http:// ijp.mums.ac.ir
Original Article (Pages: 15323-15330)

The Effect of Observing a Point-Light Display on Learning Static Balancing in Children with Mild Mental Retardation and Healthy Children

Amir Dana[1], *Mir Hamid Salehian[2], Abdollah Hemayat Talab[3], Sepideh Sarvari[4]

[1] Associate Professor, Department of Physical Education, North Tehran Branch, Islamic Azad University, Tehran, Iran.

[2] Assistant Professor, Department of Physical Education, Tabriz Branch, Islamic Azad University, Tabriz, Iran.

[3] Assistant Professor, Department of Physical Education, Marand Branch, Islamic Azad University, Marand, Iran.

[4] Assistant Professor, Department of Physical Education, Urmia University of Technology, Iran.

Abstract

Background: The study compares the learning of static balance skill by observing a point-light display between children with mild mental retardation and healthy children.

Method: The subjects are 30 children with mild mental retardation (experimental and control groups) and 30 healthy children (experimental and control groups). The motor task includes a static balance in which the length of time children could perform the skill without error was measured as a dependent variable. Subjects perform the pretest (including one trial), the acquisition phase (including five 3-minute practice blocks), and the post-test (including one trial). The children in the experimental group observed a skilled model performing static balance skills in the form of a point-light display for two minutes before performing each block.

Result: The results show that the children with Mental Retardation who had observational practice performed better than their control group in the posttest. The results also showed that healthy children performed better than the children with mental retardation when performing static balance skills.

Conclusion: Children with mild mental retardation can learn motor skills by observing a point-light display. In addition, it was revealed that healthy children perform better than children with mild mental retardation in the motor skills acquired through an observational learning process.

Key Words: Mental retardation, Model display, Point-light, Static balance.

* Please cite this article as: Dana A, Salehian M, Hemayat Talab A, Sarvari S. The Effect of Observing a Point-Light Display on Learning Static Balancing in Children with Mild Mental Retardation and Healthy Children. Int J Pediatr 2022; 10 (1):15323-15330. DOI: **10.22038/IJP.2021.61228.4713**

Corresponding Author:

Mir Hamid Salehian, Assistant Professor, Department of Physical Education, Tabriz Branch, Islamic Azad University, Tabriz, Iran. Email: M_salehian@iaut.ac.ir

Received date: Dec.12,2021; Accepted date:Dec.18,2021

1- INTRODUCTION

Demonstration of skills is a joint educational strategy to facilitate learning new motor skills (1-5). There are various studies on the effects of observational learning in healthy individuals (6-12), showing that observing a model demonstration can lead to learning simple and complex motor skills in healthy individuals. There is also some evidence showing that observing skills positively affects learning of simple motor skills such as making coffee (13) or lighting a fire for cooking (14) among people with mental retardation. However, the effects of observational learning of complex motor skills among individuals with mental retardation have been rarely investigated. Children with severe, moderate, and mild mental disabilities, generally, have lower intelligence and cognitive functioning levels than healthy children do and exhibit different social behaviors (15, 16). This, consequently, results in healthy individuals having better abilities to perform motor skills than the children with mental retardation (17).

Bandura (1986) proposed his social learning theory to describe the process of observational learning (18). This theory proposes four steps for the observational learning process: attention, retention, reproduction, and motivation. Several studies have confirmed this theory based on which motor learning is examined by observing a video model (5). In addition to classic video models, motion learning researchers have recently used digitally processed animations in the form of point-light to examine their effects on learning new motor skills (9, 11). The point-light technique is a method in which the human body is displayed on a dark background using only point-light markers on the body's main joints. Point-light techniques have also been used in motor learning (9, 19). Research has shown that observing a point-light model is as effective as observing a classic video model for learning motor skills such as shooting, sprinting, and throwing in healthy individuals; and that individuals with mental retardation are able to recognize biological movements (such as walking, running, throwing) displayed in the point-light model (3, 20). These results show that people with mental retardation are able to perceive the pattern displayed in a point-light display. However, the effects of observing a point-light display on learning motor skills have not been examined among individuals with mental retardation.

