# The Prevalence of Neuromyths among Chinese Adults

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**Abstract.** In recent years, promoted social attention to neuroscience also enhanced the spreading of neuromyths: falsely hypothesized neuroscientific items. The public belief in neuromyths would enhance the difficulties of teaching and wrongly delivering professional knowledge. Although most of the previous studies have identified the prevalence of neuromyths among educator groups in western countries, it still requires a deep investigation of neuromyths prevalence among public groups in the eastern background. This research conducted an online questionnaire to identify the Chinese adult groups' accuracy in clarifying neuromyths and examined the possible contributors and knowledge sources. The results indicated the wide spreading of neuromyths in China, and age, gender, and educational levels are the possible influencers of individuals' neuroscientific knowledge. Meanwhile, participants also recognized neuroscientific items as common sense or content learned from educational books or teachers. Therefore, it suggests society revise scientific popularization programs and school education to enhance knowledge levels and decrease the promotion of neuromyths.

**Keywords:** Neuromyths; Neuroscience; Chinese; Science education; Knowledge source.

## 1. Introduction

With the current global education development, neuroscience as a scientific item has become less unfamiliar to the public in recent years. However, previous neuroscientific hypothesizes that are falsely propagated, understood and used in society create the concept of neuromyths [1]. It means that the promotion of neuroscientific knowledge remains unclear and negatively contributes to the public knowledge construction process. According to some examples identified by Organization for Economic Co-operation and Development (OECD) [2], neuromyths involves specific false hypothesis from multiple aspects like development and learning behaviors that significantly impact individual understanding. For example, multiple channels promoted the item “we only use 10% of our brain” as classical neuromyth, like some websites’ contents and the science fiction movie “Lucy”. Consequently, the public emphasis on such neuromyths falsely stimulates public cognition and guides further misuse of scientific items.

Dekker et al. [3] emphasized that the existence of neuromyths in the educational system enhanced the time and cost westing and increased teaching difficulties. Furthermore, it implies that teachers or other parties who access the educational process would impact their teaching methods and may deliver false cognition to the next generation. Thus, recognizing and rejecting neuromyths as an essential topic in the educational area contribute to the information-delivering process, pedagogy, and curriculum design, and learning behaviors formation. Accordingly, numerous research focused on neuromyths conducted relevant investigations on neuromyths' prevalence among educators [4-7]. However, those previous studies mainly concentrated on western educational backgrounds and limited participant groups. As a result, there is insufficient awareness about how public audiences in China determine neuromyths and identify potential factors. Therefore, this article will first discuss the items in neuromyths and review previous studies on relevant areas. Furthermore, the paper also investigates how Chinese participants understand neuromyths using statistical analysis and examine possible influencers to their understanding.

### 1.1 Neuromyths and Neurofacts

Identifying concepts and items of neuromyths is crucial to clarify the specific knowledge and items that have been misunderstood. The neuromyths refer to incorrect or uncleared neuroscientific items

in professional areas [1]; in contrast, the neurofacts indicate accurate items that conform to reality with research [8]. Like rumors circulated speedily and misleading public cognition about specific facts, social media always promotes neuromyths that catch public curiosity [1]. Meanwhile, the neuromyths contribute to false understanding and the implementation stages that may be harmful to support students' education. In contrast with the rumors, neuromyths have the essential concept of 'myths', which is attractive to the public and reinforced by backfire effects [9]. Such findings indicate that neuromyths are embedded in social cognition and would be reinforced continuously through promotion from multiple channels. Thus, identifying neuromyths and neurofacts is critical for the public in revising educational content and methods to avoid spreading incorrect scientific knowledge.

