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The Contribution of Dance to Optimizing Motor Skills and Improving the Educational Process in Institutionalized Children

Gabriela TOMESCU [1*]
Monica-Iulia STĂNESCU [2]
Kamer-Ainur AIVAZ [3]

[1*] "Ovidius" University of Constanţa, Faculty of Physical Education and Sport, Romania. Corresponding author: tomescu.gabriela03@yahoo.com
[2] National University of Physical Education and Sport, Faculty of Physical Education and Sport, Bucharest, Romania
[3] "Ovidius" University of Constanţa, Faculty of Economic Sciences, Romania

Abstract: *Institutionalized children represent a risk-factor category from the perspective of social integration. Educational interventions implemented in programs designed for children raised in foster homes verify the effectiveness of complex means of training that could influence their multidimensional development. Among these means, dance has been identified as a way of developing coordination, rhythmicity, motor skills, and spatiotemporal orientation through body movements. Starting from the hypothesis that the systematic participation of institutionalized children in a dance program contributes to the development of their motor skills, an intervention model based on dance content was designed for this study. The purpose of this research is to optimize the motor skills of institutionalized children and to stimulate their bodily-kinesthetic and visual-spatial intelligences. The objectives of the study are to highlight the influence of dance on the development of institutionalized children and to develop the methodological concept regarding the use of dance for institutionalized children at the age of preadolescence. The research was conducted over a nine-month period, with a frequency of two training sessions per week of 60 minutes each, and was based on the consolidation of steps from different dance styles for a group of 29 institutionalized children aged 11-12 years. Testing was carried out using the Optojump device, and the tests applied were aimed at assessing their lower limb power, reaction speed, repetition speed, and spatiotemporal orientation. The motor effects produced indicate positive changes in test values, with all results showing significant differences after nine months of participation in the dance program. The greatest impact is for the displacement point of the March in Place Eyes Closed 30 Seconds test, which reveals an improvement in spatial orientation ability. In conclusion, the participation of institutionalized children in a dance program contributes to the optimization of their motor skills and the stimulation of their bodily-kinesthetic and visual-spatial intelligences, therefore we consider it appropriate to deepen the study of dance as a means of developing multiple intelligences through educational programs implemented in schools.*

Keywords: *dance; motor skills; institutionalized children; bodily-kinesthetic intelligence; visual-spatial intelligence.*

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Introduction

Through their specific content, sports activities influence the path towards general education in motor, intellectual, aesthetic, and emotional terms (Gevat et al., 2012), contributing to the formation of interests and motivation for achieving good results in other disciplines and fields, as well as to the bio-psychological development of a child (Popa et al., 2013). The values guiding each person throughout life are complementary to their well-being, and a very important role is played by their psychological processes (mental health), needs (relatedness, autonomy, competence), and ways of acting to achieve outcomes according to personal values and interests (Raymond & Raymond, 2019).

Sport and dance have a lot in common and are becoming increasingly complementary in practice, which is why they should attract the attention of specialists, who are suggested to study them together (Akinsipe, 2006). Bodily expression is defined by specialized authors as a phenomenon that involves cognitive processes, motivations, attitudes, mental states, and various personality traits, contributing to children's psychomotor development; they consider it necessary to educate the expressive aspects of motor skills, and dance is one of the sporting and artistic activities through which bodily expressiveness and musicality are stimulated (Manos, 2016). Dance is the most representative artistic field that allows for the development of creativity, originality, sociability, and aesthetic posture through movement, therefore including it in the school curriculum could be beneficial for the development of children's personality (Macovei et al., 2013).

Institutionalized children represent a risk-factor category from the perspective of social integration. Specialists are concerned to examine educational and social exclusion because this phenomenon starts in adolescence, a period of change that leaves its mark on behavior, psychological orientation, values, interests, and social interaction (Tudor et al., 2020).

Physical activity is a means of social integration and harmonious bodily development. Starting from the hypothesis that the systematic participation of institutionalized children in a dance program contributes to the development of their motor skills, an intervention model based on dance content was designed for this study. The purpose of this program was to improve the skills of preadolescents raised in foster care, to increase their physical performance, and to stimulate their bodily and visual-spatial intelligences, given that moving across the entire dance floor area stimulates spatial orientation, and the complexity of dance steps involves the control of all body segments, which develops kinesthetic intelligence.

