Prevalence and predictors of educational neuromyths among teachers working with gifted students

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Abstract: Educational neuromyths—misconceptions about brain function and learning—continue to persist among educators despite advances in neuroscience and science communication. This study investigated the prevalence of such myths among 454 teachers working in Science and Art Centers (BILSEMs) across Turkey, which are specialized after-school programs for gifted learners. Participants completed a survey including 15 neuromyth statements and 15 scientifically accurate brain knowledge assertions, alongside questions about their background, self-assessed competence, and professional development experiences. Descriptive analyses revealed that over half of the participants endorsed seven or more neuromyths, with the most believed myths relating to learning styles, enriched environments, and hemispheric dominance. Other factors, including gender and teaching experience, were not significantly associated with the endorsement of neuromyths or the understanding of brain-related concepts. Multiple regression analyses indicated that greater knowledge about the brain does not necessarily reduce belief in neuromyths. Additionally, general brain knowledge was positively associated with reading popular science materials and self-perceived competence, while showing a weak negative association with teaching experience. These findings underscore the pressing need for targeted neuroscience literacy initiatives within teacher education programs, especially for educators working with gifted students, who are frequently believed to possess distinct neurological characteristics. Correcting these misconceptions is crucial for fostering the implementation of evidence-based practices in gifted education.

Keywords: Neuromyths in Education

Introduction

Neuroscience has become one of the most popular scientific fields in recent years and the interest in knowledge about the brain has increased exponentially. Breakthrough discoveries in the neuroscience field are coming one after another. In 2019, the Brain Prize was awarded to French neuroscientists who discovered that CADASIL is a genetic disorder resulting from a mutation in the NOTCH3 gene located on chromosome 19. Then the scientific community honored researchers working on circadian rhythms with 2017 Nobel Prize for Physiology or Medicine.

This movement has influenced educational sciences unavoidably. Establishing effective connections between neuroscience and education remains a complex challenge (Ansari, Coch, & De Smedt, 2011). Some scholars argue that applying findings from neuroscience to classroom settings is still premature (Goswami, 2004, 2006; Lindell & Kidd, 2011; Tommerdahl, 2010). In contrast, others believe that integrating neuroscience with educational practice offers a highly relevant framework for addressing fundamental issues in education (Petito & Dunbar, 2004). Imagine a classroom of students divided by their teacher into three groups as visual, auditory and kinesthetic [VAK] learners and receive education via these channels and regularly perform finger exercises to improve their left and right hemispheric brain function integration. One can consider this teacher as an innovative one who is trying to connect brain science and education, yet it constitutes an example of misinterpretation and oversimplification of neuroscientific findings which is known as neuromyths (Organization for Economic Co-operation and Development [OECD], 2002, 2007; Goswami, 2006, Howard-Jones, 2014).

Neuromyths are popular accounts of brain functioning and widely implemented in brain-based educational implications (Geake, 2008) and according to OECD (2002), they are "misconceptions generated by a misunderstanding, a misreading or a misquoting of facts scientifically established to make a case for use of brain research in education and other contexts". Like other misconceptions, educational neuromyths have their roots in scientific research, which have been oversimplified or overgeneralized. Alike the anti-vaccination movement, the pseudoscientific claims easily become popular and spread widely in schools or in the public because they make sense and mostly rely on intuitive, familiar explanations to everyday issues (Howard-Jones, 2014).

There are various explanations on how neuromyths are generated and become prevalent. As in the case of hemispheric specialization, the results of the research gave rise to left-right brained myth and this myth can be seen as an example of distortion of a scientific fact in which the scientific facts are oversimplified (Pasquinelli, 2012). Moreover, mass media's reporting style has a deep effect in spreading and making the neuromyths more visible particularly if the claims are so-called supported or accompanied by brain imaging and even irrelevant neuroscientific information (McCabe & Castel, 2008; Weisberg et al., 2008). For example, the final image originated from functional neuroimaging techniques is affected by variables like baseline conditions or machine sensitivity. Yet, the layperson is not qualified enough to analyze and interpret these findings from a scientific perspective, and this can induce neuromyths like, humans use 10% of their brains. Another reason for this is the information gap between scientists and journalists (McCall, 1988). Journalists try to report the news in a catchier style, which scientists oppose because this can end up with presenting sensationalized and inaccurate information. When people are exposed to this material circulating in the media, they tend to believe it without questioning and it is hard to change the schemas that people already acquired (see Rapp, 2016; Singer, 2013).