Therefore, due to this lack of research, this study aimed to investigate the effects of observing a point-light display on learning a balancing skill in children with mental retardation and compare them with healthy children. Balance skills are among children's most important motor skills (21-23). According to the results of previous research on observational learning in children with mental retardation (13, 14) as well as the results of the ability to recognize biological movements displayed in the point-light model by these children (20), in the present study, it has been hypothesized that children with mental retardation can learn balance skills after observing the point-light model. Also, based on the results of studies that have compared the cognitive-motor ability of healthy children and children with mental retardation (17), in the present study, it has been assumed that healthy children are better in performing balance skills compared to children with mental retardation after observing the point-light model.

2- RESEARCH METHOD

The present study is descriptive and causal-comparative. The Participants consist of 60 girls aged 12 to 16 years. 30 children with mild mental disabilities and 30 healthy children were selected from public schools; and they were randomly and equally divided into the experimental (observational practice) and control groups. Children with mild mental retardation were selected from special schools; they were also randomly and equally divided into the experimental (observational practice) and control groups. After referring to the special schools and according to the information provided by them, children with an IQ of 50-70 and mild mental disabilities were selected for the purpose of the study.

a) Motor Task: In this study, a static balancing skill (Warrior III Pose) was selected as the motor task. This task requires the participant to balance on the right foot while lifting the left foot off the ground and holding the hands above the head. The purpose of this exercise is to maintain balance as much as possible. In this study, we measured the balance time of each child with a digital stopwatch. Therefore, the stopwatch started when the child was balanced and stopped when an error occurred, such as when the left hand or foot hit the ground.

b) Point-light model: A skilled gymnast participated in the present study as a model. This performer has more than three years of experience in official gymnastics competitions. For point-light models, reflective markers were installed on the main joints of the skilled gymnast's body, and then the player performed the balance skills three times, and cameras recorded these performances for the motion analysis system. In the next step, these performances were processed by the software related to the motion analysis system and became the point-light model. The best performance of the three recorded performances selected by a skilled gymnast was shown to the children. Balance skill point-light models took five seconds.

2-1. Procedure

First, a demographic information sheet was completed for each child by referring to the child's record at school. The children of all groups (including both healthy and mental retardation) were tested separately in a room set up for the study in the respective schools. After entering the room, the child sat on a chair in front of the monitor. A video was shown to the child in the form of the Point-Light of walking movement to get acquainted with the point-light model, and the child received explanations about the nature of the Point-Light display and the displayed movement from the examiner. Then, the examiner provided the initial explanations of the present study to the subjects of all groups. Subjects were informed that this study would teach static balance skills. To become familiarized with the protocol implementation environment and motor task, children of all groups were asked to perform static balance skills, once in a designated area. Then, in the pretest, the children of all groups once performed the static balance skill without previewing the model. Then, they participated in the acquisition phase in five training blocks, each of which consisted of three minutes of the static balance task. Children were given two minutes of rest between each educational block. Before each exercise block, the children in the observational group (including both healthy and mental retardation) observed the same point-light model for two minutes in a row on a 17-inch screen. According to the five-second duration of the point-light model, each subject observed the point-light model for 24 times. The child was informed that a skilled person performed the movement and that he should look carefully at the movement shown to imitate it. The children in the control group (including both healthy and mentally retarded ones) followed the same protocol, but no video was available to them. One day after the acquisition test, children of all groups took a posttest that performed static balance skills. No video model was observed before and during the posttest. In the pretest and posttest, children were asked to continue performing the static balance skills as much as possible. Here, the time duration that the children were able to perform the skill without error was calculated as their score in performing the static balance skill. It should be noted that the same point-light model was used for both healthy children and those with mild mental retardation; and all subjects had received the same information at the beginning of the study. However, during the practice phase, the participants in the experimental groups watched the point-light model and those in the control group did not receive any model demonstration. Moreover, each child trained separately; and was tested separately, too.

