International Journal of Learning, Teaching and Educational Research
Vol. 24, No. 6, pp. 389-414, June 2025
https://doi.org/10.26803/ijlter.24.6.18
Received Apr 11, 2025; Revised May 27, 2025; Accepted Jun 16, 2025

Prevalence of Neuromyths Among Canadian Sports Coaches: Implications for Coach Education

Matthew J. Reeves
UCLan Research Centre for Sport, Physical Activity & Performance
University of Central Lancashire, Preston, UK

Richard Peter Bailey
Faculty of Social Sciences & Liberal Arts
UCSI University, Kuala Lumpur, Malaysia

Jonathan K. Sinclair
UCLan Research Centre for Sport, Physical Activity & Performance
University of Central Lancashire, Preston, UK

Laila Alkilani
Department of Physical Sport Sciences,
College of Sport Sciences & Physical Activity,
Princess Nourah bint Abdulrahman University,
Kingdom of Saudi Arabia

Marie-Pier Charest
Coaching Association of Canada,
House of Sport, 2451 Riverside Drive, Ottawa, Ontario, Canada

Glenn Cundari
COACH+
Ontario, Canada

Nadia Samsudin*
Faculty of Social Sciences & Liberal Arts
UCSI University, Kuala Lumpur, Malaysia

Abstract. This study explored the prevalence and common sources of pseudoscientific beliefs among sports coaches, particularly those related to learning and brain function. Employing an observational design, we

*Corresponding author: Nadia Samsudin, *Nadia.Samsudin@ucsiuniversity.edu.my*

administered a one-time questionnaire to 1,568 Canadian sports coaches recruited via non-probability sampling. Coaches were surveyed regarding their familiarity with neuromyths, their beliefs about general statements concerning brain function, and the influence these ideas have on their coaching practices and the quality of coaching education. Findings indicated that coaches agreed with approximately 58.8% (±19.8) of neuromyth-related statements and accurately identified only 23.1% (±19.0) of scientifically accurate assertions about the brain. The primary exposure to these neuromyths was identified as formal coach education courses. Regression analysis revealed that knowledge of scientifically valid brain-related statements significantly predicted coaches' susceptibility to neuromyths. However, coaches' beliefs in neuromyths did not significantly predict their likelihood of applying brain-based learning ideas in their practical coaching. These results suggest a substantial challenge for sports coaches in differentiating scientifically valid information from pseudoscientific ideas regarding learning and brain functions. Given the potential negative impacts on coaching quality and athlete learning, the study underscores an urgent call for evidence-based reforms in coach education to address and mitigate the spread of pseudoscientific beliefs.

Keywords: Education Quality; learning styles; neuro-linguistic programming; Brain Gym; Myers-Briggs Type Inventory

1. Introduction

Sports coaching draws on a diverse range of knowledge sources and is at a uniquely important place in its history. Proper recognition of sports coaching as a profession by the broader educational and policy communities is one of the dominant discourses within the contemporary literature (Lara-Bercial et al., 2020); with one of the central elements of professionalisation being the establishment and maintenance of a science-based specialist knowledge (Cribb & Gewirtz, 2015). An essential skill in sports coaching involves effectively guiding athletes through the learning process. Since the widely publicized "Decade of the Brain" initiative in the 1990s (Jones & Mendell, 1999) and notably following the influential report from the Organisation for Economic Cooperation and Development (OECD) highlighting the emergence of learning sciences (OECD, 2007), research exploring human cognition and learning has significantly expanded.

This surge in empirical studies has led to a deeper and more comprehensive understanding of the psychological and neurological foundations underlying learning processes (Dehaene, 2020). Unsurprisingly, sports coaches have been drawn to this topic (Bailey et al., 2018), as have the general public (Gini et al., 2021), who are attracted by the promise of evidence-based guidelines for their practices with a strong research foundation (see Table 1). While some have suggested that many of the claims made on behalf of this emerging field are over-stated (Bailey, 2017), the number of high-quality studies under the learning sciences umbrella still represents an exciting development.

It also signifies a challenge with the emergence of widely held but questionable beliefs about learning and the brain. This is important for sports coaches because their understanding of learning processes shapes how they schedule, execute, and assess coaching sessions. Pseudoscientific concepts, such as learning styles or brain hemisphere dominance, come with risks of utilising ineffective or misleading approaches, which can stifle athlete development, squander time and resources, and cause significant harm. Moreover, accepting such notions may erode attempts to professionalize coaching by damaging the credibility of the field as scientific. Knowing and resolving these misbeliefs provides coaches the opportunity to enhance learning, improve performance, and support athlete well-being as informed decision-makers using evidence. That the growth of these beliefs and the associated industries has paralleled the development of genuine learning sciences is not surprising. A growing understanding of the brain and its functioning heightens expectations for its application to improve learning and performance. This, in turn, creates an audience whose hope exceeds its comprehension. Thus, pseudoscience leeches off science as bird excrement sticks to statues.

There has been little research into the dissemination and impact of pseudoscientific beliefs within sport coaching. This research seeks to fill this void by studying Canadian coaches, given that Canada is one of the few countries in the world with a highly developed and extensively diverse coaching system that is methodologically sophisticated and driven by research, and provides considerable diversity in sport, geography, and languages spoken. This is the first comprehensive study on the prevalence of pseudoscientific beliefs among sports coaches in North America, and it is among the very few such studies globally (Bailey et al., 2018; Schmitt & Fournier, 2023).

Other studies focused on the widespread endorsement of neuromyths in the teaching academic and student body (Dekker et al., 2012; Torrijos-Muelas et al., 2021; Dündar & Gündüz, 2016) and, more recently, coaches in Europe, while this study adds vital new evidence from a country with a mature, competency-based coach development system. So, the significance of this research lies in documenting the popularity of pseudoscientific beliefs and addressing formal coaching education as a domain of such exposure. Earlier studies are built upon these findings because most neuromyths believed by coaches, their sources of exposure, and how basic neuroscience knowledge predicts general susceptibility to those beliefs are analysed.

This study, therefore, contributes to the growing body of evidence for the need to change the approach to coach education, design professional development activities, and stimulate a more active, critical, and scientific involvement with evidence in coaching. It further reinforces the importance of the problem while justifying the absence of tailored, empirically based solutions within global sport systems.

2. Literature Review

2.1 Neuromyths

In scholarly contexts, "neuromyths" refer to widely believed yet inaccurate assumptions about brain functions and learning, which persist despite clear scientific evidence to the contrary (Howard-Jones, 2014; Torrijos-Muelas et al., 2021). The OECD, which played a significant role in popularizing this concept, describes neuromyths as misunderstandings, misinterpretations, or misrepresentations of scientifically verified information used to support the application of neuroscience in education and similar fields (OECD, 2002, p.69). Although this description effectively highlights misconceptions and their implications, further specificity can enhance its usefulness. Drawing insights from educational studies that examine students' misconceptions in science (e.g., Hammer, 1996; Stover & Saunders, 2000), we propose that neuromyths can also be identified by the following criteria:
a) They utilize scientific terminology or imagery to appear credible; b) They significantly shape perceptions of teaching, coaching, and learning practices; c) They directly conflict with robust scientific findings; d) They must be explicitly corrected to promote accurate understanding.

Certain neuromyths have permeated popular psychology, mainstream media, and general culture. A notable example is the promotional poster for the 2014 film "Lucy," which claims: "The average person uses 10% of their brain capacity. Imagine what she could do with 100%" ("Internet Movie Poster Awards – Lucy Poster", impawards.com). Despite its pervasive nature, even among psychology students, this myth persists likely due to its appealing simplicity and hopeful implications (Herculano-Houzel, 2002). The widespread acceptance of such misconceptions highlights the powerful allure of attractive but scientifically unfounded ideas, ignoring stark scientific realities. For instance, genuinely utilizing only 10% of the brain would effectively classify an individual as brain dead (Bailey, 2017).

