

What is statistics anxiety?

Most students feel a little anxious at some point in their studies particularly around the assessment period, but at times, some students feel unusually anxious which affects their ability to learn. The trigger for anxiety could be tests, writing, presentations, maths or statistics but the impact on the brain and on learning is the same. Below some students who are anxious about maths or statistics, describe how they feel in lessons or undertaking quantitative research. Do you ever feel like this?

"I arrived this morning with complete brain block and anxiety. Nervous, scared and petrified of the lesson"

"Once the teacher started talking my mind went blank as if she was talking a different language, everything she said went in one ear and out the other..."

"I was extremely anxious and overwhelmed by the amount of numbers and things I didn't understand in the software."

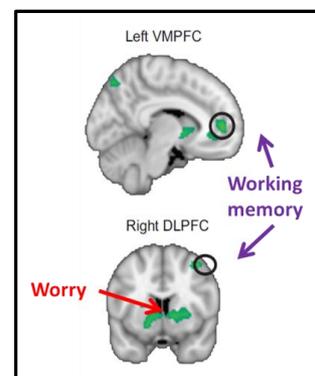
Students with statistics anxiety may experience some or all of the following feelings when studying statistics:

- **Anxiety:** Generally anxious and unable to take anything in especially near exams
- **Panic:** Feeling of helplessness that will not go away
- **Paranoia:** Believing that you are the only person not capable of doing statistics
- **Passive Behaviour:** Feeling there's no point in trying / wanting to quit and go home
- **Lack of Confidence:** Don't know where to start / expect to never know the answer to questions

Effects of anxiety on the brain

In order to study effectively, the working memory at the front of the brain needs to be fully activated. However, brain scans show that when someone is anxious, the 'worry' part of the brain takes over and inhibits your working memory making the work seem much harder than it is (Young, 2012).

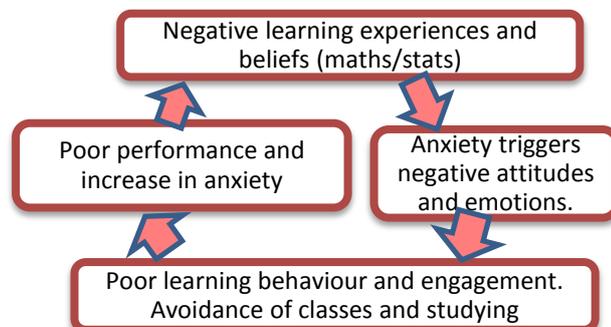
This means that whilst someone is very anxious, they will struggle to understand material or study. It is important to recognise that it is the fear rather than inability which is preventing learning.



Statistics anxiety

Many students identify statistics or research methods as the most fear-inducing course in their curriculum and it is estimated that up to 80% of students have some anxiety about statistics.

Before starting their first statistics course, many students already have negative attitudes about statistics which are often linked to negative experiences with maths in the past. Most people have had a stressful or negative experience with maths at some point such as insensitive or uncaring teachers, embarrassment in the classroom or feeling that they just don't get maths.



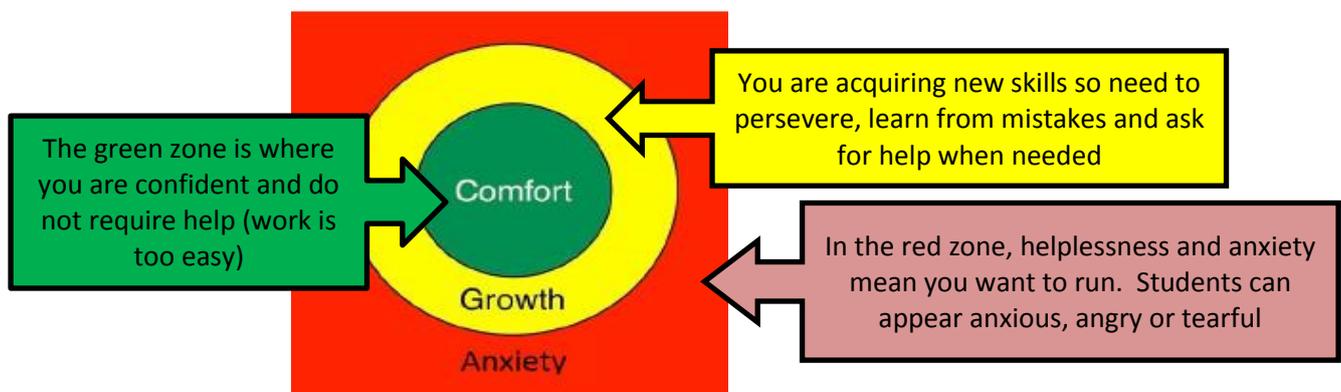
Students often link statistics with maths so students with high maths anxiety are often anxious about statistics at the start of their course. However, the two types of anxiety are different as statistics requires other skills such as verbal reasoning, computing skills and interpretation. The level of maths calculations required in a typical research

methods course is often minimal as teaching centres on the use and interpretation of statistical software. In fact, students with higher maths qualifications can find these aspects of statistics difficult.

