

The Nature–Nurture Question: Teachers’ perceptions of how genes and the environment influence educationally relevant behaviour

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Despite a substantial body of research suggesting genetic influence on educationally relevant behavioural traits, it is not clear how the nature–nurture question is perceived by teachers. In order to answer this question, we surveyed 667 UK primary school teachers, and for comparison also surveyed 1,340 parents about their perceptions of genetic and environmental influence on personality, intelligence, behaviour problems, learning difficulties, and mental illness. For these five domains of behaviour, the percentages of teachers who reported that genetics were at least as important as environment were .87, .94, .43, .94, and .91, respectively. Results for parents were similar (.92, .93, .54, .86, and .89). We also found that 80% of teachers reported no coverage of genetics during teacher training.

Despite a substantial body of research suggesting genetic influence on educationally relevant behavioural traits (Plomin, DeFries, McClearn, & McGuffin, 2001; Plomin & Walker, 2003), and efforts to enhance public understanding of genetic research (Nuffield Council on Bioethics, 2002), it is not clear how the issue of nature and nurture is perceived within the field of education. A recent survey of the general public indicated that genetic influence was considered important for most aspects of behaviour, with greater genetic influence reported for intelligence and less genetic influence for antisocial behaviour and depression (Human Genetics Commission, 2001). However, no survey has targeted teachers to gain insight into their perceptions of how nature and nurture influence behavioural traits relevant to the classroom. A review of recent editions of educational psychology textbooks revealed

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that very little attention is paid to genetics (Plomin & Walker, 2003). Can it thereby be inferred that teachers are less likely to perceive genetics as an important contributor to educationally relevant child behaviour?

This question was explored by surveying teachers' and parents' perceptions of how nature and nurture influence personality, intelligence, behaviour problems, learning difficulties, and mental illness. These specific domains were selected as a result of their relevance to the field of education. A substantial body of research shows that genetics plays an important role in all domains examined by the survey (see Plomin et al., 2001), and the current study explores the degree to which teachers' and parents' beliefs correspond to the literature. The sample included 667 Year 2 teachers and 1,340 parents of seven-year-old children.

Method

Participants

The sampling frame for our study comprised the teachers and parents of seven-year-old children enrolled in the Twins Early Development Study (TEDS), a longitudinal population-based study of twins born in England and Wales in 1994, 1995, and 1996 (Trouton, Spinath, & Plomin, 2002). The sample was selected due to the existing relationship between TEDS researchers and the families involved in the study, which made contact information readily available. After screening for infant mortality, all families identified by the UK Office for National Statistics (ONS) as having twins born during this time frame were contacted to take part in TEDS when the twins were about one year old. Subsequently, each family was sent a letter explaining the project along with a return-addressed postcard of interest. The current study is focused on a subset of the full sample: twins born between January and August, 1996.

Of the 3,088 parents who received consent forms, 1,539 (49.8%) agreed to participate in the survey. Of those, 1,529 (99.4%) agreed to allow us to contact the seven-year-old twins' Year 2 teachers via postal questionnaire and supplied teacher and school details. Of the 1,539 parent and 1,000 teacher surveys sent, 1,340 (87.1%) and 677 (67.7%) responded, respectively. Despite attrition, it has been shown that the TEDS sample at seven years is reasonably representative, in terms of education, parental ethnicity, and employment status, of the UK population of parents of young children (Spinath, Ronald, Harlaar, Price, & Plomin, 2003).

Survey Questionnaire

The survey consisted of two sections, the first of which was administered to teachers and parents. In this section, teachers and parents were given a list of five broad categories of child behavioural traits: personality, intelligence, behaviour problems, learning difficulties, and mental illness. Respondents were asked for their opinion

about the extent to which each trait is influenced by genes (nature) or the environment (nurture). The word “influenced” is intended to mean the relative extent to which genetic and environmental factors account for variation within the population of the behavioural traits in question. Respondents were asked to answer “1” if they believed the trait is entirely caused by genes (“all genes”), “2” if they believed the trait was mostly caused by genes (“more genes than the environment”), “3” if they believed that genes and the environment had roughly equal influence (“about half genes, half environment”), “4” if they believed the trait was mostly influenced by the environment (“more the environment than genes”), and “5” if they believed the trait was influenced solely by the environment (“all environment”).

