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Original Article

Effectiveness of Software Cognitive Empowerment Training and Perceptual-Motor Skills Reconstruction Program Training on Social Interest and Emotional Self-Regulation

Mansour Khodaei[1], **Toktam Sadat Jafar Tabatabaei**[2], **Fatemeh Shahabizadeh**[3], **Sakineh Soltani Kouhbanani**[4]

[1] PhD Student in Educational Psychology, Department of Psychology, Birjand Branch, Islamic Azad University, Birjand, Iran
[2] Assistant Professor, Department of Psychology, Birjand Branch, Islamic Azad University, Birjand, Iran
[3] Associate Professor, Department of Psychology, Birjand Branch, Islamic Azad University, Birjand, Iran
[4] Associate Professor, Department of Counseling and Educational Psychology, Faculty of Education and Psychology, Ferdowsi University of Mashhad, Mashhad, Iran

*Corresponding author:
Toktam Sadat Jafar Tabatabaei, Assistant Professor, Department of Psychology, Birjand Branch, Islamic Azad University, Birjand, Iran.
Tel: 091555624901
Email: toktamtabatabaee@yahoo.com

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Abstract

Background and Objective: Social interest and emotional self-regulation are important aspects of successful social interactions and psychological well-being. This study aimed to investigate the effectiveness of software cognitive empowerment training and perceptual-motor skills reconstruction program training on social interest and emotional self-regulation, and to compare these two trainings with each other.

Materials and Methods: The participants of this study included seventh-grade students in Mashhad City studying in the academic year 2022-2023. The number of 45 students was selected by non-random sampling method and randomly included in three groups, namely the software cognitive empowerment group, perceptual-motor skills reconstruction group, and control group. The training programs used in this study were Captain's Log Mind Power Builder software and Werner-Reini's training program. Moreover, Garnevski's (2001) Cognitive Emotion Regulation Questionnaire and Social Interest Scale (2021) were used for evaluation.

Results: The results of this study demonstrated that both educational programs had a positive and significant effect on social interests and emotional self-regulation. Although software cognitive empowerment training was more effective in improving emotional self-regulation, perceptual-motor skill restoration program training showed a greater effect in increasing social interest. The average scores of social interest before and after software cognitive empowerment training were 212.40 and 225.67 and perceptual-motor rehabilitation program training was 212.87 and 226.73. In addition, the average scores of positive emotional self-regulation before and after software cognitive empowerment training were reported as 58.07 and 58.40 and perceptual-motor rehabilitation program training as 56.73 and 58.73. The mean negative emotional self-regulation scores before and after software cognitive empowerment training was 48.67 and 48.13 and perceptual-motor rehabilitation program training was 46.07 and 48.07.

Conclusions: The software cognitive empowerment training and perceptual-motor rehabilitation program training for social interest variables and emotional self-regulation dimensions considering the control group were effective on the subjects. However, the software cognitive empowerment training was found to be more effective in improving emotional self-regulation, while the perceptual-motor skills reconstruction program training was more effective in enhancing social interest.

Keywords: Emotional self-regulation, Perceptual-motor skills reconstruction program, Social interest, Software cognitive empowerment

Background

In recent years, there has been an increasing emphasis on the importance of social interest and emotional self-regulation in various aspects of life, including education, professional development, and general well-being. Social interest refers to one's ability to relate to and care for others, while emotional self-regulation is the skill of effectively managing and controlling one's emotions [1]. Global organizations, such as the World Health Organization and the United Nations, have highlighted the need for interventions that focus on enhancing cognitive abilities and motor skills to promote overall well-being and mental health [2]. Social interest involves interacting with other people and contributing positively to society. Research indicates that individuals who actively engage with

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others and society tend to exhibit higher levels of social interest [3]. These individuals possess such personality traits as sociability, understanding, cooperation, patience, support, and constructive independence. On the other hand, weakness in social interest leads to an increase in the feeling of inferiority and the development of psychological disorders and crime. Benjamin et al. believe that although social interest is an inherent trait, its emergence is not self-motivated. Individuals develop their social interests to a lesser or greater extent through educational experiences provided by parents and social life [4].

