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Research Paper

# The Effect of Observing Video and Point-Light Models on Learning a Basketball Shot in Adolescents with Autism

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**Abstract**

The aim of the present study was to compare the learning of a Basketball throwing by observing video and point-light models in adolescents with autism. The subjects included 45 adolescents with autism who were divided into video, point-light and control groups. The motor task included a Basketball shot in which the throwing scores (between 0 to 2) was measured as dependent variable. Subjects performed pre-test (including three trials), acquisition phase (including five 10-trials blocks), and retention-test (including three trials). The subjects in the observation groups observed respective display for five times before performing each block. The results showed that adolescents with autism who practiced observation performed significantly better on Basketball throw scores on the retention test than those who did not practice observation. Also, there was no significant difference between the video model groups and the point-light. The results of this study show that people with autism benefit from watching video and pattern of point-light to learn a Basketball throwing skill. This result may indicate that these individuals have the mechanisms needed to learn new skills through video watching and pattern of point-light.

**Keywords:** Video, point-light, autism, motor learning, observation.

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## 1. Introduction

One of the common methods of teaching motor skills is demonstration (Ashford, Bennett and Davids, 2006; Dana and Rafiei, 2018; Ghorbani and Dana, 2019; Ghorbani, Ghanati, Dana, and Salehian, 2020; Maslavat et al., 2010). Numerous studies have shown that observing the model can improve performance as well as learning of new motor skills (Mokhtari, Shojaei, Dana, 2007; Rafiei and Dana, 2019; AlAbood et al., 2010; Breslin et al., 2005; Farsi et al., 2016; Ghorbani and Bund, 2014, 2016, 2017). As an underlying mechanism for the effect of model observation on motor learning, Bandura (1986) proposed the Social Learning Theory. Social learning theory has four stages that explain the observational learning process. These stages include attention (in which people pay attention to

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the signs of the displayed model), retention (in which people try to remember the signs of the model), reproduction (in this stage, the person tries to perform the skill), and motivation (Bandura believes that people need motivation to repeat the observed skill). Numerous studies have examined this theory, generally using a video model to demonstrate skills (Maslovat et al., 2010). The results of these studies have shown that watching a video model improves performance and learning of different motor skills in different age groups (Mokhtari, Shojaei, Dana, 2007; Rafiei and Dana, 2019; AlAbood et al., 2010; Breslin et al., 2005; Farsi et al., 2016; Ghorbani and Bund, 2014, 2016, 2017). However, observational learning in people with various mental and motor disabilities has been less studied. For example, one of the rarely studied disabilities in observational learning is autism. Autism Spectrum Disorder is a broad term used to describe a group of neurodevelopmental disorders. These disorders are characterized by communication and social interaction problems. People with autism often show limited, repetitive, and stereotypical signs or patterns of behavior. Autism is the third most common cause of developmental delays in children after mental retardation and cerebral palsy. It has been shown that people with autism often have mobility disabilities. Therefore, it can be expected that the performance and learning of motor skills in people with autism will be associated with challenges. There has not been much research on observational learning in people with autism, and it is unclear whether these individuals have the necessary mechanisms to learn motor skills through model observation. Therefore, the first aim of the present study was to investigate the effect of watching a classical video model on learning a motor skill in adolescents with autism.

Recently, in addition to classical video models, motor learning researchers have used digitally processed animations in the form of point-light to examine their effects on learning new motor skills (Breslin, Hodges, Williams, Koran, and Kramer, 2005; Ghorbani and Bund, 2016). The point-light technique is a method in which the human body is displayed in a dark background using only point lights placed on the main joints of the body. The research showed that watching a point-light pattern is as effective as watching a classic video model to learn new movement skills such as soccer shooting, cricket throwing, sprinting and Baseball throwing. However, the effect of observing the point-light model on motor learning in people with autism has not been investigated. Therefore, the second aim of the present study was to investigate the effect of observing a point-light display on learning a motor skill in adolescents with autism and comparing them with a video display group. The present study hypothesized that adolescents with autism would be able to learn a new motor skill by watching video and point-light displays.