An alternative explanation about the prevalence of myths argues that it is related to the cognitive biases (see Howard-Jones, 2014; Pasquinelli, 2012; Sarrasin, Riopel & Masson, 2019). Teachers' experiences in their classrooms and the way they perceive it can also be biased and may result in the emergence of neuromyths (Pasquinelli, 2012). Howard-Jones (2014) argues that teachers may be particularly vulnerable to cognitive biases, as their desire to support students can lead them to embrace ideas about the brain that appear to offer practical solutions—regardless of whether these ideas are supported by scientific evidence. This inclination also presents a risk of resource misallocation, especially when educators invest time and effort in unproven methods. For instance, Dekker et al. (2012) found that up to 98% of surveyed teachers in the U.K. had participated in training programs on "learning styles," 82% on "brain gym," and 71% on "multiple intelligences." These findings illustrate how educators and schools can be misled by pseudoscientific trends.

Various efforts have been made to address this issue. For example, the OECD has supported initiatives aimed at examining research in brain-based education, and institutions such as the Centre for Neuroscience in Education have been established. Graduate programs like *Mind, Brain, and Education* have begun admitting students, and numerous conferences and forums have been focused on exploring the overlap between neuroscience and education. Additionally, the Society for Neuroscience (SfN) has sought to create an informative environment for both researchers and the public, providing a channel through which scientific knowledge can be disseminated and shared. Over a decade ago, SfN published a summary of key findings from neuroscience research over the previous century, titled *Core Concepts*—eight foundational ideas that individuals should understand about the brain and nervous system. These concepts included the complexity of the brain, neuronal communication, information processing, the role of experience in shaping the brain, reasoning, planning and problem-solving, the power of language, the origins of curiosity, and the contributions of research to human health. Despite these significant efforts, research continues to show that a considerable gap remains between neuroscience and educational practice. A critical initial step in bridging this gap involves dispelling the widespread neuromyths still held by many educators. In the past decade, this issue has gained the attention of researchers, leading to numerous studies on the spread of neuromyths within the educational community. Hundreds of participants were recruited for the various neuromyths studies in different cultures and the findings documented a high popularity of neuromyths among the teachers in all these countries; UK and Netherlands' primary and secondary school teachers (Dekker et. al., 2012), educators and prospective teachers in Greece (Deligiannidi & Howard-Jones, 2015; Papadatou-Pastou, Haliou & Vlachos, 2017), China (Pei et. al., 2015), Turkey (Dundar & Gunduz, 2016; Karakus et. al., 2015), Spain (Fuentos & Risso, 2015; Ferrero et. al., 2016), Portugal (Rato et. al., 2013), Latin America (Gleichgerrcht et. al., 2015), Switzerland (Tardif, Doudin & Meylan, 2015), Canada (Sarrasin, Riopel & Masson, 2019) and educators and public in USA (Macdonald et.al., 2017).

This tremendous evidence on the prevalence of neuromyths is disquieting because it not only informs us about the misleading power of pseudoscience it also presents information about the risk of economic and opportunity cost. Such that schools and parents can waste resources and money on quasi-scientific treatments when they could use those resources on effective and evidence-based solutions (Busso & Pollack, 2014). Moreover, many of the practices, so-called brain based, are not producing positive results and may even be harmful for school children (Pasquinelli, 2012). This situation can be even more sensitive for gifted education. Educators working with gifted learners, as well as the families of gifted children, may be more susceptible to the misconceptions arising from neuromyths due to the unique nature of giftedness. Gifted individuals possess advanced cognitive abilities and exhibit differences in brain functioning, which naturally draws the attention of those who work closely with them to neuroscience-related terms and concepts. Driven by this core interest, the current research sought to examine how widespread neuromyths are among gifted education teachers in Turkey and to add to the expanding literature on the topic. Consistent with previous studies, we sought to identify which neuromyths were most endorsed and to explore the factors that predict belief in these myths within this population. Additionally, we examined the relationship between teachers' self-assessed knowledge and competence in brain-related topics and their susceptibility to neuromyths.