According to OECD [2] and Edutopia [10], the public would typically recognize neuromyths in different aspects, like human development, brain structure, biological knowledge, and academic pedagogies. Bellert and Graham [8] compared some specific neuromyths and neurofacts that may be familiar to the public. They indicated that such false information might start from commercial appeals, common misconceptions, taking out specific contexts, semantic errors, and theoretical hypotheses without data. For instance, the classical neuromyth, such as the left and right hemispheres working independently, arose from the finding that there are varied functional areas in separate hemispheres. However, the original context emphasized the anatomical difference in the brain structure, not the workload difference [9]. Meanwhile, in the neurofact, the corpus callosum connected both hemispheres for cooperative working, and interactions among hemispheres support cognitive function [8]. Based on the original finding, the neuromyth as a fallacy excluded specific conditions and misled the scientific discovery into a false hypothesis. Consequently, neuromyths construct unrealistic guessing of neuroscientific items that may logically conform to public cognition but are academically inaccurate.

### 1.2 Neuromyths among Education and Society

Unlike specific social events or cases that significantly and directly impact the public physically and mentally, the neuromyth is prone to potential consequences that affect society gradually in the educational area. Meanwhile, with the implicit cognitive construction, the neuromyth would express its negative factors consciously and unconsciously according to the application.

From the conscious perspective, the neuromyths would be misunderstood as evident-based theories and involved in the curriculum construction. The idea means that some neuromyths, like viruses, need a host and utilize their desires for existence and spread. For instance, the Brain gym project with neuromyths as theoretical frameworks captures educators' willingness for academic improvements and is speedily accepted and advertised by multiple educational institutions globally [11]. Therefore, educators would consciously involve the false concept in the curriculum design and support students' learning activities through unscientific methods. Additionally, teachers would rely on those myths' optimistic willingness to satisfy their education hypothesis [12]. For example, teachers may recognize the information they collected from their classrooms as logically acceptable to be an accurate summary of scientific discoveries. It indicates that educators are both receivers and disseminators of neuromyths that would stimulate chain reactions in the educational system. Consequently, individuals without relevant neuroscientific knowledge would readily create, misunderstand and mislead the educational orientation.

From the unconscious perspective, neuromyths are widespread fallacies that would be promoted from multiple channels and unconsciously entrenched into individuals' cognition as 'common sense'. Furthermore, the cognitive implantation strengthened the construction of a fixed mindset that individuals would prefer to believe what has been heard before, not the fact [9]. Based on this, educators' cognitive bias refers to how teachers adopt specific neuromyths that are logically acceptable and hard to revise in future periods [13]. Therefore, the social promotion of such inaccurate information becomes a barrier to future interventions, training and scientific popularization in society. Pasquinelli [1] indicated that neuromyths are similar to illusions that are robust but persistent through culture and regulated by social context. It implies the possibilities of macro conditions that contribute

to constructing neuromyths within particular backgrounds. Such a viewpoint also suggests that the prevalence of the same neuromyth would vary among countries.

However, before the consequences of the neuromyths, a critical problem for researchers is how the neuromyths disseminate to society. Researchers like Pasquinelli [1] and Tardif et al. [14] have identified crucial channels that contribute to individuals' understanding of neuromyths, such as social media, readings, and peers. Accordingly, the finding determined that neuromyths would be continuously reinforced through social activities, which create an unstoppable vicious circle. Especially media and knowledge source that receives public trust and is responsible for delivering precise information could quickly transfer neuromyths into widely known neural knowledge [1]. The emphasis on neuromyths for social attention would negatively contribute to understanding and scientific spread. Thus, identifying influential channels in spreading neuromyths is essential for prospective interventions.

### 1.3 Previous Research on Neuromyths Prevalence

With the enhanced public attention on neuromyths, recent studies have conducted considerable investigations on the prevalence in different countries. First, teachers are always the primary participants in the studies based on the impact of neuromyths in the educational area. Hughes et al. [15] focused on the neuromyths among teacher groups through systematic literature reviews on teacher sampled research. According to the research, Hughes et al. suggested that recent studies concentrate on descriptive data of the prevalence without specific data on the correlations between neuromyths and learning achievements. Meanwhile, the authors indicated the gap in neuromyths studies expressed in the educational practice with insufficient learners' or public perspectives. It recommends reorientating relevant research from deciders' understanding to learners' performance to analyze the possible outcomes of neuromyths.

