ISSN Online: 2821-1936
Transactions on Data Analysis in Social Science
Journal Homepage: https://transoscience.ir

The Effect of Functional Training on Wrist Velocity and Eye- Hand Coordination's Subtest of Bruninks Osertsky Test in an 8-Year-Old Boy with Down Syndrome

M. Khalaji[1*], M. Aghdaei[2], M. K. Vaez Mousavi[3]

[1] Faculty of Physical Education and Sports Science, Shahid Beheshti University, Tehran, Iran
[2] Faculty of Physical Education and Sports Science, Shahid Beheshti University, Tehran, Iran
[3] University of Imam Hussein (AS), Tehran, Iran

ARTICLE INFO

Article History:
Received 19 December 2021
Received in revised form
4 January 2022
Accepted 5 March 2022
Available online 13 March 2022

Keywords:
Wrist Velocity
principle of specificity
Functional Training
Bruninks Osertsky Test
Down Syndrome

ABSTRACT

The goal of this study was to see how functional training affected the velocity of the wrist in reaching objects of various shapes (cylinder, cube, pyramid) and sizes (small, medium, large) as well as the eye-hand coordination subtest of the Bruninks Osertsky [1] test in an 8-year-old boy with Down Syndrome. The current study is an experimental design with a single individual. The Down Syndrome Association introduced one person with Down syndrome who was not suffering from any significant physical or motor problem (Gender: male; Age: 8 years old) to participate in the study. The motion analysis device was used to record the pretest and posttest of reaching to objects of various shapes and sizes, and the eye-hand coordination subtest of the Bruninks Osertsky test was performed. The participant took part in 24 functional training sessions, each lasting about 60 minutes (5 days a week). Each training session consisted of three 15-minute segments separated by a 5-minute break. The results revealed that the mean velocity of the wrist to reach the medium cylinder was higher than the others (V=596.83), as was the effect size (E=0.94). The mean of the wrist velocity in the posttest revealed that the participant performed better than in the pretest. In addition, when compared to the pre-test, the quantity, time, and velocity of implementation of nine sub-tests of eye-hand coordination rose in the post-test. These results Support earlier studies that claim that task-oriented training increases movement patterns in people with Down syndrome according to the notion of training specificity. Also, we followed up with the child's parents about his schoolwork after completing the exercises, he did his schoolwork more carefully.

1. INTRODUCTION

Today, many studies have been done in this field [2, 3]. Reaching and grasping skills is an important milestone in children's life. They provide functional independence and further capabilities for learning about the environment. Polastri and Barela [4] have suggested that infants with DS may be couldn't explore their own possibilities, thus they

* corresponding author: Maryam_khalaji_69@yahoo.com
Faculty of Physical Education and Sports Science, Shahid Beheshti University, Tehran, Iran

http://dx.doi.org/10.47176/TDASS/2022.22

require more time of movement experience in order acquiring and refining motor skills. For this purpose, we used functional training. One of the increasingly popular methods in the fitness industry is functional training. It has been considered to be a better alternative than traditional resistance training for improving various measures of muscular fitness including endurance, strength coordination, and balance.

2. RESULT

In the current study, the eye-hand coordination subtest of the Bruininks-Oseretsky test and the wrist velocity to reaching objects with different shapes (cylindrical, cubic, and prismatic) and varied sizes (small, medium, and big) in an 8-year-old Down syndrome child were examined.

The current study is a single subject, semi-experimental design study. The single-subject A1-B-A2 design was employed. Over the course of nine weeks, the study was divided into three sections. Four evaluations of the Bruininks-Oseretsky outcome measures were completed in the first two weeks (phase A1). During the following five weeks (phase B), the subject participated in intervention and eight evaluations were done and after intervention (phase A2) that was obtained after a week later, participant performed four evaluations.

The pretest and posttest were given and recorded to assess her ability to reach to objects with different shapes and sizes using a motion analysis device. Between the pretest and posttest, she has the same functional training. The participant was subjected to 24 60-minute sessions of functional eye-hand coordination program, 5 times per week. Each session of practice consisted of 3 15-minute parts divided by 5-minute rest intervals. The interventional program consisted of designed functional training that we used a foam pad and plastic plates, rocket, balloon, Cardboard and paperboard, glue, clipper, pencil, yarn, flashlight, laser for functional training.

Table 1. Description of the effect of functional training on velocity of wrist

variable	Time	index			index			
		mode	median	mean	range	Variance	SD	SE
Big prism	Pre-test	294	293	292.50	79	16156.95	63.11	11.97
	Post-test	401	402	402.33	232	44656.14	76.32	37.27
Medium prism	Pre-test	247	247	245.33	95	12441.17	51.54	15.32
	Post-test	459	463	464.50	169	116970.84	63.01	24.08
Small prism	Pre-test	196	193	195.83	82	38052.30	95.07	12.68
	Post-test	343	342	345	89	44698.42	111.42	12.82
Big cube	Pre-test	386	386	387.50	60	39668.69	109.17	9.86
	Post-test	528	525	525.50	238	52688.61	99.54	40.63
Medium cube	Pre-test	383	383.50	383.33	66	42193.27	85.41	9.56
	Post-test	520	520	523.17	181	29271.79	101.09	27.80
Small cube	Pre-test	198	197.50	198.07	79	38091.33	67.17	11.98
	Post-test	365	365	365.00	174	49920.96	83.43	25.24
Big cylinder	Pre-test	389	388.50	389.67	89	17699.64	63.04	13.38
	Post-test	545	545.50	548.00	87	132962.33	94.64	13.73
Medium cylinder	Pre-test	375	374.50	375.17	37	38243.71	85.56	6.35
	Post-test	595	593	596.83	154	69944.38	98.47	26.32
Small cylinder	Pre-test	209	209.50	209	95	38243.71	65.56	16.70
	Post-test	400	400	401	236	59765.58	74.47	32.78