Methodology

Participants

This study utilizes descriptive research design. The study group consisted of 454 teachers (53.3% female, 46.7% male) from various regions across Turkey. All participants were employed at state-funded after-school institutions for gifted learners, known as Science and Art Centers. Teaching experience among participants varied as follows: 1–5 years (8.1%), 6–10 years (22%), 11–15 years (29.7%), 16–20 years (26.9%), 21–25 years (9.5%), and more than 25 years (3.7%). However, their experience specifically working with gifted learners was predominantly concentrated in the 1–5 year range (80.4%). Most teachers (80.6%) reported not having received formal training in gifted education. Notably, 91.4% of all participants believed that teachers should apply findings from learning sciences research to educational practice.

Procedure

Teachers working at after-school centers for gifted education were invited to participate in the study. The research was introduced as an investigation into teachers' views on and knowledge of the learning sciences. The term *neuromyth* was intentionally omitted throughout the study. Teachers who expressed interest in the topic and chose to participate accessed the online survey via a provided link.

Measures

The online questionnaire comprised 32 statements concerning the brain and its impact on learning, which had been previously utilized by Dekker, Lee, Howard-Jones, and Jolles (2012). The original items were translated and back translated to Turkish language and controlled by language experts. The survey comprised 15 statements that were educational neuromyhts, as defined by the OECD (2002) and Howard-Jones et. al. (2009), e.g. “We only use 10% of our brain”. The other 17 statements were general assertions about brain produced by Dekker et. al. (2012), e.g. “Mental capacity is hereditary and cannot be changed by the environment or experience”. The myth and knowledge assertions order were randomized in the survey. Answer options were “correct”, “incorrect”, or “do not know”. The number of correct and incorrect assertions was balanced. The dependent variables consisted of the proportion of incorrect responses to neuromyth statements—where a higher proportion indicates a stronger belief in such myths—and the proportion of correct answers to general knowledge statements. For the descriptive analyses (see Table 1 & 2) the answers were recoded so that the incorrect and correct column represented the final evaluations. For example, “We only use 10% of our brain” is a neuromyth and it is incorrect. In the analyses participants who judged this assertion as “incorrect” were coded as “correct”, as their judgment was right. For the remaining analyses, scores for myths (total number of myths endorsed) and brain knowledge (total number of accurately answered statements), along with their corresponding percentages, were computed separately.

Data Analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 25.0 for Mac. A significance level of $\alpha = 0.05$ was adopted for all statistical tests. Independent samples t-tests were used to examine gender differences, while one-way ANOVAs were conducted to assess differences based on teaching experience and self-evaluations. Furthermore, multiple regression analyses were performed to identify the factors that significantly predicted belief in neuromyths.

Results

Prevalence of Neuromyths

On average, teachers accepted 52.04% of the myth-based statements, reflecting a notable level of belief in such misconceptions. In contrast, their responses to general brain knowledge statements were correct 65.4% of the time. Analysis of the responses to each myth and knowledge statement revealed considerable variability across the assertions. Seven out of the fifteen myth statements were endorsed by more than 50% of the teachers. The most prevalent of these myths were (1) Individuals learn better when they receive information in their preferred learning style (e.g., auditory, visual, kinesthetic) – 93.2% agreement rate, (2) Environments that are rich in stimulus improve the brains of pre-school children – 90.7% agreement rate, and (3) Short bouts of co-ordination exercises can improve integration of left and right hemispheric brain function

– 79.7% agreement rate. In contrast, the most successfully identified neuromyths were "Individual learners show preferences for the mode in which they receive information (e.g., visual, auditory, kinesthetic)", "Learning problems associated with developmental differences in brain function cannot be remediated by education" and "Extended rehearsal of some mental processes can change the shape and structure of some parts of the brain", 85.9%, 69.6% and 53.5% of the teachers answered these assertions right, respectively.