Second, from Pasquinelli's perspective [1] about the cultural regulation of neuromyths, the viewpoint suggested more diverse investigations of neuromyths across countries. Therefore, Pei et al. [16] and Zhang et al. [17] investigate the Chinese prevalence of neuromyths to fill the global gap in neuromyths research. Results from Pei et al. [16] represented analyzed transnational data and found similar prevalence of teachers' neuromyths understanding among China and European countries. Although the overall comparison expressed that neuromyths are globally promoted, the detailed data on specific items also revealed the cultural difference contributing to participants' accuracy. Zhang et al. [17] indicated that educators as headmasters in China are passionate about neuroscience but have insufficient neuroscientific knowledge. Moreover, participants were willing to involve their previous experience in the teaching process without scientific evidence, highlighting the urgency of recognizing Chinese neuromyth's prevalence. In addition, the researchers implied that individuals' experience and educational background would positively affect their understanding of neuromyths, supporting further analysis of the prevalence.

Third, the training program and other predictors contributing to understanding neuromyths' prevalence have been emphasized in previous studies. For example, Bissessar and Youssef's cross-sectional study [4] investigated multiple variables such as individuals' gender, educational level, training, and experience did not affect the identification of neuromyths. In contrast, Simoes et al. [7] identified age, teaching level and educational periods positively correlated with the prevalence of neuromyths, suggesting the possible influence of individual characters on their professional knowledge. Another study by Ferreira and Rodríguez [5] emphasized that the experience of a training program as one-year science of learning (SoL) would significantly support the experiment groups' identification of neuromyths. Therefore, the relevant experience with professional neuroscience knowledge would also support individuals in constructing an accurate neuroscience model.

### 1.4 The Current Research

Previous studies have detailed investigated the prevalence of neuromyths among western educator groups with less emphasis on other groups. Therefore, the current research aims to identify the

prevalence of neuromyths in China by concentrating on diverse public groups from different backgrounds. Meanwhile, the subsequent research will conduct a quantitative method and analyze the impact of relevant factors such as gender, age and academic experience on the identification accuracy of neuromyths. Furthermore, the resulting information illustrates the understanding of Chinese public neuroscientific knowledge, supports further predictions, and assists further adjustments of the informational source. Compared with previous research, the current research is the first investigation of neuromyths focused on the broader Chinese sample.

## 2. Method

### 2.1 Participants

Through the online publishment of the questionnaire, a total of 85 participants involved 84 effective responses, as Table 1 expresses. Furthermore, all the participants accessed the research process from promotion on online social platforms such as Weibo and WeChat anonymously and voluntarily. Accordingly, more than 75% of participants are females, with only 23.80% males. Furthermore, there have participants from six age groups: below 18, 18-25, 26-35, 35-45, 45-60 and 60 above; in addition, 82.10% are from the age group between 18-35 years old, and there has only one response in the group below 18 and excluded from the analysis process. The educational and career information expressed that almost 50% of full-time student participants; meanwhile, 88.10% of participants hold the highest or current educational certification with bachelor's degree or master's degree, and 44.00% have an academic background in the Education field.

**Table 1**. Demographic factors of Chinese participants

| Items | Categories | *N* | Percent (%) |
|---|---|---|---|
| Gender | Male | 20.00 | 23.80 |
| | Female | 64.00 | 76.20 |
| Age | 18-25 | 52.00 | 61.90 |
| | 26-35 | 17.00 | 20.20 |
| | 36-45 | 3.00 | 3.60 |
| | 45-60 | 9.00 | 10.70 |
| | Above 60 | 3.00 | 3.60 |
| The highest/current educational level | High school and below | 3.00 | 3.60 |
| | Junior college degree | 7.00 | 8.30 |
| | Bachelor degree | 35.00 | 41.70 |
| | Master degree and above | 39.00 | 46.40 |
| Career | Full-time student | 40.00 | 47.60 |
| | Others | 44.00 | 52.40 |
| Major | Education | 37.00 | 44.00 |
| | Other majors | 47.00 | 56.00 |

### 2.2 Materials

This research conducted an online questionnaire with 18 questions involving five demographic questions, twelve neuromyths questions, and one additional question about the information channel.

