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Research Article

Comparison of Team and Individual Motor Activity Games on the Development of Elementary School Students' Social Skills and Executive Functioning

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Abstract

Background: This study compared team and individual motor activity games on the development of social skills and executive functioning of students.

Materials and Methods: This quasi-experimental study used a pretest-posttest design with a control group. The statistical population of the research consisted of all male students (256 subjects) of primary school in municipal Zone 4 of Tehran. The sample in the present study was estimated to be 30 students in 3 groups using G*POWER to achieve a test power of 0.8 and an effect size of 0.80. Cluster sampling method was used to select students. In the first stage, 5 schools, 1 class from each school, and 6 students from each class were randomly selected as samples. They were randomly and equally divided into 3 groups of team games, individual games, and the control group. The Matson Evaluation of Social Skills with Youngsters-II (1983) was used to measure social skills, and The *Barkley Deficits* in *Executive Functioning Scale—Children* and *Adolescents* (BDEFS-CA) (2012) was used for executive functioning. In the present study, the designed experiment consisted of sixteen 60-min sessions (2 sessions per week); two types of experimental protocols including individual games and team games and also control conditions were used. Individual exercises included ten male students wherein each student performed the exercises with a coach. Team exercises included ten male students in the form of two teams who performed exercises as various activities and games.

Results: By examining the results of difference in the means of the two intervention groups (team and individual exercises) and control group, it was found that in the sub-components of appropriate social skills, aggressiveness, and impulsive behaviors, the individual exercises group was more effective compared to the team exercises group ($P<0.05$). In the sub-components of non-social behaviors, superiority, high self-confidence, relationship with peers, and total social skills, the team exercises group was more effective compared to the individual exercises group ($P<0.05$). Besides, by examining the results of the difference in the means of the two intervention groups (team and individual exercises) and control group, it was found that the individual exercises group was more effective in the sub-components of self-organization, problem-solving, and self-motivation compared to the team exercises group ($P<0.001$). Yet, in the sub-component of self-management of time, self-control/inhibition, self-motivation, and total executive functioning, the team exercises group was more effective compared to the individual exercises group ($P<0.001$).

Conclusion: Based on the results of the research, it can be concluded that both team and individual exercises lead to the promotion of social skills and executive functioning in students. Moreover, compared to individual exercises, team exercises are superior in enhancing students' social skills and executive functioning.

Keywords:
Team games, individual games, social skill, executive functioning, exercises, students.

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1. Introduction

Nowadays, one of the basic and primary goals of educational systems round the globe is the growth and development of children's social abilities. The social aspect of development and preparing children to live with others and cooperate with them has attracted the attention of educators for a long time so that the responsibility of schools has presently changed. Schools are not only responsible for the scientific education of students now, but also they must prepare programs that develop the social and emotional dimension of the child's personality. This is because character development in children, becoming good citizens, avoiding violence, learning appropriate ways to deal with others, communicating with other people, and generally having social skills in interpersonal communication are mandatory for living in the world today(1). Possessing social skills by a person improves all aspects of their life. Social skills create concentration in the classroom and increase the level of responsibility of the child towards doing homework and observing school rules. In this way, it exerts an important effect on appropriate and desirable behavior with classmates and adults and enables them to interact with their peers and adults via a stable and satisfying relationship. These skills make children be better accepted by their peers and teachers and be more popular in school, resulting in academic success, growth and development of health, the ability to maintain positive relationships, and motivation to participate in different groups. The lack of social skills makes children face many problems and causes lack of compromise in interpersonal relationships and problems and behavioral disorders, exerting a negative impact on the development of the child's personality and their adaptation to the environment . (2)Children with a lack of social skills not only suffer from Children with a lack of social skills not only suffer from this deficiency, but also they will cause disturbance to others with their inappropriate and impulsive behavior. As a result, the child will be rejected by friends and peers due to this deficiency and will be more exposed to social harm and peer pressure because they do not have the necessary skills and determination to deal with these pressures. In a research by Frydenberg & Andone (2011) entitled: "Learning for 21st Century Skills", it is stated that the teaching of social skills should be achieved during the course of teaching the curriculum. Executive functioning is also one of the principal and primary goals of educational systems like social skills(3) .Executive functioning is a term referring to a set of mental skills that develop during childhood and adolescence and enable a person to perform tasks or goals. These skills are regulated by the frontal lobe of the brain and contribute to our ability to perform everyday tasks such as time management, planning, concept formation or attention (4).Fundamental executive functioning include cognitive flexibility, inhibition (self-control, self-regulation), and working memory, while more complex functions include problem-solving, reasoning, and planning (5). Although there are many different types of executive functioning, there are also certain executive functioning that are especially necessary for daily activities and sports, one of which is working memory. Working memory, a fundamental executive functioning (6), is defined as retaining information and then mentally working with this information that is critical to understanding what is happening over time(7). Working memory involves keeping in mind what has already happened and relating it to what is happening now (7). Thus, working memory is essential for understanding any linguistic information as well as understanding cause-and-effect (7),

