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Original Article

The Effectiveness of Body Percussion Rhythmic Exercises on Motor Skills in Children with Mild Intellectual Disability Between 8-12 Years Old

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ABSTRACT

Background and Objective: Intellectual disability is a common neurological disorder that involves concomitant impairments in mental and adaptive functioning and begins during the developmental period. Percussion is a rhythmic movement activity and the art of body- slapping to produce a variety of sounds for educational, therapeutic, ethnological and social purposes. The purpose of this study was to investigate the effectiveness of percussion rhythmic exercises on motor skills of mild mentally disabled children.

Methods: This is a randomized clinical trial in which 60 children with mild intellectual disability aged 8 to 12 years were selected by convenience sampling and divided into two groups: experimental (n = 31) and control (n = 29). The experimental group received body percussion exercises as a group for 12 weeks, 2 sessions per week and 30 minutes per session and the control group received only the usual school schedule. Both groups were evaluated before and after by Bruininks-Oseretsky Test of Motor Proficiency. Paired T-test was used for intra-group comparisons and independent T-test was used to compare the two groups.

Results: Results indicated that body percussion rhythmic exercises had a significant effect on some motor items including: fine motor skills, bi-lateral coordination, upper-limb coordination, visual-motor control, speed and upper- limbs speed and dexterity.

Conclusion: Therefore, it can be stated that group body percussion rhythmic exercises is a good way to improve motor skills in children with mild intellectual disability.

Keywords: Rhythm, Body Percussion, Motor skills, Mild intellectual disability

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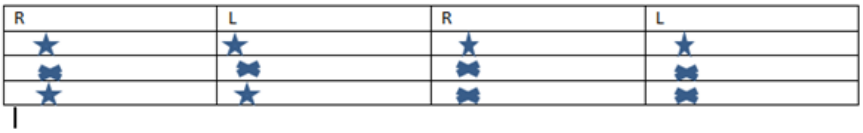
Introduction

According to the DSM-5, intellectual disability is a neurodevelopmental disorder that begins in childhood and is characterized by intellectual difficulties as well as difficulties in conceptual, social, and practical areas of living (APA,2013). In Iran, the intellectually disabled constitute 1% to 3% of the population (Nesayan & Gandomani, 2016) with a mild or educable type accounting for more than 66% of the population (Ghamari, Rafeei, Soltani, & Ghamari, 2016). These individuals have deficits in several areas such as communication, daily living skills, and motor skills (Daf-

Table 1. Exersice samples



tari, Behnia, Rassafiani, Sajedi, & Biglarian, 2014). Motor skills play a very important role in learning and provide the basis for the development of other important learned aspects such as educational and social skills (Pahlevanian, Rasoolzadeh, & Khalily, 2012). Regarding this, ocuupational therapists use a variety of interventions, one of which is music activity.

One of the subsections of music education is "music and movement". Body percussion is a fringe discussion of the different types of rhythm exercises in which the body presents itself as an audio element (Ahokas, Burger, & Thompson, 2014) and as the first musical instrument from which we can obtain an infinite range of training resources through verbal beats and sounds that create organized skills and mastery of movement (FJ Romero-Naranjo, 2013). This method has been chosen as a training method and can be run without any additional tools and can be easily ported to any accessible environment (Ahokas et al., 2014). Also, it can be performed individually, in paired groups or in groups with more than 3 people (in a circle, a semicircle, square or linear). Each of the aforementioned layouts stimulates individuals' physical and social interaction in a different way (F. J. Romero-Naranjo, 2014). Various limb movements, such as clapping, slapping, tapping, finger snapping and stomping, produce sounds with varying amplitudes that generate rhythm. Percussion training enhances the nervous system's sensitivity, rhythm knowledge about time and space and self- expression (Ahokas et al., 2014). Importantly, different cortical and subcortical regions in both hemispheres are stimulated during these activities.

As such, movement affects the prefrontal cortex, cerebellum, and basal nuclei. To properly perform body movements, cognitive aspects such as memory and attention are involved, which itself activates various areas of the brain, including the frontal cortex, cerebellum, and hippocampus. The motivational aspects of learning new skills also stimulate the limbic system, which in turn enhances learning (Ghaffarian, 2014). Group body percussion exercises facilitate direct experience-based learning (learning by doing) and provide an opportunity and space for individuals to creatively and collectively learn group skills (A. Romero- Naranjo, Romero Naranjo, & Bofill, 2016). In addition to developing such skills in the school environment, they contribute to the overall educational, individual and social development and provide opportunities for increased creativity and exploratory behavior, friendships that facilitate individual maturity and abilities related to learning and motivation (Moral-Bofill, Romero-Naranjo, Albiar-Aliaga, & Cid-Lamas, 2015). Research show that applying this method improves cognitive skills, visual-spatial abilities, psychomotor activities (including awareness of one's own body, hand-eye coordination, writing skills, laterality) (A. Carretero-Martínez & Romero-Naranjo, 2015), executive functions (Cozzutti, Guaran, Blessano, & RomeroNaranjo, 2017), socioemotional stimuli (Marcuzzi & Romero-Naranjo, 2017), and friendly relationships (Fabra-Brell & Romero-Naranjo, 2017). The present study investigated the effectiveness of this method in children with mild intellectual disability.