Self-regulation is a process by which a person can control his thoughts, emotions, and behaviors according to his goals. It involves cognitive processes, such as formation, attention, planning, and executive mode [5]. One of the forms of self-regulation is emotional self-regulation, in which a person evaluates their own actions against their personal standards, leading to feelings of satisfaction and happiness when their behavior aligns with these standards. On the other hand, if these behaviors are not in accordance with their standards, they try to achieve the standards by changing their behavior. In this regard, Garnefski and Kraaij believe that any defect in the regulation of emotions can make a person vulnerable to psychological problems, including depression and anxiety [1]. A large body of evidence proves that individuals with emotional skills, that is, those who recognize their emotions well and regulate them, and also understand others' emotions and deal with them effectively, are successful and efficient in different areas of life [6].

One approach to improving social interest and emotional self-regulation is through cognitive empowerment training, which focuses on developing cognitive skills, such as problem-solving, decision-making, and empathy. Another approach is to teach a perceptual-motor skills reconstruction program that focuses on improving physical coordination and motor skills to improve performance and overall well-being [1].

Cognitive and emotional processes are among the factors that can be influenced by children's perceptual-motor experiences and learning. The activation of different parts of the brain can improve the child's ability to recognize the methods of emotion regulation, allowing for the externalization and discharge of emotions; as a result, the person will have a greater ability to regulate his emotions [7]. In addition, the implementation of sensory-motor interventions strengthens the sensory systems and the flexibility of the cognitive nervous system, and eventually, it moderates behavioral problems and improves children's social interactions and social interests [8].

Social interest plays a crucial role in students' academic and social achievements. It is dependent on the extent of an individual's social interactions and relationships. Moreover, researchers have found that students with emotional self-regulation are more interested in companionship and cooperation, perform better in groups, and possess higher social skills [9].

While both of these training programs (i.e., software cognitive empowerment training and perceptual-motor skills reconstruction program training] have been shown to enhance students' social interest and emotional self-regulation, it is still unclear which program is more effective or which outweighs the other [10]. Several studies have been conducted on the effectiveness of different educational programs in improving social interests and emotional self-regulation. However, no research has been dedicated to directly comparing the effects of software cognitive empowerment training and perceptual-motor skills reconstruction program training on these results [11]. The necessity of performing this study lies in the potential benefits of cognitive empowerment and perceptual-motor skills reconstruction training on students' social performance and emotional regulation. Therefore, this research aimed to compare the effectiveness of software cognitive empowerment training and perceptual-motor skills reconstruction program training on social interest and emotional self-regulation among middle school students.

Objectives

The general purpose of this research is to compare the effectiveness of software cognitive empowerment training and perceptual-motor skills reconstruction program training on social interest and emotional self-regulation.

Materials and Methods

Study design

This randomized controlled trial study was conducted on three groups: a software cognitive empowerment training group, a perceptual-motor skills reconstruction program training group, and a control group. The required data were collected using questionnaires.

Participants

The participants included the students studying at the 7th grade of middle school in Mashhad, Iran, in the academic year of 2022-2023. Among these students, 45 male students were selected by purposive sampling method and randomly divided

into three groups, namely software cognitive empowerment training, perceptual-motor skills reconstruction program training, and control group (n=15 each).

Inclusion and exclusion criteria

The inclusion criteria were being a 7th-grade male student, not receiving any other psychological training during the study, and willingness to participate in the research. In addition, people who did not complete the questionnaires and were absent for more than three sessions were excluded from the study.

Data collection tools

The instruments used in this research included evaluation tools and educational tools.

Cognitive Emotion Regulation Questionnaire

This 36-item self-report tool, developed by Garnefski et al. [12], consists of 9 subscales, of which 5 subscales measure positive emotional self-regulation strategies, while 14 assess negative emotional self-regulation strategies. Positive emotional self-regulation strategies are considered normal coping strategies that involve acceptance, positive refocusing, refocus on planning, positive reappraisal, and putting into perspective. Negative emotional self-regulation strategies are abnormal coping strategies that include self-blame, verbal rumination, catastrophizing, and other-blaming. This questionnaire assesses positive emotional self-regulation strategies by 20 items and negative emotional self-regulation strategies by 16 items. To evaluate emotional self-regulation for research purposes, the respondents were asked to answer the items on a 5-point Likert scale (from never=1 to always=5).