which is essential in sports and daily activities. Another basic executive functioning that plays an essential role in daily and sports activities is cognitive flexibility (5).Cognitive flexibility is described as the ability to change perspectives about a situation, adjust one's way of thinking about a problem (e. g., thinking outside the framework to solve a problem), and flexibility in adapting to irregular obligations (7). Complex executive functions, such as problem-solving and planning(5), are also key components in daily activities and sports. Problem-solving refers to the process of formulating a sequence of actions to achieve a goal (8).Planning is the prediction of a course of action; so, a plan is the imagination of that course of action (8). Inhibition skills, flexibility, emotional control, initiation, working memory, planning/organization, organizing materials and monitoring executive functioning are the focus of this study. When research focused on executive functioning and their relationship with sports, results began to emerge simultaneously, showing a strong relationship between executive functioning and sports performance(9). This is especially true in team sports such as soccer/football, which require adaptation and anticipation to ever-changing environments. Evidence suggests that neural circuits in the prefrontal cortex are critical for the development of executive functioning. Compared to brain regions responsible for specific functions such as motor skills or language development, the period of maturation of the prefrontal cortex continues until late adolescence. The type of activities in which the child participates is very important in determining the speed, strength and growth path of the frontal cortex of the brain and their executive functioning (10). Previous research has indicated that the more cognitively engaging an exercise is, the more it relies on top-down cognitive processes (11).

It has been observed that exercises with high cognitive attractiveness improve executive performance in children and adolescents compared to exercises with low cognitive attractiveness (11). Team sports or coordination exercises with high cognitive involvement have been shown to exert outstanding effects on children's executive functioning. Ishihara et al. (2016) showed that team exercises with a cognitive approach have the strongest relationship with working memory, executive functioning, and inhibitory control. Furthermore, their findings suggested that engaging in highly attractive exercise only once a week may lead to increased executive functioning (11). This cannot be attributed to less cognitive exercises, since activities such as walking or running do not seem to have the same effect (11). Cognitive participation in team exercises has shown its importance in increasing executive functioning. Nonetheless, it is possible that components of exercise such as social interactions allow exercise to be more cognitively engaging, as social interactions may contribute to the level of cognitive engagement received from a task. Team sports activities are not only socially and physically beneficial (12), but have also been shown to improve cognition (11). Many team sports activities require cooperation with teammates, predicting the behaviors of teammates and opponents, recognizing strategies and adapting to constantly changing work needs (10). Team sports activities, especially sports such as basketball, hockey, or soccer/football, contain many of the same cognitive demands (i.e., predicting behaviors, & adapting to an unstable environment). Similar to these team sports, executive functioning tasks set requirements for children's executive functioning that require formulating, monitoring, and modifying a cognitive plan for task performance (10).

Research has suggested that children who have more experience in social interactions perform better in developing social skills. Basically, communication and social learning can be important sources for the development of social skills and executive performance (13). Hence, the current research was based on the assumption that experiments emphasizing interpersonal interactions (such as team games), compared to individual experiments, may exert a greater effect on the development of social skills and executive functions. Consequently, this research compared team and individual motor activity games on the development of social skills and executive function. In a way, the researcher looked for an answer to the question whether there is a difference between team and individual games in their effect on fostering the social skills and executive functioning of students.

