Sibling Niches and the Diagnosis of Attention-Deficit Hyperactivity Disorder

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Abstract

The diagnosis of attention-deficit hyperactivity disorder (ADHD) has been controversial. The current investigation was conducted to determine the extent to which ADHD diagnosis might reflect family constellation patterns and sibling niche adoption. While not ruling out important neurological factors, results did reveal a significant pattern of difference between siblings holding different positions in their family constellations. Most notable was the 1 in 4 probability of ADHD diagnosis for younger brothers with sisters in a two-sibling family. The results suggest that casual diagnosis of this condition, which fails to consider family constellation parameters, may lead to inappropriate and less-than-optimal treatments.

Keywords: ADHD, birth order, character displacement, competitive exclusion, niche partitioning, siblingship

Attention-deficit hyperactivity disorder (ADHD) is a controversial disorder (Barkley, 2015; Hinshaw, 2018). A great deal of the controversy concerns whether the behavioral and cognitive impairments that characterize the condition reflect neurological impairments or a pattern of learned behaviors that may or may not be a function of direct genetic and/or neurological factors. The behavioral and cognitive symptoms characterizing the condition, certainly include a large number of contributors that act independently and interactively in any one child. Indeed, for some children the condition may reflect a clear inability to engage in nonpathological behaviors, whereas for others the condition may reflect an unwillingness to engage in behaviors that adults judge to be appropriate.

To explain any childhood behavior, it is important to consider that rewards and opportunities are often available to a child that conflict with adult desires and expectations. Because children can often procure these alternatives with less effort than those that are available only via compliance with external expectation (e.g., parental or teacher requests that do not interest the child), the child may engage in those behaviors thought to be personally more desirable. That ADHD has often been diagnosed (and confused) with oppositional defiant disorder (ODD) underscores the difficulty in ruling out

The Journal of Individual Psychology, Vol. 75, No. 2, Summer 2019

Editorial office located in the College of Arts and Sciences at Lynn University.
Published for the North American Society of Adlerian Psychology.

learned attitudes and behaviors (August, MacDonald, Realmuto, & Skare, 1996; Biderman et al., 1991; Hinshaw, 1987; Speltz, McClellan, DeKlyen, & Jones, 1999). Indeed, for many children with either diagnosis, symptoms may reflect a style of attitudes and a pattern of behaviors that reflect, not neurological abnormality, but the adoption of a behavioral niche that has proved adaptive for the child as a means of deriving desired outcomes but that parents and teachers have judged to be problematic. Importantly, the notion of adaptive behaviors is easily misunderstood.

To say that a behavior is adaptive is to suggest that it serves the purpose of bringing about a rewarding outcome or that it leads to the avoidance or escape of an unpleasant outcome. In either case, it is reinforced via either positive or negative feedback. The notion of adaptive behaviors cannot be accurately understood by considering them relative only to a child's compliance with adult expectations. Although it is arguably beneficial for a child to learn the lessons taught in school and to comply with parental desires, what is of more concern to most children is creating a pleasant state of experience in the moment; and this is not, across all children, related to compliance with adult expectations. Behaviors motivated by specific attitudes may lead to an immediate, reinforcing (rewarding or relieving) outcome; yet those same attitudes and behaviors may be maladaptive in the long term. For instance, a child may be able to avoid the boredom of compliance with parental demands by misbehaving, yet the failure to learn how to act cooperatively with others may contribute to future interpersonal difficulties. It is possible that for many children with an ADHD diagnosis, the behaviors characterizing the condition reflect attitudes and behaviors that are at least minimally adaptive within the family environment but maladaptive in other contexts. Thus, the question becomes this: Why would a child develop maladaptive behaviors when parents and teachers are working so hard to foster immediately and optimally adaptive behaviors?

One explanation is the contribution of neurological pathology (Ballard et al., 1997; Kustanovich, 2004; Willis & Weiler, 2005); children are unable to engage in appropriate and optimally adaptive behaviors because of a brain abnormality. Another potential contribution, less frequently considered, is the establishment of a style of engagement that emerges from the idiosyncratic ways that children learn to manage their home environments.

