Research Article

Translation, Cultural Adaptation and Content Validity of the Persian Version of the Structured Cognitive Training Program "NEUROvitalis"

Milad Karimi[1], Amin Modarres Zadeh[1], Payam Kabiri[2], Hasan Ashayeri[3], Ahmad Rreza Khatoonabadi[1, 4, 5, 6*], Elke Kalbe[7]

1. Department of Speech Therapy, School of Rehabilitation, Tehran University of Medical Sciences, Tehran, Iran.
2. Department of Epidemiology and Biostatistics, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran.
3. Department of Basic Sciences, School of Rehabilitation Sciences, Iran University of Medical Sciences, Tehran, Iran.
4. Department of Geriatric Health, School of Rehabilitation, Tehran University of Medical Sciences, Tehran, Iran.
5. Endocrinology and Metabolism Research Institute, Tehran, Iran.
6. Elderly Health Research Center, Endocrine Population Sciences Institute, Tehran, Iran.
7. Center for Neuropsychological Diagnostics and Intervention (CeNDI), Faculty of Medicine, University Hospital Cologne, University of Cologne, Cologne, Germany.

Use your device to scan and read the article online

Citation Karimi M, Modarres Zadeh A, Kabiri P, Ashayeri H, Khatoonabadi AR, Kalbe E. Translation, Cultural Adaptation, and Content Validity of the Persian Version of the Structured Cognitive Training Program "NEUROvitalis". Journal of Modern Rehabilitation. 2025;19(3):300-310. http://dx.doi.org/10.18502/jmr.v19i3.19091

http://dx.doi.org/10.18502/jmr.v19i3.19091

Article info:
Received: 16 Feb 2025
Accepted: 03 Mar 2025
Available Online: 01 Jul 2025

Keywords:
Cognitive dysfunction; Cognitive training; Aged; Cognitive aging

ABSTRACT

Introduction: The older adult population is growing worldwide, particularly in Iran, leading to a decline in cognitive function. Cognitive training effectively enhances these skills. NEUROvitalis is a structured cognitive training program incorporating psychoeducation with individual and group cognitive tasks. It accommodates up to eight participants aged 50 and above, spanning 12 sessions over six weeks. This study aims to prepare translation, cultural adaptation, and content validity of the structured cognitive training program "NEUROvitalis

Materials and Methods: We conducted this methodological study using a standard forward-backward process. Subsequently, German translators checked the accuracy of the translation. We assessed the fluency and comprehensibility of translated material. Twelve Tehran University of Medical Sciences assessors scored each psychoeducational component, pamphlet, group game and individual exercise on a 5-point visual scale. The content validity index (CVI) was then calculated.

Results: A total of 12 participants (eight females, four males, aged 23–41, mean age 28.83±6.23) were included in the evaluation of comprehensibility and fluency. The CVI ranged from 0.8 to 1, which successfully validated the program's comprehensibility and fluency.

Conclusion: The current study's results indicate that the Persian version of the structured cognitive training program "NEUROvitalis" can be a proper, valid and comprehensive tool for cognitive training in Persian-speaking individuals aged 50 years and above.

*** Corresponding Author:**
Ahmad Reza Khatoonabadi, Associate professor.
Address: *Department of Speech Therapy, School of Rehabilitation, Tehran University of Medical Sciences, Tehran, Iran.*
Tel: *+98 (21) 77536586*
E-mail: *a.r.khatoonabadi@gmail.com*

Introduction

Age-related cognitive decline is believed to be a part of the natural aging process [1]. It includes various cognitive features that occur as aging affects cognitive domains, such as processing speed, reasoning, memory, and executive functions. This cognitive decline can lead to mild cognitive impairment (MCI) [2]. The prevalence of MCI in the older adult population is between 3% and 19%, with an annual incidence rate of 8 to 58 cases per 1000 persons [1]. MCI is when a person has cognitive function problems that are worse than typical for their age and education level but do not interfere with their daily life [3]. Individuals with MCI may experience changes in several domains, including memory, executive functioning, attention, language, and visuospatial skills [4, 5]. MCI is an intermediate stage between normal cognition and neurological disorders [6]. Individuals diagnosed with MCI are at an increased risk of impairment and loss of independence compared to those with normal cognition. Older age is strongly associated with an increased risk of MCI [7]. MCI is a significant pre-dementia state that can lead to dementia [8]. Although not all individuals with MCI will develop dementia, early diagnosis and intervention of MCI could potentially delay or prevent the onset of dementia [9]. A new case of dementia is diagnosed every three seconds worldwide [10].

Data indicate that Iran's aging trend is accelerating due to social, economic, and medical statusimprovements. These improvements have reduced mortality rates and increased life expectancy, enlarging the senior population and causing significant demographic shifts [11]. The older adult population in Iran increased by more than 100% between the five censuses held from 1956 to 2006 [12]. By 2041, the number of seniors in Iran is estimated to reach 18 million, accounting for 26% of the total population [13]. Cognitive changes associated with aging can cause loss of independence in older adults and diminish their quality of life. Therefore, preserving cognitive function is paramount for a good quality of life in older adults [14].