To achieve the purpose of the research, we set objectives aimed at both highlighting the influence of dance on the development of institutionalized children and developing the methodological concept regarding the use of dance for institutionalized children at the age of preadolescence.

Literature review

The limitation of educational and financial resources hinders the development of cognitive and non-cognitive skills in children from disadvantaged backgrounds, and physical education lessons are not sufficient for their harmonious development (Damian et al., 2018). Specialized studies suggest that children who are raised in foster care have slower or poorer cognitive, linguistic, social, motor, or behavioral development compared to those who grow up with their families (Kaur, 2015). For this reason, programs for the educational and social integration of children included in at-risk categories have started to be implemented at national level in Romania. Extracurricular activities such as sports games, music, or dance have a positive impact on the motor and educational development of young people (Martin & Dowson, 2009), but also on their personality, which is influenced by motor, biological, functional, psychological, and moral skills (Dragnea et al., 2006).

Dance is a means by which multiple intelligences can be enhanced, particularly *musical-rhythmic* and *bodily-kinesthetic* ones (Becea, 2008). A group of 31 people aged 11-54 years participated in a six-month study that involved three dance workouts per week of 90 minutes each. At the end of this program, improvements in body control and reaction speed were noted (Bonavolontà et al., 2021). This sport is used as a form of therapy in specialized studies, proving its effectiveness in physical and cognitive terms. Dance differs from other activities through the choreographic means of stimulating creativity, which translate into motor skills (Corlaci, 2010). Space, time and force/energy become the basic elements that make up the dance form with its specific structures (Kassing & Jay-Kirschenbaum, 2020).

Gardner (1983) defines intelligence as "the ability to solve problems or create products that are valued within one or more cultural settings", and describes eight types of intelligence: intrapersonal (emotional), interpersonal (social), logical-mathematical, verbal-linguistic, visual-spatial, bodily-kinesthetic, musical, and naturalistic. The traditional school system mainly depends on visual and verbal intelligences; however, a study carried out with 168 students has found that young people prefer active learning, which involves movement and emotional input, for example, kinesthetic and musical intelligences (Eccles & Wigfield, 2002).

According to a detailed analysis of the human brain, there are certain portions of the nervous system that influence intellectual abilities, and some specialists believe that the period of childhood can quickly and safely develop these qualities if they are stimulated through various activities that ensure the individual's harmonious growth from several points of view, while also discovering their predominant abilities (Piaget, 2005). In a physical and psychological sense, adolescence represents the most important stage of development, during which personality is built. The influences of the growing environment and the activities carried out are crucial for the physical and mental development of children (Melguizo-Ibanez et al., 2022).

Art and music activities are important benchmarks for children's education, as they stimulate cognitive and psychomotor development (Benic et al., 2017). A study involving 85 physical education teachers has revealed that esthetic movements are appreciated by students and that one of their favorite contents is gymnastics, an artistic sport included in the school curriculum (Stănescu, 2013).

Educational interventions implemented in programs designed for institutionalized children verify the effectiveness of complex means of training that could influence their multidimensional development. Among these means, dance has been identified as a sport that develops coordination, rhythmicity, motor skills, and spatiotemporal orientation through body movements (Zahiu et al., 2020).

Considered as a sensorimotor complex that includes physical, cognitive, and social elements (Merom et al., 2013), dance for all requires the acquisition of an optimal state of health, improved mental performance, harmonious physical development, and facilitation of communication in society (Aducovschi, 2007). It involves both anaerobic and especially aerobic effort. Such activities have been shown to reduce excess weight, correct posture, strengthen muscles, improve balance, muscle strength, and endurance (Ward, 2008), support brain activity, and reduce the rate of brain aging by stimulating attention, coordination, and creativity (Alves, 2013).

A dance program was implemented in a New York school for 64 students in grades 4 and 5, who benefited from a 16-week daily after-school study of free dance in the Mambo, Cha-Cha, Hip-Hop, and Swing styles. At the end, positive changes were found in terms of body composition, endurance, biological aspects – heart rate and diabetes risk (Hogg et al., 2012).

Also, 30 professional dancers participated in a study on visual discrimination, hand-eye coordination ability (Shape Constancy Test, a component of CAS++ test), and spatiotemporal orientation ability (MacQuarrie Test for Mechanical Ability, Tracing and Dotting subtests).

