September 06, 2019

Psychology

What could improve our children's mathematics and science abilities?

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This Break was edited by Max Caine, *Editor-in-chief* - TheScienceBreaker

ABSTRACT

Using data collected from pregnancy throughout the lives of many thousand children we have shown that the personality of the mother is strongly associated with the science and mathematics ability of the child, and that this is partly explained by her parenting behaviour.

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Locus of control (LOC) is part of one's personality. It describes how an individual reacts to their circumstances. Psychologists measure it on a scale, at the high end of which are individuals known as externally oriented, and, at the other end, the internally oriented. The scale measures the way in which a person believes in their ability to tackle a problem – at one extreme are the externals – they tend to feel that it doesn't really matter what they do, whatever is going to happen will happen (whether by luck, chance or because of other people); at the lower end of the scale are the internals - they tend to feel that what they do is important and is likely to have an effect.

We have shown that there are profound associations with the way that the child is parented according to the orientation of his/her parents. Those with both parents who were internal doing considerably better than those with one external parent and even worse if both parents were external. The consequences have been shown with early childhood behaviours such as an increased risk of temper tantrums and sleeping difficulties, later childhood behaviours such as hyperactivity and aggression in primary school. This raises the question as to how these children perform in important educational areas including the understanding of mathematics and science, which are likely to be of great benefit to them in adolescence and adulthood.

The major source of information in our study was the data collected as part of the Avon Longitudinal Survey of Parents and Children (ALSPAC), also known as 'Children of the 90s'. This longitudinal study started by studying over 14,000 pregnant women residing in one area of Britain. The children were born in 1991-1992 and have been followed throughout their childhoods. The study is unique in that data were collected from the mothers and fathers on their LOC orientation (internal or external) before the child was born.

We compared the LOC scores of mothers with the child's results on different mathematics tests, and on tests of scientific understanding of science undertaken during primary school (<12 years). Associations were analysed to see whether they were the result of other features of the family such as their social circumstances. We found that children of mothers who were external had lower scores on mental arithmetic as well as tests of understanding of 49 mathematical and scientific concepts. These associations were shown to be largely due to how the children were being brought up. The mothers who were externally oriented were more likely to smoke, and less likely to eat a balanced nutritious diet during pregnancy; once the child was born, they were less likely to breastfeed, or to have a structured attitude towards the infant's feeding and sleeping behaviour through the child's early years. They were more likely to shout at or slap their children, less likely to make sure the child was immunised, less likely to read to them or, when they were older, less likely to take an interest in their schoolwork. Many aspects of the environment known to support the child's brain development tended to be missing such as a diet with fish and appropriate vitamin content.

We showed that the early social circumstances of the parents could not explain the findings. Others have shown that the populations of the developed world are becoming more external over the decades. Our findings suggest that nations would be likely to benefit from interventions to encourage external individuals to become more internal. First, however, we suggest that randomised controlled trials be initiated to prove the efficacy (or otherwise) of such a change.