2-2. Data analysis

In the present study, the dependent variable included the balance time (in minutes) in the pretest and posttest. One-way analysis of variance (ANOVA) was used to analyze the balance time in the pretest and posttest. Tukey's post hoc test was used as a post hoc test. The level of statistical significance was considered as P <0.05

3- RESULTS

The demographic characteristics of the subjects are given in **Table 1**. They include age, height, weight, and BMI of healthy children and children with mental retardation.

Table 2 and **Fig. 1** show the performance of healthy children and children with Mental Retardation in the pretest and posttest.

The results of the ANOVA test in the pretest and posttest are given in **Table 3**.

Table-1: The demographic characteristics of the participants

Group	Age	Height	weight	BMI
Healthy	69.1 ± 02.14	61.15 ± 22.159	64.13 ± 16.58	59.2 ± 09.22
Mental Retardation	82.1 ± 96.13	50.17 ± 63.150	81.18 ± 86.52	89.3 ± 10.21

Table-2: The mean and standard deviation of the groups' performance time scores in pretest and posttest

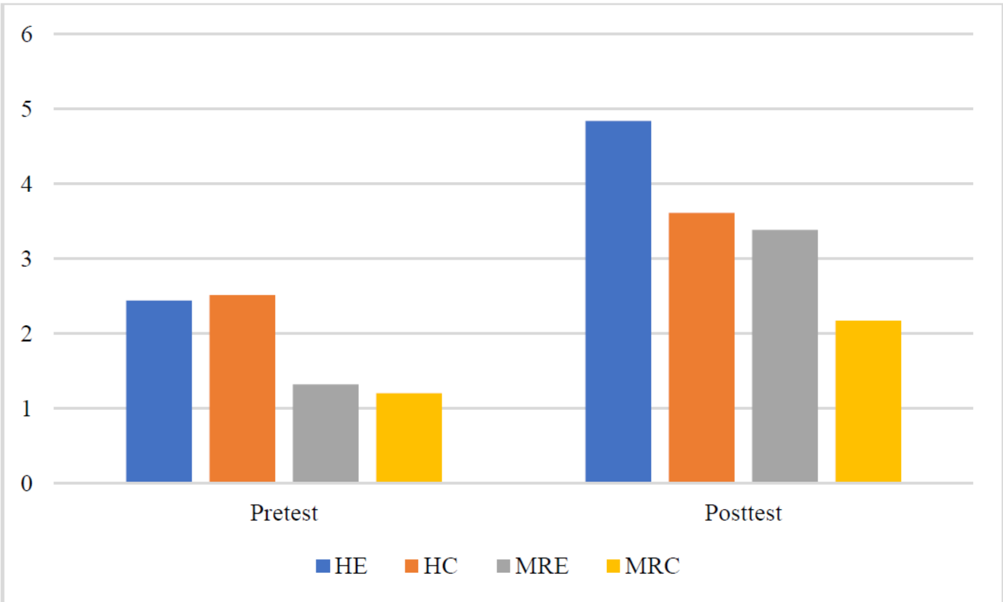
		Mentally retarded experimental	Mentally retarded control	Healthy experimental	Healthy control
Pretest	Mean	32.1	20.1	44.2	51.2
	Std.	22.1	19.1	86.2	60.2
Posttest	Mean	38.3	17.2	84.4	61.3
	Std.	02.2	75.2	96.3	39.2

Table-3: Results of ANOVA in the pretest and posttest

	Sum of Squares	df	Mean Square	F	Sig.
Pretest	92.87	3	90.43	59.10	001.0
Posttest	48.245	3	74.123	71.15	000.0

The analysis of variance showed a significant difference in the performance time between groups in the pretest (F=10.59, p <0.01). The results of the Tukey post hoc test showed that both groups of healthy children (including the experimental and control) performed better in the pretest in the performance time variable than both groups of Children with Mental Retardation (including the experimental and control) ($p < 0.01$). However, Tukey's post hoc test results showed no significant difference between healthy children in the experimental and control groups ($p > 0.05$). Also, no significant difference was observed between children with mental retardation in the experimental and control groups ($p > 0.05$).

