



TEDS NEWS

2008



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A lucky 13th year for TEDS!

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| <p>Despite the importance of learning abilities and disabilities in education and child development, little is known about their genetic and environmental origins in the early school years. We report results for English (which includes reading, writing, and spelling), mathematics, and science as well as general cognitive ability in a large and representative sample of U.K. twins, reared as 7, 9, and 10 year olds. Although preliminary reports of some of these data have been published, the purpose of this monograph is to present new molecular, behavioral, and longitudinal analyses that systematically examine genetic and environmental influences for the entire sample at all ages for all measures for both the low extremes (disabilities) and the entire sample (abilities).</p> <p>English mathematics and science yielded similarly high heritabilities and modest shared environmental</p> | <p>The Genetic and Environmental Origins of Learning Abilities and Disabilities in the Early School Years</p> | <p>With Kover, Claire M. A. Haworth, Philip S. Dale, and Robert Plomin</p> <p>with commentary by Richard Weisberg, Alexander M. Thomson, and Kurt W. Fischer</p> |
| <p>Influences at 7, 9, and 10 years despite major changes in genes across these years. We show these conclusions that go beyond learning-ability. First, the absolute is normal: low performance is the quantitative extreme of the same genetic and environmental influences that operate throughout the normal distribution. Second, continuity is genetic and change is environmental: longitudinal analyses suggest that cognitive ability is primarily mediated genetically whereas the environment contributes to change from age to age. Third, genes are omnivorous and omnivores are specialist: multivariate analyses indicate that genes largely contribute to similarity in performance across and between the three domains, and with general cognitive ability, whereas the environment contributes to differences in performance.</p> | <p>MONOGRAPHS OF THE SOCIETY FOR RESEARCH IN CHILD DEVELOPMENT</p> | <p>These conclusions have far-reaching implications for education and child development as well as for molecular genetics and neuroscience.</p> |

TEDS' 13th year is off to an exciting start. The book on TEDS described in last year's newsletter has now been published in the most prestigious and highly cited psychology series. Here is the reference:

Kovas, Y., Haworth, C. M. A., Dale, P. S., & Plomin, R. (2007). The genetic and environmental origins of learning abilities and disabilities in the early school years. *Monographs of the Society for Research in Child Development*, Volume 72, whole number 3, Serial No. 188, pp. 1-144.

The book brings together TEDS' research at 7, 9 and 10 years, as described in our previous newsletter. The book was published with two commentaries by top researchers in the field. One commentary concluded: "...a landmark in our understanding of the role of genetics and environment in the development of abilities and skills." The other commentary begins with this sentence: "This Monograph is a masterpiece – a 'must read' for the wide readership of SRCD Monographs." The book begins with this acknowledgement: "We are enormously grateful to the TEDS families for their participation and support for more than a decade." We really mean it! We have purchased 100 copies of the book which we will send free of charge to the first 100 TEDS families who let us know that they would like a copy.

Sophie wrote to us and sent us this picture. She wrote "this is me Sophie and my twin brother Joshua holding our new born twin sisters Tillie and Stella born the same week as us in December ten years apart. In the middle is our brother Brett, who is four and half years apart from both sets of twins, we call him the "twin sandwich"



Photo Competition

Thanks to all of you who sent photos. Judging them was very difficult indeed but our panel of judges managed to choose the twenty winning entries which you can see in this newsletter. We have printed five at the bottom of each page so all twenty winning entries are shown. They are also shown in a larger format on our website. To get to the photos, first go to the News page, then there is a link near the top of the page.

The actual photo page is: <http://www.teds.ac.uk/information/photos2007.htm>



We have contacted many of you this year with requests to help us with our research, and as usual you have been very generous with your time. All this information has resulted in our investigators being able to try to answer difficult questions about child development. We have highlighted some of the recent studies over the next two pages.

TEDS' Web Activities

Most of you will now have had a go at our online activities, which have been a huge success. They allow you to take part in the study when and where it suits you. But have you wondered whether your performance using a computer and over the internet is as good as your performance on traditional paper and pencil puzzles? We wanted to test this question, so thirty children kindly agreed to do paper and pencil versions so that we could compare scores. In fact, scores on the different versions of the tests were almost exactly the same, telling us that the internet puzzles work just as well as the traditional paper and pencils ones.