Similarly, misconceptions stemming from studies on brain hemisphere laterality have evolved into the popular but incorrect notion of distinct "left and right brained" thinking. Such myths are appealing because of their perceived practical value. For instance, a blog post from a popular psychologist claimed that athletes suffer disadvantages because "their right brains are being ignored" (Singer, 2020). The author then attributes several undeniably beneficial athletic skills, such as balance, emotional control, musicality, and visualization, to "right brain activities," suggesting their potential for performance enhancement.

However, these assertions rest on significant misunderstandings. The foundational studies on hemispheric specialization involved patients who underwent surgical severance of their corpus callosum, a key neural connection between the brain's two hemispheres, to control severe epilepsy. Unfortunately, the unique circumstances of these cases have been inaccurately generalized, creating a myth that we possess two independently functioning brains. Furthermore, it is often wrongly claimed that special, typically costly, techniques are required to "reintegrate" these supposedly separate hemispheres.

Contemporary neuroscience confirms the opposite; the human brain is characterized by extensive interhemispheric integration, not isolation (Eagleman, 2015). Creative thinking, frequently cited in left versus right brain debates, relies heavily on interactions between both hemispheres. Connectivity rather than separation best describes typical brain function (Lilienfeld et al., 2011). Thus, when Dr. Singer correctly notes that "the Sports Psychologist trains the athlete to exercise the right brain along with the left brain," he is accurate, though not for the reasons he assumes.

Table 1: Prevalence of Neuromyths

Myth	Dündar & Gündüz (2016) 1344 Turkish pre-service school teachers	Idrissi et al. (2020) 330 Moroccan school teachers	Chojak et al. (2021) 85 Polish school teachers	Zhang et al. (2019) 253 Chinese school	Bailey et al. (2018) 545 British & Irish sports	Schmitt & Fournier (in press)
Individuals learn better when they receive information in their preferred learning style (VAK)	98	99	99	93	62	93
Differences in hemispheric dominance (left brain, right brain) can help explain individual differences among learners	79	47	79	86	43	64
Short bouts of coordination exercises can improve integration of left and right hemispheric brain function	67	90	94	79	51	80
Children are less attentive after consuming sugary drinks and/or snacks	41	54	66	48	55	54
We only use 10% of our brain	42	69	37	52	62	54

2.2 Risks of Pseudoscience

Many neuromyths are relatively innocuous, merely risking later frustration and disappointment, but some can present possible harm to athletes. For example, coaches subscribing to Gladwell's (2008) “10,000 hours rule” are likely to practice early specialisation despite its known physical and psychological risks for young athletes, although direct evidence in this context is sparse. Subsequently, this may encourage dropout even though, to the best of our knowledge, there is no such rule (Ericsson, 2020). Similarly, myths about teaching and learning can create difficulties beyond coaching sessions. For example, parents who believe that children are motivated to develop their ability in a particular sport through unconditional praise (Dweck, 1999), or that young players progress more rapidly and achieve more when they specialise in a small number of activities from an early age (Mostafavifar et al., 2013), may expect to cater to these ideas. However, there is no direct evidence that parental belief in these myths causally determines club behaviour or coaching practices, and such links remain speculative. The discussion of specific neuromyths could go on, and books have been written about them (e.g., Adey & Dillon, 2012; Jarrett, 2015; Lilienfeld et al., 2011). As we alluded to earlier, there are typically financial costs associated with questionable products or practices. Firstly, sports clubs can face significant financial implications, as adopting certain methods often involves considerable expenses, diverting resources from other potentially more effective practices (Adey & Dillon, 2012).

Secondly, implementing classification systems like learning styles can incur educational consequences. Coaches or educators may incorrectly categorize athletes according to perceived learning preferences, subsequently limiting their resources or training approaches. While the exact impact of such labels on long-term performance remains uncertain (Takmak & Demirkasımoğlu, 2024), it is plausible that athletes—particularly younger ones—could feel discouraged if an influential figure, such as their coach, suggests a mismatch between their learning style and the demands of a particular sport. There is a genuine risk that young athletes may internalize these labels, viewing themselves as restricted learners or thinkers, thus unintentionally limiting their potential and participation in broader activities.

Thirdly, there are professional costs. Just as the professional credibility of medicine would be undermined by the introduction of homoeopathy, leeches, or aura-tweaking, so sports coaching's aspirations of professionalisation are arguably undermined by the widespread acceptance of spurious learning and teaching methods. Although plausible, this relationship has not been systematically tested, and further empirical research is needed to substantiate this claim.

2.3 Sport coaches

Sports coaches have been presented with something of a mixed blessing. On the one hand, they have access to unprecedented amounts of information that might support their work and benefit athletes. On the other hand, genuine scientific insights are often buried among pseudoscientific noise that falls along a continuum of harmless, pointless, wasteful, and outright dangerous. It is difficult to conceive of a neuromyth without cost. Few coaches and coach educators have received specialist training in cognitive psychology and neuroscience, and understandably, they might struggle to understand their complexities.

Even if they can understand, it does not follow that they will be able to translate findings into implementable practices. The "translation problem" expresses the inherent difficulty of squaring neuroscientific methodology, terminology, and common-sense concepts about the brain and learning (Francken & Slors, 2018). Another issue is the more fundamental question of how people wishing to use research findings in this area can distinguish between actual science and pseudoscience – that which is presented as genuine science but lacks many of its essential characteristics (McIntyre, 2019). Research suggests that non-experts tend to readily accept claims presented alongside appealing brain imagery, neuroscientific explanations, or terminology containing the prefix "neuro," even if the information is misleading or unrelated (Weisberg et al., 2008). This phenomenon exemplifies a persuasive form of pseudo-scientific credibility, often termed "scienciness," which creates a deceptive appearance of scientific authority and legitimacy, thus lending credibility to otherwise questionable claims (Bailey & Collins, 2013, p.2). In many cases, the popularity of adopting pseudoscientific ideas stems from athletes' never-ending pursuit of a competitive edge, even marginal gains in performance, to excel in their sport (Hall et al., 2012). Starting from the premise that "it cannot hurt to try <insert new product/training method/idea> so I will;" the scope for coaches and athletes, even recreational athletes, to become willing pawns is considerable.

A notable example of this phenomenon is the so-called hologram or energy bracelet, a rubber wristband marketed as containing a hologram, defined as a photographic record of a light field. These bracelets enjoyed substantial popularity for a period, significantly boosted by endorsements from high-profile athletes such as Ronaldo, David Beckham, and Rubens Barrichello. Interestingly, it appears the manufacturers launched these products without conducting proper effectiveness trials. Indeed, rigorous scientific evaluations consistently indicate that these bracelets have no real performance-enhancing effects beyond a placebo response (Szabo et al., 2017).

A widely cited quote from Canadian psychotherapist Nathaniel Branden states, "The first step toward change is awareness." Neuromyths have subtly infiltrated the domain of sports coaching since long before the prominent focus brought by the "decade of the brain" (Jones & Mendell, 1999) or the influential OECD report on "the birth of a learning science" (OECD, 2007). However, formal academic recognition and exploration of these neuromyths within coaching contexts have only recently gained traction (Bailey et al., 2018; Stoszkowski et al., 2021). Given this delayed scholarly attention, rigorous empirical research investigating how prevalent these myths are, their underlying characteristics, and their origins is now critically necessary. Such studies would significantly enhance coaching professionalism, ultimately improving the training and development of athletes.