In the current investigation, ADHD is considered a potential outcome of family dynamics that can be explained by looking at children's reaction to their position in a sibling array. In simpler terms, ADHD may often reflect birth-order effects. Unfortunately, the study of birth order is obscured by significant methodological problems. For example, some researchers have questioned the validity of studies that use cross-sectional designs (i.e., between-family analysis) to observe the effects of a within-family process such as birth order (Rodgers, Cleveland, van den Oord, & Rowe, 2001; Wichman, Rodgers, &

MacCullum, 2005). These studies have concluded that birth order has no effect on certain variables, namely intelligence. However, using meta-analyses on previous birth-order studies, Sulloway (1995, 1997) concluded that birth-order effects are indeed significant for many variables, particularly variables relating to personality characteristics associated with the big-five personality dimensions of extraversion, agreeableness, conscientiousness, neuroticism, and openness. We thus conclude that the effects of birth order should not be ignored. The current study conceptualizes birth-order effects by looking at psychological birth order in the context of a family's ecology rather than specifically ordinal birth order. Central to this are the concepts of resource competition, the ecological niche, and resource partitioning.

Previous studies looking at the effects of birth order consider ordinal position as representative of any birth-order effect. Although this is logical given the research question, there are several other variables that affect the total context of sibling position but are rarely examined. For example, age difference between siblings can be important. Minnett, Vandell, and Santrock (1983) found that siblings closer in age were more likely to exhibit aggressive behaviors than siblings further apart in age, which suggests that competition may be more intense in closely spaced arrays. Birth-order effects might also vary with a clear gap between an older set of siblings and a younger set of siblings (Campbell, White, & Stewart, 1991). In this context, the effects of miscarriage or a stillborn or later-decreased child on the family environment and surviving children could have indirect effects mediated through changes both in birth order and in the age gaps between surviving siblings (Daly, Wilson, Salmon, Hiraiwa-Hasegawa, & Hasegawa, 2001; Schwab, 1997).

The family environment may also be important. A competitive family environment is likely to encourage more competition among siblings and greater within-family conflict, which might affect individual character traits of the siblings (Engelhard & Monsaas, 1989). Gender ratio can be critical, as well. For example, Campbell et al. (1991) found that youngest children scored higher on attributes suggesting neediness, particularly if the next oldest sibling was a female rather than male. This was attributed to the potential for females to pamper the youngest child, which could intensify being somewhat needy. Other variables to consider include patterns of biological relatedness among siblings (Deater-Deckard, Dunn, & Lussier, 2002) and the merging of previously independent sibling sets as parents remarry. Furthermore, sibling attributes are undoubtedly important, whether perceived as assets (e.g., athleticism, intelligence, musical skill, attractiveness) (Lalumiere, Quinsey, & Craig, 1996) or as liabilities (e.g., intellectual disability, serious illness or injury, unattractiveness). Further, parents' age at the time of each child's birth is also important. Although parenting style may maintain a general consistency across children, subtle changes often occur as parents gain more experience in parenting, experience change in economic power, and contend with personal life events. The impact of parental conflict, divorce, and child custody issues might also influence birth-order effects.

All these factors can moderate ordinal birth-order effects, and the contributions are probably significant enough to obscure the direct and unitary effects of ordinal position. In light of these complexities, it is not surprising that those studies in which birth-order effects were insignificant often considered only ordinal birth position. Although it is probably impossible to examine all contributing variables in a single study, including one or several additional factors can reveal important nuances of birth-order effects. Some may argue that these factors are nonshared family environmental influences and not aspects of birth order. Although the factors are not aspects of ordinal birth order, they are necessary attributes of psychological birth order that must be examined to accurately assess the impact of siblings on character and personality development. In this investigation, we consider the effects of psychological birth order from an ecological perspective. In this context, children compete for resources within the family environment. The specific resources are varied, from satiating basic physical needs to fostering emotionally rewarding and stabilizing existential states. Fundamentally, specific resource availabilities create an environment in which children adapt to maximize the acquisition of pleasant, momentary experiences.

Human beings depend on others for the availability and delivery of resources critical to survival. These dependencies are particularly important during the early periods of life, when children depend on caregivers to deliver resources and live most closely with siblings. To obtain resources, children must remain in the positive favor of caregiving adults. That a child will remain in his or her family is generally taken for granted in our modern culture; unwanted children are not typically sold into slavery, abandoned, or killed. Nonetheless, parents do often display degrees of favoritism (Sulloway, 1995, 1997), and those children best able to secure parents' attention are those who keep the parents most invested. Thus, children know that critical resources are available when parents display evidence of investment in them. Children will use and develop means for deriving adult investment. Indeed, the family environment is naturally a competitive environment in which the members of the ecological community must retain the investment of those who control the resources.