As the population ages, improving the quality of life and reducing the risk of cognitive decline in later years have become global priorities. Identifying individuals in the transitional stage between age-appropriate cognitive functioning and the onset of severe cognitive symptoms has become imperative for the early initiation of interventions. In other words, identifying those in the MCI stage is crucial for initiating cognitive interventions as early as possible [15]. Systematic reviews have revealed that cognitive training positively affects cognitive functions [16-18]. Evidence indicates that cognitive training in older adults with MCI can help prevent or delay dementia [19-21]. Cognitive training is a behavioral intervention distinguished by structured and unstructured activities planned to improve one or more cognitive domains, such as memory, attention, language and executive function [22]. Cognitive training can be delivered individually or in groups; tasks may be presented using paper and pencil or computer-based methods [23]. Examples of computer programs include Cogmed, which is used to improve working memory in individuals with MCI [24]; COGPACK, which works on various domains of cognition, including language, memory, reaction time, and vision [25]; COMCOG, which targets various domains, such as attention, memory, and higher-level thinking abilities [26]; and CogniPlus, which targets attention, working memory, long-term memory, and visuomotor skills [27].

One of the paper-based programs is the NEUROvitalis structured cognitive training program, a neuropsychological program for enhancing cognitive functions developed by Baller et al in 2010 [27]. NEUROvitalis is unique because it follows a structured cognitive training approach, where guidelines based on evidence determine the structure and content of each training session. This cognitive training program encompasses psychoeducation, individual tasks, group tasks, and group games targeting specific cognitive functions [28]. It may be used in neuropsychology, speech therapy, occupational therapy, rehabilitation clinics, nursing homes, senior day care centers, and training institutions to help older adults regain their mental abilities. The program is designed for group training of up to eight people. With slight modifications, it can also be adapted for individual training. The program consisted of 12 training sessions. Each session consisted of two segments lasting 50 minutes, with a 10-minute break in between. Training covers different areas of cognition, including working memory, memory skills, attention, executive functioning, visuospatial functioning, and language skills. The program's psychoeducational components help participants learn how the brain works and how age-related brain changes affect cognition, experiences, and behavior. It is unique due to its proven effectiveness, user-friendliness, participant acceptance, adaptability to everyday activities, comprehensive cognitive training, and inclusion of individual and group training. The program's effectiveness has been demonstrated in persons aged 50 years and older, with and without cognitive impairment, including those with MCI and Parkinson's disease, through randomized

controlled trials [28-30]. NEUROvitalis is suitable for individuals who want to maintain their cognitive function. The program is directed at people without cognitive problems, people with brain injuries or nervous diseases, such as stroke or multiple sclerosis, who are more likely to have cognitive issues, and patients who already experience cognitive problems. It is also appropriate for patients who have changes in their cognitive performance due to mental illness [31].

Numerous cognitive training programs have been designed for preschoolers and school-aged children in Iran. No cognitive training program is designed specifically for individuals over 50, regardless of whether they have MCI [32-37]. Moreover, these existing cognitive programs in Iran do not offer comprehensive training in all cognitive functions; they usually focus on one or two cognitive domains, such as memory and attention or executive functions. To date, NEUROvitalis has only been applied in Germany and Luxembourg. Based on searches of foreign and domestic databases, currently, no comprehensive, structured Persian-language program exists specifically for individuals over 50 with or without MCI that addresses various cognitive domains, including working memory, memory skills, attention, executive functions, visuospatial abilities, and language skills [38]. Among the cognitive programs in Iran, the "Aram" program [37] is notable as it targets older individuals with MCI. However, as previously mentioned, NEUROvitalis is much more extensive than the Aram program. It is a computerized program targeting only a few cognitive domains, specifically working memory, attention, and executive functions. Additionally, it does not have age-appropriate tasks for individuals over 50 years of age. In contrast, NEUROvitalis has age-specific tasks that cover many cognitive domains. Table 1 lists some cognitive training programs in Iran, including the program name, creator, year of creation, targeted cognitive domains, and target groups.

Due to the unavailability of a Persian version of the NEUROvitalis cognitive training program, developing and validating a Persian version is essential for its introduction to the scientific community for future research on its effectiveness.

Materials and Methods

This study was conducted using a methodological research design. The program was initially translated from German to Persian. Subsequently, experts in cognitive rehabilitation and training evaluated the face and content validity of the 12 NEUROvitalis cognitive training program sessions. These specialists comprised six speech and language pathologists with a master's degree, two speech and language pathologists with a doctoral degree, two senior experts in cognitive psychology and two faculty members from the Linguistics Department of the University of Tehran. The following steps outline this in detail.

Cultural adaptation and localization of the NEUROvitalis structured cognitive training program

Overview of translation and adaptation processes (the forward and back translation)

Before conducting the study, permission to translate and culturally adapt the program was obtained from the developer via email. In the first step of our study, two official translators translated the text from German to Persian. The translators were unfamiliar with the program. Two experienced speech and language pathologists with expertise in cognitive processes evaluated the translated document for clarity, linguistic fluidity, and fidelity to original meaning. Discrepancies were resolved through discussions between the two translators, resulting in a preliminary Persian version being prepared.

In the back-translation process, two native Persian speakers fluent in German and currently residing in Germany were asked to retranslate the Persian version into German and then compare it with the original version, highlighting all the necessary corrections. Following the comments of these two reviewers familiar with German, the Persian text was finalized. The two reviewers had different opinions; therefore, a third translator was involved to discuss and resolve the differences.