The Cronbach's alpha coefficient for the subscales of this questionnaire has been reported as 0.71 to 0.81 [12] Persian version of the Cognitive Regulation of Emotion Questionnaire in Iran by Besharat [13] has been normalized. In Besharat's study, the psychometric properties of this form, including internal consistency, test-retest validity, content validity, convergent validity, and favorable diagnosis, have been reported. Moreover, Cronbach's alpha coefficients for subscales ranged from 0.67 to 0.89.

Social Interest Scale for Iranian Adolescents

This 67-item tool, designed by Alizadeh et al. (2021), is a self-report scale and measures adolescents' social interests. In a study conducted by Alizadeh et al., confirmatory factor analysis was used to investigate the factor structure of this scale. They also used the indices of Chi-square ratio to a degree of freedom, adaptive fit index, non-normalized fit index, and root mean square error index as measures of model fit. Cronbach's alpha coefficient was also utilized to check reliability.

The results of the fit indices showed that the proposed model was acceptable, and the second-order factor structure of the Social Interest Scale (with four factors of responsibility-task completion, communication-empathy, courage-confidence, and sense of superiority-striving for excellence) showed an acceptable fit with the data. Cronbach's alpha coefficient for the whole scale and the four mentioned were obtained at 0.87, 0.83, 0.86, 0.60, and 0.59, respectively, demonstrating an acceptable level of internal consistency. A high score on this scale indicates high social interest.

Study interventions

The interventions in this study involved software cognitive empowerment training and perceptual-motor skills reconstruction training.

Captain's Log software cognitive empowerment training

Captain's Log software is one of the cognitive software designed by Brain Train Company to reconstruct and empower cognitive functions. This program offers over 2,000 unique exercises targeting 20 cognitive skills that are targeted at improving an individual's performance [14]. It includes a Silver level for children, a Gold level for teenagers, and a Diamond level for adults. Moreover, users can choose from three difficulty levels of easy, medium, and hard.

All the exercises in each level are performed in 15 steps, with each step presenting a different challenge from the previous one and increasing in difficulty as the individual progresses. Players can enter the next step provided that they correctly complete the task of the previous level.

The implementation of the research was as follows. In the first session, explanations about the software and training objectives were presented, and the workspace and examples of the instructions were described so that the students could fully understand the instructions.

At first, the software administered a 9-step test for the initial evaluation of each student and provided cognitive exercises tailored to each student's cognitive weakness. Following the software's initial assessment and consultation with a specialized expert in child and adolescent, a total of 5 exercises (i.e., The Ugly Duckling, Domino Dynamite, Darts!, Puzzle Power and Racing Robots) were selected among the cognitive modules of this software.

Specific parameters, such as difficulty level, duration of gameplay, and recommended age group, were established for each participant. Each subject practiced twice a week for 45 minutes. The progress made by participants in each session was saved and continued in the next session. During the implementation of the research, some participants were given the necessary explanations in Persian language since the language of the software used was English.

Perceptual-motor skills training

The information related to the intervention program used in the present study is provided in Table 1. This intervention was prepared based on Werner-Rini's training programs in 12 sessions of 45 minutes.

Intervention method

Garnefski's Cognitive Emotion Regulation Questionnaire (2002) and Social Interest Scale were administered to measure the participants' basic levels of emotional self-regulation and social interest, respectively [12]. Following that, they were assigned to either a software cognitive empower-ment training group or a perceptual-motor skills reconstruction program training group. The former group received training using Captain's Log working memory builder software. This software is designed to improve cognitive functions, such as memory, attention, and problem-solving skills. The latter group was subjected to perceptual-motor skills training using Werner-Rini's training program. This program aims at improving coordination, balance, and fine motor skills. Both groups practiced 2 sessions/week over the course of 6 weeks. At the end of the intervention, participants were asked to complete the questionnaires again to measure any changes in their emotional self-regulation and social interest.

Data analysis

The data collected from the questionnaires were analyzed in SPSS26 software. Multivariate analysis of covariance (MANCOVA) was used to compare the effectiveness of two educational programs. A P-value of 0.05 was considered a significant level.