Table 1.
Accuracy of responses for each myth statement

Neuromyth	Do not know		Incorrect		Correct	
	f	%	f	%	f	%
Children must acquire their native language before a second language is learned. If they do not do so neither language will be fully acquired. (I)	42	9.3	216	47.6	196	43.2
If pupils do not drink sufficient amounts of water (=6–8 glasses a day) their brains shrink. (I)	171	35.2	107	23.6	176	38.8
It has been scientifically proven that fatty acid supplements (omega-3 and omega-6) have a positive effect on academic achievement. (I)	74	16.3	349	76.9	31	6.8
We only use 10% of our brain. (I)	46	10.1	197	43.4	211	46.5
Differences in hemispheric dominance (left brain, right brain) can help explain individual differences amongst learners. (I)	70	15.4	360	79.3	24	5.3
There are critical periods in childhood after which certain things can no longer be learned. (I)	51	11.2	267	58.8	136	30
Individuals learn better when they receive information in their preferred learning style (e.g., auditory, visual, kinesthetic). (I)	14	3.1	423	93.2	17	3.7
Environments that are rich in stimulus improve the brains of pre-school children. (I)	16	3.5	412	90.7	26	5.7
Children are less attentive after consuming sugary drinks and/or snacks. (I)	136	30	208	45.8	110	24.2
Regular drinking of caffeinated drinks reduces alertness. (I)	123	27.1	124	27.3	207	45.6
Exercises that rehearse co-ordination of motor-perception skills can improve literacy skills. (I)	82	18.1	341	75.1	31	6.8
Extended rehearsal of some mental processes can change the shape and structure of some parts of the brain. (C)	122	26.9	89	19.6	243	53.5
Individual learners show preferences for the mode in which they receive information (e.g., visual, auditory, kinesthetic). (C)	41	9	23	5.1	390	85.9
Learning problems associated with developmental differences in brain function cannot be remediated by education. (I)	72	15.9	66	14.5	316	69.6
Short bouts of co-ordination exercises can improve integration of left and right hemispheric brain function. (I)	77	17	362	79.7	15	3.3

*(I = Incorrect, C = Correct) The responses were analyzed to determine the frequency of incorrect answers, which represents the number of respondents who believe in neuromyths, and vice versa.

Regarding general assertions about the brain, teachers scored the lowest on the item "Learning is not due to the addition of new cells to the brain," with only 17.4% answering correctly. In contrast, more than 95% of respondents correctly identified the statements "There are sensitive periods in childhood when it is easier to learn things" and "When we sleep, the brain shuts down."

Additionally, no significant gender differences were observed in either neuromyth endorsement or brain knowledge scores. For neuromyth belief, the results were male ($M = 7.656$, $SD = 2.270$), female ($M = 7.793$, $SD = 1.919$); $t(452) = -1.420$, $p > .05$. Similarly, for brain knowledge, the scores were male ($M = 10.783$, $SD = 2.566$), female ($M = 10.984$, $SD = 2.291$); $t(452) = -0.873$, $p > .05$.

Furthermore, teaching experience was not a significant predictor of either neuromyth endorsement or brain knowledge, as determined by one-way ANOVA. No statistically significant differences were found in neuromyth belief ($F(5,448) = 0.644$, $p > .05$) or brain knowledge ($F(5,448) = 0.185$, $p > .05$) across different levels of teaching experience.

Table 2.
Accuracy of responses for each brain-knowledge statement

Knowledge about brain	Do not know		Incorrect		Correct	
	f	%	f	%	f	%
We use our brains 24 h a day. (C)	16	3.5	32	7	406	89.4
Boys have bigger brains than girls. (C)	160	35.2	170	37.4	124	27.3
When a brain region is damaged other parts of the brain can take up its function. (C)	92	20.3	220	48.5	142	31.3
The left and right hemisphere of the brain always work together. (C)	67	14.8	197	43.4	211	46.5
The brains of boys and girls develop at the same rate. (I)	100	22	118	26	236	52
Brain development has finished by the time children reach secondary school. (I)	73	16.1	70	15.4	311	68.5
Information is stored in the brain in a network of cells distributed throughout the brain. (C)	114	25.1	59	13	281	61.9
Learning is not due to the addition of new cells to the brain. (C)	92	20.3	283	62.3	79	17.4
Learning occurs through modification of the brain's neural connections. (C)	74	16.3	21	4.6	359	79.1
Academic achievement can be affected by skipping breakfast. (C)	33	7.3	35	7.7	386	85
Normal development of the human brain involves the birth and death of brain cells. (C)	120	26.4	56	12.3	278	61.2
Mental capacity is hereditary and cannot be changed by the environment or experience. (I)	26	5.7	30	6.6	398	87.7
Vigorous exercise can improve mental function. (C)	21	4.6	16	3.5	417	91.9
Circadian rhythms (body-clock") shift during adolescence, causing pupils to be tired during the first lessons of the school day. (C)	134	29.5	49	10.8	271	59.7
Production of new connections in the brain can continue into old age. (C)	100	22	77	17	277	61
There are sensitive periods in childhood when it's easier to learn things. (C)	14	3.1	6	1.3	434	95.6
When we sleep, the brain shuts down. (I)	21	4.6	12	2.6	434	95.6