The items of these tests relate to shape constancy, shape-background discrimination, and detail perception. The investigated athletes scored "very good" for coordination ability. A female advantage was noted, but the differences were not significant (Zahiu et al., 2019).

This research was carried out following a comparative study involving 29 institutionalized children and 25 dancers from organized families, with ages between 11 and 12 years, who were tested using the Optojump device. Test results suggested better developed motor skills in dancers compared to institutionalized children, especially for lower limb power (Tomescu et al., 2022). Based on these results, we developed a dance program applicable to the group of institutionalized children, with the aim of improving their motor qualities and coordination abilities.

Analyzing the previously presented aspects related to the benefits of dance, as well as the development trends of the concept of intelligence, we addressed this topic as a result of identifying the problems faced by children in foster homes. There are studies on the use of dance as a therapeutic method, but no data on the association of this sport with educational programs for institutionalized children.

Through the dance program, we aimed to stimulate the development of visual-spatial and bodily-kinesthetic intelligences, so the tests selected for this research assess lower limb power, reaction speed, repetition speed, and spatial orientation. *Visual-spatial intelligence* requires a good knowledge of surrounding objects and spaces, either by anticipating materials, volumes, profiles, and other properties, or by memorizing these aspects through the visual or tactile senses; this type of intelligence is well developed in dancers due to the activities carried out on different types of scenes (Nicholson-Nelson, 1998). It includes the ability to create a visual-spatial representation of the world and to transpose it at a mental level (Van den Stock et al., 2008). *Bodily-kinesthetic intelligence* is the ability to use a certain part of the body in different ways and to control its movements so as to express as many states and feelings as possible (Gardner, 1983; this type of intelligence is well developed in athletes and especially in artists (Root-Bernstein & Root-Bernstein, 2003).

Methodology

Previous studies demonstrate the effectiveness of dance for the harmonious physical and intellectual development of preadolescents, so we developed a dance program for a group of 29 institutionalized children aged 11-12 years. The research was conducted over a nine-month period, with a frequency of two training sessions per week of 60 minutes each. Our intervention aimed at improving motor skills and was based on the

consolidation of steps from different dance styles, being performed individually, in pairs, or in groups. The dance program is adapted to the training level of each participant, so that there is progress from a mental and physical point of view, starting from the hypothesis that systematic participation in a dance program influences the motor and psycho-social development of children. The variety of activities included in the program consists of: movement esthetics and basic positions from classical ballet, modern dance, dancesport (Latin and standard), folk dance, street dance, and aerobic dance. The program took place in the dance hall of the Magic-Star Club in Constanta, located inside the House of Culture, and in children's foster homes: 'Antonio", "Micul Rotterdam" (Little Rotterdam) – in Constanta, "Delfinul" (The Dolphin) – in Agigea, and "Callatis" in Mangalia.

The dance lesson is consistent with the sports training lesson and has the following structure:

- Preparatory part (15 minutes) – includes group organization and selective influencing of the musculoskeletal system;
- Fundamental part (40 minutes) – contains the dance-specific lesson topics;
- Final part (5 minutes) – consists of stretching exercises and muscle relaxation techniques, accompanied by specific music (nature sounds, classical music genre).

The assessment was performed with the Optojump device, which is used by researchers due to its efficiency in establishing reliable physical results (Muehlbauer et al., 2017). This is an innovative measurement system through which the progress and development of athletes can be recorded with the aim of optimizing their performance based on accurate and objective results (Pelin et al., 2014). The test variables selected for our study can be associated with visual-spatial and kinesthetic intelligences.

The Optojump device uses a software program that stores the participants' data and results, which makes it possible to observe their progress and compare the results of the same person at different times of testing. For this research, we selected tests measuring lower limb power, reaction speed, repetition speed, and spatial orientation:

- *15 Sec Jumps* – involves jumping in place on both legs for 15 seconds and assesses lower limb power, recording flight time, contact time, and height for each jump, as well as lower limb power;
- *5 Jumps Single Leg Right Left/Right* – involves 5 jumps left/right only on the right leg; this test reveals the power and height of the jumps for one leg;

- *5 Jumps Single Leg Left Left/Right* – involves 5 jumps left/right only on the left leg; this test reveals the power and height of the jumps for one leg;
- *Acoustic/Visual Reaction* – assesses the reaction speed of the athlete, who must perform a jump as soon as possible after receiving acoustic or visual stimuli;
- *March in Place Eyes Closed 30 Seconds* – involves walking on the spot with eyes closed for 30 seconds and records the number of steps and the surface traveled from the starting position; thus, the athlete's spatial orientation can be assessed;
- *Rep Speed* – measures the repetition speed of the athlete, who must run on the spot for 10 seconds with maximum step frequency, tracking the power and number of steps.

