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### **Neuromyths about special educational needs: What should teachers know?**

Jo Van Herwegen, Associate Professor, Psychology and Human Development, Faculty of Education and Society, UCL, UK

Michael Thomas, Director, Centre for Educational Neuroscience, Birkbeck, University of London, UK

Chloe Marshall, Professor, Psychology and Human Development, Faculty of Education and Society, UCL, UK

Rebecca Gordon, Associate Professor, Psychology and Human Development, Faculty of Education and Society, UCL, UK

#### **<A>Introduction**

Neuromyths are widely held misconceptions about how the brain works. They arise from several sources, including the oversimplification of scientific findings from cognitive neuroscience research, the public's appetite for brain-related news, and pre-held beliefs about the brain (Pasquinelli, 2012). Their *myth* status means that they are enduring and continue to circulate as scientifically based truths, even when their claims are repeatedly shown to be false. Some of the most common neuromyths include the beliefs that humans only use 10 per cent of their brain, that left-versus-right-brain dominance affects learning and that individuals learn better when taught in their 'preferred learning style' (Torrijos-Muelas et al., 2021).

Neuromyths have grown in popularity despite the best efforts of educational neuroscience, an emerging field that aims to use robust research findings related to the neural mechanisms of learning to design evidence-based guidelines for educational practices (Fischer et al., 2010). Following the 'Decade of the Brain' (1990–2000), the general public has become increasingly interested in learning about neuroscience (Jones and Mendell, 1999). Sometimes referred to as 'neurophilia', this enthusiasm for brain-related information is also reflected in the increased attention to neuroscience from the media and the extensive coverage of neuroscientific discoveries (Racine et al., 2006). Neurophilia has also seeped into the educational field, with one study reporting that 82 per cent of teachers were interested in learning about the brain (Simmonds, 2014).

This enthusiasm for obtaining a better understanding of learning is to be encouraged, as it can inform evidence-based classroom practice and improve student outcomes. However, a recent systematic review of 24 studies examining neuromyths concluded that the majority of misunderstandings regarding the brain focused on the same small set of neuromyths (e.g.

‘learning styles’). The review also found that these misconceptions about the brain are endorsed across the world, including by various groups of educators such as in-service and pre-service teachers (Torrijos-Muelas et al., 2021). This demonstrates that there are shortcomings in the channels of communication between researchers and educators, and that further dialogue is required to avoid the negative impact that neuromyths could have on effective classroom practice.

### **<A>Neuromyths related to special educational needs and their impact on pedagogy**

While much research has investigated the prevalence of myths about the typically developing brain, less attention has been devoted to the pervasiveness of neuromyths regarding learners with special educational needs and disabilities (SEND). One particular group of learners with SEND includes those with neurodevelopmental conditions or neurodivergent students. According to the DSM-V (American Psychiatric Association, 2013), neurodevelopmental conditions include intellectual disabilities, communication disorders, autism spectrum disorders (ASD), attention deficit hyperactivity disorder (ADHD), specific learning conditions (e.g. dyslexia), motor disorders (including developmental coordination and movement disorders, Tourette’s and tic disorders) and other specified and unspecified neurodevelopmental conditions.

In a survey of 366 members of the general public and 203 educators, Gini and colleagues (2021) examined the endorsement of neuromyths generally and those specifically related to autism, dyslexia, ADHD and intellectual disability (with a focus on Down syndrome). Findings from this study revealed that educators and members of the general public endorsed myths to approximately the same degree. This was particularly prevalent in relation to how these pupils can be supported in the classroom. Most commonly endorsed myths included: ‘Dyslexia can be helped by using coloured lenses and/or coloured overlays’ and ‘Reducing dietary intake of sugar or food additives is generally effective in reducing the symptoms of ADHD’ (the full list of neuromyths tested by Gini et al., plus the research evidence showing that they are mistaken, can be found at: [educationalneuroscience.org.uk/neurosense](http://educationalneuroscience.org.uk/neurosense)). These findings were contrary to the prediction that, given their exposure to educational training and/or direct experience, educators would hold fewer incorrect beliefs than the general public. Indeed, previous research has suggested that greater accuracy in identifying neuromyths can be predicted by both the years spent in education (with those with postgraduate degrees outperforming those with an undergraduate degree or no university education) and by the content of education (with those who attended

neuroscience courses outperforming those with no neuroscientific background) (Macdonald et al., 2017). Interestingly, Gini and colleagues found that the incidence of general neuromyths was lower than that found by earlier studies, perhaps showing that attempts by researchers to improve science communication have been succeeding – but not yet for SEND-related myths.