2. Materials and Methods

The current quasi-experimental study applied a pretest-posttest design with a control group. The statistical population of the research included all male students (256 subjects) of elementary school in municipal Zone 4 of Tehran, capital of Iran. The sample of the present study was estimated to be 30 students in 3 groups using G*POWER to achieve a test power of 0.8 and an effect size of 0.80. The cluster sampling method was used to select students. In the first stage, 5 schools, 1 class in each school, 6 students from each class were randomly selected as samples. They were randomly and equally divided into 3 groups of team games, individual games, and the control group. The inclusion criteria were: parental consent, being a male student, age of 9-11 years, studying in 2022-2023, voluntary attendance and absence of any physical and psychological problems. Besides, the exclusion criteria were: being absent in more than 2 sessions, injury, withdrawal of participation, failure to complete the questionnaire accurately, and engagement in activities other than the considered protocols.

Procedure

After meeting the inclusion criteria and preparing the conditions, explanations were given to the subjects about the rationale and research objective of the intervention. They were also assured that all their information will remain confidential and anonymous. To participate in the research, informed written consent was obtained from the parents of the children. Then, executive functioning and social skills were measured as a pre-test. Subsequently, 30 male students were randomly divided into 3 groups of team exercises, individual exercises, and control group. Both groups participated in team and individual exercises in sixteen 60-min sessions (2 sessions per week) in the selected exercise program. Finally, after implementing the training protocol, executive functioning and social skills were measured as a post-test.

Exercise Protocol

In the present study, the designed experiment consisted of sixteen 60-min sessions (2 sessions per week) and two types of experimental protocols including individual games, team games, and control conditions. Individual exercises were performed by ten male students wherein each student performed the exercises with a coach. Team exercises involved ten male students that performed exercises in two teams by performing various activities and games. . It should be mentioned that all the trainers were given explanations regarding the way of coaching and communication with the students.

All coaches were sports teachers and had at least one coaching degree (physical fitness). In general, 4 important principles of purposeful games were emphasized in the design and application of both types of individual and team experimental protocols (14): 1. Each game was designed for specific purposes, 2. The participants were given the freedom to choose the games and their order, 3. The enjoyment and fun of the games were ensured through the verbal feedback of the participants, and if any of the games were boring, they were not presented again. 4. While playing the games, the researcher interacted verbally with the child and structured the cognitive (task characteristics) and motivational (encouragement for better performance) components of the game to increase the child's involvement in the game and improve the quality of the game experience in teachable moments. The goals of the games in the present study were focused on improving visual-motor skills, attention control (selective/focused attention), cognitive inhibition, visuospatial working memory, cognitive flexibility and emotion recognition and false belief perception (15, 16). Based on the type of cognitive game behavior of children at the age of 8 and older, the intended games were considered to be rule-oriented games (17). The games were subject to two categories of rules: the first category was the predetermined rules for each of the games describing how to play the game and the functional goals of the game. The second category entailed the rules that were agreed upon in the process of playing the game based on the opinion of the child in the interaction with the researcher in the individual test group, and based on the collective opinion of the children and the researcher in the team test group. All these rules were changed to increase enjoyment, fun, and child engagement, and improve children's game behavior. Another thing in the design of the experiment was considering the amount of social interaction based on the hierarchy of social games in the protocol of team games (18), (19). Team games were performed as two subgroups with 5 students, and social interaction was created in the form of two types of accompanying games in the first 2 sessions and cooperative games in the rest of the sessions. The amount of collective participation in the game was gradually increased. Based on previous studies, in individual and team game protocols, both types of physical activity games consisting of gross and fine movement games were used (20). Moreover, the level of complexity and difficulty of the games was increased once out of every 5 sessions, so that the experimental period started from simple and easy games at the beginning of the period and ended with complex and difficult games at the end of the period. The instrument used for data collection is described below.