The twelve questions about prevalent neuromyths referred to the statements from Bellert & Graham [8], OECD neuromyths [2] and [10]. According to previous findings, the selected items are significant neuroscience debates that have been evidenced as neuromyths but are typically misunderstood by the public. Three dimensions of neuroscience with correct answers are involved in the 12 questions: neurodevelopment (questions 6-7), brain structure and working process (questions 8-12), and learning behaviors (questions 13-17). Therefore, this section executed the true or false question structure as previous research implemented to examine the public understanding of

neuroscience [7, 8]. Moreover, among the 12 questions of neuroscience, there have 11 questions that are neuromyths, and one as the reversed item is the neurofact (the eleventh question). In the preparation stage, considering all the original items from the initial database are in English while the participants are from a Chinese language background, this questionnaire was translated into Chinese and revised by two experienced local reviewers with expertise in English translation in the professional field.

Additionally, the five demographic questions collected information about gender, age, educational level and majors, and careers for comprehensive statistical data of the participants' population. The additional channel question with multiple choice aims to identify where those participants received relevant neuroscience information. Selections in the section involve multiple knowledge-receiving channels such as social relationships, academic resources, official or private content, entertainment products, and even common sense the public felt.

### 2.3. Procedure

Based on the epidemic prevention policy during the COVID-19 period that has numerous limitations of the offline survey, this research conducted an online survey through a platform called 'Wen Juan Xing (https://www.wjx.cn/)'. Within the survey, participants must complete all the demographic questions, neuromyths questions and additional channel questions in order. Typically, the survey time of each participant would be one to five minutes, and the online platform allows multiple users to complete the survey simultaneously. After submitting the survey, participants were not allowed to change their selections, and the platform automatically reserved those responses for further analysis.

## 3. Results

For the data analysis, this research conducted IBM SPSS version 28.0.1.1 to identify the frequency of each response and used one-way ANOVA to investigate differences in accuracy on different demographic variables.

### 3.1 Descriptive Statistics

#### 3.1.1 The prevalence of neuromyths

According to the table 2 about the descriptive frequency of the neuroscience section, 70.24% of participants falsely believed the question 'Humans only use 10% of their brains', while only 29.76% of answers are correct. However, the question about genes and brain development receives different responses that the percentage of true and false are balanced to 50%. More than 50% of participants selected correct answers to the following five questions about brain structure. Although the 11th question is the reversed item, 67.86% of the sample identified the neurofacts correctly. The results significantly varied among the four questions in the last part about learning behaviors. Participants' selection of the item 'The ages 0-3 are more important than any other age for learning' has no significant distribution with 55.95% accuracy and 44.05% error rate. Compared with the balanced result, the responses about language learning are biased toward the correct selection, with 80.05%, 92.86% and 59.52% accuracy in the 14th-17th question. However, the last question expressed a different result: 97.62% of the sample selected the false option, while only 2.38% of participants answered it correctly.

**Table 2**. The accurancy of neuro science

| Items | Accuracy | *N* | Percent (%) |
|---|---|---|---|
| **Neuro development** | | | |
| Humans only use 10% of their brains. | T | 59 | 70.24 |
| Genes determine the fate of our brains. | T | 43 | 51.19 |
| **Brain structure** | | | |
| People are either right-brained or left-brained. | T | 7 | 8.33 |
| The left and right sides of the brain act independently (left brain thinking and right brain thinking). | T | 39 | 46.43 |
| Male and femal brains are raducally different. | T | 22 | 26.19 |
| Your brain could make new cells. | T | 57 | 67.86 |
| The bigger your brain, the smarter you are. | T | 14 | 16.67 |
| **Learning behaviours** | | | |
| The ages 0-3 are more important than any other age for learning. | T | 37 | 44.05 |
| Two languages compete for resources. | T | 16 | 19.05 |
| Knowledge, acquired in one language, is not accessible in the other language. | T | 6 | 7.14 |
| The first language must be spoken well, before the second language is learnt. | T | 34 | 40.48 |
| Visual, auditory and kinaesthetic learning styles. Learning can be improved if children are classified and taught according to their preferred learning style, specifically as visual, auditory or kinaesthetic learners. | T | 82 | 97.62 |