Table 1. Objectives and content of perceptual-motor skills training sessions

Session	Title	Descriptions
1	Balance training and related exercises	1- Balance puzzles, 2- Balance rod, 3- Balance board, 4- Skipping board, 5- Rolling board, 6- Spinning board, 7- Large tube, 8- Rower board, 9 Walking on canned cans, 10- Stepping ladder
2	Other exercises related to balance training	1- Balance puzzles, 2- Balance rod, 3- Balance board, 4- Skipping board, 5- Rolling board, 6- Spinning board, 7- Large tube, 8- Rower board, 9 Walking on canned cans, 10- Stepping ladder
3-4	Tones of awareness training, body parts' role and related exercises	1- Deleting pipes in the form of human, 2- Human puzzle, 3- Drawing body parts, 4- Felt board with right and left-hand drawings, 5- Obeying left-hand commands on the right foot and vice versa, 6- Mirror and blackboard
5-6	Space awareness training and related exercises	1- Reading flow chart and arrows, 2- Floor covering block, 3- Similarities and differences puzzle, 4- Finding directions, 5- Following directions, 6- Bending and balancing on geometric shapes, 7- Nail boards
7-8	Perception of shape training and related exercises	1- Geometric barriers, 2- Molds, 3- Shape, letters, and number dominoes, 4- Puzzles, 5- Field shaped exercises, 6- Design and color games, 7- Tangram
9-10	Visual perception training and related exercises	1- Timer, 2- Rotation eyes, 3- Spotlight, 4- Maze, 5- What is forgotten, 6- Stabilization exercises, 7-Visual memory exercises, 8-Threads, 9- Sharp-eye game, 10- Hidden pictures
11-12	Auditory perception training and related exercises	1- Audible tape, 2- Knocking, clapping, and snapping, 3- Prediction, 4- Making a sentence by adding a word to other words, 5- Storytelling and repeating some parts, 6- Stating the opposite sentences, 7- Bubble exercise

Results

The results of this study showed that the average scores of social interest before and after software cognitive empowerment training were 212.40 and 225.67, respectively. Furthermore, these scores before and after the perceptual-motor recons-truction program training were 212.87 and 226.73. The average scores of social interest before and after the test in the control group were obtained at 225.80 and 190 (Table 2).

The results revealed that the average scores of positive emotional self-regulation before and after software cognitive empowerment training were 58.07 and 58.40, respectively. These scores were 56.73 and 58.73 before and after the perceptual-motor reconstruction program training and 58.20 and 50.13 before and after the test in the control group (Table 2).

Based on the results of this study, the average scores of negative emotional self-regulation were estimated at 45.67 and 48.13 before and after software cognitive empowerment training, 46.07 and 48.07 before and after the perceptual-motor reconstruction program training, and 58.20 and 50.13 before and after the test in the control group, respectively (Table 2).

In this study, the Shapiro-Wilk test was used to check the normality of the data distribution due to

the small sample size in each group (n<50). As displayed in Table 3, the data distribution was reported to be normal (P>0.05). Based on the results presented in Table 4, the assumption of homogeneity of variances was fulfilled (P>0.05).

Box's M test was used to investigate the homogeneity of variance-covariance matrices of the research variables. The homogeneity or non-homogeneity of the variance-covariance matrices can be checked based on the significance level obtained in this test. Regarding this, a significance level of > 0.05 is indicative of the homogeneity of the matrices and vice versa. The results of examining this assumption in the group membership model are provided in Table 5. These findings demonstrated that the assumption of variance-covariance matrix homogeneity was fulfilled (P>0.05).

The significant coefficients of Bartlett's test suggested that there was a multivariate correlation between dependent variables (Table 6). Table 6 presents the results regarding the multivariate correlation between dependent variables. Based on these results, the posttest multivariate correlation of the dimensions of these structures was significant, demonstrating the fulfillment of the assumption of sphericity (P≤0.05).

The results of covariance analysis to examine the differences in the variables of the current research are presented in Table 7. According to Table 7, the difference between the adjusted means of the research variables was statistically significant in the experimental and control groups (F=10.55, Wilks' Lambda=0.360, P<0.01). The difference in the scores of the groups or the effect size of group membership was 0.40.

The results of Table 8 show that there is a significant difference in the dependent variables by removing the pretest effect (P≤0.01). This means that there was a significant difference between the means in the experimental and control groups. The effect size of interventions for research variables varied from 0.33 to 0.57. The between-group comparisons are provided in Table 9.