This discussion rests on the ecological ideas of niche theory (Elton, 1927; Grinnell, 1904; Hutchinson, 1965), competitive exclusion (Gause, 1934), character displacement (Brown & Wilson, 1956), and priority effects (Alford & Wilbur, 1985). Extensive ecological research supports the existence of these phenomena (Cody & Diamond, 1975; Diamond & Case, 1986; Strong, Simberloff, Abele, & Thistle, 1984). To begin, each species has a set of fundamental requirements that define its ecological niche (Grinnell, 1904). The niche is defined not only by the nonliving environment (e.g., tolerable climatic conditions) but also by aspects of the living environment (e.g., food resources, competitors, predators) (Elton, 1927). In a given environment, no two species can occupy the same exact niche (Gause, 1934; Hardin, 1960). One species will inevitably be more efficient than the other at gathering resources or avoiding predators. The better-adapted species will eventually edge out the subordinate species from the niche. The subordinate species either will go extinct in this environment or will remain by accommodating its niche-based behaviors. The first scenario describes competitive exclusion (Gause, 1934; Hardin, 1960); the second scenario describes a niche shift, which results in resource partitioning between species (Brown & Wilson, 1956; MacArthur, 1958).

In this scenario, competition has a negative effect on both participants' resource use. Because competition negatively affects both species, each species can reduce resource overlap by shifting away from its competitor. When a consistent morphological or behavioral change accompanies this niche shift and resource partitioning, it is called character displacement (Brown & Wilson, 1956). The outcome of competitive interactions can be strongly influenced by the order in which the species inhabit the environment. Typically, the first species to occupy an environment has a decided advantage over later species; it can harvest resources efficiently, increase the size of the population, and exert a disproportionate competitive advantage over later inhabitants. These temporal dependencies are called priority effects (Alford & Wilbur, 1985; Lawler & Morin, 1993; Wilbur & Alford, 1985). In essence, the first species can fill the preferred niche and relegate subsequent occupiers to less optimal niches.

In a given environment, survival depends on selecting a niche with minimal competition for resources. Adoption of a particular niche requires specific behavioral attributes and may require a change in a preformed or preestablished character disposition (i.e., character displacement). With respect to children, their basic and natural tendencies may be modified as a consequence of environmental interactions, including their interactions with competing siblings. Lalumiere et al. (1996) referred to this process as sibling differentiation and indicated that specialization, or niche picking, is clearly advantageous because it reduces competition in an environment with limited resources.

For children within a family, survival is in many ways dependent on resources provided by parents. However, in modern families, survival is less literal and more closely associated with material possession and issues related to self-esteem (Millon, 1990, 1999). Children compete not only for literal physical survival resources but also for resources that validate and solidify their position in the family and broader community (e.g., that solidify their position in the social hierarchy). Next, each child defines his or her own particular niche from the available niches (Lalumiere et al., 1996).

Children will find the position in the family that best leads to validating outcomes. In some families, as a function of parental or traditional values, a very narrow range of niches is available (i.e., parents maintain narrow and rigid attitudes regarding acceptable child behaviors); in others, a wide range of healthy niches may be available. The available niches will be determined by parental values and the priority effects of older siblings. It is important that the availability of any niche is a function of parents' attitude concerning acceptable and objectionable behaviors, and the child's perception of available niches. Although there is typically some consistency between parental attitudes and child perceptions, this is not always true. Most important, children will adapt to the niches they perceive as providing the greatest opportunity for reinforcing outcomes, regardless of whether they are consistent with parental preferences.

