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Does math make you anxious?

- Greater anxiety towards mathematics is associated with lower scores in mathematics, both between and within countries.
- The better a student's schoolmates perform in mathematics, the greater the student's anxiety towards mathematics.
- Teachers' use of formative assessment practices is associated with lower levels of mathematics anxiety in 39 countries and economies.

Mathematics can provoke worry, stress and even feelings of powerlessness in some 15-year-olds; and this anxiety towards mathematics is shown to be strongly related to mathematics performance. Which students are most susceptible to mathematics anxiety?

Mathematics anxiety is associated with worse performance in mathematics.

PISA 2012 reveals that countries and economies where students tended to report higher levels of anxiety are also those where students tend to perform less well in mathematics. For example, among the lowest-performing countries in mathematics (those that score below 400 points on the PISA test), Argentina, Brazil, Jordan and Tunisia reported the highest levels of student anxiety towards mathematics. Conversely, countries that perform above the OECD average (494 score points), notably Austria, Denmark, Finland, Germany, Liechtenstein, the Netherlands and Switzerland, tended to show the lowest levels of anxiety. However, not all countries and economies follow this pattern. Students in most of the highest-performing countries/economies in PISA, such as Hong Kong-China, Japan, Korea, Macao-China, Shanghai-China, Singapore and Chinese Taipei, reported higher levels of anxiety than would have been expected given their performance.

The negative association between anxiety and mathematics performance is also observed when comparing different students in a single school system. The higher the level of mathematics anxiety, the lower the student's score in mathematics. On average across OECD countries, mathematics anxiety is associated with a 34 score-point decline in mathematics performance – the equivalent of almost one year of school. In New Zealand, Norway and Poland, the decline is far greater than the average – at least 45 score points – while in Indonesia, Japan and Tunisia, it is smaller (less than 20 score points), but still significant. While these findings cannot be used to establish a direct causal link between mathematics anxiety and poor performance in mathematics, PISA results are consistent with the evidence from experimental research examining the role of anxiety in undermining academic achievement.

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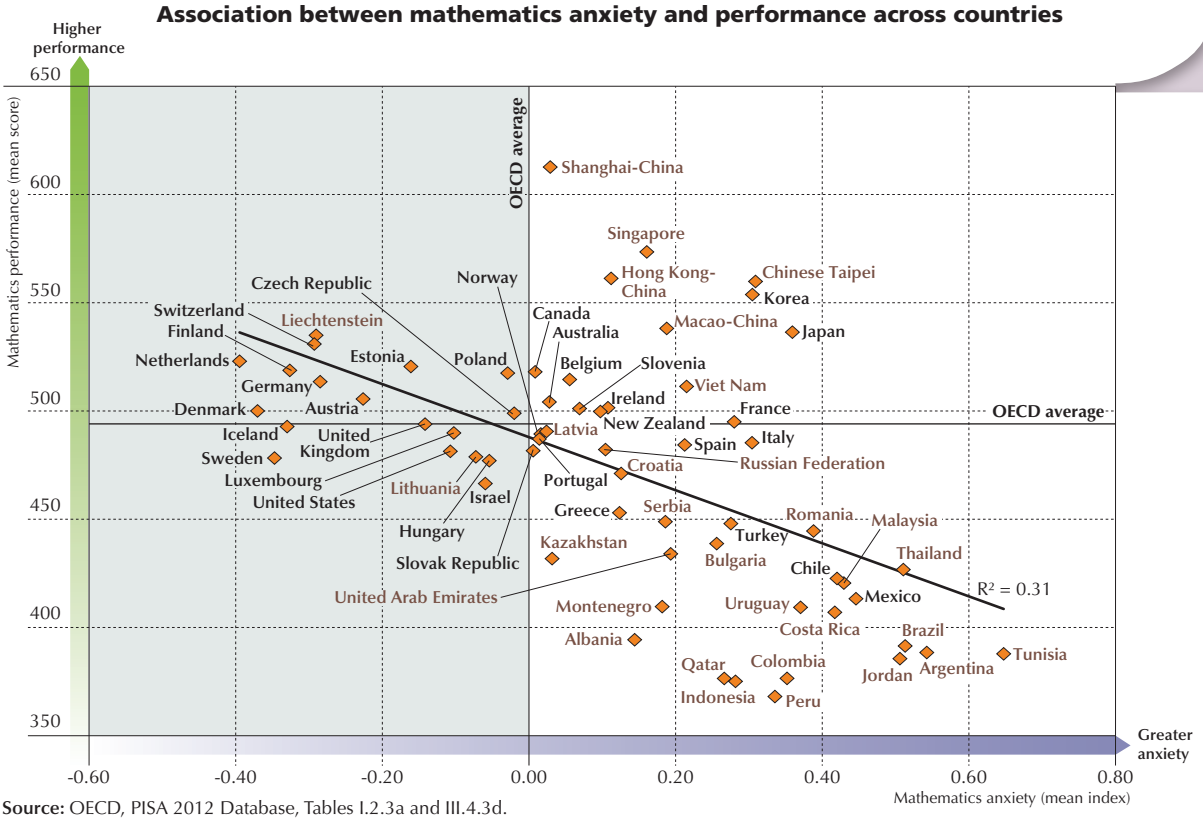
Association between mathematics anxiety and performance across countries