If students have negative attitudes, experiences and anxiety about statistics, the brain can see statistics as a threat and the natural response is to 'run' away from situations involving statistics in a similar way as one would run from a tiger! Students with statistics anxiety may avoid statistics lectures, put off studying until the last minute and lack perseverance, subsequently leading to poor grades and increased anxiety.

The impact on learning

There are different stages of learning which are summarised in the growth zone model below (Johnston-Wilder et al, 2016). The green area in the diagram is referred to as the 'Comfort Zone' where students work independently on material they are familiar or comfortable with. The 'Growth Zone' is where new material is being learnt which can be challenging but rewarding. When a student is interested in a subject and motivated to learn, they will invest more time and effort in their learning, look for alternative explanations or ask for help when struggling and persevere even when they make mistakes.



Students may feel a bit anxious in the growth zone but many students with statistics anxiety lack motivation, expect failure and move straight to the 'Anxiety or panic zone' where very little learning can occur. At this stage, stress levels increase rapidly, statistical helplessness takes over and the brain activates the 'fight or flight' defence mechanism. In the anxiety zone, students may feel tearful or angry and want to remove themselves from the situation as soon as possible. It is important to recognise when you are in this zone and develop strategies for coming out of it.

Strategies for overcoming statistics anxiety

Strategies that help address statistics anxiety can allow someone to overcome their fear and become successful learners. Statistical resilience is a term used to describe a positive stance towards statistics where someone overcomes their barriers to learning, are motivated to persevere with statistics and acknowledge that mistakes are part of the learning process. In order to develop statistical resilience and progress with the learning statistics, several stages are suggested (adapted from Johnston-Wilder, 2016):

1. **Awareness:** Understanding the impact of statistics anxiety and recognising when it is inhibiting learning
2. **Challenging unhelpful beliefs:** Belief that everyone can progress with statistical learning (growth mindset) and understanding of the personal relevance of statistics
3. **Effective study:** Understanding of how to study statistics effectively including seeking help

There is a 'reflection and planning' sheet associated with this resource. When reading through this resource, make notes on the reflection sheet to help you understand your anxiety, how anxiety is affecting you and when you are too anxious to study.

Awareness

Why are you anxious and what is the impact?

Consider the reasons which may be contributing to your anxiety about statistics such as stressful or negative experiences with maths or statistics in the past or expectations/concerns about studying statistics.

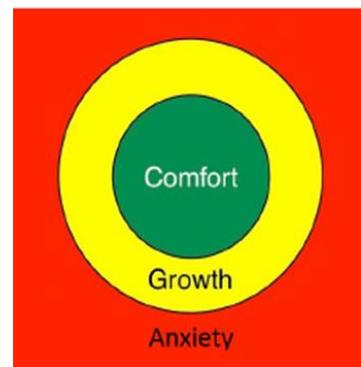
Think back to a time you were anxious about statistics and try to identify how you felt. Think about how anxiety affected you emotionally or physically and whether you had any negative thoughts about statistics or your ability.

"My anxiety stems from maths in school where I would get upset and cry if ever I didn't understand something."

Learn to recognise when anxiety is impacting on learning and develop strategies for reducing anxiety and returning to the yellow 'growth zone'. Remember that you may feel slightly anxious when learning something new and may make mistakes but when in the red anxiety zone, even reading a question can become very difficult. If you are feeling anxious generally, what do you do to help yourself calm down?

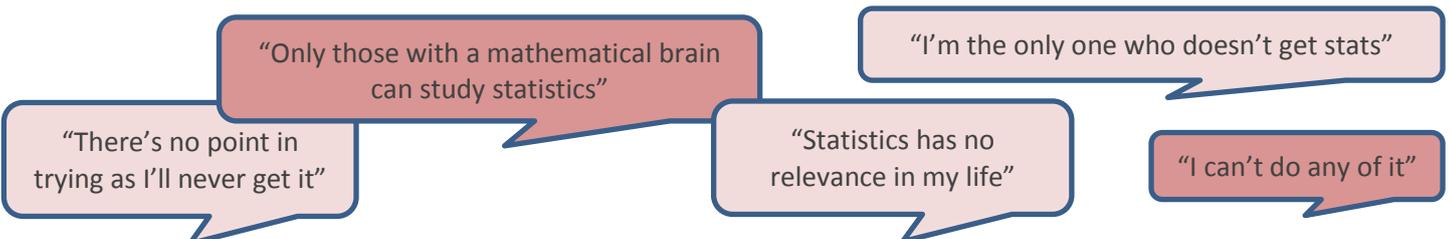
Reducing anxiety: Suggested strategies for reducing anxiety are primarily based around short term distraction. For example:

- concentrate on your breathing, breathing out for longer than breathing in (count in for 5 and out for 7)
- identify five sounds you can hear
- write about the anxiety you are feeling e.g. emotions, thoughts and how this is impacting on learning
- any other technique you find helpful such as listening to music or taking a short break



Challenging unhelpful beliefs

Students with statistics anxiety often have negative beliefs and attitudes about statistics. Thoughts such as those below are common when feeling anxious but will stop you being able to concentrate.



