sequential phases of protest, despair, and detachment. This reaction to separation is often observed most clearly when children aged between 6 months and 4 yrs. Multiple admissions are associated with higher risk of later problems that are more marked in discordant families (no buffer mechanisms) [13,18]. Zaky et al. (2015)_b [20] studied the psychosocial profile and quality of life in children with bronchial asthma as a chronic pediatric disease that necessitates frequent hospitalizations and found that the Total Health Related Quality of Life (HRQOL) score and all its sub-scores (both child and parental reports) were significantly lower in asthmatics compared to controls. HRQOL total score was also negatively correlated with anxiety and depression scores and positively correlated

with pulmonary function tests (FEV1 and FEF 25%-75%) i.e. the worse these pulmonary functions, the severer the disease, the poorer its control, the worse the total HRQOL score, the higher the anxiety and depression scores.

Other risk factors for child psychiatric problems are family size and birth order as large families are associated with social disadvantage with a direct effect of the number of brothers as a predictor for externalizing problems rather than the number of sisters. Middle children have more conduct problems than oldest or youngest children with a link between school refusal and being the youngest in the family [21].

The children of mentally ill parents are at increased risk of developing emotional and behavioral problems, with a particularly marked increase in conduct disorders. This fact could be explained by shared genes, shared environment, direct modeling, or children's exposure to parental hostility and marital discord. Parents with personality disorder (whether antisocial or otherwise) are even more likely than parents with affective or psychotic disorders to have children who develop conduct disorders. Parents with personality disorders tend to be hostile to their children specially those who are temperamentally difficult [22].

Non familial environmental factors

In spite of the fact that liability to autism may have a heritability of over 90% [9], yet there is an agreement among all professionals that it is one of the most puzzling diseases with a complex etiology. It is well known that environmental as well as genetic factors are important in the etiology of autism [23]. As an example of the studies that investigated environmental risk factors for the development of autism, Mohamed et al (2015) [24] assessed the hair levels of mercury, lead, and aluminum and explored their possible environmental exposure sources in a group of autistic children compared to their matched controls. Their studied autistic children had significantly higher levels of the assessed toxic heavy metals in comparison to controls; such finding suggested that environmental exposure to these toxic heavy metals at key times in development, may play a causal role in autism. On the other hand, Cannell (2008) [25] hypothesized that simple Gaussian distributions of the enzyme that activates neural calcitriol combined with widespread gestational and/or early childhood vitamin D deficiency may explain both the genetics and epidemiology of autism. If so, he claimed, much of the disease is iatrogenic brought on by medical advice to avoid the sun. To test his theory, Zaky et al (2015) c [26] investigated the prevalence of Autism Spectrum Disorders in an Egyptian sample of vitamin D deficient/insufficient rachitic infants and children compared to age and sex matched healthy controls and found mild to moderate autism in 25.71% of the studied vitamin D deficient/insufficient rachitic cases compared to none of controls. Furthermore, 25 (OH) vitamin D has been proven to be significantly negatively correlated with the total Childhood Autism Rating Scale (CARS) scores i.e. the lower the 25 (OH) vitamin D, the higher the total CARS scores, the severe the autistic manifestations.

Another example of non-familial environmental factors that might compromise pediatric mental health is secondhand smoke (SHS). Studies indicated that prenatal tobacco and childhood SHS exposure are associated with child behavioral problems, including internalizing and externalizing behaviors, ADHD, and conduct disorder [27]. It was reported that primate postnatal tobacco smoke exposure leads to changes in brain cell development similar to prenatal nicotine exposure [28]. Zaky et al (2015)_d [29] investigated the potential

association of SHS exposure with children's mental health disorders. They found that SHS exposed children had significantly higher mean value of urinary cotinine level (a biological marker of SHS), total Pediatric Symptom Checklist's (PSC), and Strength Difficulties Questionnaire's (SDQ) scores compared to controls with significantly higher mean values of ADHD, internalization, and externalization behaviors' sub-scores of PSC in SHS children compared to controls. Also, they found that the degree of secondhand smoking was significantly positively correlated with PSC internalization behavior subscore and emotion subscore of SDQ while smoking index significantly positively correlated with ADHD subscore of SDQ. They concluded that SHS exposure significantly compromised mental health of the studied sample of Egyptian SHS exposed children.

Conclusion

To summarize, the debate concerned with the extent to which particular aspects of behavior are a product of either nature (inherited i.e. genetic), nurture (acquired i.e. learned), or their interaction is endless. In spite of the philosophical conflict between nativists who adopt an extreme hereditary position i.e. attributing everything to biological factors (nature) and environmentalists who believe that the way we are brought up (nurture) totally governs the psychological aspects of our childhood development through learning, it is hardly today to accept either of these extreme positions. There are simply too many "facts" on both sides of the argument which are inconsistent with an "all or none" view. So instead of asking whether the child development is down to nature or nurture, the question has been reformulated to "How much?" i.e. considering the fact that both heredity and environment influence the person we become, which is the more important? This is really the individualized question that needs to be answered. Lastly but by no means least, sorting out what is the cause and what is the effect is no mere academic matter. If we are really trying to help people's lives, it is essential to get it right.

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