2.4 Coaching and Coach Education in Canada

Canada is widely recognized as having one of the most developed systems of coach education in the world. At the centre of this system is the National Coaching Certification Program (NCCP), which functions as the primary framework through which sports coaches acquire, demonstrate, and are formally recognised for their competencies. The NCCP was established in 1974 and initially followed a tiered structure based on the delivery of Level 1 to 5 workshops, focused primarily on theoretical and technical knowledge. At that time, certification required not only completion of these training modules but also a specified amount of coaching experience.

In the early 2000s, the programme underwent a significant transformation. It moved away from its traditional knowledge-based approach and toward a competency-based model that emphasised applied practice and contextual relevance. Rather than simply accumulating knowledge, coaches are now required to demonstrate their ability to function effectively in real coaching environments, in alignment with the needs of their specific athlete groups. Certification is granted only after formal evaluation, whereby coaches are assessed against outcomes that are tailored to the context in which they operate. These outcomes, and the standards they are measured against, are developed by individual sports but situated within the overarching NCCP framework. National Sport Organisations (NSOs), in turn, are responsible for ensuring that evaluation criteria are clearly articulated and consistently applied.

The Coaching Association of Canada (CAC), working in partnership with NSOs and provincial and territorial representatives, serves as the key administrative and coordinating body for the programme. Among its responsibilities is the ongoing revision and quality assurance of NCCP materials. In 2017, the CAC introduced a new research strategy designed to strengthen the evidence base of its programming. This was undertaken in parallel with a comprehensive revision of multisport content and templates for sport-specific training. Since that point, all updates to the NCCP have been guided by the principle that content should be explicitly informed by research evidence. This alignment with the academic literature reflects a growing commitment to ensure that Canadian coaches are supported by the best available knowledge and pedagogical practices.

There are several strengths that have emerged from this shift in orientation. The move to a competency-based model reflects broader developments in adult education and aligns with what is currently understood about how coaches learn most effectively. It also enables a more meaningful assessment of coaching capability, as it asks candidates not just to know, but to do. The contextual nature of NCCP evaluation, whereby the expectations placed on a community coach differ from those placed on a high-performance coach, helps to ensure that certification remains relevant and appropriately demanding. Further, the CAC's commitment to bilingualism and its partnerships with national and provincial bodies have contributed to the accessibility and reach of the programme across Canada's diverse sporting landscape.

Nonetheless, the NCCP is not without limitations. One ongoing challenge is the time it takes for new research to be integrated into formal materials. Fields such as cognitive science, motor learning, and pedagogy evolve quickly, and even with the best of intentions, curricula can lag behind. Moreover, while the competency-based model is theoretically sound, questions remain about the consistency with which it is implemented across sports and regions. The quality of instruction, the rigour of evaluation, and the fidelity of delivery can all vary significantly, depending on the sport or location in which a coach is trained. There is also relatively little published research that has rigorously evaluated the long-term impact of the NCCP on coaching practice or athlete outcomes. While internal reviews and user feedback are regularly collected, more independent, peer-reviewed studies would help to substantiate the programme's effectiveness and guide its future development.

In this context, efforts to examine the extent to which Canadian coaches engage with both scientific and pseudoscientific ideas are especially important. Such research can serve as a valuable proxy for assessing how well the NCCP, in its current form, prepares coaches to critically evaluate information and make evidence-informed decisions in their day-to-day work. Given the stated commitment of the CAC to build an evidence-based system of coach development, these questions are not peripheral, they go to the heart of the programme's aims and its capacity to support the professionalisation of coaching in Canada.

3. Methods

3.1 Objective

The primary aim of this research was to explore how prevalent scientific and pseudoscientific beliefs are among sports coaches and to identify where coaches commonly encounter these ideas.

3.2 Design

The research adopted an observational methodology, employing a self-administered questionnaire completed at a single point in time. Ethical approval was obtained from the institutional research ethics board (Ref: HEALTH/0133). All data utilized in the study are publicly accessible at https://uclandata.uclan.ac.uk/. Informed consent was explicitly obtained from every participant.

3.3 Setting

This study encompassed participants from every Canadian province and territory, involving coaches from all sports officially recognized by the Coaching Association of Canada (CAC).

3.4 Participants

Eligible participants met the following criteria: (1) adults aged 18 or older, (2) actively coaching in a Canadian province or territory, and (3) fluent in either English or French. Individuals not meeting all three criteria were excluded from participation.

3.5 Sampling and Sample Size

We utilized a non-probability convenience sampling method, allowing potential participants to voluntarily choose whether to participate. A minimum target of 350 participants was established to ensure sufficient statistical power and to allow for subgroup analyses based on demographics, coaching experience, employment status, and familiarity with neuromyth-related concepts.

3.6 Procedure
Three approaches were utilised to recruit potential participants:
Social media posts distributed via Twitter and Facebook

- Multiple posts by authors between June 2021 and December and November 2021
- CAC social media posts week commencing 4th October 2021

A call for participants in two of CACs regular emails to members

- Inside Coaching Newsletter, 16th June 2021
- SIRC Newsletter
- Dedicated email 8th October 2021

Personal email invitations to individual contacts of the research team

- Emails sent between September and November 2021

These recruitment approaches were planned to occur sequentially. Potential participants were provided with the study information sheet and had the opportunity to contact the principal investigator if they had any questions about the study. Participants who consented to involvement in the study completed a one-off survey at a time of their choosing.

3.6.1 Questionnaire
The questionnaire utilized in this study was adapted from previous research by Bailey et al. (2018), originally developed based on various national and international studies examining the prevalence of neuromyths in educational settings (Torrijos-Muelas et al., 2021). The survey commenced with standard demographic queries (e.g., age, sex, ethnicity), consistent with typical practice in social science research (Gilovich et al., 2006). Following demographic information, participants provided details relevant to their coaching roles, including the sport coached, the age groups of athletes, years of coaching experience, highest attained coaching qualification, and employment status within coaching.

Subsequently, participants responded to specific questions regarding their familiarity with neuroscience-related concepts introduced through coaching education or professional development. The questionnaire targeted ten particular educational theories and ideas: (1) goal setting, (2) learning styles, (3) direct instruction, (4) neurolinguistic programming (NLP), (5) guided discovery, (6) brain gym, (7) demonstrations, (8) Myers-Briggs Type Inventory (MBTI), (9) growth mindset, and (10) action types of approach (ATA).

These concepts were selected from established empirical research exploring pedagogical methods supported by evidence (e.g., Carter et al., 2012; Hattie, 2008), as well as authoritative texts on educational neuroscience (Della Sala, 2007; Della Sala & Anderson, 2012; Mareschal et al., 2014). Although originally derived from

Bailey et al. (2018), the list underwent a thorough contemporary literature review for relevance, though no additional items were deemed necessary.

Following this, participants were presented with statements regarding brain function and learning, developed from literature highlighting neuromyth prevalence and pseudoscience within education (e.g., Dekker et al., 2012; Dündar & Gündüz, 2016; Ferrero et al., 2016; Pickering & Howard-Jones, 2007; refer to Table 3 for detailed statements). Statements deemed context-specific or irrelevant to the broad educational landscape were excluded. In total, the questionnaire comprised 40 questions directly addressing coaching, learning processes, and neuroscience concepts—38 items designed to generate quantitative data and two open-ended questions inviting qualitative feedback. Among these, participants evaluated 14 statements about brain function and learning, six identified as neuromyths based on definitions from OECD (2002), Howard-Jones (2014), and Dekker et al. (2012). To reduce response biases, statements were randomly ordered, and participants indicated whether they considered each statement "correct," "incorrect," or if they "did not know."