### 3.1.2 Neuroscience and knowledge source

The analysis conducted a multiple-responses method to identify participants' informational channel of receiving neuroscience knowledge in the last question. Table 3 clarifies that the most influential channels participants identified are the educational videos and books (67.90%) they have accessed before. Meanwhile, 51.20% of the individuals recognized some neuroscience questions as common senses that have been clarified typically. The information channels as textbooks and teachers have similar percentages, which are 47.60% and 42.90%, and significantly contribute to individual knowledge of neuroscience. Channels such as parents, peers, and advertisements have limited impact, with less than 30% result compared with other channels. News and academic articles shared the same percentage of frequency (39.30%), while website content (35.70%), online YouTubers (31.00%) and entertainment channels (36.90%) also partially contribute to individual knowledge building with more than 30% of the prevalence.

**Table 3.** Channels Frequencies

| Channels | Responses (*N*) | Percent (%) |
|---|---|---|
| Teacher | 36 | 42.90 |
| Parents | 21 | 25.00 |
| Peers | 23 | 27.40 |
| Article | 33 | 39.30 |
| Textbook | 40 | 47.60 |
| News | 33 | 39.30 |
| Advertisment | 17 | 20.20 |
| Educational videos/books | 57 | 67.90 |
| Online YouTuber/twitter | 26 | 31.00 |
| Website contents | 30 | 35.70 |
| Movie/Tv shows/entertainment shows/anime/game | 31 | 36.90 |
| Common sense | 43 | 51.20 |
| Others | 5 | 6.00 |

### 3.2 Neuromyths and influencers

This section investigated the contributors of neuromyths to identify the relationships between individual factors and neuroscientific knowledge. Therefore, the analysis conducted one-way ANOVA analyses using IBM SPSS version 28.0.1.1, illustrated in Table 4. The independent variables are demographic information and measured by collecting data such as gender, age, educational level and major. At the same time, the dependent variables are their understanding of neuroscience and are represented via the accuracy of neuromyths questions based on three dimensions of all the questions: neurodevelopment, brain structure and learning.

First, the primary analysis identified the relationships between gender and neuroscientific knowledge. According to the results, there has a considerable difference between gender and brain structure questions, $F$ (1,82) = 8.87, $p$ = 0.004 < 0.01. It indicates that females have higher abilities to choose the correct answers and are less likely to believe neuromyths. However, in other sections as neurodevelopment and learning behaviors, the differences among gender all expressed consistency without significant differences.

Second, the investigation of the age factors' impactions on neuromyths accuracy expressed considerable differences. Age groups significantly impact the accuracy of neurodevelopment questions, $F$ (4,79) = 5.28, $p$ < 0.001. It indicates that participants' age variables would influence their understanding of the neurodevelopmental statements. With the description of the mean score in this factor, participants from age groups 26-35 ($M$ = 1.71) and 35-45 ($M$ = 1.67) expressed the highest accuracy in identifying neuromyths about neurodevelopment. In contrast, participants from age groups 18-25 and 45-60 expressed less accuracy in the neurodevelopment part. Meanwhile, there are also significant age differences in brain structure issues, $F$ (4,79) = 2.50, $p$ = 0.049 < 0.05. Age groups 18-25 and 26-35 in the brain structure section represented the best accuracy in identifying neuromyths, $M$ = 1.77 and $M$ = 1.79. However, among all the neuroscientific aspects, the mean score expressed that the age group above 60 always has the fewest neuroscience questions accuracy. Accordingly, the older age groups are identified with less neuroscientific knowledge than younger groups.