Translation and cultural adaptation of the program's manual and educational booklets

The "NEUROvitalis" structured cognitive training program contains 12 cognitive training sessions, while its German-language implementation manual has approximately 380 pages. This manual includes:

1) Instructions for implementing the program; 2) Theoretical chapters and tutorial booklets to improve participants' knowledge about the brain and its functions; 3) Cognitive exercises for individual home practice; 4) Group exercises and cognitive games can be applied during therapy sessions.

Table 1. Examples of cognitive training programs available in Iran

Row	Program Name	Creator, Year	Target Cognitive Areas	Target Group
1	Baran [33, 34]	Najafi, 2017	Attention and executive functions based on movement (involving the whole body)	Children with attention-deficit/hyperactivity disorder, typically developing children, children with autism spectrum disorder
2	Pars [35]	Najafi, 2017	Attention	Children with Attention-deficit/hyperactivity disorder, children with Autism spectrum disorder, children with learning disabilities
3	Paria [36]	Najafi, 2014	Rehabilitation based on reverse imitation	Children with autism spectrum disorder
4	Aram [32, 37]	Najafi, 2006	Working memory, attention, and executive functions through computer-based training	Children with attention-deficit/hyperactivity disorder, children with specific language impairment, children with learning disabilities, typically developing children, older adult people with MCI, neurologically impaired patients with cognitive deficits

JMR

In addition, some words and expressions that did not conform to Iranian cultural values were replaced with appropriate ones during translation. For instance, referring to drinking alcoholic beverages was removed.

Translation and cultural adaptation of the program's images

The "NEUROvitalis" program includes 138 images designed to stimulate cognition and enhance memory by encouraging recall of objects, people, and places. Additionally, it facilitates comprehension and learning. The above-described procedure was applied for translation and cultural adaptation. Following translation and revisions by two experienced speech and language pathologists in cognitive neurology, two native Persian speakers who were also fluent in German checked the pictures for accuracy. Any image judged to be culturally inappropriate for Iranian participants was deleted and replaced with a suitable alternative.

Translation and cultural adaptation of the program's individual and practical exercises

The "NEUROvitalis" cognitive training program comprises 72 exercises and 14 practical exercises. These exercises are designed for implementation in a center or home environment and aim to enhance cognitive function. Within the practical exercises, theoretical content from educational booklets is consolidated by hands-on activities contextualized through appropriate examples from everyday life. The individual exercises are cognitive tasks related to topics discussed in the theoretical sections and are conducted independently at home. Answer sheets were provided for individual exercises to evaluate the participants' responses.

The exercise instructions and associated images were first translated as described earlier for the individual exercise translation and cultural adaptation. Then, translating the exercises' vocabulary, sentences and passages

Table 2. Cultural adaptation of images

Row	Description of Original Image	Description of Replaced Image	Cognitive Training Session Number
1	Image of stretching exercises performed by a woman	Image of stretching exercises performed by a man	Session 2
2	German alphabet	Persian alphabet	Session 3
3	Map of walking to the church	Map of walking to the mosque	Session 8
4	Visual memory exercise with images of women	Visual memory exercise with images of men	Session 10
5	Image of Dr. Ursula Lehr	Image removed due to the inappropriate veil	Session 12
6	Image of a cathedral	Image of a holy shrine	City map game
7	Image of a neighborhood church	Image of a mosque	City map game

JMR

Table 3. Cultural and/or linguistic adaptation of words

Row	Literal Translation of the German Word into Persian	Replaced Word in Persian	Reason for Replacement
1	Dance	Rhythmic movements	Contradiction with Iranian-Islamic culture
2	Lightbulb bubble	Luster	Low frequency of the word in Persian and the compound nature of the Lightbulb bubble in Persian, while the original German word is not compound
3	Cycling tour	Travel tour	Cycling tours are common in Europe but not in Iran
4	Red	ت و پ	Due to the content of the exercise requiring the letters to be read from left to right, the letters "ت و پ" were chosen, forming the word /toop/ (ball) when read from left to right
5	New	ل ی ف	For the content of the exercise, where the letters must be read from both right to left and left to right and make sense in both directions, the letters "ل ی ف" were chosen, forming /fil/ (elephant) when read from left to right and /lif/ (towel) when read from right to left
6	Sugar	د ا م ا د	Considering the content of the exercise, which required letters to be read both from right to left and left to right to form meaningful words, the letters "د ا م ا د" were chosen. This selection ensured that the resulting word, /damad/ (groom), remained the same and meaningful when read in both directions.
7	Poppy	Chocolate	Contradiction with Iranian-Islamic culture
8	Mistletoe	Poplar tree	Low frequency of mistletoe in Iran
9	Beech tree	Pine tree	Low frequency of beech tree in Iran
10	Fir tree	Sycamore tree	Low frequency of fir tree in Iran
11	German names	Persian names	No German names in the Persian language
12	German surnames	Persian surnames	No German surnames in the Persian language
13	Names of Gregorian months	Names of Persian months	The official calendar of Iran is the Solar Hijri calendar
14	Compound German words	Compound Persian words	In some exercises, a simple word is given and the person has to provide a derived word or another simple word combined to form a new compound word. Due to structural differences between German and Persian, the words were changed
15	German prefixes and suffixes	Persian prefixes and suffixes	In some exercises, a simple word is given and the participant must create a new word by adding the appropriate prefix or suffix. Due to structural differences between German and Persian, the words were changed.