Table 1.shows descriptive statistics for movement time (ms) of each shape with different sizes. The effect size of velocity of wrist in the cylindrical object was 0.94, indicating the huge effect of functional training on reaching skill.

Fig. 1. Reaching pattern training after marker installation

Table 2. Effect Size coefficient at velocity of wrist to reaching objects with different shapes and sizes

Statistics / Object	Effect size
Big prism	0.62
Medium prism	0.79
Small prism	0.73
Big Cube	0.64
Medium Cube	0.73
Small Cube	0.79
Big cylinder	0.81
Medium cylinder	0.94
Small cylinder	0.87

The result of table 2 revealed that the number of motor units in acceleration phase in reaching to objects with different shapes and sizes decreased.

The results of the pre-test and post-test of the Bruninks-Oseretsky test are investigated in the following table.

Table 3. The scores in each subtest of Bruninks-Oseretsky's eye- hand coordination subtest

Time / subtests	Sum of correct movement's score	
	Pre test	Post test
Subtest 1	0	0
Subtest 2	0	0
Subtest 3	0	1
Subtest 4	0	0
Subtest 5	0	1
Subtest 6	0	2
Subtest 7	2	10
Subtest 8	8	22
Subtest 9	0	2

3. CONCLUSION

Regarding the comparison between the pretest and the posttest, the participant has progressed towards the pretest. The significant kinematic features in the individual with Down syndrome include slow movements with unusual, less efficient patterns of co-ordination and high rates of failure. These differences may be due to organic

characteristics of individuals with Down syndrome such as slower reaction times due to slowness in perception, lower muscle tone and ligament laxity. Charlton, Ihsen, and Oxley and Asuk and Nadkrani [5,6] considered the difference in production of primary impulses as a cause of the slowdown in movement. The model proposed by Roy [7] showed that the processing rules for movements may be affected by specific background signs of object properties. Children with Down syndrome are expected to have problems in extracting information from an object or using background information to control a specific task. However, the shape of the object (cylindrical) and its size (medium) facilitated the processing and using of background information and its faster adaption with the size and shape of the subject's fingers. Since the path of motion was constant for all forms, the changes in the path of reaching were influenced by different conditions of the task.

As a result, the facilitating factor of appropriate shape and size minimizes the process of perception. In fact, the children with Down syndrome were able to make fast and right decisions in reaching movements which needed less difficulty in perception. The results were consistent with Roy's model (1983). In fact, the less the complexity of the object, the more quickly the perceptual system perceives and instructs the production system to move. The feasibility of exercises designed for children with Down syndrome was another important finding in the present study. Initially, there was a concern that the subject would have no desire to participate in the training process, since people with Down syndrome usually lack sufficient motivation to continue exercises. However, the subject's attended 92 percent of the training sessions and did not leave during this period, indicating the feasibility of the designed exercises for the purposes of the present study.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

REFERENCES

[1] Bruininks, R. H., & Bruininks, B. D. (1978). Bruininks–Oseretsky test of motor proficiency. Circle Pines, MN: American Guidance Service.

[2] Weiss, A. H., Kelly, J. P., & Phillips, J. O. (2016). Infantile nystagmus and abnormalities of conjugate eye movements in Down syndrome. Investigative Ophthalmology & Visual Science, 57(3), 1301–1309. https://doi.org/10.1167/iovs.15-18532

[3] Weiss, T., Kreitinger, J., Wilde, H., Wiora, C., Steege, M., Dalleck, L., & Janot, J. (2010). Effect of functional resistance training on muscular fitness outcomes in young adults. Journal of Exercise Science & Fitness, 8(2), 113–122. https://doi.org/10.1016/S1728-869X(10)60017-2

[4] Andrews, C. M. (2007). Participants' perspectives of an adapted physical education clinical field experience (Doctoral dissertation, University of Georgia). ProQuest Dissertations Publishing.

[5] Charlton, J. L., Ihsen, E., & Oxley, J. (1996). Kinematic characteristics of reaching in children with Down syndrome. Human Movement Science, 15(5), 727–743. https://doi.org/10.1016/0167-9457(96)00017-6

[6] Nadkarni, S., & Ashok, D. (2012). Enhancing eye-hand coordination with therapy intervention to improve visual-spatial abilities using "The re-training approach" in children with Down syndrome: Three case studies. Disability, CBR & Inclusive Development, 23(2), 87–94. https://doi.org/10.5463/dcid.v23i2.87

[7] Roy, E. A. (1983). Neuropsychological perspectives on apraxia and related action disorders. In A. F. Sanders & J. E. Ritter (Eds.), Memory and control of action (pp. 293–320). North-Holland. https://doi.org/10.1016/S0166-4115(08)61996-2