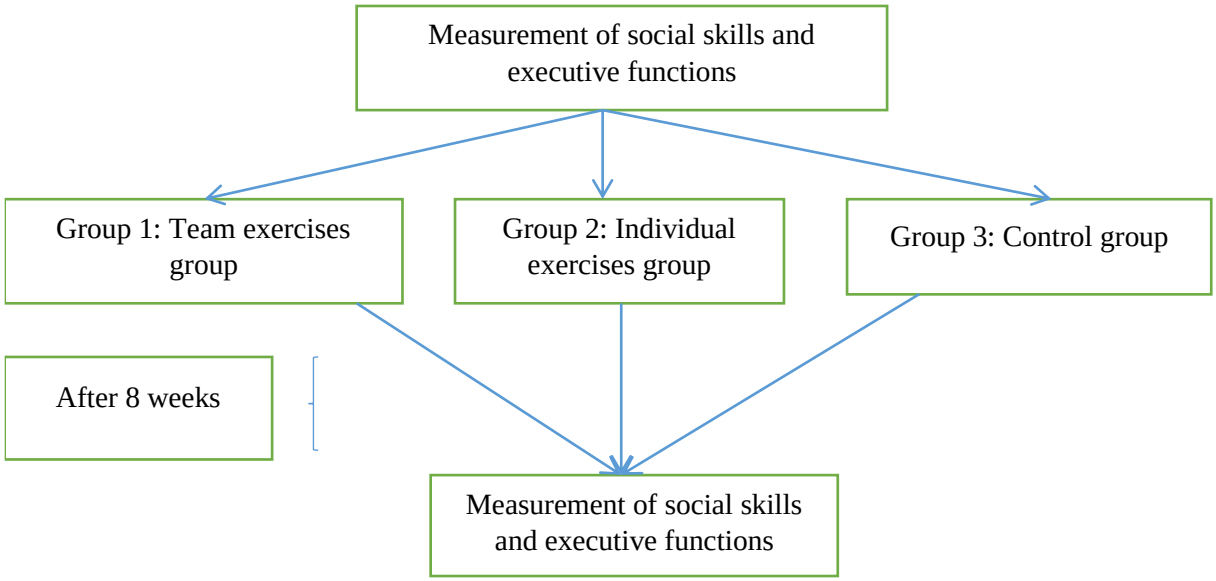

Table 1: A summary of the exercises performed by the two groups during the intervention

Game	Game challenge	Game purpose
Performing different movements with sports balls	Individual or team success in moving consecutively a lot of sports balls	Strengthening control skills, increasing concentration skills
Spiral movement with eyes closed	Fast passage through conical obstacles alone or with help of peers	Strengthening physical and spatial awareness, increasing concentration skills
Twenty-one stray balls	Keeping a ball during the game and trying to get 21 points	Strengthening control skills, increasing motor awareness skills
Throwing ball to the ring	Getting maximum points possible	Control skill development, increasing motor awareness, understanding the importance of team activity
Agility	Reacting very quickly to individual or team orders	Increasing physical and spatial awareness, encouraging creativity
The bear escapes from the cage	Bringing back the little teddy bears alone or with the help of each other inside cardboard boxes	Increasing spatial awareness, increasing transfer skill, knowledge of the concept of pair movement
Ball and ring	Catching the ball in the air with a bath towel with a length 60 to 120 cm	Development of control skills, increasing spatial awareness, understanding power generation

Statistical Analysis

Data were analyzed with SPSS24. Shapiro-Wilk test was used to determine the normality of the data distribution. Levene test was used for homogeneity of variances, and one-way analysis of variance (ANOVA) was used to check the demographic indices of the subjects. Multivariate covariance analysis was used to determine the inter-class differences. LSD test was used to compare groups, and paired t-test (difference between pre-test and post-test of each group) was used for intra-class differences. Data were reported as Mean±SD (P≤0.05).

3. Results

The results of one-way ANOVA suggested that the demographic indices of the subjects in the three groups did not show any significant in the pre-test stage (Table 2).

Table 2: Demographic indices of subjects

Variables	Control group	Team exercises group	Individual exercises group	F	P-value
Age (year)	9.40±0.51	9.50±0.52	9.30±0.48	0.10	0.684
Weight (kg)	32.60±2.59	33.90±1.79	33.70±3.19	4.90	0.491
Height (cm)	135.60±3.83	132.90±3.63	133.80±3.35	18.90	0.253
BMI (kg/m^2)	17.73±1.31	19.19±0.87	18.84±1.92	5.84	0.077

The results displayed in Table 3 presents the descriptive indices (mean and standard deviation) of all research variables.