There is a lack of consistent evidence about the extent to which neuromyths are detrimental to pupils' learning or adversely impact the quality of teachers' delivery (Horvath et al., 2018), but some studies have highlighted how teachers who endorse neuromyths often adopt teaching practices linked to these incorrect beliefs (Lethaby and Harries, 2016). It should also be considered that neuromyths about neurodevelopmental conditions could result in mislabelling, stigma or inadequate support if the profiles of specific conditions are not fully understood (Washburn et al., 2014). There is considerable evidence that being a victim of stigma can result in increased stress, which has tangible effects on physical and mental health (Hatzenbuehler et al., 2013). For example, if it is commonly believed that children with dyslexia reverse letters when writing (this is, in fact, not specific to dyslexia but is a common developmental phenomenon), then parents and teachers would be less able to identify which children require assessment and formal diagnosis. Alternatively, the wrongly held belief that dyslexia is caused by visual stress might lead to the development and use of ineffective interventions, such as the use of the aforementioned coloured overlays (Henderson et al., 2013).

It is easy to see how the cost of not addressing the prevalence of neuromyths within the education system might be considerable. Endorsement of neuromyths might lead to the use of ineffective (or even damaging) methods and materials, resulting in a waste of time and resources, and poorer outcomes for the learner (Dekker et al., 2012).

### **<A>Busting common neuromyths**

So, what can be done to lessen the endorsement of incorrect brain-related facts and reduce implementation of unhelpful educational practices related to brain development?

Much campaigning has taken place over recent years to improve awareness surrounding autism, including the Autism Awareness Campaign UK in 2000, which aimed to improve services in health and education. It is worth considering one of the findings from Gini et al.'s (2021) study, which was that both educators and members from the public endorsed significantly fewer neuromyths related to autism. In addition, there are a number of

continuing professional development (CPD) programmes to support teachers in adopting good practices for autistic children in the classroom. Research has shown that short workshops can have a significant positive impact on reducing initial teacher trainees' beliefs in neuromyths (McMahon et al., 2019), and there is also evidence that working with educational professionals and stakeholders to create materials and information related to understanding neurodevelopmental conditions can result in greater uptake of this information and better translation from research to practice (Howard-Jones et al., 2020). One such example of this is the NeuroSENse project and related resources. NeuroSENse was created by the University of London Centre for Educational Neuroscience to raise awareness of misconceptions related to neurodevelopmental disorders and disabilities, and SEND (NeuroSENse, 2021). It includes blogs and video explainers on conditions such as ADHD, autism, dyslexia, deafness and intellectual impairment. More detail on this resource is included in the following section.

Given the evidence of success from studies and campaigns addressing neuromyths, there is considerable benefit in better understanding why educators believe in neuromyths, whether teaching professionals understand the importance of addressing neuromyths in classroom practice and how information debunking neuromyths can be distributed to educators and stakeholders.

### **<A>The current study**

We organised three one-hour focus groups. These included 14 teachers, teaching assistants and SENDCos. The aim was to reflect on how beliefs about SEND-related neuromyths can be addressed and dispelled. When participants were asked about what they thought caused neuromyths to spread throughout the education systems and be endorsed by classroom practice, four main themes were identified from the participants' answers. First, participants raised issues related to training, highlighting that most educators, including SENDCos, do not always have adequate training in SEND. They also raised the issue that external professionals have endorsed certain myths and recommended particular ineffective interventions. This is in line with findings from a recent survey by the Department for Education, which found that less than half of teachers (41 per cent) think that there is adequate and appropriate teacher training related to SEND. The survey also highlighted that SEND-related CPD is often not prioritised (see Wall et al., 2019).

The second issue related to a lack of time for teachers to truly find out what works for each individual in the classroom. As individualising the curriculum takes time, educators often resort to ‘off-the-shelf’ solutions, as these are quick and easy to implement.