C.M.A. Haworth, N. Harlaar, Y. Kovas, O.S.P. Davis, B.R. Oliver, M.E. Hayiou-Thomas, J. Frances, P. Busfield, A. McMillan, P.S. Dale, and R. Plomin (2007). Internet Cognitive Testing of Large Samples Needed in Genetic Research. *Twin Research and Human Genetics*, 10(4), 554-563

Genes and Behaviour



Shona and Rosie

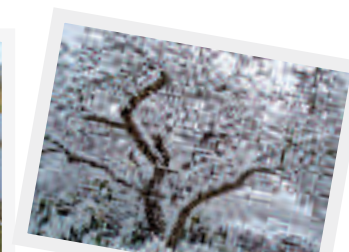
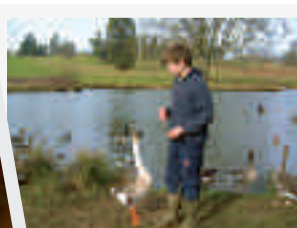
One of the aims of TEDS is to understand the connection between DNA and behaviour. DNA is basically a very long molecule that looks a bit like a twisted ladder, and each 'rung' of the ladder consists of a pair of four bases A, C, G or T. In total there are three billion rungs, or letters -- many more than we can possibly look at in one go! With the

exception of identical twins, all people have small differences in the letters that their DNA contains, and it's these differences that make each of us unique. The letters of our DNA are 'read' to produce products that our bodies need to develop and function normally. In TEDS we have examined how differences in the letters of our DNA can change the products that are made, and how this in turn can alter behaviour (such as how well we learn to read).

However, we know that it is not enough for the correct gene products to be made; they also need to be made at the correct time, at the correct level and in the right order – called 'gene expression'. In a new direction for TEDS research we have started to look at gene expression in saliva and blood and ask how they change within twin pairs. So far, five families have visited us at the TEDS office and allowed us to collect saliva and blood samples from them. From this small study we have identified genes whose levels of expression change within identical twins – a very exciting finding! Because the study went so well, we have applied for funding to look at 500 families. If we are successful we may be contacting you next year asking if you would like to help us with this new research.

Genes and Maths

Whilst many environmental factors influence mathematical ability, TEDS research has shown that genes can also affect how good we are at learning maths. We have been trying to find out exactly where these genes are in our DNA. Using the results of the web tests you have completed, and the reports which your teachers have kindly sent in, we have selected individuals with the highest and lowest scores in maths. We then searched for differences in their DNA which might relate to these differing scores. Ours was the first time anyone had done this with maths. Just as with other traits such as reading, or even diseases such as diabetes, no large DNA differences were found. This tells us that maths is probably affected by lots and lots of different genes, each having only a tiny effect. It tells us that we may have been

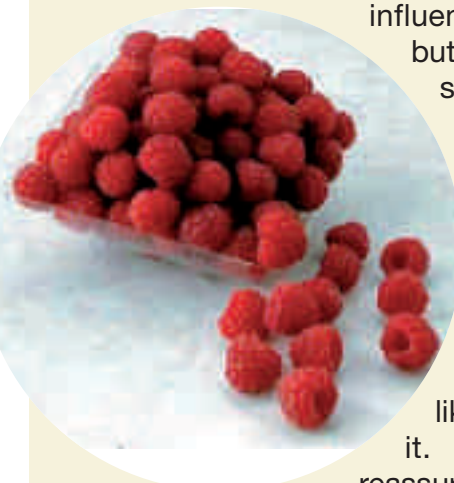


wrong in assuming we were searching for only a few genes. However, it also means we have a lot of work ahead of us if we are finally going to locate them all.

Docherty, S. J. Poster presentation #376: A two-stage genomewide association scan of pooled DNA for QTLs associated with mathematical ability in 10-year-old children. ISPG's XV World Congress on Psychiatric Genetics. October 2007. NYC, NY.

Are you afraid of trying new foods?

Humans typically avoid new foods to some extent. Whilst this was beneficial in the past when unfamiliar foods may have been poisonous, in the modern environment foods are generally safe to eat. Nowadays the fear of trying new foods often leads to poor intake of fruit and vegetables. For example, children scoring high on a food aversion scale ate, on average, 35% less fruit and vegetables than children who scored low on the scale. Using the information you gave us we were able to assess how important our genes are when it comes to trying new foods. We found that genes are a very important influence on food aversions, explaining almost 80% of the differences between food aversion scores. Environmental influences were also an important factor influencing food aversion but, surprisingly, not the shared family environment.



Our research also suggests that if you don't like a new food you should keep trying it, because the more you try it the more likely you are to enjoy it. Parents can be reassured that their child's reluctance to try new foods is not

simply the result of poor parental feeding practices but is partly in the genes. New foods can become familiar, and disliked foods liked, after repeated tries.

L.J. Cooke, C.M.A. Haworth & J. Wardle (2007). Genetic and environmental influences on children's food neophobia. *American Journal of Clinical Nutrition*, 86, 428-433.