Materials and Methods

Trial Design

This study is a randomized clinical trial, with code of ethics IR.IUMS.REC.1397.1132, and trial ID 39719. Bruininks-Oseretsky Test of Motor Proficiency was performed by a blinded assessor before and after the intervention.

Randomization

Initially two schools that were willing to cooperate with the research project were selected through convenience sampling and sixty students with inclusion criteria were enrolled in the study and then randomly assigned to two groups of experimental (n=31) and

Table 2. Comparison of mean and standard deviation of variables with normal distribution before and after treatment using paired T-test

Variables	Group		Number	Mean	Standard Deviation	T	Significance Level
Balance	Test	Pre-test	29	23.2414	7.69348	-4.429	0.000
		Post-test		27.4483	5.57152		
	Control	Pre-test	28	17.1786	10.24895	-2.787	0.010
		Post-test		19.0714	10.44537		
Bi-lateral coordination	Test	Pre-test	29	6.6207	2.45552	-7.616	0.000
		Post-test		9.6207	2.59689		
	Control	Pre-test	28	5.2143	3.22441	-1.952	0.061
		Post-test		5.7500	3.63751		
Strength	Test	Pre-test	29	9.4828	4.05868	-8.885	0.000
		Post-test		13.1034	4.16915		
	Control	Pre-test	28	8.2143	5.10887	-2.892	0.007
		Post-test		9.5714	6.23270		
Upper- limb coordination	Test	Pre-test	29	10.6207	4.67832	-5.547	0.000
		Post-test		13.8621	5.04072		
	Control	Pre-test	28	9	5.46368	-0.926	0.363
		Post-test		9.5357	6.15529		
Visual-motor control	Test	Pre-test	29	13	4.40779	-7.045	0.000
		Post-test		16.6552	2.66292		
	Control	Pre-test	28	10.5000	4.02308	-3.544	0.001
		Post-test		12.1429	4.24015		
Upper-limb speed and dexterity	Test	Pre-test	29	16.1034	5.62739	-8.033	0.000
		Post-test		21.8621	5.65511		
	Control	Pre-test		13.7143	5.58342	-3.949	0.001
		Post-test		16.6429	6.09927		
Gross motor skills	Test	Pre-test	29	43.7586	14.15641	-10.698	0.000
		Post-test		57.2069	11.80913		
	Control	Pre-test	28	33.8571	19.65200	-5.159	0.000
		Post-test		38.7857	21.10881		
Fine motor skills	Test	Pre-test	29	30.2069	9.75185	-9.979	0.000
		Post-test		40.1034	7.71522		
	Control	Pre-test	28	25.2500	9.7282	-5.326	0.000
		Post-test		30	10.59000		

Table 3. Intra-group comparison of variables with abnormal distribution before and after treatment using Wilcoxon test

Variables	Groups	Number	Z	Significance Level
Running speed and agility	Test	29	-1.802	0.072
	Control	28		
Response speed	Test	29	-0.963	0.335
	Control	28		

Table 4. Comparison of mean and standard deviation of variables with normal distribution in two groups of test and control using independent T-test

Variables	Groups		Number	Z	Significance Level
Running speed and agility	Test	Pre-test	29	-3.930	0.000
		Post-test			
	Control	Pre-test	28	-2.740	0.006
		Post-test			
Response speed	Test	Pre-test	29	-2.122	0.034
		Post-test			
	Control	Pre-test	28	-1.508	0.132
		Post-test			

Table 5. Comparison of variables with abnormal distribution in two groups of test and control using Mann-Whitney U test