JMR

was based on the criteria and goals used by the program's designers in choosing the elements. Based on these criteria and considering linguistic and psychological characteristics, such as word frequency and the number of syllables in German, appropriate vocabulary, sentences, and texts were selected and translated into Persian. The translations were sent to two experienced speech and language pathologists who were specialists in cognitive rehabilitation for review. After receiving their feedback, the translations were sent to two Persian-German bilinguals, one living in Germany, who were familiar with both languages' word frequency and syllable structure, for review and revision.

Finally, the translations were sent to a member of the Linguistics Department at Tehran University to examine semantic, phonological, and syntactic consistency, and their comments were incorporated into the final draft.

Translation and cultural adaptation of the program's group games

The "NEUROvitalis" program comprises five group activities designed to train cognitive functions in community-based centers. First, the instructional text was translated as described above for group activities' translation and cultural adaptation. This was followed by the translation and cultural adaptation of the exercise images used in the exercises. Subsequently, the group games' translation of words and sentences followed the same methodology used for individual and practical exercises.

Table 4. Cultural and/or linguistic adaptation of sentences and texts

Row	Literal Translation of the German Sentence into Persian	Replaced Sentence in Persian	Reason for Replacement
1	Benefits of alcohol consumption for heart health	Removal of the entire related text	Contradiction with Iranian-Islamic culture
2	Text about the German Art Museum	Text about the National Museum of Iran	Due to the exercise requiring memorization of the text, the replacement text was chosen for its cultural similarity
3	Text about a forest park in one of the cities in Germany	Text about Golestan National Park	Due to the exercise requiring memorization of the text, the replacement text was chosen for its cultural similarity
4	German proverbs	Persian proverbs with the same meaning	Use of Persian proverbs

JMR

Evaluation of the comprehensibility and fluency of the translated text

Following the approval of the translated draft by translators living in Germany in terms of accuracy, the comprehensibility and fluency of the translated text were examined. To do this, eight speech/language pathologists (six with a master's degree and two with a PhD degree), two cognitive psychology experts with a master's degree, and two faculty members from the Department of Linguistics evaluated the draft.

A five-point visual scale was used to test the fluidity and clarity of each component, educational resources, booklets, group games, and individual exercises. For comprehensibility, a score of 5 meant that the text was "completely comprehensible," 4 meant "very good comprehensibility," 3 meant "moderate comprehensibility," 2 meant "limited comprehensibility," and one indicated "not comprehensible at all." For fluency, a score of 5 meant "completely fluent text," 4 indicated "very good fluency," 3 meant "moderate fluency," 2 meant "limited fluency" and one meant "not fluent at all."

The evaluation instrument was distributed to speech and language pathologists, master's level students in cognitive psychology, and two faculty members in the linguistics department to evaluate the comprehensibility and fluency of the translated text. Excerpts from the program were randomly selected and sent to the evaluators: Implementation guidelines, theoretical frameworks, educational booklets, individual tasks, practical assignments, group activities and games. The participants were asked to evaluate the comprehensibility and fluency of the translated material based on the above criteria.

Table 5. Demographic characteristics of participants in the first phase of the study to assess the comprehensibility and fluency of the translated text

Variables		No. (%)
Gender	Female	8(66.7)
	Male	4(33.3)
Field of study	Speech therapy	8(66.7)
	Cognitive psychology	2(16.7)
	Linguistics	2(16.7)
Education level	Master's degree	8(66.7)
	Doctorate	4(33.3)
History of cognitive injury treatment	Yes	8(66.7)
	No	4(33.3)

JMR

Table 6. CVI Evaluation for the structured cognitive training program "NEUROvitalis"

Relevant Section		CVI Value	Result
Comprehensibility of text	Theoretical section	0.83	CVI is acceptable
	Handouts section	1.00	CVI is acceptable
	Exercises section	0.91	CVI is acceptable
Fluency of text	Theoretical section	0.83	CVI is acceptable
	Handouts section	0.83	CVI is acceptable
	Exercises section	0.91	CVI is acceptable

JMR

A content validity index (CVI) was used to evaluate the clarity and linguistic fluency of the texts. Wherever unintelligible words or syntactic structures were found, the translated document was accordingly revised.

Results

The current research first translated the text of the "NEUROvitalis" cognitive training program from German to Persian and then vice versa. Finally, words, sentences, and images deemed appropriate were selected. Table 2 presents the cultural adaptation of images, Table 3 presents the cultural and linguistic changes of words, and Table 4 presents the cultural and linguistic modifications of sentences and texts.

Various parts of the program were randomly assigned to experts in geriatric rehabilitation to evaluate the understandability and flow of the Persian version of the "NEUROvitalis" structured cognitive training program. The expert committee comprised six speech and language pathologists at the master's level, two speech and language pathologists at the doctoral level, two cognitive psychology specialists at the master's level, and two linguistics faculty members. The panel consisted of eight females and four males, aged between 23 and 41 years, with an Mean±SD age of 28.83±6.23. All participants had graduate-level education, and 66.6% had experience related to therapy for cognitive impairments. Table 5 presents the participants' demographic details.

The content validity of the Persian version of the "NEUROvitalis" program was checked using the CVI. Participants were asked to grade the comprehensibility and fluency of the following program components on a scale of 1 to 5: 1) Theoretical content; 2) Educational booklets; 3) Program exercises (individual, practical, and group exercises).