Third, participants raised concerns about filtering through the information that they receive and finding information from trusted resources. Specifically, there was concern that many neuromyths circulate via social media and the internet generally (e.g. ‘Googling stuff’). Indeed, there is evidence that neuromyths not only spread rapidly but are also highly resistant to change, and can be strengthened when particularly familiar neuromyths are briefly mentioned, the alternatives are too complex or pre-held beliefs are particularly strong (Grospietsch and Lins, 2021).

Also problematic is the fact that there is no specific recommended approach that is likely to work for all students in all situations. This might result in different teachers using different approaches. As students often have multiple teachers or teachers change year after year, this could result in a lack of continuation for particular children. Participants therefore raised the importance of communication between staff about what works for individual children with SEND.

The insights provided by these focus groups have led to the creation of the aforementioned awareness campaign, NeuroSENse. This extensive set of resources provides summaries of the latest research on various truths related to SEND ([educationalneuroscience.org.uk/neurosense-resources](https://educationalneuroscience.org.uk/neurosense-resources)). Designed by scientists and education professionals, the purpose is to inform teachers, teaching assistants, SENDCOs, and school leaders to help build knowledge of common neurodevelopmental disorders and associated neuromyths.

However, a critical review of intervention approaches to neuromyths found that just providing counter-facts to neuromyths does not result in a drop in neuromyths beliefs in the long term (Rousseau, 2021). Instead, there is evidence that encouraging people to reflect on their own misconceptions (Grospietsch and Lins, 2021) and their own cognitive biases (Rousseau, 2021) can be successful in dispelling people’s beliefs in neuromyths. As such, we have created an infographic that includes five steps that teachers can take to reduce their endorsement of neuromyths (see Figure 1 and link above).

Finally, educational neuroscience is not solely about neuromyths: it is about providing greater insight into learning mechanisms, providing evidence of why certain teaching methods work and empowering educators by providing a more evidence-based approach to

their practice. As stated at the beginning of this article, neuromyths are often the result of miscommunication, and thus a greater dialogue is required between scientists and educators, including how research can be translated into practice. The co-produced NeuroSENse resources are a first step towards a greater knowledge exchange between educators and scientists. Currently, beyond good teacher practice it is unclear what specific practices would work best for students with SEND. To address this, we aim in our future work to conduct systematic review updates related to efficacious pedagogical approaches to specific SEND groups (e.g. Davis and Florian, 2004). We also welcome educators getting in touch with us so that we can develop ways to co-produce evidence-based practice.

Figure 1.

*Infographic from the Centre of Educational Neuroscience NeuroSENse campaign*

**NeuroSENse**  
Five steps towards addressing neuromyths in Special Educational Needs & Disabilities (SEND)

Free CPD resources: [educationalneuroscience.org.uk/neuroSENse](http://educationalneuroscience.org.uk/neuroSENse)

- 1 Developing professional knowledge**
  - Myths spread when there is weak and inconsistent knowledge among staff
  - Understanding basic principles of common developmental disorders can inform teaching practice and help protect against potentially damaging misconceptions
  - Visit the NeuroSENse website for CPD materials and links to resources
- 2 Understanding individual differences**
  - Labels can be a good starting point for understanding children's individual needs and linking them to support, although children with the same diagnosis can have different strengths and weakness and may need different types of support
  - Develop professional knowledge of common developmental disorders (point 1), engage in regular reflection (point 3), and communicate with colleagues (point 4)
- 3 Individual reflection**
  - Ongoing reflective practice and communication with colleagues can help develop teaching expertise and knowledge of children's individual support needs
  - Notice when support works well and collect evidence (keep a diary of what worked / did not work in different lessons). Reflect on how children's strengths and weaknesses, social groupings, and classroom activities can impact support
- 4 Whole-school communication**
  - SEND support works best when teachers, assistants, SENDCos, and school leaders have shared knowledge and are working together
  - Develop an ongoing SEND working group to regularly discuss children's needs, share and develop expertise, and reflect on teaching practice and school policy
- 5 Reaching out to experts**
  - If you are unsure about whether something is true or a neuromyth, reach out to trusted experts
  - Build a knowledge-base of specialist organisations
  - Visit the NeuroSENse website for links to organisations and experts who can help

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