*(I = Incorrect, C = Correct)

Differences across groups

Participants were asked to answer how often they follow science magazines and evaluate their knowledge on brain and learning sciences in a scale ranging from one to five. Participants' frequency for following science magazines did not produce significant differences for the sum of myth assertions as determined by one-way ANOVA ($F(4,449)=1.685$, $p>.05$. Whereas there was a statistically significant difference between groups for the sum of knowledge of brain assertions as determined by one-way ANOVA ($F(4,449)=7.457$, $p<.00$. A Tukey post hoc test showed that participants in the groups who follow science magazines fewer (M=9.9, SD=2.11; M=10.08, SD=2.44; M=10.58, SD=2.42) scored significantly lower than the ones claimed they follow science magazines often (M=11.41, SD=2.43) and very often (M=11.57, SD=2.20). Following popular magazines helped participants to be more knowledgeable about brain.

Participants' self-evaluation about their knowledge on brain effected their beliefs on myths ($F(4,449)=7.637$, $p<.00$) and score in knowledge of brain assertions ($F(4,449)=6.146$). A Tukey post-hoc test revealed that participants who consider themselves insufficient about their knowledge on brain (M=6.52, SD=2.42) scored significantly lower than the ones who claimed they are sufficient and pretty sufficient (M=8.28, SD=1.88; M=8.69, SD=1.73). Lower scores indicate that those participants held less neuromyths, there was an inverse proportion between myths and self-evaluation on knowledge about brain. Whereas, for the knowledge of brain assertions post hoc test revealed that participants who consider themselves insufficient about their knowledge on brain (M=9.17, SD=2.78) scored significantly lower than the ones who claimed they are sufficient and pretty sufficient (M=11.31, SD=2.06; M=11.84, SD=2.35). Higher scores indicate that those participants were more knowledgeable about brain.

Furthermore, we found that participants' self-evaluation of their knowledge learning sciences caused some differences between groups (for myths $F(4,449)=4.661$, $p<.00$, for knowledge on brain assertion $F(4,449)=3.494$), $p<.01$). For the neuromyths, participants who consider themselves slightly sufficient about their knowledge on learning sciences (M=7.32, SD=2.07) scored significantly lower than the ones claimed they are sufficient (M=8.04, SD=2.14). Lower scores indicate that those participants held less neuromyths; there was an inverse proportion between myths and self-evaluation on knowledge about learning sciences. And for brain assertions, participants who consider themselves slightly sufficient about their knowledge on learning sciences (M=10.41, SD=2.61) scored significantly lower than the ones claimed they are pretty sufficient (M=11.71, SD=2.23). Higher scores indicate that those participants who consider themselves more informed about learning sciences were more knowledgeable about the brain. Statistical differences were not observed between other groups.

Predictors of neuromyths and knowledge

A multiple linear regression analysis was conducted to predict belief in neuromyths using the following independent variables: knowledge of brain-related statements, gender, years of experience, formal education, reading of popular science magazines, self-evaluation of brain knowledge, and self-evaluation of learning sciences knowledge. A significant regression equation was found (F (8,445) = 13.716, p = .00), with an R^2 of .198. The model explained 19.8% of the variance in overall neuromyth beliefs. Belief in neuromyths was significantly predicted by general knowledge of the brain (β = .378) and participants' self-evaluation about their knowledge on brain (β = .174). General knowledge of brain assertions was predicted by experience (β = -.93), reading popular science (β = .178), and participants' self-evaluation about their knowledge on brain (β = .185). A significant regression equation was found (F (6,447) = 7.160, p = .00), with an R^2 of .088. The model explained 8.8% of the variance in participants' overall general knowledge of brain assertions.