The process of adaptation depends on basic behavioral principles. If specific behaviors lead to parental investments that are not perceived as available via alternative—often more optimally adaptive—actions, then children will enact those behaviors again in similar situations (i.e., the behaviors will have been reinforced), thereby coming to define niche-based behaviors. A child's natural ability and disposition certainly influences the specific nature of the niche adopted, but specific behaviors will depend on patterns of reinforcement (Lalumiere et al., 1996). Thus, genetically mediated assets and liabilities, including temperamental characteristics (Harkness & Super, 1994; Super & Harkness, 1986, 1994; Van Heck, 1991), influence niche selection. Natural abilities and dispositions can be expressed and reinforced within a very wide range of possibilities. Because parents do not often abandon misbehaving offspring, children are able to derive resources via negatively valenced niches as well as positively valenced niches. In fact, disruptive and oppositional children are often able to secure the greatest proportion of parental investment, which is logical considering that infant attention seeking and early maternal unresponsiveness have been found to predict the development of disruptive behaviors (Shaw, Keenan, & Vondra, 1992). Thus, it is understandable how these behaviors develop in an attempt to either reassert or secure parental attention and investment. Furthermore, as long as the niche and the associated actions retain the investment (attention and reward) or accommodation (active or passive actions by the parent that reinforce expressed behaviors) of the parent, the niche will be retained. This is particularly true when other niches are not perceived to be available to that child or are less attractive to the child, possibly because siblings already occupy them. Indeed, for some children the opportunity to watch television is made possible by compliance with homework; for another, the opportunity to watch television is secured by various forms of oppositional behavior (e.g., ignoring the parent, angry negotiation, manipulation). For this latter child, the battle is preferable to the task of doing homework.

Once a niche has been adopted, a child typically generalizes niche-based behaviors to new environments and situations, which may help account for the consistency of personality across ages and across situations. Early adolescence (middle school) puts the child into a new environment with the necessity to adopt a new niche. Usually, however, niche-based behaviors created at home are generalized to the broader environment (Sander, 1987). Thus, the obedient child will be the obedient and conscientious student. The difficult child will become the rebellious and troubled student who associates with a bad peer group. Further, if an older child is feeling encroached upon by a younger sibling, he or she may abandon a family-based niche and adopt a peer-based niche. This will often lead to great frustration in the parents and considerable parent–child conflict. Finally, if the generalized niche does not lead to reinforcing outcomes outside of the home, the adolescent child may adopt a new niche that proves reinforcing in the group (i.e., peer) that has become most important.

In this investigation, we describe the associations between birth-order effects and diagnosed ADHD. There are many reasons a child might be diagnosed with this condition, but the hypothesis we test here is that children adopt a family niche that includes ADHD behaviors in response to competition among siblings. Some children in a multisibling family might adopt a niche characterized by behaviors that are objectionable to parents and teachers (for the sake of attention in a competitive environment) but immediately adaptive to the child.

Parents were surveyed regarding the presence or absence of ADHD diagnosis in each of their offspring. The data were used to assess the probability of ADHD diagnosis as a function of family constellation patterns. Specifically, base-rate probability of ADHD diagnosis was compared to ADHD probabilities in different sibling arrays. If psychological birth order is not a factor in ADHD diagnosis, there should be no differences between the defined groups and base-rate probability of ADHD diagnosis. However, the hypotheses of niche partitioning and priority effects leads to several specific predictions about how children in subordinate positions in competitive sibling arrays (close age proximity and hierarchical position) should be more likely to be diagnosed with ADHD. For example, because firstborn children receive the most focused attention from parents, and because most parents value obedience and learning (as reflected later in educational gains), this is the most readily perceived and available niche. Firstborn siblings are expected to select this niche and exhibit a lower proportion of ADHD diagnosis than the base rate. Only children also receive the uncompromised attention of parents (at least as it relates to other siblings) and are thus more likely to adopt a niche that includes conscientiousness to behaviors and academic tasks. However, because single children may have other countervailing attributes that result from their particular family circumstance, frequency of ADHD diagnoses may not be significantly lower than baseline.