In the posttest, the ANOVA showed a significant difference in the performance time between the groups ($F = 15.71$, $p < 0.001$). The Tukey post hoc test showed that the experimental group of healthy children performed better than all other groups ($p < 0.001$). Furthermore, the Tukey post hoc test showed that there was no significant difference between children in the healthy control group and Mentally Retarded experimental group ($p > 0.05$). However, both groups performed significantly better than the Mentally Retarded control group ($p < 0.01$).



HE: Healthy Experimental group
HC: Healthy Control group
MRE: Mentally Retarded Experimental group
MRC: Mentally Retarded Control group

Fig. 1: Performance of healthy children and children with mental retardation in the pretest and posttest

4- DISCUSSION

This study compared learning static balance skills through observing a point-light model between healthy children and those with mild mental retardation. Based on the research confirming the effects of observational learning on children with mental retardation (14) and their ability to recognize biological movements displayed in the point-light model (20), this study assumed that children with mental retardation would be able to learn a static balance skill after a course of observational practice using the Point-

Light technique. Also, based on the results of previous research comparing the cognitive-motor ability of healthy children and children with mental retardation (17), it was assumed that healthy children are better than children with mental retardation in learning a static balance skill after a period of observational practice using the Point-Light technique.

The results indicate that the first hypothesis of the research is confirmed. It is revealed that the children with mental retardation who had observational practice performed significantly better in the posttest than those with mild mental disabilities who did not take observational practice. These results show that children with mental retardation have been able to use the motor information shown in the Point-Light display and improve their performance after the test. The results are in line with previous research on the identification of movement models by children with mental retardation; it has been reported that these children had identified biological movements such as walking by observing a Point-Light display (20). Also, the results of the present study are consistent with the results of previous studies that examined the effect of observational learning in children with mental retardation (13, 14). The present study adds new findings to the research literature in the field showing that children with mental retardation can understand the point-light model and the required information from a very complex set. They extract motor signals and use them to learn observed skills. In addition, these results may indicate that in children with mild mental retardation, there are cognitive mechanisms required for observational learning of advanced skills such as balancing movements.

The study's second hypothesis was that healthy children would perform better than children with mental retardation in learning a static balance skill. The results of the research confirm this hypothesis. The results showed that healthy children performed better in static balance skills than children with mental retardation. This result is consistent with previous research showing that healthy individuals can learn new motor skills by observing the point-light model (1, 8, 9, 10, 11, 24). In addition, the results are in alignment with the results of previous research finding that healthy children perform better than children with mental retardation in performing motor skills (17). These results may indicate that the cognitive mechanisms required for learning observational motor skills are better developed in healthy children.

5- CONCLUSION

Overall, the results show that children with mental retardation benefit from observing a point-light model to learn a static balance skill. This result may indicate that these children have the mechanisms to learn new skills by observing the point-light model. The results also showed that healthy children performed better than children with mental retardation in learning only one static balance skill.

6- REFERENCES

1. Ashford, D., Bennett, S. J., & Davids, K. (2006). Observational modeling effects for movement dynamics and movement outcome measures across differing task constraints: A meta-analysis. Journal of Motor Behavior, 38(3), 185-205.

2. Dana, A., Rafiee, S. (2018). The role of task constraints in learning Football chip shot through observation. Iranian Journal of Learning & Memory, 1(3), 61-70.

3. Ghorbani, S., & Dana, A. (2019). Comparing the acquisition of internal motor representation by observing a point-light display between children with mild intellectual disability and normal children

based on task complexity level. Journal of Exceptional Children, 19(2), 89-100.

4. Ghorbani, S., Ghanati, P., Dana, A., Salehian, M. (2020). The Effects of Autonomy Support on Observational Motor Learning. Iranian Journal of Learning & Memory, 3(11), 77-87.

5. Maslovat, D., Hayes S, J., Horn, R., & Hodges, N. J. (2010). Motor learning through observation. In D, Elliott & M.A. Khan (Eds.), Vision and Goal-Directed Movement: Neurobehavioral Perspectives. (1nd ed., pp. 315-340).