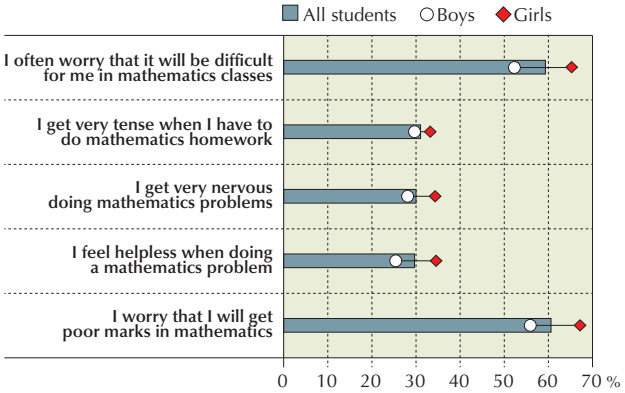
Source: OECD, PISA 2012 Database, Tables I.2.3a and III.4.3d.
StatLink http://dx.doi.org/10.1787/888932963844

On average, about one in three students feels anxious when confronted with a mathematics problem.

PISA 2012 measured students' anxiety towards mathematics through their responses to questions about how they feel when they anticipate having to perform mathematical tasks, when they anticipate their performance in mathematics class, and while they are attempting to solve mathematics problems. Across OECD countries, 59% of students reported that they often worry that it will be difficult for them in mathematics classes; 33% reported that they get very tense when they have to do mathematics homework; 31% reported that they get very nervous doing mathematics problems; 30% reported that they feel helpless when doing a mathematics problem; and 61% reported that they worry about getting poor grades in mathematics. In all countries and economies, at least one in three students reported that they often worry that it will be difficult for them in mathematics classes. Students are particularly anxious in Argentina, Indonesia, Jordan, Korea, Malaysia, Mexico, Romania, Tunisia and Uruguay, where more than three in four students reported that they worry about mathematics classes. By contrast, in Denmark, Iceland, Liechtenstein, the Netherlands, Sweden, Switzerland and the United Kingdom, fewer than one in two students so reported.

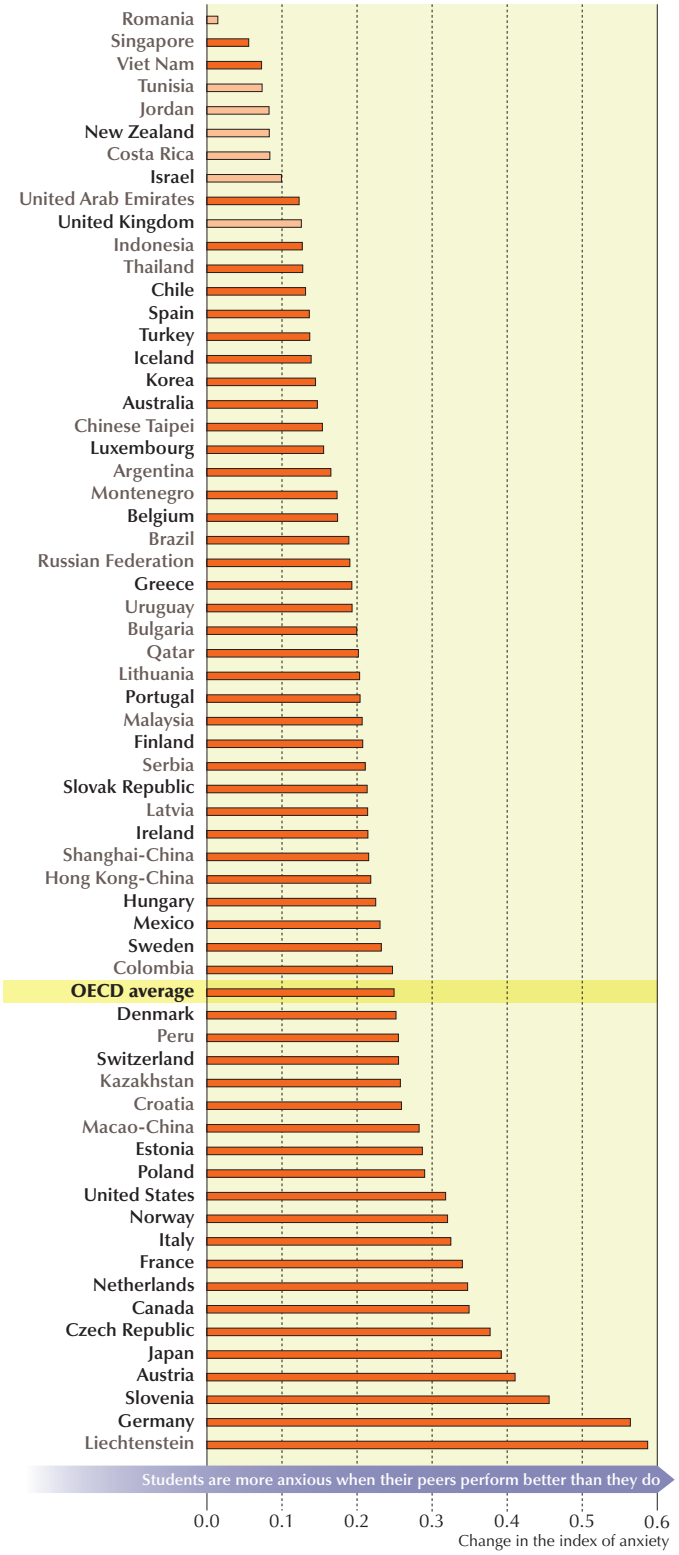
How students express their anxiety towards mathematics