In families with multiple offspring, the eldest child should be more conscientious and therefore less likely to be labeled with the ADHD diagnosis. The second born should fulfill the opposite niche and be more likely to be diagnosed with ADHD. In families with more than two children, a larger proportion of middle children should be diagnosed with ADHD. However, because niche availability depends on many factors, including number of siblings and gender differences, the various contributing factors will compromise this effect. Similarly, youngest children (in families with three or more children) should receive the diagnosis of ADHD more often than firstborn children, but not significantly more often than baseline. As more siblings are included in the specific family array, the reactant patterns will be altered and the youngest then more, or less, likely to adopt a niche characterized by behavioral displays associated with ADHD. Finally, the competition model predicts that the greatest proportion of ADHD diagnosis should emerge from two-sibling arrays. This prediction stems from the observation that families with two siblings often have children with highly dissimilar behaviors—what we have referred to as "bookend" children—which suggests two children at opposite ends of a continuum. We believe that without additional children to modify the dynamic, the competition between two children in a two-sibling family is strong. Finally, this effect should be most pronounced in two-sibling arrays with an older sister and younger brother. Because girls tend to be more conscientious and more readily accept academic responsibilities (Smith, Calkins, Keane, Anastopoulos, & Shelton, 2004), the younger brother is more likely to adopt an opposing niche and subsequently has greater likelihood of being diagnosed with ADHD. If the firstborn child is male, he will receive greater parental attention and should be more likely to select a conscientious niche; however, because of basic gender differences, males are less likely to have the same degree of conscientiousness as firstborn females. The younger daughter will be less likely to display ADHD behaviors because females are generally less likely to engage in behaviors suggestive of ADHD. For instance, girls are less aggressive than boys (Fabes, Einsenberg, Nyman, & Michealieu, 1991; Kochanska, 2001; Macoby & Jacklin, 1974), are generally less active than boys (Phillips, King, & Dubois, 1978), and take fewer risks (Ginsburg & Miller, 1982); and they tend to be more nurturing (Whiting & Edwards, 1988), better able to resist temptations than boys (Silverman, 2003), and more compliant with parental requests than boys (Whiting & Edwards, 1988). Two-sibling families are of particular interest because of the presumed greater competition, and because a two-child family is currently the most typical family constellation in the United States (average = 1.86; U.S. Census Bureau, 2004). Two-sibling families are examined relative to the probability of one sibling being diagnosed, probability across gender, and probability relative to whether one is first or second born in the two-sibling array.

Methods

Participants were randomly selected alumni from a liberal arts college in the southeastern United States who graduated between 1965 and 1985. This population was chosen to reach families whose youngest children would be at least 10 years of age and whose oldest offspring would be younger than 30 years of age at data collection. Families with adopted children and/or children whose primary guardian before age 10 were not the surveyed parent were eliminated from our sample. Twenty-five hundred surveys were sent out, 436 (17%) were returned, and 308 (12%) were included in the analyses. Surveys were omitted because the families were mixed and siblings did not share the same environments for extended periods, because children were adopted, because age gaps were greater than 4 years, and because the disability of one or more siblings was substantial enough to alter the effects being tested (e.g., child with Down syndrome). Surveys were completed anonymously and requested information regarding children's behavioral characteristics and possible learning disabilities, referenced by each child's age and birth-order position. Also included were indications of whether the children were stepchildren, biological offspring, or adopted.

Results

Of the 594 children included in the analysis, 50 had received an ADHD diagnosis at some point in their childhood. This clinical proportion (8%) is well within estimated baseline rates of 3%–10% (Barkley, 2015). In comparative analyses, we used the base-rate scores from our own sample to represent expected values in chi-square analyses. Because our base rate is moderately high relative to other estimations, our analyses should yield more conservative results. To minimize the risk of Type I error, we did not conduct chi-square analyses on those differences that were similar to our base rate, and we report them simply as not differing from base-rate. Within each set of analyses, we use a Bonferroni adjustment (i.e., $\alpha = .05$/number of planned comparisons) for planned comparisons corresponding to the number of analyses conducted within the identified sibling array.

We began by considering sibling arrays that included at least three related siblings and for which the age difference was no greater than 4 years between one sibling and the next sibling in the array (Table 1). In this set of analyses, we conducted four planned comparisons and adjusted our alpha level from .05 to .0125 (.05/4 = .0125). Beginning with firstborn offspring, we found the proportion of these siblings receiving the ADHD diagnosis (1 of 78 = 1.3%) to be less than our base rate of 8% ($\chi^2 = 4.53$, $p < 0.02$), and this difference approached our adjusted alpha level. In these families, youngest children were diagnosed with ADHD (6 of 77 = 8%) at a proportion that did not differ from base rate. Middle children, however, were more likely to receive an ADHD diagnosis (13 of 97 = 13%) as compared to the 8% base rate ($\chi^2 = 3.59$; $p < 0.06$), yet this difference did not reach our adjusted level of statistical significance. Not surprisingly, the difference between firstborn offspring and their middle-children siblings was significantly different ($\chi^2 = 7.46$; $p > .0125$). The difference in ADHD diagnosis between firstborn siblings and their youngest siblings ($\chi^2 = 1.12$; ns) was not statistically significant. Looking next at only children (Table 1), the proportion receiving an ADHD diagnosis (4 of 48 = 8%) did not differ from our base rate of 8%. Subsequently, we did not conduct a chi-square analysis on these scores.