Picture 1. *Testing children with the Optojump device*

Results

Statistical analysis is performed using the Dependent Samples t-Test in order to compare the scores and analyze whether the differences between the initial and final testing are significant for the same group of subjects. The effect size of the dance program on the subjects (Cohen's d) and the best developed physical ability following the intervention were also determined.

Table 1. *Statistical description of the results obtained by institutionalized children in Optojump tests – final testing*

Pairs		Mean	N	Std. Dev.	Std. Error Mean
1	15_J_Height [cm] T0	5.46	29	2.65	.49
	15_J_Height [cm] T1	7.96	29	4.05	.75
2	15_J_Power [W/Kg] T0	9.25	29	4.46	.82
	15_J_Power [W/Kg] T1	12.94	29	6.30	1.17
3	5_RL_Height [cm] T0	4.85	29	1.23	.22
	5_RL_Height [cm] T1	6.52	29	2.66	.49
4	5_RL_Power [W/Kg] T0	1.95	29	.40	.07
	5_RL_Power [W/Kg] T1	3.09	29	1.11	.20
5	5_LL_Height [cm] T0	4.04	29	1.30	.24
	5_LL_Height [cm] T1	5.59	29	2.77	.51
6	5_LL_Power [W/Kg] T0	1.95	29	.55	.10
	5_LL_Power [W/Kg] T1	3.02	29	3.97	.73
7	AV_ReactionTime [s] T0	.97	29	.34	.06
	AV_ReactionTime [s] T1	.67	29	.18	.03
8	MY_Nsteps T0	34.38	29	9.05	1.68
	MY_Nsteps T1	36.03	29	8.41	1.56
9	MY_Jumping Point [cm] T0	167.07	29	55.50	10.30
	MY_Jumping Point [cm] T1	104.98	29	49.24	9.14
10	SR_Nsteps T0	21.38	29	5.47	1.01
	SR_Nsteps T1	25.24	29	5.95	1.10
11	SR_Power [W/Kg] T0	.20	29	.19	.03
	SR_Power [W/Kg] T1	1.44	29	1.05	.19

This analysis involves a comparison between the initial time T0 of the test and the end of the study. Mean scores indicate improvements in lower limb power and reaction time (T0 = 0.97 sec vs. T1 = 0.67 sec). Repetition speed increased from a frequency of 21.38 steps to an average of 25.24 steps at the end of the program. Two-leg jumps were performed with a power that increased from 9.25 W/Kg in the initial phase to 12.94 W/Kg

in the final phase. Single-leg jumps also improved in terms of both power and height, especially for the right leg (5_RL_Height T0 = 4.85, T1 = 6.52).

Differences between the two testing phases are significant for all motor tests applied. Table 2 highlights that only the power of jumps on the left leg does not show a significant increase ($p = 0.081$). Both one- and two-sided (one- and two-tailed) significance levels indicate that there are significant differences between the two measurements (T0 and T1), with the significance indicator value being less than 0.001 ($p < 0.001$) for almost all variables.

Table 2. *T-Test results for Optojump tests applied to institutionalized children – final testing*