Third, the educational level as one of the academic factors represented significant differences in the brain structure section. The finding clarified that participants with different educational levels would have varied in their neuroscientific knowledge about brain structure, $F$ (3,80) = 4.80, $p$ =0.004 < 0.01. According to means, educational levels above bachelor's or master's degree have more accuracy in the section, $M$ = 1.75 and $M$ =1.79. In comparison, participants' educational level with high school certification or Junior college degree would be less likely to identify brain structural neuromyths. However, in other parts as neurodevelopment and learning behaviors, the educational level did not contribute to noticeable differences among each participant group.

Lastly, unlike other factors in this research that significantly contribute to neuroscientific questions, participants with or without academic experience in the education major have no significant difference in their neuroscientific knowledge.

**Table 4.** Predictors of neuroscience accurancy

| | | Sum of Squares | df | Mean Square | *F* | Sig. |
|---|---|---|---|---|---|---|
| Neuro development | Gender | 0.086 | 1 | 0.086 | 0.59 | 0.445 |
| | Age | 2.54 | 4 | 0.635 | 5.28 | <.001 |
| | EduLevel | 0.179 | 3 | 0.06 | 0.40 | 0.751 |
| | Major | 0.104 | 1 | 0.104 | 0.71 | 0.401 |
| Brain Structure | Gender | 0.381 | 1 | 0.381 | 8.87 | 0.004 |
| | Age | 0.438 | 4 | 0.11 | 2.50 | 0.049 |
| | EduLevel | 0.595 | 3 | 0.198 | 4.80 | 0.004 |
| | Major | 0.07 | 1 | 0.07 | 1.49 | 0.225 |
| Learning | Gender | 0.049 | 1 | 0.049 | 1.22 | 0.274 |
| | Age | 0.26 | 4 | 0.065 | 1.65 | 0.171 |
| | EduLevel | 0.123 | 3 | 0.041 | 1.00 | 0.395 |
| | Major | 0.002 | 1 | 0.002 | 0.04 | 0.843 |

# 4. Discussion

Illustrated results have identified the significant difference in neuroscientific knowledge among demographic factors. Gender, age, and educational level contribute to neuroscientific understanding

## 4.1 Gender

Compared with previous research about the prevalence of neuromyths among teacher groups, the current data on gender expressed different results. For example, studies by Bissessar and Youssef [4] and Dekker et al. [3] indicated that gender did not significantly affect individuals' understanding of neuroscience. However, this research represents the significant difference in neuroscientific knowledge between males and females. The possible contribution of such a gap may be that the current study has an unbalanced gender rate with more female participants.

## 4.2 Age

The relationship between age groups and accuracy in neuromyths in this research revealed significant differences in the neurodevelopment section. Primarily, the finding suggested that older groups always had less accuracy in the neuroscientific questions. That is inconsistent with the previous articles that age did not contribute to neuroscientific understanding [4][6]. Furthermore, it also conflicts with the results from Simoes et al. [7], that participants from older groups have more accuracy in identifying neuromyths. Considering the difference among participants' groups, the age item in previous studies also correlated with the teaching experience because the target groups are teachers. Therefore, previous research demonstrated that older educators with more educational experience would have higher accuracy in identifying neuromyths. It means that the age factor in those articles has more than one potential influencer, such as more educational experience is relevant to more educational training and practices. However, in the current research, the participants are from broader backgrounds with different careers and majors, and their age did not support their teaching experience.

Meanwhile, considering the educational development in China, although the illiteracy rate has dropped in recent years, the older public still has limited educational levels [17]. Meanwhile, the revolution in scientific findings also has a different prevalence, which means the timeliness of the latest findings. For instance, the results of informational channels identified that most participants received neuroscience knowledge from textbooks and teachers in this research. However, previous research [18] also identified biological textbook errors, which means outdated or unreformed textbooks that may mislead students' perceptions. Therefore, this finding of age factor expressed both contextual and generational variables that affect individuals' neuroscientific knowledge.