Of greatest interest to us were the children in two-sibling families. Of the 292 children in 146 two-sibling families, 25 (8%) had been diagnosed with ADHD. In this set of comparisons, we conducted a total of five analyses and adjusted our .05 alpha level to .01 (.05/5 = .01). We first considered gender differences (Table 2). As expected, boys were diagnosed more often than girls in these arrays, yet the difference between the two groups failed to meet the standard of statistical significance (12% vs. 5%; $\chi^2 = 2.98$; $p > 0.10$). Looking next at two-sibling arrays in which the siblings were of the same gender (Table 3), we did not find any notable differences in probability of ADHD diagnosis. Although the males were more likely to have been diagnosed with ADHD, this difference was negligible in this sample.

Table 1

Chi-Square Results for Different Birth Orders Considering Rate of ADHD Diagnosis Compared to Base-Rate Probability

Array	Sample Size	No. Diagnosed With ADHD	Proportion	χ^2
Overall	252	24	.09	ns
First born	78	1	.01	4.53; $p < .02$
Youngest	77	6	.08	ns
Middle	97	13	.13	ns
Only	48	4	.08	ns

Table 2
Chi-Square Results for Two-Gender Children Sibling Arrays:
Rate of ADHD Diagnosis Compared to Base-Rate Probability

Array	Sample Size	No. Diagnosed With ADHD	Proportion	χ^2
Overall	292	25	.08	ns
Male	146	17	.12	ns
Female	146	8	.05	ns

Table 3
Chi-Square Results for Two-Sibling Matched Gender Arrays:
Rate of ADHD Diagnosis Compared to Base-Rate Probability

Array	Sample Size	No. Diagnosed With ADHD	Proportion	χ^2
First born	74	4	.05	ns
Second born	74	5	.07	ns
Male first	37	3	.08	ns
Male second	37	2	.05	ns
Female first	37	1	.03	ns
Female second	37	3	.08	ns

The frequency of ADHD diagnoses did not differ between older and younger siblings, nor did the frequencies differ from our base rate.

As expected, the most notable results were found in the two-sibling, mixed-gender arrays (Table 4). Comparing firstborn to second-born children, the later-born children in mixed, two-sibling arrays were observed to have been diagnosed with ADHD more frequently than their older siblings (.07 vs. .14), but this difference was not statistically significant (χ^2 = 2.03; ns). Considering next the four possible arrays, prominent differences were observed. To begin, male firstborn siblings with a younger sister were not diagnosed with ADHD at a rate significantly greater than base rate (.12 vs. .08). Next, firstborn females with a younger brother were simply not diagnosed with ADHD, and this difference was found to be statistically significant using

Table 4
Chi-Square Results for Two-Sibling Mixed-Gender Arrays:
Rate of ADHD Diagnosis Compared to Base-Rate Probability

Array	Sample Size	No. Diagnosed With ADHD	Proportion	χ^2
First born	73	5	.07	ns
Second born	73	10	.14	ns
Male first	41	5	.12	ns
Male second	32	8	.25	7.26; $p > .01$
Female first	32	0	.00	6.09; $p > .02$
Female second	41	3	.07	ns

an unadjusted alpha of $p < .05$ but failed to reach our more conservative level of .01. Considering younger sisters with older brothers, the younger sisters were diagnosed with ADHD more often than older sisters with younger brothers, but the rate did not differ from the base rate. Our most striking results were for younger brothers with older sisters. Second-born sons in two-sibling arrays with older sisters had a 1 in 4 probability of having received an ADHD diagnosis. Of these boys, 25% (8 of 32) had at some point received an ADHD diagnosis, significantly more than the base rate ($\chi^2 = 6.64$, $p < 0.01$).

Discussion

The results of this study are largely consistent with the predictions derived from character displacement as a factor in the diagnosis of attention-deficit hyperactivity disorder. As predicted, firstborn children were diagnosed with ADHD significantly less often than base rate. This suggests that there is something common to firstborn children creating a degree of immunity to ADHD. Although there may be critical neurological differences mediated by genetic or maternal effects, we believe this to be unlikely. It seems more probable that firstborn children, who later have siblings, adopt a family niche that is most compatible with parental expectations, which includes, among other attributes, obedience, conscientiousness, and academic achievement. Further, these eldest children are able to maintain that advantage over their siblings as a result of their perpetual age advantage. Later-born children are not in this advantageous position and must adapt to an available, alternative niche. To be sure, for various reasons, including inherited assets and liabilities, the advantage can be lost. However, the advanced age provides distinct adaptive advantage.