6. Mokhtari, P., Shojaei, M., & Dana, A. (2007). The effect of observational practice on the Badminton volley service learning: The role of self-efficacy. Harakat, 32, 117-131.

7. Rafiee, S., & Dana, A. (2019). The effect of observing different information on learning the basketball jump shot. Acta Gymnica, 49(4), 164-173.

8. Al-Abood, S. A., Davids, K., Bennett, S. J., Ashford, D., & Martinez-Marin, M. (2001). Effects of manipulating relative and absolute motion information during observational learning of an aiming task. Journal of Sports Sciences, 19, 507-520.

9. Breslin, G., Hodges, N. J., Williams, M. A., Curran, W., & Kremer, J. (2005). Modeling relative motion to facilitate intra-limb coordination. Human Movement Science, 24, 446-463.

10. Farsi, A., Bahmanbegloo, Z, Abdoli, B., & Ghorbani, S. (2016). The effect of observational practice by a point-light model on learning a novel motor skill. Perceptual & Motor Skills, 123(2), 477-488.

11. Ghorbani, S., & Bund, A. (2014). Acquisition a Baseball-pitch by observation: Which information is extracted? American Journal of Sport Science & Medicine, 2(6A), 18-21.

12. Ghorbani, S., & Bund, A. (2017). Throwing skills: Analysis of movement phases in early motor learning. Perceptual & Motor Skills, 124(2), 502-513.

13. Bidwell, M. A., & Rehfeldt, R. A. (2004). Using video modeling to teach a domestic skill with an embedded social skill to adults with severe mental retardation. Behavioral Intervention, 19, 263-274.

14. Mechling, L. C., Gast, D. L., Gustafson, M. R. (2009). Use of video modeling to teach extinguishing of cooking related fires to individuals with moderate intellectual disabilities. Education and Training in Developmental Disabilities, 44(1), 67–79.

15. Baniasadi, T., Namazizadeh, M., Sheikh, M. (2018). Attentional focus can affect sway in postural and supra-postural tasks in community-dwelling older adults. Annals of Applied Sport Science, 6(3), 31-37.

16. Baniasadi, T., Namazi Zadeh, M., Sheikh, M. (2019). The effects of balance training and focus of attention on sway in postural and supra-postural tasks in the elderly population. Motor Behavior, 11(36), 89-104.

17. Ghorbani, S., Dana, A., Christodoulides, E. (2020). Effects of external focus of attention on learning static balance among girls with ADHD. Biomedical Human Kinetics, 12(1), 69-74.

18. Bandura, A. (1986). Social foundations of thought and action: A social cognitive theory. Englewood Cliffs, NJ: Prentice-Hall.

19. Ghorbani, S., & Bund, A. (2016). Observational learning of a new motor skill: The effect of highlighting relative motion information. International Journal of Sport Science & Coaching, 15(4), 514-522.

20. Jordan, H., Reiss, J. E., Hoffman, J. E., & Landau, B. (2002). Intact perception of biological motion in the face of profound spatial deficits: Williams's syndrome. Psychological Science, 13, 162–167.

21. Saeedpour-Parizi, M. R., Hassan, S. E., Azad, A. Baute, K. J., Baniasadi, T., Shear, J. B. (2021). Target position and avoidance margin effects on path planning in obstacle avoidance. Scientific Reports, 11, 15285.

22. Dana, A., Sabzi, A., Christodoulides, E. (2019). The effect of virtual reality exercises on dynamic balance of children with developmental coordination disorder. Journal of Humanities Insights, 3(3), 123-128.

23. Dana, A., Sabzi, A. H., Ghorbani, S., & Ghiami Rad, A. (2021). The effect of diurnal rhythms on static and dynamic balance performance. Biomedical Human Kinetics, 13(1), 205-211.

24. Wulf, G., Shea, C. & Lewthwaite, R. (2010). Motor skill learning and performance: A review of influential factors. Medical Education, 44, 75-84.