Percentage of students across OECD countries who reported that they "agree" or "strongly agree" with the following statements:



Note: All differences between boys and girls are statistically significant.
Source: OECD, PISA 2012 Database, Tables III.4.3a and III.4.3b.
StatLink http://dx.doi.org/10.1787/888932963958

Comparisons with schoolmates and mathematics anxiety



Note: Statistically significant differences are marked in a darker tone.
Countries and economies are ranked in ascending order of the association between relative performance and anxiety.
Source: OECD, PISA 2012 Database, Table III.5.9c.
StatLink http://dx.doi.org/10.1787/888932963977

Girls are more anxious towards mathematics than boys.

In almost all countries and economies that participated in PISA 2012, girls reported greater mathematics anxiety than boys. In Albania, Bulgaria, Indonesia, Kazakhstan, Malaysia, Montenegro, Romania, Serbia and Turkey, there was no gender difference in mathematics anxiety, while in Jordan, Qatar and the United Arab Emirates, boys reported greater feelings of anxiety than girls. Gender differences in mathematics anxiety tend to be particularly wide in Denmark, France, Germany, Liechtenstein, Luxembourg, Switzerland and the United Kingdom. For example, in Denmark and Liechtenstein, the proportion of girls who worry that it will be difficult for them in mathematics classes is at least 20 percentage points larger than the proportion of boys who are similarly worried.

Students tend to feel more anxious about mathematics when most of their schoolmates perform better than they do.

For many students, mathematics anxiety is their reaction to the subject, itself. But PISA 2012 also finds that a student's likelihood of developing anxiety towards mathematics is closely related to the school he or she attends and, in particular, how well he or she performs compared to his or her schoolmates. Students who perform well in mathematics, and who attend schools where other students perform better than they do, on average, tend to feel more anxious towards mathematics than students who perform at the same level but who attend schools where other students perform worse than they do.
In some school systems, students' success is measured by their ability to outperform their peers, thus education is perceived as a zero-sum game. This can happen, for example, in school systems where the demand for access to universities, academic programmes or particular schools exceeds the number of places available, or where there are large between-school variations in achievement.

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PISA 2012 shows that mathematics anxiety is associated with students' relative performance in all participating countries except Costa Rica, Israel, Jordan, New Zealand, Romania, Tunisia and the United Kingdom, where this relationship is not significant. Students are more strongly affected by their relative performance in Austria, Canada, the Czech Republic, France, Germany, Italy, Japan, Liechtenstein, the Netherlands and Slovenia. In this latter group of countries, when students attend schools where the average student performs better than they do in mathematics, their level of anxiety towards mathematics tends to be considerably higher than that of students with similar marks in mathematics, but who attend schools where the average student performs as well as they do or worse.

Teachers can help relieve students' anxiety.

Students who participated in PISA 2012 were asked to report the frequency with which their mathematics teacher tells students in the class how well they are doing in mathematics, gives students feedback on their strengths and weaknesses in mathematics, and/or tells students what they need to do to become better in mathematics. In 39 countries and economies, among students with similar performance in mathematics, those who reported that their teacher practices these teaching methods extensively reported less anxiety towards mathematics.

The bottom line: Educators should be concerned that the majority of students feels anxious about mathematics. Teachers who use formative practices, such as telling students how well they are doing in mathematics class, giving students feedback on their strengths and weaknesses in mathematics, and telling students what they need to do to become better in mathematics, help students to become less anxious.

For more information

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See *PISA 2012 Results: Ready to Learn: Students' Engagement, Drive and Self-Beliefs, (Volume III)*, PISA, OECD Publishing, Paris.

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Coming next month
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