The questionnaire was administered in English and French. Professional translation into French was conducted, followed by verification from a French-speaking researcher (MPC). To ensure linguistic accuracy and equivalence, another researcher (MJR) independently performed backward translation from French back into English.

3.7 Mitigating Bias and Ensuring Validity

A number of approaches were taken to improve the rigour of the study as well as to mitigate the occurrence of response bias. Questionnaire completion took place online and was anonymous. This step minimised demand characteristics and social-desirability bias (Dekker et al., 2012; Torrijos-Muelas et al., 2021). Participants were instructed that there were no right or wrong answers; instead, responses would reflect views on claims that are often presented in public.

The instrument's structure and content were checked by a group of coaches and sport educators to assess culture and relevance, understanding, and clarity, which ensured no major issues were present. Some changes were made to the order of items and vocabulary that was used. The items were taken from instruments created in earlier studies on neuromyths (Dekker et al., 2012; Howard-Jones, 2014; Hughes et al., 2020). Computation of internal reliability was done for pertinent sections of the questionnaire. All sub-scales had a Cronbach's alpha greater than .70 indicating acceptable consistency.

These processes align with the guidance for enhancing neuromyths research through bias-free methods, transparent revision practices, and structured reporting systems (Grospietsch & Lins, 2021). It is important to note, however, that belief in neuromyths is so deeply ingrained that it operates outside of conscious awareness (Im et al, 2018). Moreover, the neuromyth may not be endorsed as the reality of coaching or teaching practices. Such gaps between professed belief and actual teaching have been documented in earlier work (Howard-Jones, 2014; Hughes et al., 2020).

3.8 Data Analysis

Responses from both the English and French questionnaires were initially downloaded and consolidated into a unified Excel file. We carefully reviewed this combined dataset to identify and resolve missing or inconsistent entries, ensuring its integrity before transferring it into SPSS software (version 28) for further statistical analysis. Descriptive analyses were first conducted to calculate the mean scores and standard deviations for key study variables. Given the exploratory approach of our study, we did not set explicit hypotheses beforehand. Instead, we chose multiple regression analyses to investigate possible connections between various predictor variables and the likelihood of coaches endorsing neuromyths. Initially, demographic factors, such as participants' sex, age, and their highest coaching qualification, along with the accuracy percentage of their responses to general assertions about the brain, were analyzed in relation to belief in neuromyths. Next, we examined the influence of participants' attitudes toward integrating brain-based information into their coaching practice. Finally, a third regression explored specific types of learning-related and brain-based beliefs as potential predictors.

Further, linear mixed-effects models were employed to detect potential variations in neuromyth acceptance and general brain-knowledge accuracy based on gender, state, sport, province, or territory. We also carried out two-way Pearson chi-square tests of independence, using cross-tabulation comparisons to identify demographic differences regarding exposure to neuromyths. Monte Carlo simulations were applied to obtain accurate significance values for these chi-square tests, with a significance threshold set at $p < 0.05$. To maintain clarity and conciseness, only significant outcomes from linear mixed-effects and chi-square analyses are presented in the results.

4. Results

5,983 potential participants were recruited between 1st June 2021 and 31st October 2021. Of those potential participants, 1,568 (20.2%) completed the survey in its entirety. Responses were from English (n=1,342) and French (n=226) speaking individuals. Participant characteristics can be seen below in Table 2.

4.1 Participant Characteristics

Participants were mainly male (61.5%); aged between 45-54 years old (31.7%); living in Ontario (34.8%); with over 15 years of coaching experience (48.9%); highest coaching qualification at level two (67.9%); mainly coaching in a voluntary capacity (53.8%); and coaching groups aged between 12-16 years old (33.4%).

Table 2: Participant Characteristics

Characteristic	*N*	%
Sex		
Male	965	61.5
Female	593	37.8
Prefer not to say	10	0.6
Age		
18-24 years	80	5.1
25-34	142	9.1
35-44	297	18.9
45-54	497	31.7
55-64	362	23.1
65-74	153	9.8
75+	37	2.4
Province/Territory		
Alberta	215	13.7
British Colombia	261	16.6
Manitoba	60	3.8
New Brunswick	29	1.8
Newfoundland and Labrador	19	1.2
Nova Scotia	65	4.1
Ontario	545	34.8
Prince Edward Island	12	0.8
Quebec	298	19.0
Saskatchewan	57	3.6
Northwest Territories	2	0.1
Nunavut Territory	2	0.1
Yukon Territory	3	0.2
No. Years Coaching Experience		
0-3 years	167	10.7
4-6 years	225	14.3
7-9 years	144	9.2
10-12 years	171	10.9
13-15 years	94	6.0
15+ years	767	48.9
Highest Coaching Qualification		
No qualification	409	26.1
Level 1	241	15.4
Level 2	398	25.4
Level 3	344	21.9
Level 4	61	3.9
Level 5	40	2.6
NCI Diploma	75	4.8
Employment Status as a Coach		
Full-time (40 hours per week)	232	14.8
Part-time (less than 40 hours per week)	443	28.3
Volunteer (unpaid)	843	53.8
Other	50	3.2
Age Groups Coached		
<6 years	217	6.5
6-11 years	624	18.6
12-16 years	1118	33.4
17-25 years	828	24.7

26-35 years	382	11.4
36+ years	183	5.5

4.2 Prevalence of neuromyths and knowledge about the brain
We assessed how frequently participants endorsed neuromyths by measuring the percentage of incorrect answers given to myth-related statements—thus, higher percentages indicated stronger belief in these misconceptions. Additionally, we calculated the accuracy rate for responses to scientifically valid general assertions about the brain. Detailed response patterns showing the extent of agreement or disagreement with each neuromyth are provided in Table 3. Overall, participants expressed agreement with neuromyth statements 58.8% (±19.8) of the time. The most widely endorsed myth was that "Individuals learn more effectively when taught through their preferred learning style (e.g., auditory, visual, or kinaesthetic)," with 90.1% of coaches accepting this statement. Conversely, the most accurately recognized fact was "Vigorous exercise can enhance cognitive performance," which 82.6% of respondents correctly identified as true.

Table 3: Percentage of correct and incorrect responses for each neuromyth and each general assertion about the brain

	Correct (C) / Incorrect (I)	Agree (%)	Disagree (%)	Do not know (%)
NEUROMYTH				
Individuals learn better when they receive information in their preferred learning style (e.g., visual, auditory, kinaesthetic)	I	90.1	6.3	3.6
Differences in hemispheric dominance (left brain, right brain) can help explain individual differences amongst learners	I	60.8	8.3	30.9
Short bouts of coordination exercises can improve integration of left and right hemispheric brain function	I	65.0	2.7	32.3
Children are less attentive after consuming sugary drinks and/or snacks	I	48.5	23.7	27.8
There are critical periods in childhood after which certain things can no longer be learned	I	14.7	66.1	19.2
We only use 10% of our brain	I	36.1	31.8	32.1
GENERAL ASSERTION				
Vigorous exercise can improve mental function	C	82.6	7.1	10.3
Boys have bigger brains than girls	C	6.7	64.6	28.7
The left and right hemispheres of the brain always work together	C	19.4	47.6	33.0

We use our brains 24 hours a day	C	76.0	9.1	14.9
Extended rehearsal of some mental processes can change the shape and structure of some parts of the brain	C	68.7	4.7	26.7
The brain of boys and girls develop at the same rate	I	6.1	71.9	22.1
There are sensitive periods in childhood when it is easier to learn things	C	82.7	3.4	13.9
Learning occurs through modification of the brains' neural connections	C	62.8	3.4	33.7

N=1,568

Participants correctly answered an average of 23.1% (±19.0) of the general assertions related to brain functioning. The statements most frequently identified correctly included "There are sensitive developmental periods in childhood when learning certain skills is easier" (82.7%) and "Engaging in vigorous physical activity can enhance cognitive function" (82.6%). Conversely, the least accurately answered statement was "Boys possess larger brains than girls" (64.6%).