Left to right: C. Curtis, Dr L. Butcher, S. Docherty, Dr E Meabum

Generalist Genes

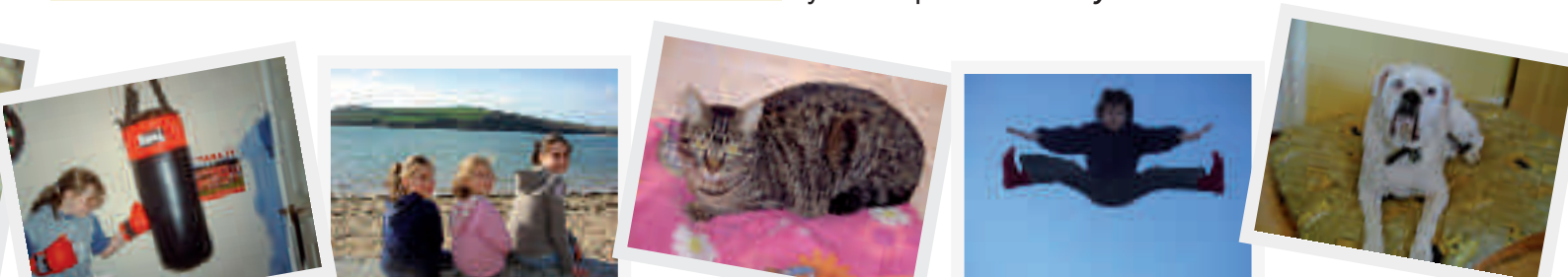
In last year's newsletter we told you about our finding of *generalist genes* – that is, the same set of genes influence different learning abilities. So genes that influence maths will also be likely to influence reading. This is why we have called the genes *generalist*. In contrast, environmental influences on performance tend to be *specialist* – those for maths are not the same as those for reading.

Environmental influences could be a result of teachers, schools or friends, as well as many other factors. What's interesting about them is that they are likely to explain differences in performance between school subjects. For example if a child is better at maths than at reading, the difference is likely to be environmental. We have been looking into environmental influences that are important for school performance. Once we have identified them we will be able to suggest environmental interventions that will allow all children to reach their potential.

Our research also shows that environmental influences that are important to school learning are largely specific to each individual – so experiences can decrease the similarity between a pair of twins. For example, these experiences might include having different friends, different hobbies or going to different schools.

For education, our research supports the idea of *individualised* education plans. Rather than expecting all children to respond in the same way to the same style of learning, children should be treated as individual learners with different strengths and different needs. Advances in school technology means that this will be even easier to provide in the future.

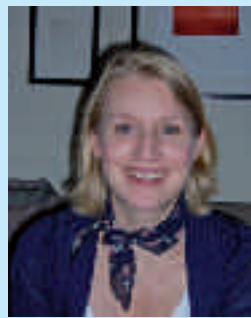
We really couldn't do this research without all of your help – *so thank you!*



We have two new PhD students this year

- Corina Greven and Stephanie Lietz

Two new PhD students will rely on TEDS for their dissertation research: Stephanie Lietz and Corina Greven. By coincidence, both grew up in Germany and both read psychology at London universities – Corina at University College London and Stephanie at Birkbeck College. Stephanie will study the interface between nature and nurture, that is, the ways in which our experiences are influenced by genetic factors. Corina’s research will focus on the links between learning abilities and behaviour problems, especially hyperactivity. It’s a good sign that although Corina and Stephanie only began to work on TEDS in August 2007, both of them presented excellent posters on their research at the World Congress on Psychiatric Genetics in New York in October.



Dr E Viding

In previous years, we have introduced other PhD students whose dissertations depend on TEDS. During the past year, we are pleased to let you know that three of these students have recently become



Dr A Ronald

lecturers at London universities: Essi Viding is now at University College London, Angelica Ronald is at Birkbeck College, and Yulia Kovas is at

Goldsmith’s College. The research of Yulia on learning maths was described in the 2006 TEDS Newsletter and the 2007 TEDS Newsletter summarised the research of Angelica on autistic-like



Dr Y Kovas

behaviours and of Essi on antisocial behaviour. Angelica, Essi and Yulia are keen to continue their TEDS research.

Please see our website for answers to frequently asked questions. This covers general questions about TEDS, along with other queries about filling in booklets and logging on to do the web activities. Go to <http://www.teds.ac.uk/information/faqs.htm> to find out more.

Please help us stay in touch with you by letting us know any change of address or phone number. You can also call us free on 0800 317 029 or e-mail us at teds@iop.kcl.ac.uk



Have you changed your address or phone number?

Your name.....the children’s names.....&.....

New Address

Postcode Telephone no.