In the CVI, scores attributed to the items across the two criteria of comprehensibility and fluency varied between 0.8 and 1. Therefore, the comprehensibility and fluency of different program parts were confirmed. Table 6 presents the results obtained from the content validity assessment of the "NEUROvitalis" structured cognitive training program.

Several cultural and linguistic adjustments were made to ensure acceptance among Persian-speaking people and validate the Persian adaptation of the "NEUROvitalis" cognitive training program. Changes were made to the images used in this program. For instance, the images of stretching exercises in the original version were altered to conform to Iranian cultural norms. Accordingly, images of religious places of worship, such as churches, were replaced with images of mosques to make them relevant to the cultural and religious backgrounds of the Persian-speaking participants. Moreover, in cognitive exercises, Persian letters replaced German letters, and participants had to arrange letters alphabetically. Appropriate pictures or pictures of males replaced pictures of female subjects whose dressing was inconsistent with Iranian cultural norms. Further changes were made to the sentences and training materials. Information that was inconsistent with Iranian-Islamic cultural norms, such as the benefits of alcohol consumption to prevent cardiovascular disease, was removed. Exercises regarding the National Museum of Iran and Golestan National Park replaced pictures and information about the German Art Museum or a forest park in Germany since the former were culturally more relevant for Persian speakers. When the cognitive exercises required memorizing specific texts, the replacement text was selected in cooperation with the program's original developers, experts, and cognitive experts to retain the structure and number of words while changing its content. Moreover, Persian proverbs were substituted for German ones that conveyed the same meanings and promoted the understanding of psycho-educational principles.

All cultural and other sensitive German terms and expressions without exact Persian translations or those that did not correspond to the cultural appropriateness of Iranian culture were replaced. For example, "dance" was replaced with "rhythmic movements" to conform to Iranian culture. Similarly, phrases, such as "bicycle tour" were changed to "travel tour" and the names of species of trees less common in Iran were replaced with those well known to Iranians. German names, surnames, and months of the Gregorian calendar for which equivalent terms do not exist in Persian were replaced by their Persian equivalents. For instance, "German names" were changed to "Persian names," "German surnames" to "Persian surnames," and "Gregorian months" to "Persian calendar months."

In some cognitive tasks, the participants were given a base word and asked to add appropriate prefixes or suffixes or combine them with another base word to form either a compound or a derived word. These words were adapted due to structural differences between German and Persian. For exercises that required participants to read letters in reverse order and form meaningful words, the letters "T and P" substituted for "red" to form the word /toop/ (Ball) in Persian when reversed. All these changes were made in collaboration with the original program developers, experts, and cognitive researchers.

Discussion

This study aimed to translate and validate the "NEUROvitalis" structured cognitive training program into Persian in response to the growing need for cognitive interventions to meet the needs of growing older adult population in Iran. The results showed that the Persian "NEUROvitalis" structured cognitive training program had satisfactory face validity and translation quality. More specifically, the CVI checked the understandability and fluency of the program's translated elements.

It should be noted that the current study was designed to present the Persian version of the "NEUROvitalis" cognitive training program; hence, content validity was not assessed separately. Cultural, and linguistic adaptation was found to be an essential component of this study for maintaining the program's validity. Moreover, the involvement of experts from various fields during the validation process increased the reliability of the translation and validation study.

The "NEUROvitalis" program offers a comprehensive approach to individuals aged 50 years and above, irrespective of MCI status. It covers several cognitive domains during 12 group sessions. This program also involves lifestyle change promotion with nutritional and physical activity recommendations to maintain and enhance cognitive function. Cognitive exercises, physical activities, social interactions, nutrition counseling, and lifestyle support are combined in this program [31].

In contrast to existing Persian-language cognitive intervention programs, which focus on particular cognitive areas, such as attention, working memory, and executive functions, "NEUROvitalis" offers an extensive training regimen that encompasses a range of cognitive domains, including working memory, learning, memory skills, attention, executive functions, visuospatial skills and language [31-37]. Moreover, "NEUROvitalis" offers structured cognitive training and is appropriate for individual and group settings, whereas most of the programs available in Persian are designed only for individual use [32-37]. One of the unique features of "NEUROvitalis" is that every session includes a psychoeducational component through which participants receive information about brain functioning, aging-related changes, and their consequences for cognition and behavior. Thus, we can better understand cognitive problems. It has also demonstrated its effectiveness, user-friendliness and popularity among participants, making its use acceptable in daily activities [31].

Unlike "NEUROvitalis," many non-Persian cognitive training programs, such as Lumosity, CogniFit, Cogmed, and Happy Neuron are not as comprehensive. For instance, programs usually lack specific exercises that target the normal age group over 50 or subjects with MCI. In addition, they lack factors, such as physical exercise, social interactions, dietary guidance and lifestyle management [39-42]. Programs, such as Lumosity, CogniFit, and Happy Neuron are designed to target a broad age group, including adults and children [39-42]. Since these programs do not focus on the specific cognitive challenges faced by individuals aged 50 years and older, they may not effectively address the unique needs of this age group.

One of the distinctive features of "NEUROvitalis" is its strong psycho-educational elements, which provide participants with extensive knowledge about cognitive processes and health behavior. In contrast, most programs, such as Lumosity and CogniFit, provide limited educational content and focus on cognitive training rather than education [43, 44]. Programs like Happy Neuron offer a mix of educational material on brain health and cognitive exercises, but the breadth of their educational content is far smaller than that of "NEURO-

vitalis" [45]. Similarly, cogmed has limited educational content and focuses primarily on cognitive training [42]. Furthermore, other programs, such as the Mentally Fit Program [28] and the brain jogging program [46], are unstructured, presenting cognitive activities randomly in groups or individually without any training component. This contrasts the structured, comprehensive approach of "NEUROvitalis."