4.3 Exposure to Neuromyths

We also investigated where coaches typically encountered various learning- and brain-based concepts. The primary source, accounting for approximately 60% of the examined ideas—such as goal setting, learning styles, direct instruction, guided discovery, demonstration, and action type approach—was official coaching qualification programs. Courses offered by external organizations were the second most common source, contributing about 30% and included neurolinguistic programming, Myers-Briggs Type Inventory, and the growth mindset concept. Finally, conferences and other events accounted for the remaining 10%, where participants were exposed to practices like brain gym activities (see Table 4).

Table 4: Coaches' exposure to different learning-based and brain-based ideas

	Core Coaching Qualification courses	Other courses run by sports organisation	Conferences run by your sports organisation	Coaching courses delivered by other organisations	Courses delivered by other organisations	Other conferences
Goal Setting	32.4	12.0	10.9	17.2	16.4	11.1
Learning Styles	28.4	12.3	8.9	16.5	20.8	13.1
Direct Instruction	36.4	13.3	10.6	14.5	15.0	10.1
Neuro-Linguistic Programming (NLP)	12.6	6.2	6.8	13.7	32.5	28.2
Guided Discovery	24.4	11.0	8.7	14.8	23.8	17.3
Brain Gym	12.2	7.6	7.4	13.8	28.1	30.9
Demonstration	34.6	14.9	11.1	14.4	15.0	10.0

Myers-Briggs Type Inventory (MBTI)	9.3	6.8	5.0	10.5	37.6	30.8
Growth Mindset	17.8	10.4	8.9	15.1	25.9	21.9
Action Type Approach (ATA)	23.9	10.4	8.5	14.7	21.6	21.0

All values are percentages (%)

4.4 Prevalence of Neuromyths

The results from multiple regression analyses are presented below (Tables 5-7). Analyses tested the variables associated with participants believing neuromyths (i.e., responding incorrectly).

Table 5: Multiple regression predicting neuromyths from demographics and general assertions

	Neuromyths	
	R^2	β
	0.09***	
Sex		1.03
Age		-0.03
Highest coaching qualification		-0.03
% of assertions correct		0.28***

*N=1,568. **p < 0.01. ***p < 0.001.*

A multiple regression analysis was performed to determine whether demographic factors and participants' accurate knowledge of general brain-related assertions could predict their belief in neuromyths. Results indicated that the proportion of correctly identified assertions significantly predicted belief in neuromyths, F (4, 1563) = 36.765, $p < .001$, $R^2 = .09$.

Table 6: Multiple regression predicting neuromyths from attitudes to situations that would be improved by an understanding of the brain

	Neuromyths	
	R^2	β
	0.001	
The planning of sports coaching sessions		0.02
The delivery of sports coaching sessions (i.e., coaching)		0.89
The assessment of players'/athletes' learning and development		-0.47

*N=1,568. Betas were reversed to enhance interpretation (i.e., positive beta signifies a positive relationship). **p < 0.01.*

The multiple regression to predict belief in neuromyths and situations that might be improved by an understanding of the brain were not statistically significant.

Table 7: Multiple regression predicting neuromyths from use of learning-based and brain-based ideas in practice

	Neuromyths	
	R^2	β
	0.006	
Goal setting		-0.90
Learning styles		-0.07
Direct instruction		-0.19
Neuro-linguistic Programming (NLP)		1.32
Guided discovery		0.15
Brain Gym		-0.41
Demonstrations		0.05
Myers-Briggs Type Inventory (MBTI)		-0.45
Growth Mindset		-0.36
Action Types Approach (ATA)		0.36

*N=1,568. Betas were reversed to enhance interpretation (i.e., positive beta signifies a positive relationship). *p < 0.05. ***p < 0.001.*

Belief in neuromyths did not predict whether participants used learning-based brain ideas in their practice.

5. Discussion

This research explored how widespread pseudoscientific beliefs are among sports coaches in Canada. To date, only two peer-reviewed studies have specifically investigated the prevalence of neuromyths within sports coaching contexts. The initial study focused on 545 sports coaches from Britain and Ireland (Bailey et al., 2018), revealing that approximately 41.6% endorsed various neuromyth-related statements. The most commonly endorsed neuromyth in that study was the belief that "individuals learn best when information aligns with their preferred learning style, such as auditory, visual, or kinaesthetic."

Additionally, significant numbers of coaches held misconceptions regarding left and right-brain dominance as explanations for individual differences, and the erroneous notion that humans typically utilize only 10% of their brain capacity. None of these beliefs is consistent with our scientific understanding of learning and the brain, yet the study found that many coaches in its sample based their coaching practice on neuromyths. It was also found that much of the misunderstanding originated in compulsory training courses provided by national governing bodies. The second study replicated the first with 254 French coaches (Schmitt & Fournier, 2023). This study also found that coaches were frequently using pseudoscientific methods. Interestingly, the same three most popular neuromyth were identified in both studies. However, the authors of the French paper reported that coaches seemed to be equally influenced by science-based statements. Schmitt and Fournier conclude that their findings – like those of Bailey et al. – are cause for concern precisely because many neuromyths originated in compulsory coach education training courses. Table 7 (below) summarises the evidence of the prevalence of certain neuromyths among the current and previous studies of neuromyths and recent studies from teacher education.

Canadian participants displayed a higher tendency to endorse neuromyths despite demonstrating solid knowledge regarding general brain-related statements. Multiple regression analyses confirmed that individuals with a stronger grasp of brain functions were also more inclined to accept neuromyths or brain-based misconceptions, aligning with findings from prior research (Dekker et al., 2012; Ferrero et al., 2016). This outcome questions the commonly held belief that enhancing general brain knowledge effectively protects individuals from neuromyth acceptance (Papadatou-Pastou et al., 2017, p. 1). This issue is considered a little later in this article. Coaches in Canada less frequently reported being exposed to brain-based ideas during coach education courses organised by their sport the British/Irish and French coaches questioned earlier. There was no single site in Canada where coaches reported being more, or less, exposed to these ideas.

As with previous studies involving sports coaches and samples related to general education, the belief in learning styles was the most dominant neuromyth. Still, several questionable ideas were widely held, as shown in Table 2. What this means in terms of coaching practice and participant development is unclear. How do beliefs based on participants supposed hemispherical dominance or assumed learning style translate to coaching practice? Do coaches accepting such ideas structure their pedagogy in those terms, or do they turn to them when participants struggle somehow? Perhaps coaches merely sit through coach education sessions that promote neuromyths, with little or no impact on their day-to-day coaching. At present, we simply do not know. So, it should be acknowledged that there is no evidence of a causal effect of belief in neuromyths and poor pedagogy.

However, this is due to the absence of evidence rather than evidence of absence. Most commentators assume that neuromyths can "waste money and time and, at worst, also result in poor teaching and learning (Howard-Jones & Fenton, 2012), but this is largely taken for granted. In addition, almost all studies (including this one) could be criticised for treating 'neuromyths' as a singular concept rather than an umbrella term for a disparate set of ideas and practices. Thus, it may be helpful to discuss neuromyths in terms of some typology.

A wide range of strategies has been proposed to combat the rise of neuromyths in education (see Rousseau, 2021; Tokuhama-Espinosa, 2018, for reviews). These include the inclusion of critical thinking skills during training courses (Pasquinelli, 2012), the introduction of 'neuroeducation' courses (Macdonald et al., 2017), and the establishment of collaborative projects between neuroscientists and practitioners (Connell et al., 2012). Each of these proposals has merit, in theory, but their applicability in the real-world contexts of coaches, of whom the great majority teach sports voluntarily, make them difficult to accept.

