

# NEURO-WHAT? NEUROMYTHS AND THEIR PERSISTENCE IN EDUCATION



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## RATIONALE

While teaching in South Korea during my M.Ed. (2019) I stumbled upon the term 'neuromyth' and became intrigued. I was able to interweave various course assignments with the topic of neuromyths as a cross cutting concept of inquiry & investigation. During a literacy course for the M.I.T. I discovered the value of research/evidence-based curriculum and the dangers of misinformed instructional methods. While the 'Reading Wars' (Science of Reading vs. Whole Language) remains somewhat controversial I was reminded of the pervasiveness of neuromyths in education and was shocked to find little changed in six years.

## WHAT IS A NEUROMYTH?

Coined by Alan Crookard in the 1980s, 1 'neuromyths' are inaccurate beliefs about brain function and learning rooted in misunderstandings or misapplications of neuroscience research particularly when the findings are oversimplified or commercialized; distorted, misinterpreted, or maintained through outdated hypotheses. 2,3 The persistence of these myths in education can be attributed to the combination of factors including cognitive bias, 4,5 insufficient neuroscience literacy among educators, 6-8 and the appeal of simplicity by offering easily digestible explanations for complex behaviors via straightforward solutions. 2-4

## NEUROMYTH EXAMPLES

The most commonly endorsed neuromyths believed by educators despite lacking scientific support are:

### Learning Styles

- A belief that student learn better when taught in their preferred sensory modality (Visual, Auditory, Kinesthetic [VAK]). 2,4-6,8-10

### Left Brain vs. Right Brain Dominance

- A myth that claims individuals are either "left-brained" (logical/analytical) or "right-brained" (creative/emotional) thus affecting how they learn. 2,4-6,11

### Only 10% of the Human Brain is Used

- A misbelief that claims 90% of the brain is unused (or inactive), implying an untapped potential to "unlock." 4-6,10

### Physical Exercises Improve Cognitive Performance

- A commercialized myth that states coordinated physical exercises boost brain function and learning ability. 3-5,11

## INQUIRY BACKGROUND:

In the 2002 report, *Understanding the Brain: Towards a New Learning Science*, the Organisation for Economic Co-operation and Development (OECD) brought attention to neuromyths in the context of education to make a case for the use of brain research in education and other contexts. 1,6,13 The proliferation of neuromyths in education over time is well documented, 5,7,9,12,14,15,16 the implications known, 3-6,8-10,14,19 and a set of solutions to bust neuromyth endorsement was strategized. 8,17,18,19

## INQUIRY QUESTION

How pervasive are Italian neuromyths in education, what are their implications, and what are the proposed 'neuromyth-busting' solutions for educators, administrators, and neuroscientists?

## PERMEATING WORLDWIDE

Educational neuromyths are internationally pervasive within the teaching profession as evidenced by the span of surveys researched around the world including North America, Latin America, Europe, North Africa, Australia, Middle-Eastern countries, India, Hong Kong, China and South Korea. "Despite the use of different survey instruments across countries, it is accurate to assert that certain neuromyths consistently exhibit high prevalence rates globally." 17

Table 1. Synthesis of the investigations about neuromyths. Columns include: References, Sample, Methodology, Neuromyths included, Response type, Prevalence of neuromyths, Most Less, Score in GKAB, Neuromyths predictors or protectors, and Main outcomes.

In order of appearance: GKAB: general knowledge about the brain; Pr: primary school; Sc: secondary school; DKAB: do not know; PS: preschool; HS: high school; ECE: early childhood education; HE: high education; GK: general knowledge; R: tertiary sector school; NAQD: no agree or disagree; US: learning styles; M: multiple intelligences. \*The percentage that has been calculated according to the given data in tables or appears into the article analysis. \*\*Updated percentage with the acknowledgment of the article authors (D. Bassis, personal communication). \*twice item. Torrijos-Muelas, M. (2021) Table 1. Synthesis of the investigations about neuromyths.