Table 3.
Predictors of neuromyths

	B	SE	β	t	p	%95 CI for B	
						Lower	Upper
Knowledge (% correct)	.370	.044	.378	8.510	.000	.285	.456
Gender	1.862	1.193	.067	1.561	.119	-.483	4.207
Experience	.667	.532	.059	1.254	.210	-.378	1.712
Formal education	1.758	1.527	.050	1.151	.251	-1.244	4.760
Read popular science	-.655	.574	-.056	-1.141	.255	-1.784	.474
Self-evaluation of brain knowledge	2.675	.858	.174	3.116	.002	.987	4.362
Self-evaluation of learning science knowledge	.056	.909	.003	.062	.951	-1.729	1.842

Figure 1.
Graphical representation of predictors of neuromyths

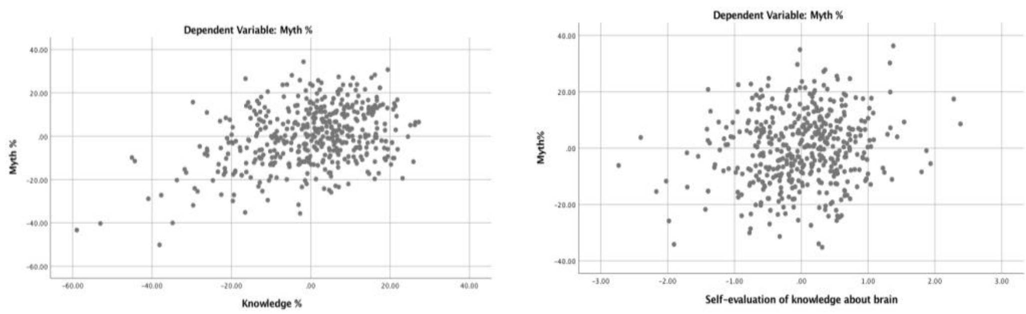
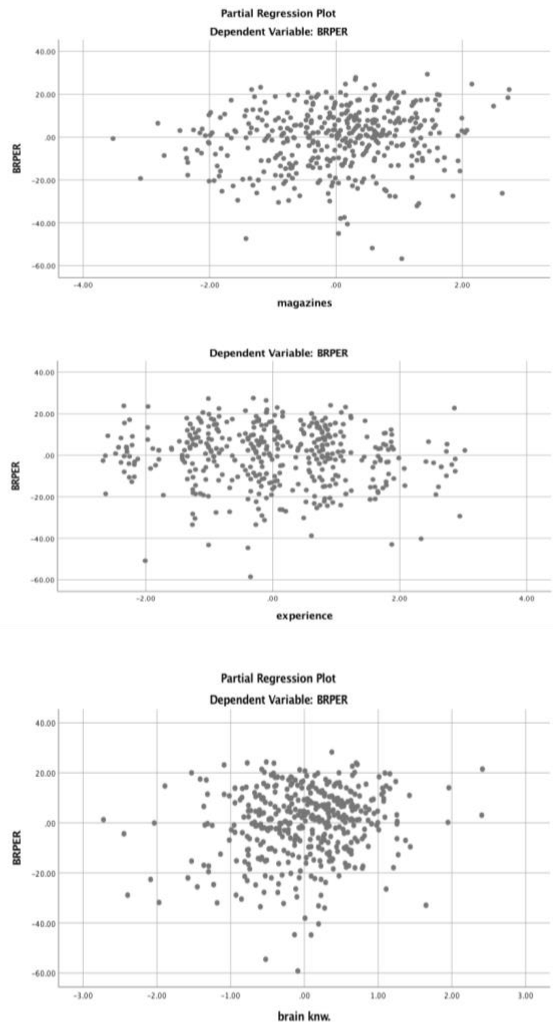


Table 4.
Predictors of general knowledge

	B	SE	β	t	p	%95 CI for B	
						Lower	Upper
Gender	1.133	1.296	.040	.874	.382	-1.414	3.679
Experience	-1.081	.536	-.093	-2.018	.044	-2.134	-.028
Formal education	1.399	1.641	.039	.852	.394	-1.826	4.623
Read popular science	2.118	.616	.178	3.439	.001	.908	3.329
Self-evaluation of brain knowledge	2.909	.922	.185	3.155	.002	1.097	4.721
Self-evaluation of learning science knowledge	-.826	.987	-.049	-.837	.403	-2.765	1.113

Figure 2.
Graphical representation of predictors of general knowledge



Discussion

The current research investigated the level of neuromyth awareness among Turkish educators specializing in gifted education. Numerous studies have been conducted on this topic, revealing that both pre-service and in-service teachers, as well as university educators, show considerable interest in neuroscience but often fail to distinguish between neuromyths and scientifically supported neurofacts (see Grospietsch & Mayer, 2020; Torrijos-Muelas, González-Víllora, & Bodoque-Osma, 2021 for a critical review). The concept of neuromyths has been investigated by researchers for a considerable period, and findings over the years across various sample groups consistently demonstrate similar patterns. This suggests that neuromyths not only still exist but also persist across educational contexts.