Research from education has shown a relationship between teachers' beliefs about learning and instructional practices (Lunn Brownlee et al., 2017; Nie et al., 2013), but not all neuromyths translate into pedagogy, and it is conceivable that some highly questionable ideas are entirely harmless: Krammer, Vogel and Grabner (2021, p.55) suggest the claim that "the brain shrinks if pupils do not drink enough water" is an example of this category. Of course, water is a fundamental human need, critical in sports training with its heightened risk of dehydration (Cheuvront & Kenefick, 2014). Nevertheless, the idea that lack of water results in brain shrinkage is probably harmless nonsense. Some neuromyths are really collections of ideas rather than a unified framework.

NLP typically presents collections of relatively discrete activities. While some of these activities might be useful for coaches, others will not. Perhaps because they are based on dubious assumptions about the mind and learning (Bailey, 2017). Much the same could be said of ATA. Both approaches seem to derive some of their credibility from the judicious inclusion of sensible content (such as detailed hypnosis in some NLP courses and detailed observation schedules in ATA).

Nevertheless, since they are presented as packages, they should be treated with caution. Krammer et al. (2021) suggest that the learning styles concept offers a hybrid of potentially valuable and detrimental elements. Whilst acknowledging its general implausibility, the authors claim two mitigating factors: belief in learning styles might encourage the use of differentiated teaching methods or different methods. No empirical evidence is offered to support these hypotheses. Indeed, they would seem to contradict one of the foundational principles of learning styles, namely that teaching should be tailored to the assessed style of participants (Bailey, 2017).

It also presumes that available assessment methods are valid and reliable, which has largely been falsified by research (Rousseau & Brabant-Beaulieu, 2020). Narrowed or even restricted opportunities are likely to impoverish participants' learning by unnecessarily labelling them in terms of a spurious classification. Thus, we suggest that the learning styles concept is appropriately considered a hostile neuromyth, as it risks harmful outcomes for participants. Thinking about neuromyths in this way may help inform a strategic approach. Focusing on the most detrimental myths might make the development of focused materials more manageable and effective.

There is a growing body of research into the efficacy of different attempts to combat neuromyths (Rousseau, 2021), although none of these has been based in sports settings. Most strategies have focused on some sort of educational course. As alluded to earlier, a common-sense solution might be the introduction of neuroscience content into coach education (Schmitt & Fournier, 2023), with several commentators supporting this approach (e.g., Blanchette Sarrasin et al., 2019; Jolles & Jolles, 2021). However, findings using this approach are inconclusive. For example, in a South Korean study, 50 pre-service teachers were presented with content on memory, learning, complex cognition, and 'neuroscience knowledge' (Im et al., 2018). Members in the experimental group experienced pre-post gains in neuroscience understanding but no significant decrease in belief in neuromyths. In contrast, Menz and colleagues (Menz et al.,

2021) found that German pre-service teachers, enrolled on a psychology course, reduced their acceptance of neuromyths. The most impactful part of their intervention was 'refutation lectures', which explicitly addressed learners' misconceptions. It seems that mere exposure to scientific information about the brain and learning is insufficient to dispel neuromyths (Macdonald et al., 2017).

As the Menz study implies, a more assertive response may be necessary to address neuromyths. Following Chi's (2013) analysis of learners' misconceptions, in which neuromyths would be classified as "false single beliefs" (p. 51), Grospietsch and Mayer (2021) tested the effect of a set of interventions that created cognitive conflict between neuromyths and actual neuroscientific knowledge. Results indicated a positive effect when students reflected on and read refutation texts related to specific neuromyths, spilling over into belief in other myths. It is unclear why this outcome happened: texts, reflection, or both? It is noteworthy that Lithander et al. (2021) specifically tested the impact of different types of refutation texts and found that all formats were effective in correcting individuals' belief in neuromyths. Generally, however, the impacts of educational interventions are small and short-lived (Rousseau, 2021).

The resilience of neuromyths suggests that they connect with deeply rooted belief systems. Simple typologies, such as those used in many learning styles theories, NLP, and ATA, surely draw on the intuitive appeal of dichotomous thinking (Berlin, 1990). The implied or occasionally overtly claimed 'magical' potential of NLP (Bandler & Grinder, 1975), and Brain Gym (Dennison & Dennison, 1992) seems to tap into the same source of inspiration as the 10% myth, and the promise of extraordinary change thanks to a simple trick.

However, there seems to be a more general issue, namely the reluctance of people to relinquish misconceptions, even after taking University-level psychology or neuroscience courses (Grospietsch & Mayer, 2021; Kowalski & Taylor, 2017). Anecdotal evidence that sports coaches can cling to their misconceptions in the face of empirical demonstrations and theoretical explanations to the contrary is lent support from recent studies in educational settings (Torrijos-Muelas et al., 2021). This might explain the difficulty researchers have experienced in combating neuromyths. It also suggests that these myths will be amenable to simple or brief interventions.

5.1 Strengths, Limitations and Future Research

As with all studies, this one has its strengths and weaknesses. A strength in this case is the scale and geographical scope of the dataset. The design of the online survey allowed for engagement with a large and diverse sample of coaches from all provinces and territories of Canada, which is a remarkable level of coverage in sport coaching research. The ecological validity of the findings and their relevance to real-world practice was enhanced by the fact that a wide range of sports, coaching roles, and levels of experience were captured in the survey. From a methodological standpoint, the study was bolstered by the use of a rigorously defined instrument based on previously validated surveys, which had been tailored by coaches through a pilot-testing process. This approach enhanced content validity, contextual clarity, and permitted strong across-country comparisons with studies conducted in the UK, Ireland, and France.

Regardless of these benefits, some limitations deserve consideration. The self-administered online survey, while convenient, raises concerns pertaining to informed consent, privacy of data, and authenticity of responses—for instance, knowledge-based questions where participants may have been inclined to consult outside sources (Evans & Mathur, 2018). Using a self-selected sample also poses risks due to selection bias since respondents with a strong interest in science, teaching, or career advancement are likely overrepresented. In addition, although the survey offers important insights into patterns of beliefs, it did not provide direct conclusions on how those beliefs interact with coaching practices because of the self-report nature of the data collected. In the absence of observational or longitudinal data, the causal link between belief in pseudoscientific ideas and coaching behaviours remains untested.

These approaches could be better addressed in future research using a mix of methods and disciplines. Qualitative research using interviews, ethnographies, or focus groups may help answer the "how" question on the processes coaches use in acquiring, interpreting, and operationalizing (mis)information related to the theory of learning and the brain. Examining how the exposure to evidence-informed coach education or critical belief change interventions impact beliefs over time would require longitudinal research.

Studies using targeted intervention methods such as exposure to refutation texts, cognitive conflicts, or information illiteracy teaching targeted at reducing neuromyth endorsement could have their effectiveness evaluated with these approaches. Such intervention studies could also cross borders and examine other countries to show how differences in the structure, content, and delivery of coach education programs affect the spread and consolidation of pseudoscientific concepts. All of these approaches would help create scientifically grounded, critically reflexive coach education programs that would help advance the coaching profession as a credible field of educational practice.

5.2 Conclusion

This study highlights a widespread belief in neuromyths among sports coaches, with nearly 60% of myth-based statements being incorrectly endorsed. The most pervasive misconception, that individuals learn better when taught in their preferred learning style, was believed by over 90% of participants. While a majority of respondents correctly identified some basic truths about brain function, such as the benefits of vigorous exercise on mental performance and the existence of sensitive periods in childhood learning, their overall knowledge of general brain assertions remained limited.