The second section of the survey was administered only to teachers, and was composed of two questions. Teachers were asked whether knowing that a child had a genetically-influenced learning difficulty would affect their method of instructing and tracking the child, and were given five response categories (“certainly true,” “somewhat true,” “neither true nor untrue,” “somewhat untrue,” or “untrue”). Finally, teachers were asked whether they studied any aspect of genetics during teacher training, and were given two response options: “yes” or “no.”

Analyses

Teacher and parent data from the survey’s first section were analysed to examine the overall frequency of 1, 2, 3, 4, and 5 answers for each behavioural trait as well as an average. An average of 1 indicates a belief that the trait is entirely influenced by genes, and an average of 5 indicates a belief that the trait is solely influenced by the environment. In addition, means and standard deviations were calculated, and paired sample *t*-test analyses were performed in order to examine whether there were significant differences between teachers’ and parents’ responses.

Results

Table 1 presents means, standard deviations, and percentages of teachers’ and parents’ responses for the five domains of behaviour: personality, intelligence, behaviour problems, learning difficulties, and mental illness. The means indicate that both teachers and parents believe that both genetic and environmental factors are important, with genetics somewhat more important than environment for all of the behaviours except behaviour problems. *T*-test results showed that teachers’ responses were significantly more oriented towards the environment than parents’ responses for personality ($t = -6.60, p = .00, d = .32$), behaviour problems ($t = -4.85, p = .00, d = .26$), and mental illness ($t = -2.31, p = .02, d = .13$), and significantly more oriented towards genetics for learning difficulties ($t = 2.63, p = .00, d = .15$). However, the relatively large samples are responsible for these significant differences; the amount of variance accounted for by these differences was modest: 2%, 2%, 1%, and 1% of the variance, respectively. There were no significant differences between teachers’

Table 1. Percentages of teachers' ($n = 667$) and parents' ($n = 1,340$) responses regarding whether nature or nurture influence child behaviour

	All genes 1	G > E 2	G = E 3	G > E 4	All environment 5	Mean	SD
Personality:							
Teachers	2.2	36.6	48.3	12.8	0.0	2.71*	.71
Parents	9.3	43.9	39.1	7.5	0.1	2.47	.80
Intelligence:							
Teachers	6.2	58.6	29.3	5.9	0.0	2.35	.68
Parents	13.2	47.7	32.3	6.7	0.1	2.29	.78
Behaviour problems:							
Teachers	0.9	7.8	33.9	56.1	1.2	3.49*	.70
Parents	2.3	13.1	38.7	43.6	2.3	3.29	.81
Learning difficulties:							
Teachers	5.9	55.3	32.7	6.2	0.0	2.39*	.69
Parents	12.6	36.7	36.3	13.9	0.5	2.51	.94
Mental illness:							
Teachers	9.2	51.5	30.6	8.6	0.2	2.39*	.78
Parents	20.0	42.0	26.5	10.6	0.9	2.28	.94

*Significant mean difference between teachers' and parents' responses.

and parents' responses for intelligence ($t = -1.39$, $p = .16$, $d = .08$), amounting to less than 1% of the variance.

In relation to the individual response categories, it is noteworthy that hardly any teachers reported that these behavioural domains are influenced solely by the environment, although 1.2% responded in this way for behavioural problems. In contrast, a surprisingly large percentage of teachers responded that genetic factors were solely responsible for intelligence (6.2%), learning difficulties (5.9%), and mental illness (9.2%). The percentage of teachers who perceived that genetics accounts for at least half of the influence was 87% for personality, 94% for intelligence, 43% for behaviour problems, 94% for learning difficulties, and 91% for mental illness. Parents yielded similar results: 92%, 93%, 54%, 86%, and 89%, respectively. Both teachers and parents perceived that behaviour problems are less genetically influenced than the other domains.