The questionnaire revealed that the teachers in our study demonstrated a notable interest in neuroscientific information; however, the results indicate a gap between their interest and their proficiency in understanding, using, and interpreting such scientific information. A total of 52.04% of participating teachers accepted statements endorsing neuromyths as correct, while their accuracy rate for general brain knowledge items was 65.4%. The results revealed substantial variation in responses across different myths and knowledge items. Of the fifteen neuromyth statements, seven were endorsed by more than 50% of the participants. The finding is consistent with those obtained in previous studies conducted on different samples in the UK, the Netherlands, Latin America, Spain, and Turkey.

The most prevalent neuromyths identified in our sample concerned the belief in 'preferred learning styles (the VAK model), the idea that a stimulus-rich environment enhances brain development, the notion that coordination exercises improve interhemispheric communication, and misconceptions related to hemispheric dominance. Although empirical evidence has not demonstrated a relationship between learning styles and the VAK modalities, this neuromyth remains prevalent among educators. The brain processes information using multiple modalities—visual, auditory, and tactile—simultaneously (Kayser, 2007). Therefore, categorizing learners as visual or auditory and designing instruction accordingly is unlikely to enhance learning outcomes. While early experiences play a critical role in brain development, the idea that simply exposing preschool children to stimulus-rich environments will enhance their brain development is an oversimplification (Goswami, 2006; OECD, 2002). It is the meaningfulness, developmental appropriateness, and emotional richness of the environment—rather than the quantity of sensory input—that fosters healthy cognitive and neural development. Myths related to hemispheric dominance and interhemispheric communication can be attributed to misinterpretations of laterality research, particularly studies involving split-brain patients (Goswami, 2004; Dündar & Gündüz, 2016). Contrary to the popular belief that the left hemisphere is analytical and the right creative, the human brain is highly integrated and functions as a cohesive whole in executing various cognitive processes (Chrysikou, 2019; Sing & O'Boyle, 2004). These results are consistent with prevailing trends in neuromyths research (Dekker et. al., 2012; Dündar & Gündüz, 2016; Hughes, Sullivan, & Gilmore, 2022; Martin et.al., 2022; Rato et. al., 2013, Torrijos-Muelas et. al., 2021). More than two decades have passed since researchers first began investigating the prevalence of neuromyths, yet despite significant advancements in technology and science communication, many educators continue to hold these misconceptions. Conversely, some myths were more accurately identified as false. The highest correct response rates were for statements concerning individual preferences for learning modalities, the irreversibility of learning problems due to developmental brain differences, and the idea that repeated mental activity can change the brain's structure.

Analyses based on gender revealed no statistically significant differences in either neuromyth belief or brain knowledge scores. Similarly, teaching experience was not a significant predictor of neuromyth endorsement or neuroscience knowledge, as no significant differences were observed across levels of professional experience. These findings are consistent with the existing literature, which largely indicates that neither gender nor professional experience is associated with the endorsement of neuromyths or teachers' knowledge about the brain (e.g., Dekker et al., 2012; Hughes et al., Karakus et al., 2015; Papadatou-Pastou et al., 2017; Rato et al., 2013; Tardif et al., 2015). However, some studies have reported gender-related differences: in two of them, female teachers were found to endorse more neuromyths (Dündar & Gündüz, 2016; Ferrero et al., 2016), while in the other two (Canbulat & Kırıktas, 2017; Macdonald et al., 2017), the opposite pattern was observed.

Participants' engagement with scientific content and their self-assessed knowledge levels were associated with notable differences in both neuromyth endorsement and brain knowledge. While the frequency of following science magazines did not significantly impact belief in neuromyths, it was positively associated with higher scores on brain knowledge items. Self-evaluation of knowledge about the brain was significantly related to both neuromyth endorsement and brain knowledge scores. Those who rated their knowledge as insufficient held fewer neuromyth beliefs but also scored lower on brain knowledge items compared to participants who rated themselves as sufficient or very sufficient. This suggests an inverse relationship between confidence in brain knowledge and belief in neuromyths, but a positive relationship with actual knowledge. Similarly, self-perceived knowledge about learning sciences had a significant effect on both neuromyth belief and brain knowledge. Participants who viewed themselves as slightly sufficient in this domain endorsed significantly fewer neuromyths and scored lower on brain knowledge items compared to those who perceived their knowledge as higher.