Demographic characteristics, including sex, age, and coaching qualification, showed minimal predictive value in relation to neuromyth belief. However, a significant relationship emerged between general brain knowledge and reduced belief in neuromyths, suggesting that improved neuroscience literacy could serve as a protective factor against such misconceptions. The findings also reveal that core coaching courses are a primary source of exposure to both evidence-based and pseudoscientific educational practices.

This underscores an urgent need to reevaluate the content of coaching curricula, ensuring they are informed by contemporary neuroscience rather than outdated or unvalidated psychological models. Given the potential implications of neuromyths on coaching effectiveness and athlete development, these insights call for targeted educational interventions to correct misconceptions and promote evidence-informed practices in sports coaching. Future research should explore the efficacy of such interventions and examine their impact on coaching outcomes.

6. References

Adey, P., & Dillon, J. (2012). *Bad education: Debunking myths in education*. Open University Press.

Bailey, R., P. & Collins, D. (2013). The standard model of talent development and its discontents. *Kinesiology review, 2*(4), 248–259. https://doi.org/10.1123/krj.2.4.248

Bailey, R. P. (2017). Science, pseudoscience and exercise neuroscience: Untangling the good, the bad, and the ugly. In R. Meeusen, S. Schaefer, P. Tomporowski, & R. P. Bailey (Eds.), *Physical activity and educational achievement: Insights from exercise neuroscience* (pp. 335–359). Routledge.

Bailey, R. P., Madigan, D. J., Cope, E., & Nicholls, A. R. (2018). The prevalence of pseudoscientific ideas and neuromyths among sports coaches. *Frontiers in psychology, 9*, 641. https://doi.org/10.3389/fpsyg.2018.00641

Bandler, R., & Grinder, J. (1975). *The structure of magic I: A book about language and therapy*. Science & Behavior Books.

Berlin, S. B. (1990). Dichotomous and complex thinking. *Social service review, 64*(1), 46–59. https://doi.org/10.1086/603741

Blanchette Sarrasin, J., Riopel, M., & Masson, S. (2019). Neuromyths and their origin among teachers in Quebec. *Mind, brain, and education, 13*(2), 100–109. https://doi.org/10.1111/mbe.12193

Carter, M., Strnadová, I., & Stephenson, J. (2012). Reported prevalence of evidence-based instructional practices by special educators in the Czech Republic. *European journal of special needs education, 27*(3), 319–335. https://doi.org/10.1080/08856257.2012.691229

Cheuvront, S. N., & Kenefick, R. W. (2014). Dehydration: physiology, assessment, and performance effects. *Comprehensive physiology*, 4(1), 257-285. https://doi.org/10.1002/cphy.c130017

Chi, M. T. H. (2013). Two kinds and four sub-types of misconceived knowledge, ways to change it, and the learning outcomes. In S. Vosniadou (Ed.), *The international handbook of conceptual change* (2nd ed., pp. 49–70). Routledge.

Connell, M. W., Stein, Z., & Gardner, H. (2012). Bridging between brain science and educational practice with design patterns. In S. Della Sala & M. Anderson (Eds.), *Neuroscience in education: The good, the bad, and the ugly* (pp. 267–285). Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199600496.003.0081

Cribb, A., & Gewirtz, S. (2015). *Professionalism*. Polity Press.

Dehaene, S. (2020). *How we learn: The new science of education and the brain*. Penguin Books.

Dekker, S., Lee, N. C., Howard-Jones, P., & Jolles, J. (2012). Neuromyths in education: Prevalence and predictors of misconceptions among teachers. *Frontiers in Psychology, 3*, 429. https://doi.org/10.3389/fpsyg.2012.00429

Della Sala, S. (2007). *Tall tales about the mind and brain: Separating fact from fiction*. Oxford University Press.
Della Sala, S., & Anderson, M. (Eds.). (2012). *Neuroscience in education: The good, the bad, and the ugly*. Oxford University Press.
Dennison, P. E., & Dennison, G. E. (1992). *Brain gym*. Edu-Kinesthetics Inc.
Dündar, S., & Gündüz, N. (2016). Misconceptions regarding the brain: The neuromyths of preservice teachers. *Mind, brain, and education, 10*(4), 212–232. https://doi.org/10.1111/mbe.12119
Dweck, C. S. (1999). *Self-theories: Their role in motivation, personality, and development*. Psychology Press.
Eagleman, D. (2015). *The brain: The story of you*. Pantheon.
Ericsson, K. A. (2020). Towards a science of the acquisition of expert performance in sports: Clarifying the differences between deliberate practice and other types of practice. *Journal of sports sciences, 38*(2), 159–176. https://doi.org/10.1080/02640414.2019.1688618
Evans, J. R., & Mathur, A. (2018). The value of online surveys: A look back and a look ahead. *Internet research, 28*(4), 854–887. https://doi.org/10.1108/IntR-03-2018-0089
Ferrero, M., Garaizar, P., & Vadillo, M. A. (2016). Neuromyths in education: Prevalence among Spanish teachers and an exploration of cross-cultural variation. *Frontiers in human neuroscience, 10*, 496. https://doi.org/10.3389/fnhum.2016.00496
Francken, J. C., & Slors, M. (2018). Neuroscience and everyday life: Facing the translation problem. *Brain and cognition, 120*, 67–74. https://doi.org/10.1016/j.bandc.2017.09.004
Gilovich, T., Keltner, D., & Nisbett, R. E. (2006). *Social psychology*. W.W. Norton & Company.
Gini, S., Knowland, V., Thomas, M. S. C., & Van Herwegen, J. (2021). Neuromyths about neurodevelopmental disorders: Misconceptions by educators and the general public. *Mind, brain, and education, 15*(4), 289–298. https://doi.org/10.1111/mbe.12303
Gladwell, M. (2008). *Outliers: The story of success*. Little, Brown & Company.
Grospietsch, F., & Mayer, J. (2021). Didaktische Rekonstruktion als Planungs-und Forschungsrahmen nutzen. *Herausforderung Lehrer*innenbildung, 4(2), 165–192. https://doi.org/10.11576/hlz-2548
Hall, D., James, D., & Marsden, N. (2012). Marginal gains: Olympic lessons in high performance for organisations. *HR Bulletin: research and practice, 7*(2), 9–13.
Hammer, D. (1996). More than misconceptions: Multiple perspectives on student knowledge and reasoning, and an appropriate role for education research. *American journal of physics, 64*(10), 1316–1325. https://doi.org/10.1119/1.18376
Hattie, J. (2008). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. Routledge.
Herculano-Houzel, S. (2002). Do you know your brain? A survey on public neuroscience literacy at the closing of the decade of the brain. *The neuroscientist, 8*(2), 98–110. https://doi.org/10.1177/107385840200800206
Howard-Jones, P. A. (2014). Neuroscience and education: Myths and messages. *Nature reviews neuroscience, 15*(12), 817–824. https://doi.org/10.1038/nrn3817
Howard-Jones, P. A., & Fenton, K. D. (2012). The need for interdisciplinary dialogue in developing ethical approaches to neuroeducational research. *Neuroethics, 5*(2), 119–134. https://doi.org/10.1007/s12152-011-9101-0
Im, S., Cho, J.-Y., Dubinsky, J. M., & Varma, S. (2018). Taking an educational psychology course improves neuroscience literacy but does not reduce belief in neuromyths. *PLOS ONE, 13*(2), e0192163. https://doi.org/10.1371/journal.pone.0192163
Jarrett, C. (2015). *Great myths of the brain*. Wiley-Blackwell.