Table 2. Mean and standard deviation of the scores of social interest and emotional self-regulation parameters before and after the interventions

Variables	Components	Group	Pretest		Posttest	
			Mean	SD	Mean	SD
Social interest	-	Experiment 1 (software cognitive empowerment training)	212.40	21.71	225.67	29.95
		Experiment 2 (perceptual-motor skills reconstruction program training)	212.87	28.168	226.73	21.75
		Control	225.80	20.85	190	19.81
Emotional self-regulation	Positive emotional self-regulation	Experiment 1 (software cognitive empowerment training)	58.07	5.23	58.40	7.10
		Experiment 2 (perceptual-motor skills reconstruction program training)	56.73	4.65	58.73	7.85
		Control	58.20	5.89	50.13	5.69
	Negative emotional self-regulation	Experiment 1 (software cognitive empowerment training)	45.67	5.74	48.13	4.79
		Experiment 2 (perceptual-motor skills reconstruction program training)	46.07	5.52	48.07	6.96
		Control	47.27	6.33	41.33	5.43

Table 3. Shapiro-Wilk test results to check the normal distribution of variables

Variables	Components	Group	Shapiro Wilk statistics	Degrees of freedom	P
Social interest	-	Experiment 1	0.935	15	0.325
		Experiment 2	0.944	15	0.430
		Control	0.961	15	0.713
Emotional self-regulation	Positive emotional self-regulation	Experiment 1	0.952	15	0.555
		Experiment 2	0.925	15	0.229
		Control	0.964	15	0.761
	Negative emotional self-regulation	Experiment 1	0.878	15	0.044
		Experiment 2	0.950	15	0.522
		Control	0.939	15	0.370

Table 4. Levene's test results for equality of variances in social interest and emotional self-regulation dimensions

Variables	Components	F	df_1	df_2	P
Social interest	-	2.264	2	42	0.116
Dimensions of emotional self-regulation	Positive emotional self-regulation	0.970	2	42	0.387
	Negative emotional self-regulation	0.802	2	42	0.455

Table 5. Examining the assumption of homogeneity of variance-covariance matrices in the group membership model

Model	Box's M	F	df_1	df_2	P
Group membership	19.424	1.44	12	8548.615	0.136

Table 6. Results of checking the assumption of sphericity in the group membership model

Model	Bartlett's χ^2	df	P
Group membership	102.126	5	0.0001

Table 7. Results of multivariate covariance analysis to investigate differences in social interest and emotional self-regulation dimensions

Test	Value	F	Hypothesis df	Error df	P	Partial eta squared
Pillai's trace	0.647	6.05	6	76	0.0001	0.32
Wilks' Lambda	0.360	8.22	6	74	0.0001	0.40
Hotelling's trace	1.76	10.55	6	72	0.0001	0.468
Roy's largest root	1.74	22.15	3	38	0.0001	0.636

Table 8. Results of covariance analysis of the difference in social interest and emotional self-regulation dimensions by removing the pretest effect

Variables	Source variation	Sum of Square	df	Mean square	F	P	Partial Eta squared
Social interest	Pretest	8184.77	1	8184.77	22.96	0.0001	0.37
	Group membership	19001.93	2	9500.96	26.65	0.0001	0.57
Positive emotional self-regulation	Pretest	119.75	1	119.75	2.80	0.102	0.06
	Group membership	855.73	2	427.86	10.01	0.0001	0.33
Negative emotional self-regulation	Pretest	244.75	1	244.75	10.87	0.002	0.21
	Group membership	638.99	2	319.49	14.19	0.0001	0.42

Table 9. Comparison of groups according to variables

Group	Experiment 1-Experiment 2		Experiment 1-Control		Experiment 2-Control	
Variables	Mean difference	Significance level	Mean difference	Significance level	Mean difference	Significance level
Posttest social interest	-1.79	1.000	44.98	0.0001	46.17	0.0001
Posttest positive emotional self-regulation	-0.810	1.000	9.182	0.002	9.99	0.001
Posttest negative emotional self-regulation	0.283	1.000	8.44	0.0001	8.16	0.0001

Table 10. Adjusted means of variables in group membership

Variables	Group	Mean	Standard error
Posttest social interest	Experiment 1	228.32	4.94
	Experiment 2	230.12	4.93
	Control	183.90	5.004
Posttest positive emotional self-regulation	Experiment 1	58.54	1.71
	Experiment 2	59.35	1.70
	Control	49.36	1.73
Posttest negative emotional self-regulation	Experiment 1	48.75	1.24
	Experiment 2	48.47	1.24
	Control	40.30	1.25

Discussion

The results of this study showed that both the software cognitive empowerment training program and perceptual-motor skills reconstruction program were effective in improving the social interest and emotional self-regulation of school students at Mashhad. However, there was no significant difference between these two training methods. In addition, both experimental groups showed significant improvement in social interest and emotional self-regulation compared to the control group, indicating that both interventions were more effective than the control condition. These findings highlight the importance of using cognitive empowerment and perceptual-motor skills training in educational environments to increase students' social and emotional development. The descriptive results of the research variables in the pretest and posttest stages, separated by groups, are presented in Table 2.