Table 3: Descriptive indices of research variables

Variables	Control group		Team exercises group		Individual exercises group	
	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
Adequate social skills	5.66±42.90	2.99±38.50	4.22±39.10	12.23±55.30	6.61±42.00	6.33±64.20
Non-social behaviors	4.58±39.20	3.86±40.40	3.62±38.50	1.93±16.20	4.88±37.50	4.03±17.50
Aggressiveness and impulsive behaviors	3.38±39.10	4.62±40.70	5.12±40.70	2.78±17.80	2.60±41.90	3.67±18.20
Superiority, self-confidence	2.37±18.90	2.35±18.30	6.52±24.20	2.31±13.40	2.06±24.40	3.33±14.40
Relationship with peers	2.64±31.90	2.65±32.20	5.34±32.20	2.79±17.40	4.72±30.10	3.23±17.60
Total social skills	10.67±172.00	5.97±170.10	14.65±174.70	11.79±120.10	8.94±175.90	8.26±131.90
Self-management of time	1.95±25.50	2.95±26.40	3.52±27.80	3.84±42.10	5.51±28.20	3.06±40.40
Self-organized problem-solving	4.13±29.20	4.88±27.90	4.58±31.90	4.00±41.00	4.60±32.10	4.47±41.30
Self-control/inhibition	1.31±26.80	5.41±28.00	5.12±25.60	4.95±42.10	3.16±26.40	2.42±40.10
Self-motivation	3.80±26.50	5.20±25.30	4.83±29.90	2.55±45.10	5.22±28.80	3.15±39.80
Self-regulation of excitement	4.51±31.80	3.58±29.80	6.70±28.70	3.66±41.90	4.52±29.40	4.34±42.20
General executive functioning	7.14±139.80	6.09±137.40	12.73±143.90	10.34±212.20	13.75±144.90	7.84±203.80

The results of the Shapiro-Wilk test revealed that all the variables in the pre-test stage had a normal distribution. The equality of variances was evaluated using Levene test. The results of this test showed that the variance of the components of social skills and executive functioning is homogeneous among the groups (team, individual and control exercises) (P>0.05) (Table 4).

Table 4: Levene test

Variables	F	df1	df2	P-value
Adequate social skills	0.63	2	27	0.540
Non-social behaviors	2.90	2	27	0.072
Aggressiveness and impulsive behaviors	2.41	2	27	0.108
Superiority, self-confidence	1.49	2	27	0.242
Relationship with peers	0.86	2	27	0.433
Total social skills	2.89	2	27	0.072
Self-management of time	0.40	2	27	0.674
Self-organized problem-solving	0.79	2	27	0.46
Self-control/inhibition	1.20	2	27	0.31
Self-motivation	2.96	2	27	0.06
Self-regulation of emotion	0.44	2	27	0.64
General executive functioning	0.84	2	27	0.44

The results of the intergroup test showed that appropriate social skills (P<0.001), non-social behaviors (P<0.001), aggressiveness and impulsive behavior (P<0.001), superiority (P=0.027), high self-confidence (P<0.001), relationship with peers and total social skills (P<0.001) had significant differences in three groups of team exercises, individual exercises, and control group (Table 5). Additionally, the results suggested that time self-management (P<0.001), self-organization of problem-solving (P<0.001), self-control/inhibition (P<0.001), self-motivation (P<0.001), self-regulation of emotion, (P<0.001), and total executive functioning (P<0.001) had significant differences among three groups of team and individual exercises and control group (Table 5).

Table 5: Intergroup test of social skills in three groups: team exercises, individual exercises, and control group

Variables	Sum of means	df	Square of means	F	P-value	Statistical power	Effect size
Adequate social skills	1544.89	2	722.44	25.05	P<0.001	1.00	0.695
Non-social Behaviors	2050.84	2	1025.42	85.17	P<0.001	1.00	0.886
Aggressiveness and impulsive behaviors	1976.69	2	988.34	84.64	P<0.001	1.00	0.885
Superiority, self-confidence	66.70	2	33.35	4.29	P=0.027	0.686	0.281
Relationship with peers	816.41	2	408.20	50.12	P<0.001	1.00	0.820
Total social skills	9678.20	2	4839.10	87.61	P<0.001	1.00	0.888
Self-management of time	619.42	2	309.71	38.11	P<0.001	1.00	0.776
Self-organized problem-solving	511.94	2	255.97	16.20	P<0.001	0.999	0.596
Self-control/inhibition	846.48	2	423.24	19.55	P<0.001	1.00	0.640
Self-motivation	1500.91	2	750.45	51.93	P<0.001	1.00	0.825
Self-regulation of emotions	534.00	2	267.00	17.70	P<0.001	0.999	0.617
General executive functioning	18710.15	2	9355.07	207.57	P<0.001	1.00	0.950