		Paired Differences							Significance	
					95% Confidence Interval of the Difference					
	Pairs	Mean	Std. Dev.	Std. Error Mean	Lower	Upper	t	df	One-Sided p	Two-Sided p
1	15_J_Height [cm] T0 - T1	-2.49	3.52	.65	-3.84	-1.15	-3.81	28	**<.001**	<.001
2	15_J_Power [W/Kg] T0 - T1	-3.69	5.43	1.008	-5.76	-1.62	-3.66	28	**<.001**	.001
3	5_RL_Height [cm] T0 - T1	-1.66	2.18	.404	-2.49	-.83	-4.11	28	**<.001**	<.001
4	5_RL_Power [W/Kg] T0 - T1	-1.13	1.22	.22	-1.60	-.67	-5.01	28	**<.001**	<.001
5	5_LL_Height [cm] T0 - T1	-1.55	2.81	.52	-2.62	-.48	-2.96	28	**.003**	.006
6	5_LL_Power [W/Kg] T0 - T1	-1.07	4.02	.74	-2.60	.45	-1.43	28	.081	.162
7	AV_ReactionTime [s] T0 - T1	.304	.3	.05	.18	.42	5.09	28	**<.001**	<.001
8	MY_Nsteps T0 - T1	-1.65	3.09	.575	-2.83	-.47	-2.87	28	**.004**	.008
9	MY_Jumping Point [cm] T0 - T1	62.09	68.61	12.74	35.99	88.19	4.87	28	**<.001**	<.001
10	SR_Nsteps T0 - T1	-3.86	4.06	.755	-5.41	-2.31	-5.11	28	**<.001**	<.001
11	SR_Power [W/Kg] T0 - T1	-1.24	1.07	.19	-1.65	-.83	-6.21	28	**<.001**	<.001

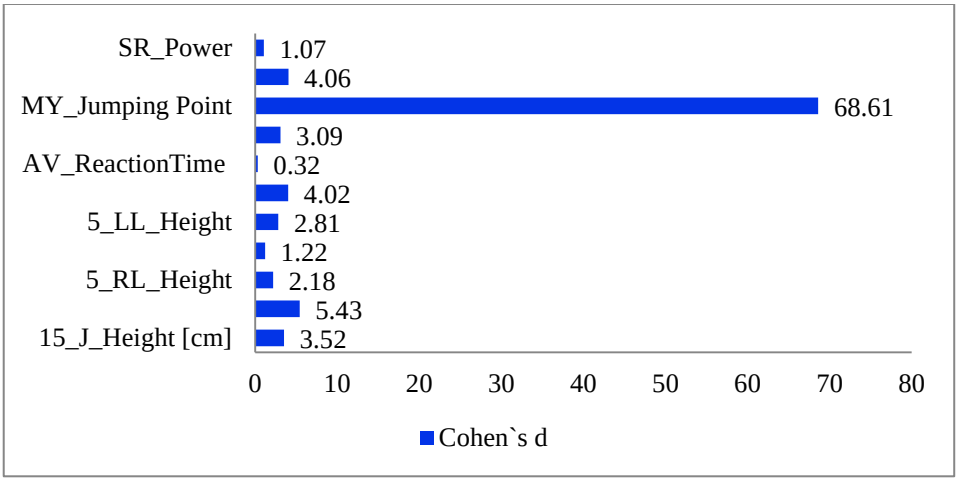
Cohen's d value must be greater than 0.50 for the effect size of the dance program to be significant and greater or equal to 0.80 for the magnitude to be considered strong. Motor results are impressive because, except for the test measuring reaction speed (*Acoustic/Visual Reaction* – Cohen's d = 0.32), all other variables recorded values well above 0.80.

Table 3. *Effect size of the dance program on motor ability*

	Pairs		Standardizer[a]	Point Estimate	95% Confidence Interval	
					Lower	Upper
1	15_J_Height [cm] T0 - T1	Cohen's d	**3.52**	-.70	-1.11	-.29
		Hedges' correction	3.62	-.68	-1.08	-.28
2	15_J_Power [W/Kg] T0 - T1	Cohen's d	**5.43**	-.68	-1.08	-.27
		Hedges' correction	5.58	-.66	-1.05	-.26
3	5_RL_Height [cm] T0 - T1	Cohen's d	**2.18**	-.76	-1.17	-.34
		Hedges' correction	2.24	-.74	-1.14	-.33
4	5_RL_Power[W/Kg] T0 - T1	Cohen's d	**1.22**	-.93	-1.36	-.48
		Hedges' correction	1.25	-.90	-1.32	-.47
5	5_LL_Height [cm] T0 - T1	Cohen's d	**2.81**	-.55	-.93	-.15
		Hedges' correction	2.89	-.53	-.91	-.15
6	5_LL_Power [W/Kg] T0 - T1	Cohen's d	**4.02**	-.26	-.63	.10
		Hedges' correction	4.13	-.26	-.61	.10
7	AV_ReactionTime [s] T0 - T1	Cohen's d	**.32**	.94	.50	1.38
		Hedges' correction	.33	.92	.48	1.34
8	MY_Nsteps T0 - T1	Cohen's d	**3.09**	-.53	-.92	-.14
		Hedges' correction	3.18	-.52	-.89	-.13
9	MY_Jumping Point[cm] T0 - T1	Cohen's d	**68.61**	.90	.46	1.33
		Hedges' correction	70.52	.88	.45	1.29
10	SR_Nsteps T0 - T1	Cohen's d	**4.06**	-.94	-1.38	-.50
		Hedges' correction	4.18	-.92	-1.34	-.49
11	SR_Power [W/Kg] T0 - T1	Cohen's d	**1.07**	-1.15	-1.62	-.67
		Hedges' correction	1.10	-1.12	-1.57	-.65