The CVI index was used to check the intelligibility and fluency of the Persian version. While evaluating content validity, experts analyzed three parts, the theoretical section, the handouts section, and the exercises section, and provided their comments regarding clarity and fluency. The information obtained from these comments ultimately led to the approval of the program's content. The results indicated that the text, images and exercise adjustments positively enhanced the overall quality of the Persian program adaptation, which positively affected understanding and usage. These results confirm that the Persian adaptation of the program meets the cognitive training and cultural needs of Persian-speaking individuals regarding content suitability and validity.

Conclusion

In conclusion, this study aimed to develop and establish a Persian version of the NEUROvitalis cognitive training program. Accordingly, a Persian adaptation of the structured cognitive training program "NEUROvitalis" is an appropriate, valid, and complete tool in cognitive training among Persian-speaking subjects over 50 regardless of MCI presence or absence. This validation is crucial considering the increasing prevalence of age-related cognitive decline. Cognitive training programs, such as "NEUROvitalis," may potentially improve cognitive functions or delay further cognitive decline and thus improve the quality of life and independence of individuals over 50. The present study can form the basis for future research into the effectiveness of the Persian version of the standardized cognitive training program "NEUROvitalis."

Ethical Considerations

Compliance with ethical guidelines

This study was approved by Ethics Committee of Tehran University of Medical Sciences, Tehran, Iran (Code: IR.TUMS.MEDICINE.REC.1401.276). Since no direct interaction was observed with the subjects, informed consent was unnecessary. However, permission to translate and culturally adapt the program was obtained from the original developer, thereby fulfilling the ethics component. Given the unique needs of older adults and Iran's cultural realities, attempts were made to tailor the content and assessment procedures to be linguistically, conceptually, and practically suitable for this population. Furthermore, all cultural and linguistic changes were made with due attention to the country's social and cultural norms, ensuring program applicability to Persian-speaking populations.

Funding

This research did not receive any grant from funding agencies in the public, commercial, or non-profit sectors.

Authors' contributions

All authors contributed equally to the conception and design of the study, data collection and analysis, interpretation of the results, and drafting of the manuscript. Each author approved the final version of the manuscript for submission.

Conflict of interest

The authors declared no conflict of interest.

Acknowledgments

The authors sincerely thank the Tehran University of Medical Sciences, Tehran, Iran, for supporting in this study.

References

[1] Deary IJ, Corley J, Gow AJ, Harris SE, Houlihan LM, Marioni RE, et al. Age-associated cognitive decline. British Medical Bulletin. 2009; 92(1):135-52. [DOI:10.1093/bmb/ldp033] [PMID]

[2] Salthouse T. Consequences of age-related cognitive declines. Annual Review of Psychology. 2012; 63(1):201-26. [DOI:10.1146/annurev-psych-120710-100328] [PMID]

[3] Gauthier S, Reisberg B, Zaudig M, Petersen RC, Ritchie K, Broich K, et al. Mild cognitive impairment. The Lancet. 2006; 367(9518):1262-70. [DOI:10.1016/S0140-6736(06)68542-5] [PMID]

[4] Albert MS, DeKosky ST, Dickson D, Dubois B, Feldman HH, Fox NC, et al. The diagnosis of mild cognitive impairment due to Alzheimer's disease: Recommendations from the National Institute on Aging-Alzheimer's Association workgroups on diagnostic guidelines for Alzheimer's disease. Alzheimer's & Dementia. 2011; 7(3):270-9. [DOI:10.1016/j.jalz.2011.03.008] [PMID]

[5] Saber-Moghadam R, Zeinalzadeh A, Momenzadeh M, Farzadfar MT, Ghaemi H, Sobhani-Rad D. The relationship between memory, type, and severity of aphasia with confrontation naming in post-stroke patients with chronic aphasia. Iranian Rehabilitation Journal. 2022; 20(4):561-8. [DOI:10.32598/irj.20.4.1693.1]

[6] Sachdev PS, Blacker D, Blazer DG, Ganguli M, Jeste DV, Paulsen JS, et al. Classifying neurocognitive disorders: The DSM-5 approach. Nature Reviews Neurology. 2014; 10(11):634-42. [DOI:10.1038/nrneurol.2014.181] [PMID]

[7] Anton SD, Woods AJ, Ashizawa T, Barb D, Buford TW, Carter CS, et al. Successful aging: Advancing the science of physical independence in older adults. Ageing Research Reviews. 2015; 24(Pt B):304-27. [DOI:10.1016/j.arr.2015.09.005] [PMID]

[8] Okunishi T, Zheng C, Bouazizi M, Ohtsuki T, Kitazawa M, Horigome T, et al. Dementia and MCI detection based on comprehensive facial expression analysis from videos during conversation. IEEE Journal of Biomedical and Health Informatics. 2025; PP. [DOI:10.1109/JBHI.2025.3526553] [PMID]

[9] Livingston G, Huntley J, Liu KY, Costafreda SG, Selbæk G, Alladi S, et al. Dementia prevention, intervention, and care: 2024 report of the Lancet standing Commission. The Lancet. 2024; 404(10452):572-628. [DOI:10.1016/S0140-6736(24)01296-0] [PMID]