Jolles, J., & Jolles, D. D. (2021). On neuroeducation: Why and how to improve neuroscientific literacy in educational professionals. *Frontiers in psychology, 12*, 752151. https://doi.org/10.3389/fpsyg.2021.752151

Jones, E. G., & Mendell, L. M. (1999). Assessing the decade of the brain. *Science, 284*(5415), 739. https://doi.org/10.1126/science.284.5415.739

Kowalski, P., & Taylor, A. K. (2017). Reducing students' misconceptions with refutational teaching: For long-term retention, comprehension matters. *Scholarship of teaching and learning in psychology, 3*(2), 90–100. https://doi.org/10.1037/stl0000082

Krammer, G., Vogel, S. E., & Grabner, R. H. (2021). Believing in neuromyths makes neither a bad nor good student-teacher: The relationship between neuromyths and academic achievement in teacher education. *Mind, brain, and education, 15*(1), 54–60. https://doi.org/10.1111/mbe.12266

Lara-Bercial, S., Bales, J., & North, J. (2020). Coaching around the world: On becoming a profession. In J. Wallis & J. Lambert (Eds.), *Coaching for human development and performance in sports* (pp. 93–121). Springer International Publishing. https://doi.org/10.1007/978-3-030-63912-9_6

Lilienfeld, S. O., Lynn, S. J., Ruscio, J., & Beyerstein, B. L. (2011). *50 great myths of popular psychology: Shattering widespread misconceptions about human behavior*. Wiley-Blackwell.

Lithander, M. P. G., Geraci, L., Karaca, M., & Rydberg, J. (2021). Correcting neuromyths: A comparison of different types of refutations. *Journal of applied research in memory and cognition, 10*(4), 577–588. https://doi.org/10.1016/j.jarmac.2021.03.006

Lunn Brownlee, J., Ferguson, L. E., & Ryan, M. (2017). Changing teachers' epistemic cognition: A new conceptual framework for epistemic reflexivity. *Educational psychologist, 52*(4), 242–252. https://doi.org/10.1080/00461520.2017.1333430

Macdonald, K., Germine, L., Anderson, A., Christodoulou, J., & McGrath, L. M. (2017). Dispelling the myth: Training in education or neuroscience decreases but does not eliminate beliefs in neuromyths. *Frontiers in psychology, 8*, 1314. https://doi.org/10.3389/fpsyg.2017.01314

Mareschal, D., Butterworth, B., & Tolmie, A. (Eds.). (2014). *Educational neuroscience*. Wiley-Blackwell.

McIntyre, L. (2019). *The scientific attitude: Defending science from denial, fraud, and pseudoscience*. The MIT Press.

Menz, C., Spinath, B., Hendriks, F., & Seifried, E. (2021). Reducing educational psychological misconceptions: How effective are standard lectures, refutation lectures, and instruction in information evaluation strategies? *Scholarship of teaching and learning in psychology*. Advance online publication. https://doi.org/10.1037/stl0000269

Mostafavifar, A. M., Best, T. M., & Myer, G. D. (2013). Early sport specialisation, does it lead to long-term problems? *British journal of sports medicine, 47*(17), 1060–1061. https://doi.org/10.1136/bjsports-2012-092005

Nie, Y., Tan, G. H., Liau, A. K., Lau, S., & Chua, B. L. (2013). The roles of teacher efficacy in instructional innovation: Its predictive relations to constructivist and didactic instruction. *Educational research for policy and practice, 12*(1), 67–77. https://doi.org/10.1007/s10671-012-9128-y

Organisation for Economic Cooperation and Development (OECD). (2002). *Understanding the brain: Towards a new learning science*. OECD Publishing.

Organisation for Economic Cooperation and Development (OECD). (2007). *Understanding the brain: The birth of a learning science*. OECD Publishing.

Papadatou-Pastou, M., Haliou, E., & Vlachos, F. (2017). Brain knowledge and the prevalence of neuromyths among prospective teachers in Greece. *Frontiers in psychology, 8*, 804. https://doi.org/10.3389/fpsyg.2017.00804
Pasquinelli, E. (2012). Neuromyths: Why do they exist and persist? *Mind, brain, and education, 6*(2), 89–96. https://doi.org/10.1111/j.1751-228X.2012.01141.x
Pickering, S. J., & Howard-Jones, P. (2007). Educators' views on the role of neuroscience in education: Findings from a study of UK and international perspectives. *Mind, brain, and education, 1*(3), 109–113. https://doi.org/10.1111/j.1751-228X.2007.00011.x
Rousseau, L. (2021). Interventions to dispel neuromyths in educational settings—A review. *Frontiers in psychology, 12*, 719692. https://doi.org/10.3389/fpsyg.2021.719692
Singer, J. (2020). Athletes and sports psychologists. *Psychologically Speaking with Dr Jack Singer*. https://drjacksinger.com/athletes-and-sports-psychologists/
Stoszkowski, J., MacNamara, Á., Collins, D., & Hodgkinson, A. (2021). "Opinion and fact, perspective and truth": Seeking truthfulness and integrity in coaching and coach education. *International sport coaching journal, 8*(2), 263–269. https://doi.org/10.1123/iscj.2020-0023
Stover, S., & Saunders, G. (2000). Astronomical misconceptions and the effectiveness of science museums in promoting conceptual change. *Journal of elementary science education, 12*(1), 41–51. https://doi.org/10.1007/BF03176897
Szabo, A., Szemerszky, R., Dömötör, Z., Gresits, I., & Köteles, F. (2017). Laboratory investigation of specific and placebo effects of a magnetic bracelet on a short bout of aerobic exercise. *Journal of sport behavior, 40*(4), 410–422.
Takmak, H., & Demirkasımoğlu, N. (2024). Casting labels in high schools: Perspectives, patterns, and prophecies. *International Journal of Educational Research*, 124, 102318.
Tokuhama-Espinosa, T. (2018). *Neuromyths: Debunking false ideas about the brain*. W. W. Norton & Company.
Torrijos-Muelas, M., González-Víllora, S., & Bodoque-Osma, A. R. (2021). The persistence of neuromyths in educational settings: A systematic review. *Frontiers in psychology, 11*, 591923. https://doi.org/10.3389/fpsyg.2020.591923
Weisberg, D. S., Keil, F. C., Goodstein, J., Rawson, E., & Gray, J. R. (2008). The seductive allure of neuroscience explanations. *Journal of cognitive neuroscience, 20*(3), 470–477. https://doi.org/10.1162/jocn.2008.20040

7. Declaration

Funding

The authors were not in receipt of any funding for this study.

Acknowledgements

The authors acknowledge the support of all coaches who took the time to complete the survey; and of the Coaching Association of Canada for supporting data collection efforts.

Contributorship

RB conceived of the study, contributed to manuscript preparation, and reviewing drafts. MJR led data collection, and data analysis, contributed to manuscript preparation, and reviewing drafts. MP and GC supported data collection and contributed to manuscript preparation and commented on drafts. JS and NS supported data analysis and contributed to manuscript preparation. All authors agreed on the final draft of the submitted manuscript.

Conflicts of interest
MJR, RB, LA, JS and NS have no conflicts of interest that are directly relevant to the content of this article. MP is employed by the Coaching Association of Canada. GC is a Master Coach Developer for the Coaching Association of Ontario, a provincial/territorial coaching representative that delivers the NCCP on behalf of the Coaching Association of Canada.

Ethics approval
This study was approved by an institutional research ethics committee (Ref: HEALTH/0133).

Data availability
The data supporting this study's findings are available from https://uclandata.uclan.ac.uk/ upon reasonable request.

Consent to participate
All respondents provided informed consent before participating in the survey.

Consent for publication
All respondents provided consent for the use of data (anonymous) for research purposes and publications.