The results of this study showed that there was no statistically significant difference in the mean scores of the posttest social interest between the experimental groups (Table 9). The mean scores of posttest positive and negative emotional self-regulation were not statistically significantly different between the experimental groups. In addition, the results indicated that there was a statistically significant difference between the post-test averages of the social interests of the first and second experimental groups compared to the control group.

Furthermore, a statistically significant difference was reported between the post-test scores of positive emotional self-regulation and negative emotional self-regulation of subjects in the first and

second test groups compared to the control group (Table 9). The results also showed that the posttest mean scores of social interest in experiment 1 (software cognitive empowerment training) and experiment 2 (perceptual-motor skills reconstruction program training) were higher than that in the control group. In addition, regarding the dimensions of emotional self-regulation, the posttest mean scores of positive emotional self-regulation and negative emotional self-regulation were also higher in experimental groups 1 and 2 than in the control group (Table 10).

In this study, both software cognitive empower-ment training and perceptual-motor skills reconstruction program training exhibited a significant improvement in social interest and emotional self-regulation in the intervention groups compared to the control group. The mean scores of both parameters increased after the training programs, which indicated a positive effect on students' social and emotional development.

The research results also showed that software cognitive empowerment training and perceptual-motor reconstruction program training were equally effective in improving students' social interest and emotional self-regulation. There was a slight difference in the mean scores before and after each exercise program; however, both showed a significant improvement compared to the control group. These findings revealed that both software cognitive empowerment training and perceptual-motor skills reconstruction program training could be useful interventions to increase students' social interest and emotional self-regulation.

Heshmati et al. investigated the relationship between emotional intelligence, mindfulness, and emotional self-regulation among gifted high school students[15]. In their study, 144 gifted students (77 boys and 67 girls) were selected from schools for gifted students using a random sampling method. The participants were asked to fill out the Self-Regulation Questionnaire. The results of their study showed that there were no significant differences in demographic variables between the two male and female gifted students. It was also found that the two groups had a significant difference in terms of emotional intelligence. The stepwise regression results showed that variables of acting with awareness and no reaction from mindfulness variable explained about 17% of emotional self-regulation variance. In addition, the components of problem-solving and optimism about emotional intelligence explained 38% of emotional self-regulation. In general, they concluded that acting with awareness and no mental reaction from components of mindfulness, and problem-solving and optimism from components of emotional intelligence played a major role in the emotional self-regulation of the gifted students. Therefore, it is necessary to pay attention to the role of these components in emotional self-regulation and in reducing negative emotions in such students [15].

In another study, Gilman et al. investigated the relationship between life satisfaction, social interest, and frequency of extracurricular activities among adolescent students. A total of 321 high school students (grades 9-12) were studied using a scale that assessed social interest. The samples were also asked to list the extracurricular activities they had participated in since high school. The results of their study indicated that higher social interest was significantly associated with higher levels of overall satisfaction as well as satisfaction with friends and family. In addition, significant racial differences were observed. The students who participated in more structured extracurricular activities reported higher levels of satisfaction with school. The relationship between social interest and actual participation in extracurricular activities was insignificant [16].

Rezaei et al. evaluated the effectiveness of computerized cognitive empowerment on attentional functions, concentration, and cognitive effort in the elderly. Their research was semi-experimental with a pretest-posttest design and a control group. The participants consisted of 30 elderly people who were selected by the available sampling method and randomly divided into an experimental group and a control group (n=15 each). The tools included Captain's Log cognitive software and the D2 test. Data analysis using covariance analysis showed that there was a significant difference between the mean pretest and posttest scores in the experimental and control groups. Based on the findings of this study, computerized cognitive empowerment could be adopted as an effective method to improve attention, concentration, and cognitive effort in the elderly [17]. The results of their study were similar to those obtained from our study and confirmed them.