## 4.3 Educational Levels

The current result expressed a significant difference between educational levels on public understanding of neuromyths about brain structure. However, the educational levels represent non-significance findings in other sections like neurodevelopment and learning styles. On the one hand, the significant results in the brain structure section may be because the educational level always represents individuals' academic abilities in the professional area with knowledge. For example, previous research about neuromyths among Australian teachers emphasized that teachers with higher degrees of professional teaching qualifications have more possibilities to reject neuromyths [15]. Therefore, the current finding indicated the relationship between professional development and neuroscience knowledge which corresponds with previous research.

On the other hand, the nonsignificant finding about educational levels in other sections may be relevant to contemporary informational platforms. The result of information channels expressed that contemporary channels such as online videos, YouTubers or entertainment products also provide neuroscience knowledge for the public. It refers to multiple learning ways for individuals from different educational backgrounds to engage in neuroscientific exploration without relying on

traditional textbooks or school learning. However, such diverse informational channels also indicated the possibility of misleading, that individuals with higher educational certifications may also be influenced by social information. Pasquinelli [11] identified that individuals might unconsciously absorb neuromyths in their daily life, which corresponds with the finding that many participants consider the knowledge common sense. It suggested that unconscious personal experience misled their judgment in identifying such neuroscience. For instance, some popular science fiction or movies may involve neuromyths as the future willingness of scientific development but are false in reality. Thus, such controversial expression between artworks and actual concepts also confused individuals on clarifying neuromyths.

### 4.4 Academic Experience of Major

The majors in colleges as the factor in allocating students to different academic areas contribute to participants' knowledge development. Based on the results, some participants in this research have a relevant learning experience in an education major, which could recognize as the training experience factor as other articles emphasized [4][7][8][15]. Previous research illustrated that educational training positively contributes to participants' neuroscientific knowledge with higher accuracy in identifying neuromyths. Yet, the current finding did not express a great difference between majors. The potential contributors may be the curriculum design, limited neuroscience courses in current education majors and teacher training programs. For example, Weisberg et al. [19] identified that neuroscience is still an unfamiliar area for teachers. Neuromyths are hard to distinguish, and even professional neuroscientists would be misled. Such findings indicated that the interactions between neuroscience and education have limited overlapping and that even individuals with an educational background may not be able to contact relevant knowledge.

### 4.5 Other Findings

According to the current research results, the last question about learning behaviors has a significant error rate that almost all participants believed is an accurate statement, which is desynchrony to Bellert & Graham's results [8]. The OECD [2] website identified 'students have visual, auditive and haptic types of learning' as a neuromyth but also mentioned that current science has not understood learning effectively. The explanation from OECD focused on the contradiction in previous educators' perspectives and emphasized the item is logically wrong and did not indicate it is factually wrong. Therefore, this neuromyth is vague and ambiguous for participants because it is an unsolved scientific issue. Meanwhile, current educational recommendations for student-centered teaching methods suggest that teachers should provide flexible pedagogies to support different individual preferences. Such advice is similar to this neuromyth item semantically because both of them mentioned varied pedagogies. Otherwise, the language translation may increase the unclear definitions in this neuromyth. Thus, the possible misleading factors like educational promotion and language differences potentially confuse individuals.

## 5. Conclusion

This study has demonstrated the prevalence of neuromyths among Chinese adult groups and found that personal neuroscientific knowledge varied among conditions. Individuals from younger groups are more likely to identify neuromyths with generational development advantages. Meanwhile, educational level as an essential character in representing personal academic abilities also supports the rejection of neuromyths. The finding indicates that enhancing the educational level could reinforce social knowledge, which benefits for future popularization of science. However, as experience with an education major, the professional program did not significantly support individuals' neuroscience knowledge. According to previous findings on the neuromyths prevalence among educators, the existing teacher training courses have limited emphasis on accurate neuroscience content. It also explained why teachers would trust and utilize neuromyths in their

pedagogical design because of the absence of relevant knowledge. Therefore, the future teacher training program should involve corresponding neuroscientific content. Also, society could strengthen the promotion of scientific popularization to improve public cognition. Further research could involve more samples with comprehensive demographic factors to identify the possible influencer of neuromyths.

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