When teachers were asked whether their methods of instructing and tracking would be influenced as a result of knowing that a pupil had a genetically-influenced learning difficulty, 82% responded that this was certainly true (49%) or somewhat true (33%) – see Figure 1.

Finally, results showed that 80% of teachers had not studied any aspect of genetics during their teacher training.

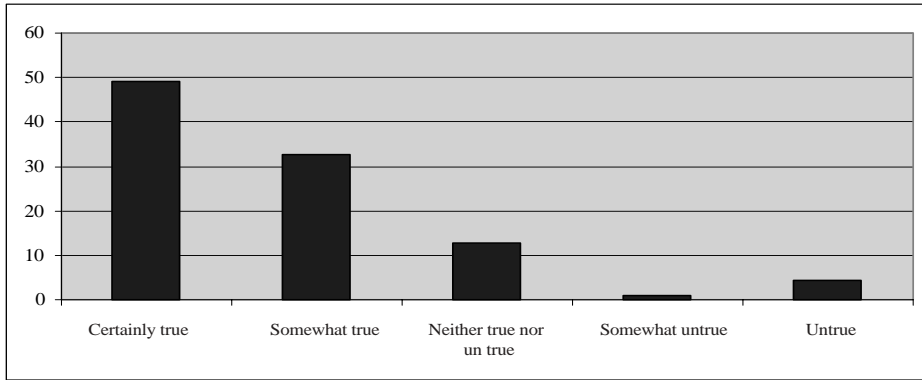


Figure 1. Percentages of teacher responses to the statement “Knowing that a child has a genetically influenced learning difficulty would affect my method of tracking and instructing the child”

Discussion

The current survey examined teachers’ and parents’ perceptions of how nature and nurture influence educationally relevant behavioural traits. Results indicated that teachers perceive genetics as being at least equally as important as the environment with respect to influence on personality, intelligence, learning difficulties, and mental illness. Behaviour problems were perceived as being more influenced by the environment than by genes, although genetic influence was nonetheless perceived as substantial. Thus, teacher perceptions were in line with research that indicates substantial genetic influence on these domains (e.g., Plomin et al., 2001). However, this cannot be attributed to formal instruction as only a small proportion of teachers reported having studied the topic of genetics during teacher training. Moreover, results for parents were highly similar to those for teachers despite parent–teacher differences in exposure to diverse types of children and training in educational psychology.

It is noteworthy that this average balanced view of nature and nurture did not mask a bimodal nature versus nurture distribution in which teachers believed that behaviour was either “all genes” or “all environment.” Across the five behaviours, only 1–9% of the teachers responded “all genes,” and only 0–1% perceived the behaviours as “all environment.” Teachers’ perceived importance of genetics is intriguing in light of the predominant environmental focus within educational psychology research (Plomin & Walker, 2003). In short, results were different from what might have been expected given the absence of genetic coverage in the texts designed to provide teachers with a comprehensive child development knowledge base. However, there are some signs that this environmental orientation within the literature is changing (Plomin & Walker, 2003); our survey suggests that academia

may merely be coming into line with a more balanced view already held by the public, including teachers and parents. It is also possible that media attention to genetics has brought a higher level of awareness to the general public. Genetics is not only a “hot topic,” but advances in scientific research, particularly related to molecular genetics, are highly visible in the news.

Perhaps the current sample, comprising teachers and parents of twins, makes for a greater propensity to point to the role of nature over nurture. Another by-product of the sample may be evident in parents reporting more genetic influence than teachers for three of the five domains. This may simply be a result of the parents in question being parents of twins who are more tuned in to nature–nurture issues. However, despite significant differences in responses between teachers and parents, it is important to note that effect sizes were small. Nonetheless, it is clear that our results need to be replicated using samples of teachers and parents of non-twin children. With this said, we think it unlikely that teachers who happen to have a pair of MZ or DZ twins in their classroom are necessarily converted to the importance of genetics. First, DZ twins are no more alike genetically than any siblings and their similarity can just as easily be attributed to shared environment as to shared heredity. Second, in our experience, teachers and parents are more likely to remark on the notable behavioural differences within pairs of MZ twins, which imply environmental influence. Genetic influence is only noticed when one studies large samples of MZ and DZ twins and notes the statistically greater similarity of MZ twins as compared to DZ twins.