[10] Prince M, Wimo A, Guerchet M, Ali GC, Wu YT, Prina M. World alzheimer report 2015. The global impact of dementia: An analysis of prevalence, incidence, cost and trends. London: Alzheimer's Disease International; 2015. [Link]

[11] Alalhesabi M, Rafiee F. [Evaluation of the requirements in public space for elderly: A case study in Kholdebarin Park, Shiraz, Iran (Persian)]. Assessing the needs of the Elderly in Urban Spaces. 2013; 5(9):247-57. [Link]

[12] Shirazi Khah M, Mousavi M, Sahaf R. [Study of health and social indicators of elderly women in Iran (Persian)]. Salmand. 2012; 6(S1):66-78. [Link]

[13] Dindar Farkosh J, Kazemipour Sabet S, Ansari H. [Foresight of the aging trend of the Iranian population in different regions and population groups until 1420 (Persian)]. Future Study Management. 2022; 33(1):103-22. [Link]

[14] Kalbe E, Bintener C, Ophey A, Reuter C, Göbel S, Klöters S, et al. Computerized cognitive training in healthy older adults: Baseline cognitive level and subjective cognitive concerns predict training outcome. Health. 2018; 10(01):20. [DOI:10.4236/health.2018.101003]

[15] Sloane PD, Zimmerman S, Suchindran C, Reed P, Wang L, Boustani M, et al. The public health impact of Alzheimer's disease, 2000-2050: Potential implication of treatment advances. Annual Review of Public Health. 2002; 23(1):213-31. [DOI:10.1146/annurev.publhealth.23.100901.140525] [PMID]

[16] Faucounau V, Wu YH, Boulay M, De Rotrou J, Rigaud AS. Cognitive intervention programmes on patients affected by mild cognitive impairment: A promising intervention tool for MCI? The Journal of Nutrition, Health and Aging. 2010; 14(1):31-5. [DOI:10.1007/s12603-010-0006-0] [PMID]

[17] Li H, Li J, Li N, Li B, Wang P, Zhou T. Cognitive intervention for persons with mild cognitive impairment: A meta-analysis. Ageing Research Reviews. 2011; 10(2):285-96. [DOI:10.1016/j.arr.2010.11.003] [PMID]

[18] Saber-Moghadam R, Zeinalzadeh A, Jamali J, Farzadfard MT, Sobhani-Rad D. Synergistic effects of combined motor and language interventions on stroke rehabilitation: A holistic approach. Frontiers in Human Neuroscience. 2024; 18:1454491. [DOI:10.3389/fnhum.2024.1454491] [PMID]

[19] Brum PS, Forlenza OV, Yassuda MS. Cognitive training in older adults with mild cognitive impairment: Impact on cognitive and functional performance. Dementia & Neuropsychologia. 2009; 3(2):124-31. [DOI:10.1590/S1980-57642009DN30200010] [PMID]

[20] Butler M, McCreedy E, Nelson VA, Desai P, Ratner E, Fink HA, et al. Does cognitive training prevent cognitive decline? A systematic review. Annals of Internal Medicine. 2018; 168(1):63-8. [DOI:10.7326/M17-1531] [PMID]

[21] Gates NJ, Vernooij RW, Di Nisio M, Karim S, March E, Martínez G, Rutjes AW. Computerised cognitive training for preventing dementia in people with mild cognitive impairment. Cochrane Database of Systematic Reviews. 2019; 3:CD012279. [DOI:10.1002/14651858.CD012279.pub2]

[22] Belleville S, Boller B, del Val LP. Cognitive training in mild cognitive impairment. In: Strobach T, Karbach J, editors. Cognitive training: An overview of features and applications. London: Springer Nature; 2016. [DOI:10.1007/978-3-319-42662-4_18]

[23] Hötting K, Röder B. Beneficial effects of physical exercise on neuroplasticity and cognition. Neuroscience & Biobehavioral Reviews. 2013; 37(9):2243-57. [DOI:10.1016/j.neubiorev.2013.04.005] [PMID]

[24] Hyer L, Scott C, Atkinson MM, Mullen CM, Lee A, Johnson A, Mckenzie LC. Cognitive training program to improve working memory in older adults with MCI. Clinical Gerontologist. 2016; 39(5):410-27. [DOI:10.1080/07317115.2015.1120257] [PMID]

[25] Lee H, Hwang K. The effects of cogpack program on LOTCA and ADL in elderly with alzheimer's dementia. Journal of The Korean Society of Integrative Medicine. 2014; 2(3):1-7. [DOI:10.15268/ksim.2015.3.3.001]

[26] Irazoki E, Contreras-Somoza LM, Toribio-Guzmán JM, Jenaro-Río C, Van der Roest H, Franco-Martín MA. Technologies for cognitive training and cognitive rehabilitation for people with mild cognitive impairment and dementia. A systematic review. Frontiers in psychology. 2020; 11:528939. [DOI:10.3389/fpsyg.2020.00648] [PMID]

[27] Baller G, Kalbe E, Kaesberg S, Kessler J. NEUROvitalis. Neuro-psychologisches Gruppentraining. Prolog, Cologne. 2010. [Link]