According to the results shown in Table 3, our study had an impact on children's motor development, the effect size being remarkable for all variables. We can note in Graph 1 that the highest value belongs to the displacement point coefficient of the *March in Place Eyes Closed 30 Seconds* test (68.61), which is well above the values of the other variables.

Graph 1. *Effect of the dance program on the development of physical abilities*



Limitations and discussions

The literature describes the contribution of dance to the improvement of physical and mental well-being, and there are countless studies that support the importance of music and dance therapy in improving quality of life. However, there is little information on the applicability of dance in the context of institutionalization. Improvements in cognitive and non-cognitive skills are also reported following the constant practice of dance, but very little research has associated dance with the development of multiple intelligences.

Some specific intervention programs or physical and artistic activities can protect institutionalized children from certain negative consequences and can contribute to a harmonious physical development comparable to that of children from organized families (Engle et al., 2011). The educational system should be constantly updated and respond to the needs of new generations of children. A recent study highlights the importance of dancesport for the development of learning strategies and intelligence types in institutionalized children, and its results are benchmarks for inclusive education and practice at the age of preadolescence, from the perspective of school vectors (Tomescu et al., 2023).

Specialists in the field consider it necessary to design educational programs aimed at developing non-cognitive skills and physical abilities because education is insufficiently focused on stimulating self-confidence and managing emotions or social skills, and the effect of the unmotivating educational system is reflected in the number of students who lose their concentration and interest in school performance during high school (Durlak et al., 2011). Young people's interest in practicing physical activities can be maintained through activities performed with a musical background, which means charging oneself with energy and releasing energy, and this provides satisfaction and good mood (Teodorescu & Bota, 2008).

Following this study, we have identified the children's desire to practice art in any form, but financial issues limit their opportunities to participate in programs that require them to get out of their foster homes. The staff in foster care is sometimes insufficient to be able to accompany the children to various activities that they want to do; for this reason, without the help of specialized institutions, the possibilities of implementing a program similar to the one applied in this research are minimal in many foster homes.

Conclusions

The stimulation of physical abilities, as well as visual-spatial and bodily intelligences through dance, validates the hypothesis that the participation of institutionalized children in a dance program contributes to the optimization of their lower limb power, reaction speed, repetition speed, and spatial orientation. The motor effects assessed with the Optojump device indicate impressive positive changes in test values, with all results highlighting significant differences after nine months of studying dance. The greatest impact is for the displacement point of the *March in Place Eyes Closed 30 Seconds* test, which reveals an improvement in spatial orientation ability. Certain dance styles included in the program require very good body control, or involve specific basic jumping steps. These aspects place demands on the lower limb muscles, highlighting a significant improvement in lower limb power.

This study was oriented towards the axis of research on motor activities as priority resources for improving quality of life and increasing human performance. We consider it appropriate to deepen the study of dance as a means of developing multiple intelligences through educational programs implemented in schools, and this hypothesis can be exploited in future experimental studies aimed at inclusive education and bio-psycho-social development of preadolescents. There are schools that have used the

theory of multiple intelligences in their school curricula and have noted improvements in student performance on assessment tests; thus, student scores increased by 20% at a school in Maryland in just one year after adopting the new educational model. This example was followed by other Chicago schools where, according to a study with 288 students in grade 4, a connection was found between their logical-mathematical intelligence and their ability to read and comprehend a text (McMahon et al., 2004).

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