Variables	Groups		Number	Mean	Standard Deviation	T	Significance Level
Balance	/Pre-test	Test	29	4.2069	5.11566	1.970	0.054
	Post-test	Control	28	1.8929	3.59361		
Bi-lateral coordination	/Pre-test	Test	29	3	2.12132	5.100	0.000
	Post-test	Control	28	0.5357	1.45251		
Strength	/Pre-test	Test	29	3.7931	2.25799	3.878	0.000
	Post-test	Control	28	1.3571	2.48274		
Upper- limb coordination	/Pre-test	Test	29	3.2411	3.14705	3.289	0.002
	Post-test	Control	28	0.5357	3.06089		
Visual-motor control	/Pre-test	Test	29	3.6552	2.79382	2.886	0.006
	Post-test	Control	28	1.6429	2.45273		
Upper-limb speed and dexterity	/Pre-test	Test	29	5.7586	3.86056	2.744	0.008
	Post-test	Control	28	2.9286	3.92455		
Gross motor skills	/Pre-test	Test	29	13.5862	6.54390	5.576	0.000
	Post-test	Control	28	4.9286	5.05473		
Fine motor skills	/Pre-test	Test	29	9.8968	5.34085	3.850	0.000
	Post-test	Control	28	4.7500	4.71895		

control (n=29). The mean age of the test group was 9.6 and the mean age of the control group was 9.4.

Participants

In the schools in question, inclusion criteria were considered while selecting 60 samples. Inclusion criteria for all participants included: Diagnosis of mild intellectual disability (educable) according to the Department of Special Education, age range of 8-12 years, no neurological disorders such as cerebral palsy, epilepsy and seizures, accompanying psychiatric disorders such as attention deficit / hyperactivity disorder and autism, lack of orthopedic disorders that cause problems in child movement, and lack of visual and hearing impairment that impair understanding of instructions. After selecting the samples, the project was described to the targets' parents and teachers and demographic questionnaire and consent form were completed. Exclusion criterium was no lack of cooperation of the students or their family. By the end of the intervention, after omitting 2 cases the experimental group had 29 cases and the control group had 28 cases after omitting only 1 sample.

Setting

This study was conducted in Kashefi Kashani Mashhad boys and girls schools in autumn and winter of 2018.

Intervention

Both groups had traditional school education as the underlying treatment, and the experimental group received music percussion interventions in groups for 12 weeks and two 30 minutes sessions per week. Students would visit between 8 AM and 12 AM during the designated groupings for practice. The exercises were researcher-made and selected from simple to complex, based on team experience, resource review, and under the supervision of rhythmic instrument experts. The focus was on teamwork and included aspects of social skills such as teamwork, ability to adapt to the group, play and leisure, eye contact, expressing emotion, and actively participating in the group. Four percussions were selected which included: clapping, hitting on the thigh, Hitting on the chest, stamping the feet. A symbol was defined for each percussion and arranged in tables to practice as a template. For example, the thigh was defined with the star symbol and the chest with the cross symbol. Table 1 shows the samples.

Bruininks-Oseretsky Test of Motor Proficiency

It is one of the most commonly used tests in motor performance assessment and is a standard reference test that measures motor skills of 4.5 to 14.5 years old children and consists of eight sub-tests with 46 items. It takes 45-60 minutes to complete the whole test. The full test consists of eight sub-tests including four gross motor skills tests (running, balance, bi-lateral coordination and strength), one upper-body coordination skills test, and three sub- tests evaluate fine motor skills (response speed, visual-motor control, upper-limb speed and dexterity) . The validity of this test was 0.78, the inter-rater reliability was 0.99 - 0.92 before and after the test, 0.80 to 0.80 (Soltanikhadiv, Kamali, Rafiei, & Taghizade, 2014).

Statistical Method

Data were analyzed by SPSS 21 (SPSS Inc., Chicago, IL. USA) (significance level $P<0.05$). Normality of data distribution was assessed by Kolmogorov-Smirnov test. Paired t-test (Table 2) and Wilcoxon (Table 3) were used to compare within-group scores. Independent T-test (Table 4) and Mann-Whitney U test (Table 5) were used to compare the scores of the two groups.

Results

According to the results (Tables 2-5), there is a significant difference in the variables of bi-lateral coordination, upper- limb coordination, visual-motor control, upper -limb speed and dexterity and skill, gross and fine motor skills, meaning that intervention of body percussion rhythmic exercises were effective on these motor items. But in the items of balance, speed and agility and speed of response, there was no significant difference between groups.

Discussion

The findings of the study confirmed that a percussion rhythmic program based on the group participation of students in school has a significant effect on some motor items. Various studies have investigated the efficacy

of body percussion on eye-hand coordination (A. Carretero-Martínez & Romero-Naranjo, 2015; Colomino & Naranjo, 2014), body coordination (Cozzutti, Blessano, Biaggio, Tomasin, & Romero-Naranjo, 2017; Ahokas et al., 2014) and confirmed the improvement of psychomotor skills (Andrea Carretero-Martínez, Romero-Naranjo, PonsTerrés, & Crespo-Colomino, 2014). Body percussion activities play an important role in improving children's learning by activating all areas of the brain including cognitive types of attention, muscle and rhythmic memory, fine motor skills, and emotional and social aspects (Colomino & Naranjo, 2014). This is in line with the results of this study. Results also showed that percussion rhythmic exercises did not have a significant effect on running items, balance and response speed. To increase speed, one must practice the ability to use maximum force during very fast movements.