Examination of the results of the difference in the means of the two intervention groups (team and individual exercises) and control group showed that the individual exercises group was more effective in the sub-components of "appropriate social skills" and "aggressiveness and impulsive behaviors" compared to the team exercises group (P<0.05) (Table 6). In the sub-component of non-social behaviors, superiority, high self-confidence, relationship with peers and total social skills, the team exercises group was more effective compared to the individual exercises group (P<0.05) (Table 6). Furthermore, examination of results of the difference in the means of the two intervention groups (team and individual exercises) and control group showed that the individual exercises group was more effective in the sub-components of self-organization of problem-solving and self-motivation compared to the team exercises group (P<0.001) (Table 6).

Yet, the team exercises group was more effective in the sub-components of time self-management, self-control/inhibition, self-motivation, and total executive functioning compared to the individual exercises group (P<0.001) (Table 6).

Table 6: Comparison of social skills in different groups

Variables	Groups		Differences of means	P-value
Adequate social skills	Control	Team	-11.06	P=0.001
		Individual	-22.14	P<0.001
Antisocial behaviors	Control	Team	22.77	P<0.001
		Individual	22.28	P<0.001
Aggressiveness and impulsive behaviors	Control	Team	22.01	P<0.001
		Individual	22.33	P<0.001
Superiority, self-confidence	Control	Team	4.35	P=0.008
		Individual	3.40	P=0.043
Relationship with peers	Control	Team	14.63	P<0.001
		Individual	13.62	P<0.001
Total social skills	Control	Team	52.71	P<0.001
		Individual	39.50	P<0.001
Self-management of time	Control	Team	-12.94	P<0.001
		Individual	-11.69	P<0.001
Self-organized problem-solving	Control	Team	-10.69	P<0.001
		Individual	-11.49	P<0.001
Self-control/inhibition	Control	Team	-15.48	P<0.001
		Individual	-13.19	P<0.001
Self-motivation	Control	Team	-21.35	P<0.001
		Individual	-15.91	P<0.001
Self-regulation of emotion	Control	Team	-10.85	P<0.001
		Individual	-11.77	P<0.001
General executive functioning	Control	Team	-71.33	P<0.001
		Individual	-64.06	P<0.001

4. Discussion

This study explored the effect of team and individual motor activity games on the development of social skills and executive functioning of elementary school students. The results showed that team games are superior to individual games in promoting the executive functioning and social skills of students. The results of the present study are somehow consistent with the results by McKenzie (8)and inconsistent with the results by Kolvolonis et al.(21). Recently, Borhani Dizji (22)showed that team exercises are more optimal than individual exercises. But what are the possible reasons for this superiority*?*

In explaining the present results, it can be said that observing a model that is learning is probably one of the important reasons for the superiority of the team exercises method. Those who were present in the team game benefited from observational exercise in addition to physical exercise. Nonetheless, this opportunity was not available for the individual exercises group. The students of the team exercise group carefully observed their partner's performance of the desired skills in half of their practice attempts, in such a way that they could give him/her feedback on his/her performance after the end of the physical effort. Observing a model in learning has many benefits