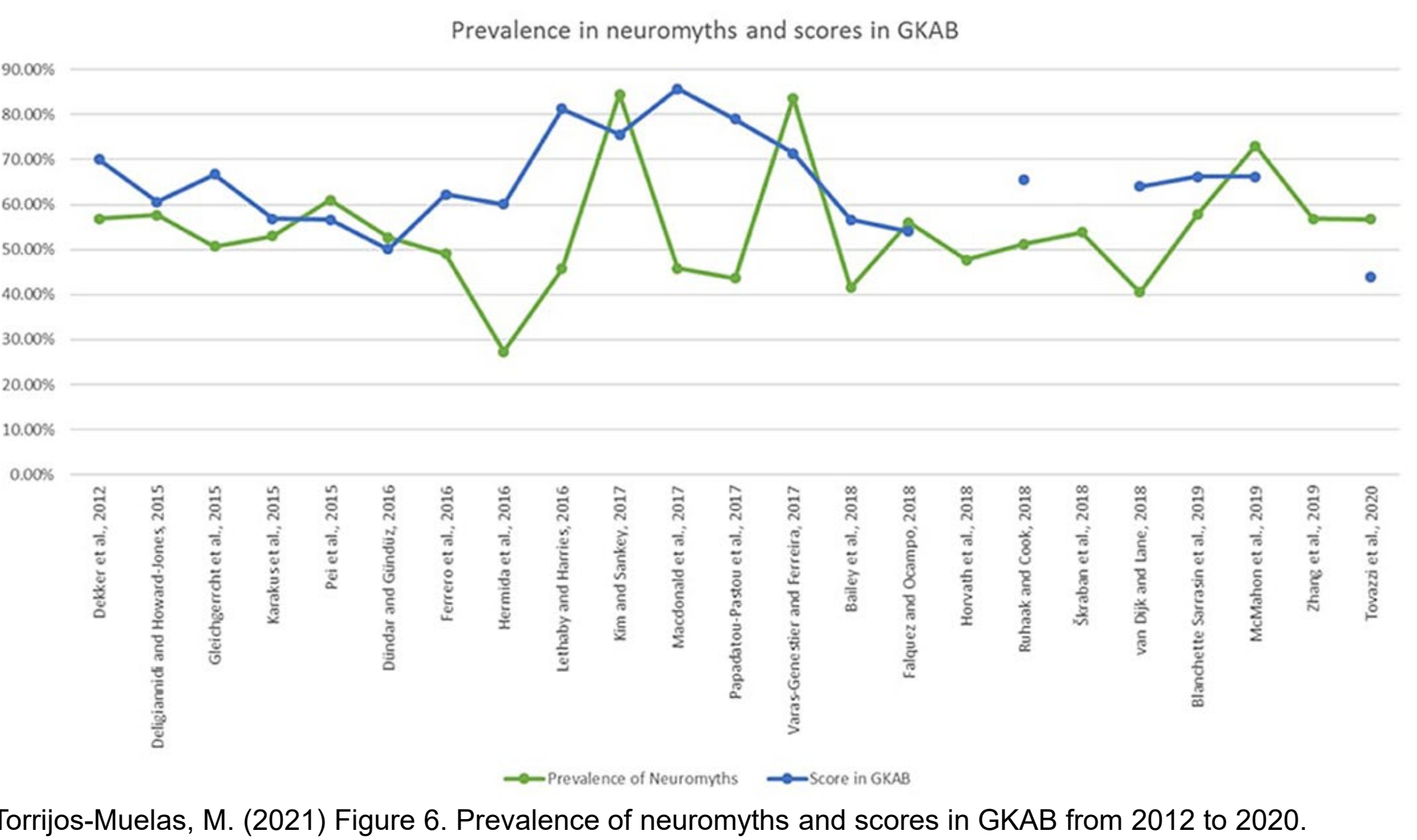
Table 2. List of neuromyths appeared in analyzed articles. Columns include: No, Neuromyths, and a list of 39 neuromyths with their descriptions.

Items 13, 14, 15, and 39 have been considered "correct statements" in the papers where they had been used.

Torrijos-Muelas, M. (2021) Table 2. List of neuromyths appeared in analyzed articles.

## NEUROMYTH RESILIENCE

The finding of the Torrijos-Muelas, Gonzalex-Villora, and Bodoque-Osma examination of an amalgamation of neuromyth survey data from various countries was the resilient continuation of neuromyths within the profession between 2012 and 2020, despite intervention. 17



Torrijos-Muelas, M. (2021) Figure 6. Prevalence of neuromyths and scores in GKAB from 2012 to 2020.

## IMPLICATIONS

- Misguided Instructional Strategies: Learning styles & brain-based myths reduce instructional quality. 5,6,21
- Misdirected Teacher Training: Teacher prep programs unknowingly reinforce neuromyths. 8,13,19
- Resource Misallocation: Funding is spent on un- or disproven tools like Brain Gym. 2,3,5
- Reduced Student Outcomes: Students don't benefit from evidence-based learning strategies. 9,14
- Resistance to Scientific Findings: Entrenchment in myths hinder the adoption of research-based methods. 2,4,10

## PERTAINING TO US EDUCATION

Educational similarities exist between countries, but how do US teachers compare? Well, about the same. 8,10,20 Neuromyth prevalence in US education is attributed to being deeply embedded in the US education system, 10,20 ineffective teacher training, 19 teachers with low neuroscience literacy, 8 being normalized through commercialization by marketed "brain-based" products. 20

## CRITICISM

While the existence of neuromyths nor their prevalence in the education system is debated the impact of their existence and the importance placed on them is, "Actually, the very idea that neuromyths are inherently harmful to teaching may, itself, be a neuromyth." 17 However, what Rousseau fails to mention is that Horvath, Donoghue, Horton, Lodge, & Hattie suggest a correlation between award winning teachers and actual, measurable teaching efficacy. Horvath et. al. conducted their study using winners of the CCSSO (Council of Chief State School Officers) State and National Teacher of the Year winners as their participants. However, the nomination process, criteria, and selection of CCSSO winners are arbitrary and subjective. Factors such as nomination by chief state school officers can vary based on differing "methods and materials" used from one jurisdiction to another; criteria that states candidates must express "themselves in an engaging and clear way," and are chosen by a National Selection Committee composed of representatives from 15-20 national education organizations," yet no specific criteria or qualifications for committee membership are mentioned. 23 Yet, even critics like Krammer conclude that neuromyths (as cited by Krammer, Vogel, et al. 24) diverge from evidence-based practices and should thus be actively addressed and reduced, regardless of their impact on instructional practices.

## SOLUTIONS

- Integrate neuroscience content into pre-service teacher training, 5,8,19 especially learning and memory mechanisms, 18 yet this is debated. 20
- Explicit "myth-busting" instruction to in-service teachers through PD, 11,17 and pre-service teachers. 7
- Promote critical thinking and scientific skepticism 19 that fosters analytical reasoning when evaluating neuroscience claims. 4,5
- Collaboration between educators, administrators, 20 and neuroscientists to co-develop learning materials grounded in research 16,25 and evidence-based practices. 8
- Media literacy to assist in identifying the perpetuation of neuromyths through commercial marketing and judging the credibility of "brain-based" companies. 20

## FUTURE PRACTICE

Understanding that neuromyths are pervasive and resilient I will periodically read updated peer-reviewed science journals concerning neuroscience informed education and stay up-to-date on neuromyth research to better inform my teaching practices as it pertains to instructional methods and curriculum adaptation via differentiated pedagogy.