## 2. Method

The present study applied a causal-comparative method. The subjects of this study were 45 adolescents with autism in the age range of 15 to 18 years and were randomly and equally divided into three groups: video model, point-light model, and control.

**2.1. Motor task:** Motor task in the present study included a Basketball throwing skill. To perform this motor task, a standard ball as well as a standard Basketball board were used. In this task, the subject was asked to stand behind the Basketball penalty line and throw the ball towards the basketball hoop. The scoring of this skill was such that if the ball landed inside the ring, 2 points was given, if the ball hit the ring or the square part of the board, one point was given, and otherwise no points were considered.

**2.2. Model demonstrations:** A skilled Basketball player participated in the present study as a model. This player has more than ten years of experience in official Basketball competitions. To create the video model, the skilled model was asked to perform basketball shot three times. Then, all throws were filmed using a digital camera. Then the person was asked to choose one of them as his best throw, and we used it as a video model in this study. To produce point-light patterns, light-reflecting markers were installed on the main joints of skilled Basketball player, and then the player performed Basketball shot three times, and these performances were recorded by special cameras of the motion analysis system. In the next step, these performances were processed by the software related to the motion analysis system and became the pattern of point-light. The best performance of the three recorded performances selected by a skilled gymnast was used to show adolescents with autism. Point-light pattern take five seconds.

**2.3. Procedure:** First, by referring to the individual file in the school, a demographic information sheet was completed for each child. Subjects were tested separately in the gym. Upon entering the room, the subject sat on a chair in front of the monitor. To acquaint the subjects with video and point-light models, a video and a point-light display of walking was shown to the subject and the subject was explained the nature of the video models and the point-light display. Then the initial explanations of the present study were provided to the subjects by the examiner. Subjects were informed that this study would teach Basketball throwing skills. To familiarize the subjects with the protocol implementation environment and motor task, they were asked to practice Basketball throwing skills

twice. Then, in the pre-test, the subjects performed Basketball throwing skills three times without previewing the model. Then, they participated in the acquisition phase in five training blocks, each containing ten throws. Subjects were given a three-minute break between each training block. Before each training block, the subjects in the observation group observed their respective displays five times on a 17-inch screen. The subject was informed that the movement was performed by a skilled person and that he should look carefully at the movement shown in order to imitate it. The subjects in the control group performed the same protocol but no video display was available to them. One day after the acquisition test, the subjects took a retention test that included three throws. No video model was observed before and during the retention test.

**2.4. Data analysis:** In the present study, the dependent variable included throw accuracy in pre-test and retention test. One-way analysis of variance was used to analyze the accuracy of throwing in pre-test and retention test. Tukey post hoc test was used as a post hoc test. The level of statistical significance was used at $P < 0.05$.

## 3. Results

The demographic characteristics of the subjects including age, height, weight, and BMI are given in Table 1.

**Table 1.** Demographic characteristics of the subjects

| Group | Age | Height | Weight | BMI |
|---|---|---|---|---|
| **Video** | 17.02±1.05 | 165.22±15.28 | 60.16±15.07 | 21.09±2.90 |
| **Point-Light** | 16.96±1.54 | 168.63±16.08 | 61.86±17.43 | 20.10±3.64 |
| **Control** | 16.90±1.59 | 167.63±16.90 | 59.86±16.17 | 21.07±3.07 |

Performances of the subjects in the pre-test and retention test is shown in Table 2 and Figure 1.