for acquiring new skills, because it seems that in this situation, the observer participates in the same cognitive processes that the model is fa This enables them to develop a correction reference during this process to be used by them during the implementation of the assignment. Adams (23)claimed that while observing the learning model, the observer has the opportunity to observe the progress of the model, and as a result, learning takes place through the process of trial and error. Moreover, Lee & White (24)suggested that observers of a learning model may benefit from accompanying the model in error diagnosis and problem-solving activities that are the basic processes in motor learning. Another possible reason for the superiority of the team exercise method over the individual one is their higher motivation as a result of participating in the team method. It appears that the team exercise method increases students' motivation in several ways. Firstly, it seems that team exercise method enhances students' motivation as a result of adding the competition factor to the practice situation. In this way, the competition formed between the students possibly leads them to choose a target at a level slightly higher than their own level. In the goal-setting literature, it has been shown that specific objectives, for example, outrunning one's partner in a team exercises method, lead to greater performance and learning of motor skills (25, 26). Secondly, it seems that motivation increases with the feeling of being seen. In fact, not only the learning model brings benefits to the person who observes the model, but also the model himself/herself, considering that s/he knows that s/he is being observed, finds more motivation to try to learn. Thirdly, recent researches have shown that involving students in their learning process increases their motivation to continue their activities (27). cing. The students of the team exercise group were involved in the learning process by encouraging maximum interaction with each other and finding each other's weaknesses and this increases their motivation. In team exercise group, the students were encouraged to try to achieve a common goal, i.e., skills learning through collaborating with each other. In all stages of learning, they all have an active role and collaborate together to achieve a specific goal with proper planning. Another possible factor that seems to have played an important role in the superiority of the team exercise group compared to individual exercise is feedback. Students of team exercises who were in the role of coach were encouraged to give feedback to their partner after each attempt. Thus, the performers in the team exercise group received feedback on their performance after each attempt. In feedback literature, it is stated that when learning tasks, the more complex the feedback, the more the learning will be as a result (27). This issue is especially evident in the case of children, who are more limited in their attention span and information processing capacity than adults (28). Hence, it seems that the students of the team exercise group have benefited from both the informational and motivational load by receiving feedback after each attempt. It is further possible that the team shared different strategies to solve the motor problem, which has led to their more involvement in the solving process. Recently, researches in the field of motor problem learning have shown that more involvement of students in problem-solving processes using different methods such as self-control and increasing contextual interference will lead to more learning in the intended task, the main reason of which is probably deeper processing of information related to the students. Encouraging students to interact as much as possible after every effort on how to overcome weaknesses in performance will probably increase their executive performance and social skills and their participation in processing activities that are not possible in the individual exercise method (28,29). The results of the present study can have practical consequences for physical education and good,

practices in designing effective physical education programs targeting the physical and cognitive development of students in a comprehensive manner(27). Physical activity games are considered appropriate content to meet the standards and goals of physical education, such as achieving and maintaining health-enhancing levels of physical activity and fitness and promoting self-expression, enjoyment, and cognitive development (27). Traditional forms of physical activity tasks may not be very attractive to many students, and therefore, some students may be reluctant to participate in physical activity tasks. To overcome this problem, physical education instructors should include cognitively challenging physical activity games in their programs. These games have the advantage of engaging students in attractive and pleasant forms of physical activity while stimulating their executive functioning. Considering that the types of cognitively challenging physical activity games exerted a significant impact on students' executive functioning and social skills, physical education programs may include a combination of these games. Physical educators may choose different types of games based on the specific characteristics of each type of game and how they fit the learning objectives of each session. In addition, physical educators can adapt physical activity tasks or games commonly used during physical education to make them more challenging and cognitive for their students. The three principles of highlighting contextual interference emphasizing mental control, and promoting discovery can be used as guides in this process. In addition, physical educators should design physical activity tasks that require students to be active and make repeated decisions to solve problems. Physical educators may also consider their students in the process of adopting and creating their own cognitively challenging physical activity games. It is also suggested that physical education trainers use both team and individual exercises to improve social skills and executive functioning, though albeit, team exercises have been more effective.

Acknowledgements

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Conclusion

Given the results of the present study, it can be concluded that both team and individual exercise methods lead to the improvement of social skills and executive functioning in students. Besides, compared to individual exercises, team exercises are superior in fostering social skills and executive functioning.

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No funding agency had a role in the study design, analysis or interpretation.

Compliance with ethical standards

Conflict of interest None declared.

Ethical approval the research was conducted with regard to the ethical principles.

Informed consent Informed consent was obtained from all participants.

Author contributions

Conceptualization: S.M.K.S, M.B.M, GH.M; Methodology: S.M.K.S, M.B.M, GH.M; Software: S.M.K.S, M.B.M, GH.M;Validation: S.M.K.S, M.B.M, GH.M; Formal analysis: S.M.K.S, M.B.M, GH.M; Investigation: S.M.K.S, M.B.M, GH.M; Resources: S.M.K.S, M.B.M, GH.M; Data curation S.M.K.S, M.B.M, GH.M; Writing - original draft: S.M.K.S, M.B.M, GH.M; Writing - review & editing: S.M.K.S, M.B.M, GH.M; Visualization S.M.K.S, M.B.M, GH.M; Supervision: S.S., A.F.B, N.Sh ; Project administration: S.S., A.F.B, N.Sh ; Funding acquisition: S.M.K.S, M.B.M, GH.M.

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