[28] Petrelli A, Kaesberg S, Barbe MT, Timmermann L, Fink GR, Kessler J, et al. Effects of cognitive training in Parkinson's disease: A randomized controlled trial. Parkinsonism & Related Disorders. 2014; 20(11):1196-202. [DOI:10.1016/j.parkreldis.2014.08.023] [PMID]

[29] Rahe J, Becker J, Fink GR, Kessler J, Kukolja J, Rahn A, et al. Cognitive training with and without additional physical activity in healthy older adults: Cognitive effects, neurobiological mechanisms, and prediction of training success. Frontiers in Aging Neuroscience. 2015; 7:187. [DOI:10.3389/fnagi.2015.00187] [PMID]

[30] Kalbe E, Roheger M, Paluszak K, Meyer J, Becker J, Fink GR, et al. Effects of a cognitive training with and without additional physical activity in healthy older adults: A follow-up 1 year after a randomized controlled trial. Frontiers in Aging Neuroscience. 2018; 10:407. [DOI:10.3389/fnagi.2018.00407] [PMID]

[31] Kalbe E, Bintener C, Ophey A, Reuter C, Göbel S, Klöters S, et al. Computerized cognitive training in healthy older adults: Baseline cognitive level and subjective cognitive concerns predict training outcome. Health. 2018; 10(01):20. [DOI:10.4236/health.2017.101003]

[32] Nazarboland N, Tahmasi A, Nejati V. Effectiveness of cognitive rehabilitation based on "ARAM" program in improving executive functions of selective attention and inhibitory control in elderly people with mild cognitive impairment. Journal of Cognitive Psychology. 2019; 7(3):40-59. [Link]

[33] Mohammadi S, Baseri A, Mohammadi Aria A. Comparison of the effect of cognitive-balance rehabilitation with Orton-Davis integrated method in the form of distance education on the overall performance of reading and understanding words and text comprehension of dyslexic children. Journal of Adolescent and Youth Psychological Studies. 2022; 3(3):100-4. [DOI:10.61838/kman.jayps.3.3.21]

[34] Javadzadeh Z, Nejati V, Poushaneh K. Effectiveness of BARAN cognitive rehabilitation program on executive functioning children with high-function autism spectrum. Scientific Journal of Rehabilitation Medicine. 2023; 12(1):132-45. [DOI:10.32598/SJRM.11.5.10]

[35] Ramezan nia Z, Nejati V. [Effectiveness of PARS cognitive rehabilitation program on the improvement of executive function in children with ADHD (Persian)]. The Scientific Journal of Rehabilitation Medicine. 2017; 6(4):219-30. [DOI:10.22037/jrm.2017.110436.1284]

[36] Abadi F, Nejati V, Pouretemad Hr. [The effect of paria cognitive rehabilitation program on recognition of basic emotions in children with high functioning autism disorder (Persian)]. The Journal of Urmia University of Medical Sciences. 2016; 27(7):570-9. [Link]

[37] Nazarzade Gigloo S, Fathabadi J, Nejati V, Nazarboland N, Sadeghi Firoozabadi V. [The impact of computer-based cognitive rehabilitation (ARAM software) on executive functions (selective attention, working memory, and behavioral inhibition) of students with specific learning disorders (Persian)]. Journal of Pouyesh in Education and Consultation (JPEC). 2022; 1400(15):69-89. [Link]

[38] Ghaderi Rammazi M, Tavakoli M, Barekatain M, Abedi A. [Cognitive problems of Iranian elderly with mild cognitive impairment: A qualitative study for developing a cognitive rehabilitation package (Persian)]. Advances in Cognitive Sciences. 2023; 25(2):1-14. [DOI:10.30514/icss.25.2.1]

[39] Mam Khezri A, Mikaeli Manieh F. Investigation into effects of lumosity on working memory, visual memory and executive functions among the elderly. Shenakht Journal of Psychology and Psychiatry. 2021; 8(3):25-38. [DOI:10.32598/shenakht.8.3.25]

[40] Dunning T. Happy neuron launches online brain games. Activities, Adaptation & Aging. 2007; 31(4):59-60. [DOI:10.1300/J016v31n04_05]

[41] Peretz C, Korczyn AD, Shatil E, Aharonson V, Birnboim S, Giladi N. Computer-based, personalized cognitive training versus classical computer games: A randomized double-blind prospective trial of cognitive stimulation. Neuroepidemiology. 2011; 36(2):91-9. [DOI:10.1159/000323950] [PMID]

[42] Aksayli ND, Sala G, Gobet F. The cognitive and academic benefits of Cogmed: A meta-analysis. Educational Research Review. 2019; 27:229-43. [DOI:10.1016/j.edurev.2019.04.003]

[43] Kpolovie PJ. Lumosity training and brain-boosting food effects on learning. International Research Journals. 2012; 2(6):217-30. [Link]

[44] Breznitz S. Cognifit training: The key to cognitive vitality. New York: CogniFit Ltd. [Link]

[45] McDonnell A, Agius M, Zaytseva Y. Is there an optimal cognitive application to be used for cognitive remediation in clinical psychiatric practice? Psychiatria Danubina. 2017; 29(suppl. 3):292-9. [Link]

[46] Roheger M, Kessler J, Kalbe E. Structured cognitive training yields best results in healthy older adults, and their ApoE4 state and baseline cognitive level predict training Benefits. Cognitive and Behavioral Neurology. 2019; 32(2):76-86. [DOI:10.1097/WNN.0000000000000195] [PMID]