Relevance: Many students fail to understand why learning quantitative methods are useful which impacts on their motivation to learn. Recognising that statistics is used in daily life as well as within your chosen discipline is an important step in changing your attitude and motivation. For example, newspapers use simple statistics from the results of quantitative research, google collect and analyse data daily and this resource contains results from many quantitative studies!

Self-efficacy/confidence: Self-efficacy is the belief that you are capable of successfully performing a task and several studies have shown that high scores of self-efficacy are related to good exam performance. If you believe that you can do it, you are more likely to put the effort in, will be more motivated to study and persevere with questions which results in better understanding and performance. Everyone is capable of progressing with statistics but you need to allow yourself time to progress at your own speed and recognise small achievements.

Effective studying

In order to progress with your learning of statistics, start by recognising what you already know or are comfortable with and build up slowly from there. On the 'reflection' sheet, consider the different aspects of statistics to get you started. What are your current green zone activities? For example, are you comfortable with reading statistics such as percentages or bar charts in newspaper articles or summarising your own data?

Classroom strategies: You can't be an expert in statistics overnight and if you have high statistics anxiety, any progress is good. If you normally avoid class or put off studying, progress is attending class! It is common for University classes to move at a very fast rate particularly for statistics which may make you feel overwhelmed so some anxious students find it helpful to go through the learning material before the lecture. In the lecture, concentrate on understanding the core concepts from the lecture rather than every detail and go back over the notes later to help fill in any gaps. Use your de-stressing techniques to reduce anxiety in class and remind yourself that it is the anxiety rather than your ability which is impacting on learning.

Help seeking: You will not be the only one struggling with the statistics content of your course or the only person who is anxious so talk to your friends about how they feel about statistics. You may also find it helpful to set aside some time each week to work through class material together as you are more likely to do the work and persevere. Students who ask for help when needed or look for alternative explanations are more likely to do well in statistics.

As well as asking peers or teaching staff for help, many institutions now have maths and statistics help centres where you can get individual support with any aspect of statistics. Receiving individual help is a very effective method for reducing anxiety and building confidence as the teaching will be at your own speed and level.

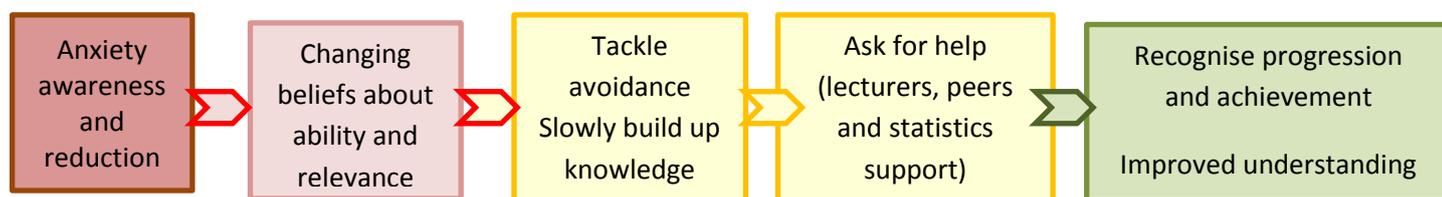
Statistics support feedback

*"Thank you for making complicated aspects much simpler!"
"Lots of help; feel less stressed now thank you!!"*

Planning, perseverance and recognising achievement: Develop a sensible, achievable plan giving yourself time to build up your knowledge slowly particularly if you are working on your dissertation. Start with your green zone activities and progress slowly into the 'growth zone' with activities just above your current knowledge. Accept that you may struggle or make mistakes when new learning is happening and learn to ask for help. Keep a journal of your progress however small so that you can reflect on your progression when feeling anxious and doubting your ability to learn statistics.

"I felt a lot less anxious when I began writing the results in my actual dissertation and visually seeing progress"

The diagram below summarises the steps discussed to help overcome anxiety and progress with statistics.



References

This resource was created as part of a collaborative project to understand and address statistics anxiety: *Ellen Marshall (Sheffield Hallam University), Anna Riach (University of York) & Amanda Shaker (La Trobe University)*
Please let us know if you have used the resource and any feedback you have through the following link:
<https://forms.gle/A1TX9uXcrWvNEPHv7>

- Johnston-Wilder, S., Pardoe, S., Almehr, B., Marsh, J. Richards, S. (2016). Developing teaching for mathematical resilience in further education. *9th International Conference of Education, Research and Innovation, ICERI2016, Seville (SPAIN), 14th - 16th of November, 2016.*
- Young, C. B., Wu, S. S., & Menon, V. (2012). The neurodevelopmental basis of math anxiety. *Psychological Science*, 0956797611429134.