In a study, Soltani et al. investigated the effectiveness of a perceptual skills rebuilding program in improving motor problems among primary students with developmental coordination disorder. The research was semi-experimental with a pretest-posttest design. The statistical population (n=40) included all the students (age range 7-9 years) of Mashhad who visited the rehabilitation centers in this city in 2017. After identifying students with developmental coordination disorder, 20 cases were randomly selected to receive training and were trained for sixteen 30-minute sessions [18].

The instruments employed in the mentioned research included the Developmental Coordination Disorder Questionnaire version 7 for parents, the Wechsler

Intelligence Scale for Children (short form), and the Bruininks-Oseretsky Test of Motor Proficiency. The results of the statistical analysis showed that the reconstruction of perceptual skills significantly affected the development of macro-perceptual-motor function, perceptual-motor balance function, and fine motor perceptual function in children with developmental coordination disorder [18].

The results also indicated a significant effect of perceptual exercises on the motor skills of the subjects in the experimental group compared to the control group. They concluded that cognitive skills training could have beneficial and significant applications to improve movement problems in children with developmental coordination disorders and provide diverse and valuable services for the evaluation, educational methods, and treatment of these children [18]. The results of their study were similar to those of our study and were consistent.

Software cognitive empowerment training is a program designed to help people improve their cognitive skills through the use of application software. This training usually includes exercises and activities that target various cognitive functions, such as memory, attention, and problem-solving skills. Regular engagement in these activities can enhance participants' cognitive abilities and improve their overall cognitive performance [19]. This type of training can be especially beneficial for people who are looking to strengthen their cognitive abilities to perform better at work or school. Perceptual-motor skills reconstruction program training refers to a program that focuses on reconstructing or strengthening perceptual-motor skills. This type of exercise often involves activities that improve coordination, balance, reaction time, and gross motor skills [20].

In today's fast-paced and technological society, there is an increasing need for people to have strong cognitive and perceptual-motor skills so that they can succeed in various aspects of life. One of the ways to strengthen these skills is through specialized training programs that focus on cognitive empowerment and reconstruction of perceptual-motor skills [21-23].

Two training programs of this kind that have gained popularity in recent years are software cognitive empowerment training and perceptual-motor skills reconstruction program training. The former focuses on improving cognitive abilities through the use of technology-based software and exercises, while the training goal of the latter program is to strengthen perceptual-motor skills via various physical activities and exercises. Both of these training programs have exhibited positive effects on people's cognitive and perceptual-motor skills [6]. However, the impact of these programs on social interest and emotional self-regulation in students has not been widely studied.

Conclusions

Based on the results of this study, it can be concluded that both software cognitive empowerment training and perceptual-motor skills reconstruction program training have a positive effect on students' social interests and emotional self-regulation. Both training programs led to an increase in social interest and positive emotional self-regulation, as well as a decrease in negative emotional self-regulation. Nevertheless, the effectiveness of the two training programs on social interest and emotional self-regulation was not statistically significant. Both programs showed similar improvements in these parameters compared to the control group. This shows that both software cognitive empowerment training and perceptual-motor skills reconstruction program training can be effective interventions to enhance social interest and emotional self-regulation in students.

Overall, these findings highlight the importance of incorporating cognitive empowerment and perceptual-motor skills training in educational programs to improve social and emotional skills in students. Implementing these educational programs in schools may help support students in developing social and emotional competencies necessary for their personal and academic success.

Study limitations

Among the limitations of this study one can refer to the restriction of samples to a single geographic area and gender (male). The other limitation was related to the use of self-reporting tools. Future studies on larger sample sizes, both genders, different cultures, and long follow-ups may lead to more accurate results. Moreover, due to the quasi-experimental design of this study, it was impossible to randomly assign individuals to the experimental and control groups, as typically done in real experimental research. In addition, this study was conducted only in the city of Mashhad, limiting the generalizability of the results to other regions of the country because of geographical and cultural differences.

Compliance with ethical guidelines

Ethical principles were observed in the research. Participants were allowed to withdraw from the study at any stage. They were also assured that the research would have no financial burden on them and their information would remain confidential. This study was approved by the Ethics Committee of Mashhad University of Medical Sciences (code: IR.MUMS.REC.1402.097).

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