In multisibling arrays, middle children were diagnosed marginally more frequently with ADHD (relative to the base rate), and youngest siblings were diagnosed at a frequency consistent with base rate. This is consistent with both competition theory and priority effects. Younger children are less likely to adopt the obedient niche most often occupied by the eldest child, or the more ADHD-prone niche of a middle child. As a result, younger children need to partition parental interest along different axes, defining a different niche in the family environment. Being the youngest member of a family could contribute to the adoption of several different family niches, some of which could be associated with ADHD symptoms and others with other adaptive and maladaptive niches. In addition, middle children are thought to exist in the most disadvantageous position and must exert greater effort to elicit parental investment. This could be accomplished via compliant behaviors, but an older sibling typically has embraced this niche, rendering it less available to the younger sibling. Further, that middle children are diagnosed with ADHD at a higher rate than younger siblings suggests that a narrower range of niche options exists for middle children. Because youngest children are able to elicit the attention and investment of the entire family, they are able to find effective niches within the family. Middle children may not see this option and thus turn their attention to interests and behaviors that are more independent of family values.

Only children have many of the same opportunities as do firstborn children. However, they do not have to compete to maintain their privileged status. As a result, they may be less inclined to adopt a particular niche and may flit between different niches, free of competition. To be sure, competition causes both competitors to shift away from each other in the niche space. As such, one might expect two siblings to shift away from each other in their behavioral space, magnifying the differences between them. Without the competitive pressure of a younger sibling, only children would be less likely to shift to the obedient niche, would exhibit a greater range of observable behaviors, and would not differ in ADHD diagnoses from base rates. So, because only children maintain the whole of parents' caregiving attention, they are able to elicit parental investment via a broader range of behaviors and do not have to create a particular niche among siblings.

The highest frequency of ADHD diagnosis was found in the younger male siblings of older sisters in two-sibling arrays. For this group, the probability of ADHD diagnosis was an astonishing 25%. This rate is compared to the probability of diagnosis for the elder sister in this array, at less than 3%. In part, this can be accounted for by the greater probability of diagnosis for males, suggesting that there are factors related to the male temperament that contribute to attentional and behavioral liabilities. However, this extreme difference is particular to males in this family position and indicates interactions between gender and birth order that contribute to the diagnosis of this common condition. We suggest that these factors can be explained by a consideration of processes that exist across species and define any organism's inherent need to adapt to its environment in order to maximize the enhancing and protective aspects of its existence (Millon, 1990).

Implications

The implications of this investigation concern how to conceptualize this controversial disorder. Although there may be a common assumption, particularly among the public, that ADHD reflects underlying neurological pathology, this is not an uncontroversial assumption. As stated in the introduction, there may be as many reasons for a child to be diagnosed with ADHD as there are children with that diagnosis. To be sure, some children—including many of whom might have been included in the present sample—struggle to control impulses and to pay attention, and these difficulties, for these particular children, emerge from neurological abnormality. However, it is unlikely that all, or even most, children with this diagnosis have an abnormal neurology. The present report indicates that for many children who display signs of ADHD, those behaviors suggestive of the disorder may be niche-based adaptations that are being reinforced in positive and negative ways and thus serve to secure that child's position in an ecological niche within the family environment.

These results also underscore the fact that children being raised in the same family do not grow up in the same environment, and those differences created by siblingship can have dramatic effects on the child's developing character. As a result, children who display behaviors consistent with an ADHD pattern may need to be directed toward a new, more optimally adaptive niche—this cannot be accomplished via medical or behavioral interventions alone and requires greater attention to family patterns that are contributing to the display and reinforcement of those behaviors. To be sure, when behaviors suggestive of ADHD are manifestations of niche-based behaviors yet are explained as indicative of neurological abnormality, those children may be subjected to treatments that are ultimately not helpful and may even be dangerous. It could be more appropriate to educate parents on the nature of family niche partitioning and provide them with the guidance necessary to encourage healthy development in their child given his or her family position.

Limitations

There are certain limitations of the current investigation. First, the sample could have been larger. However, we might expect similar patterns in a larger sample, and our results suggest a rather robust effect. We did not assess evidence of neurological involvement or specifics of the diagnosis, only the occurrence of diagnosis. We make no claims regarding neurological differences between children in different arrays. We contend only with the occurrence of diagnosis, understanding that several factors might contribute to the display of behaviors that would lead to the ADHD diagnosis.

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