The study was also limited by investigating parents and teachers of seven-year-olds. For example, it is possible that parents and teachers of older children perceive genetics as being of less importance – another interesting question for future research. Another limitation of the study is that there are no data on reliability or validity for the survey. However, the items certainly have face validity and written responses on the questionnaires indicated no uncertainties or difficulties with completing the survey. Moreover, the structure of the questionnaire was nearly the same as the only other similar survey we are aware of (Human Genetics Commission, 2001).

It is noteworthy that “behaviour problems” was the only domain for which the majority of teachers (57%) perceived the environment as playing a greater role than genetics. Why are behaviour problems perceived to be less heritable, when behaviour problems such as hyperactivity show as much genetic influence as the other domains in the current survey, and perhaps even more heritability than personality (Eaves et al., 1997; Loehlin, 1992)? It is possible that teachers feel that children’s problem behaviour is more malleable than personality and mental illness, and that problem behaviour can and ought to be managed by adults. It is also reasonable for teachers to believe that children’s behaviour problems are caused by a challenging home environment or by difficult peers. General public perception of the aetiology of behaviour problems does not appear to have changed markedly; an earlier survey indicated that antisocial behaviour was believed to be primarily environmental in origin (Human Genetics Commission, 2001).

An overwhelming majority of teachers (82%) indicated that knowing more about a child’s genetically-influenced learning difficulty would influence their method of

instructing and tracking the child. Teachers' additional comments on this question indicated that they would ultimately do their best to help pupils with learning difficulties regardless of whether the difficulties were genetically influenced or not. Teachers also believed that having more knowledge about genetic associations would allow for earlier identification of learning-related issues, and facilitate more effective preventative action. For example, knowledge that a child has a genetic form of reading disability at the beginning of formal schooling could allow the teacher to act in a pre-emptive manner from the beginning, rather than being forced to wait for the emergence of a more pronounced problem.

The finding that 80% of teachers reported not having studied any aspect of genetics during their training as a teacher is consistent with our review of recent editions of major educational psychology textbooks. Our review revealed that no text included more than three pages devoted to the topic of genetics (Plomin & Walker, 2003), and some textbooks reviewed did not include basic terms such as “genes,” “genetics,” or “heredity” in their subject index (Plomin & Walker, 2003).

Our finding that teachers view nature to be at least as important as nurture does not imply that teachers, whose job is to educate children and nurture their potential, believe that their efforts have no impact – or they would not be in the field of education. It was clear from teachers' comments on the questionnaires that best efforts are made to teach children individually and effectively, regardless of their viewpoints on nature and nurture. The one area in which teachers believed more information would be particularly helpful was in the area of learning difficulties – not in order to spend less time with an afflicted child, but rather in order to begin the process of helping the child earlier. Notwithstanding, the specific implications of teacher and parent perceptions for teaching and learning have never been studied empirically, and this is an important direction for future research. Moreover, once genes associated with learning disabilities are identified, it will be essential to examine how early teachers and parents can begin the job of prevention, and what difference such interventions make on long-term child outcomes.

In closing, results indicate that teachers and parents are generally aware of the influence of both genetics and the environment as they relate to personality, intelligence, behaviour problems, learning difficulties, and mental illness. Additional comments on the teacher questionnaires indicated a significant curiosity about genetics, in particular with regard to knowing more about genetically-influenced learning difficulties. Although no research has addressed the extent to which teachers' views of the nature–nurture question influence their method of instructing, the desire for additional knowledge is particularly interesting as it is related to potential advances in teaching effectiveness by tailoring educational curricula to individual children's preferred learning styles, as well as to the pro-active treatment of genetically-mediated learning disabilities. Comments on the questionnaires indicated the hope that future genetically-sensitive research would provide solutions for the field of education. However, for now, it is encouraging that teachers and parents appear to have moved beyond the nature versus nurture debate, and hold the more balanced viewpoint that both genes and the environment are important.

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