**Table 2.** Mean and standard deviation of Basketball throwing scores in pre-test and retention test

| Group | Age | Video | Point-light | Control |
|---|---|---|---|---|
| **Pretest** | Mean | 0.34 | 0.31 | 0.30 |
| | SD | 0.33 | 0.21 | 0.17 |
| **Retention** | Mean | 0.98 | 0.96 | 0.39 |
| | SD | 0.80 | 0.67 | 0.57 |

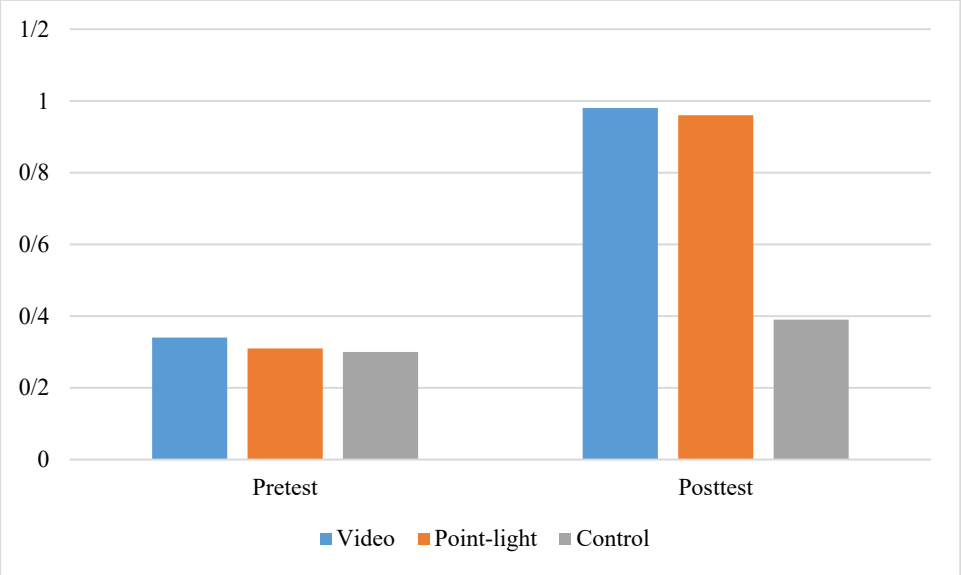


**Figure 1.** Means of throwing scores across groups

The results of analysis of variance in pre-test and retention test are given in Table 3.

**Table 3.** Results of analysis of variance in pre-test and retention test

| Group | Sum of Squares | df | Mean Square | F | Sig |
|---|---|---|---|---|---|
| **Pretest** | 76.22 | 2 | 34.19 | 0.90 | 0.647 |
| **Retention** | 295.84 | 2 | 134.80 | 24.88 | 0.000 |

The results of analysis of variance showed that there was no significant difference in throwing scores between the groups in the pre-test ($F = 0.90$, $p = 0.64$). Therefore, the subjects' conditions were the same before training. In retention test, the results of analysis of variance showed that there was a significant difference in throwing scores between groups ($F = 24.88$, $p < 0.001$). The results of Tukey post hoc test showed that the video model group and the point-light model performed better than the control group ($p < 0.001$). However, there was no significant difference between the video model and point-light model groups ($p > 0.05$).

## 4. Discussion and Conclusion

This study was designed to compare the learning of a Basketball throwing skill by observing video patterns and point-light in adolescents with autism. The study hypothesized that adolescents with autism would be able to learn a Basketball throwing skill after observational practice using a video model and a point-light technique. The results showed that adolescents with autism who practiced observation performed significantly better on Basketball throw scores on the retention test than those who did not practice observation. Also, there was no significant difference between the video model groups and the point-light. These results show that adolescents with autism have been able to use the motor information shown in video models and point-light display, and have improved their post-test performance.

The results of this study are csonsistent with previous research on the identification of movement patterns by people with autism who have shown that they have identified biological movements such as walking by observing a point-light display (Nackaerts et al., 2012). 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 autism (Foti et al., 2019). The results of the present study add new findings to the literature and show that people with autism are able to understand the pattern of point-light and the extract information from a very complex set of motor signals and use them to learn the observed skill. In addition, these results may indicate that there are cognitive mechanisms needed to learn observational skills such as throwing skills in people with autism.

In summary, the results of this study show that people with autism benefit from watching video and pattern of point-light to learn a Basketball throwing skill. This result may indicate that these individuals have the mechanisms needed to learn new skills through video watching and pattern of point-light. Future studies should focus on different motor tasks as well as other age groups.

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