Although these results may seem trivial at first glance, they are consistent with the very nature of myths. The evidence concerning the impact of engagement with scientific content on neuromyth belief is mixed and inconclusive. According to Macdonald et al. (2017), individuals with more advanced knowledge of neuroscience tend to be less prone to believing in neuromyths compared to educators and the general population. Similarly, Papadatou-Pastou et al. (2017) argue that a solid understanding of brain science serves as an effective safeguard against accepting neuromyths. Dündar and Gündüz (2016) suggest that reading popular science journals has a modest but positive effect on lowering belief in common neuromyths. However, other research indicates that exposure to scientific information does not always decrease susceptibility to these myths (Gleichgerrcht et al., 2015). In fact, some studies have found that educators with greater brain knowledge may sometimes be more prone to endorsing neuromyths (Dekker et al., 2012; Papadatou-Pastou et al., 2017; van Dijk & Lane, 2018).

The regression analyses in our study revealed that belief in neuromyths was primarily predicted by participants' actual knowledge about the brain and their self-assessed understanding of brain-related topics. Interestingly, those with greater factual knowledge and higher confidence in their brain knowledge were not necessarily less likely to endorse neuromyths. Our results suggest that general knowledge about the brain does not consistently act as a safeguard against believing in neuromyths. One possible explanation is the growing interest in neuroscience; teachers—especially those working with gifted learners—tend to seek out more information about the brain. However, as they are increasingly exposed to a wide range of brain-related content, without the necessary skills to critically evaluate the accuracy of this information or sufficient expertise in neuroeducation, they may struggle to distinguish scientific facts from misconceptions, resulting in a fragmented or confused understanding. Our findings aligned with those of Dekker et al. (2012), while contradicting the results presented by Howard-Jones et al. (2009). Weisberg's (2008) experiments demonstrated that individuals with limited neuroscientific knowledge were just as likely as laypeople to be misled by neuroscientific explanations, whereas only experts in neuroscience could accurately detect misleading or nonsensical findings. This suggests that the level of neuroscience understanding among teachers in our sample was insufficient to shield them from accepting neuroscience claims uncritically. When teachers are eager to apply neuroscientific insights but lack deep expertise and prefer quick, straightforward solutions, they may be more vulnerable to accepting misconceptions. Additionally, general knowledge about the brain was positively associated with reading popular science materials and individuals' self-perceived competence in brain science, whereas teaching experience demonstrated a weak negative relationship. These findings suggest that both objective knowledge and self-perception play critical roles in shaping educators' susceptibility to neuromyths and their understanding of brain-related content.

As noted by Bodenmann (as cited in Grospietsch & Lins, 2021), scientific myths can emerge from both the public and the scientific community, especially when core principles of scientific reasoning and the nature of science are disregarded. Such myths tend to spread rapidly, are often resistant to correction, and can be further reinforced by different types of backfire effects. In educational settings, it is considered important not only to assess the prevalence of misconceptions and neuromyths, but also to implement educational interventions aimed at eliminating them, to prevent potential misapplications. Literature highlights the need to enhance educators' neuroscience literacy. This need is particularly critical for teachers working with gifted students, as they serve as direct role models for their students through their scientific literacy competencies, especially in accessing and interpreting scientific research findings. Moreover, it appears crucial to support the professional development of teachers working with neurodiverse learners to promote evidence-based educational interventions. In summary, this study highlights that teachers who are interested in applying neuroscience findings to classroom practice often struggle to differentiate between scientific evidence and pseudoscientific claims. A high level of general knowledge about the brain does not necessarily prevent individuals from accepting neuromyths. This underscores the importance of supporting teachers' professional development and fostering interdisciplinary collaboration. It is promising that educators are motivated to understand the role of the brain in learning. Although integrating neuroscience into educational practice remains a complex endeavor, strong partnerships between researchers and practitioners may facilitate a more effective and meaningful implementation.

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