In the present study, the focus of the exercises was on proper percussion on the desired part of the body and producing rhythmic sound from the body. The same is true of agility and balance. Since these children are slower than their peers in initiating and performing target movements, reaction times, and movement times (Kahrizsangi, Salehi, & Heydari, 2012) and need to spend longer time on learning, accelerating so dealing with agility and balance was virtually impossible. In addition, by searching for various articles in the field of percussion or rhythmic movements, no study was found to confirm the effectiveness of such exercises on running and agility. Inconsistent studies of response speed, or speed of action, include the 2017 Cozzotti study showing that percussion stimulation, improves memorized motor sequence and implementing more tasks simultaneously (Cozzutti, Guaran, et al., 2017). Also, a 2014 study by Colomino and Naranjo confirms that body percussion rhythmic exercises can help the process of recovery of dyslexic individuals in terms of speed of action (Colomino & Naranjo, 2014). To justify the insignificance of items for running, balance, and response speed, the 24-session intervention period seems to be too short to improve for educated children or the time allocated to each session (30 to 45 minutes) is insufficient.

Conclusion

The body percussion method is one of the types of stimuli that is physically non-terminable and almost readily available. Therefore, it can be used as an effective and enjoyable therapeutic modality in a variety of sectors, including rehabilitation of intellectually disabled children and motor retardation, in accordance with scientific principles.

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The authors would like to thank the families of all the children who participated in this study. Also they appreciate the help of the staff of the schools where this study was conducted, for their cooperation.

Conflict of Interest

No conflict of interest was declared by the authors.

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مقالهٔ پژوهشی

بررسی اثربخشی تمرینات ریتمیک بادی پرکاشن بر مهارت‌های حرکتی کودکان کم‌توانی ذهنی خفیف ۱۲-۸ سال

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چکیده

زمینه و هدف: کم‌توانی ذهنی یک اختلال شایع نورولوژیکی است که شامل نقص‌های هم زمان در عملکردهای ذهنی و سازگارانه است و در طول دورهٔ رشدی شروع می‌شود. بادی پرکاشن یک فعالیت حرکتی ریتمیک و هنر ضربه‌زدن به بدن برای تولید انواع صداهای مختلف برای اهداف آموزشی، درمانی، قوم‌شناسی و اجتماعی است. هدف از این مطالعه بررسی اثربخشی تمرینات ریتمیک بادی پرکاشن بر مهارت‌های حرکتی کودکان کم توان ذهنی خفیف است.

روش کار: این مطالعه کارآزمایی بالینی تصادفی است که ۶۰ کودک کم‌توان ذهنی خفیف ۸ تا ۱۲ سال به صورت در دسترس انتخاب شدند و به روش تصادفی به دو گروه آزمون (۳۱نفر) و کنترل (۲۹ نفر) تقسیم شدند. گروه آزمون تمرینات بادی پرکاشن را در قالب گروهی برای ۱۲ هفته، ۲جلسه در هفته و هر جلسه ۳۰ دقیقه دریافت کرد و گروه کنترل فقط برنامه رایج مدرسه را دریافت کرد. هردو گروه به‌طور قبل و بعد توسط آزمون تبحرحرکتی برونینیکس ازورتسکی مورد ارزیابی قرار گرفتند. از آزمون T زوج برای مقایسه درون گروهی و از T مستقل برای مقایسه دو گروه استفاده شد.

یافته‌ها: نتایج حاکی از آن بود که تمرینات ریتمیک بادی پرکاشن تأثیر قابل توجهی در برخی آیتم‌های حرکتی از جمله: مهارت‌های حرکتی درشت و ظریف، هماهنگی دو طرفه، هماهنگی اندام‌های فوقانی، کنترل بینایی حرکتی، سرعت و مهارت اندام فوقانی دارد.

نتیجه‌گیری: بنابراین می‌توان اظهار کرد که اجرای گروهی تمرینات ریتمیک بادی پرکاشن یک راه مناسب برای بهبود مهارت‌های حرکتی در کودکان کم توان ذهنی خفیف است.

واژه‌های کلیدی: ریتم، بادی پرکاشن، مهارت‌های حرکتی، کم‌توانی ذهنی خفیف