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Effect of Observational Expert and Beginner Model on Learning of Basketball Free Throw: The Role of Imagination Capability

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Abstract

The purpose of the present study was to examine the effect of observational expert and beginner model on learning basketball free throw skill in those with different levels of imagination capability. For this purpose, 30 students with high imagination capability and 30 students with low imagination capability were selected among volunteered students and divided into 6 groups. The free throw accuracy and model were measured with 10 throws at the pre and post-test stages. At the exercise stage, the participants also performed 240 throws based on the specific protocol of the group. The experimental groups watched the video of the Expert or beginner model at the beginning of each exercise block while the control group did not watch any kind of video. The results of multivariate covariance analysis showed that the accuracy and the model of throws in different groups were significantly different. Those with high imagination capability benefit more from observational learning and learned better than those with low imagination capability. Also, those with high imagination capability significantly benefit from Expert model observation. The results of this research show that in addition to the characteristics of the observed model, which can have a great impact on observational learning, the observers' characteristics are also very influential in this. One of these effective characteristics was the individual's imagination ability; people with lower abilities were more likely to encounter problems with the use of observational learning. Therefore, developing of individual's imagination ability is necessary for this type of learning.

Keywords: Beginner model, expert model, imagination capability, observational learning

Introduction

Observational learning is one of the basic methods through which each person acquires new knowledge and skills. Typically, observational exercises have been performed by various methods of exercising motor skills. Today, this type of exercise is often considered by the researchers as an effective method on learning simple and complex motor skills. However, the effect of observational exercise relative to the effects of physical exercise is not significant, but studies have shown that its effect is better than no exercise (McCullagh & Weiss, 2001). Because studies have shown that the observational communication network (including the pre-motor cortex, inferior parietal lobe, temporal sulcus and supplementary motor area) involves in observation processes similar to or the same processes that occur during physical exercise (Cross et al., 2009). As a result, observational exercise can be an important and unique link in learning, especially when combined with exercise, so that the combination of observational exercise and physical exercise can be quite effective, and even its effects on learning versus physical exercise alone will be much higher (Shea et al., 2000).

With proving the effectiveness of observing the model on learning skills, the observed model level is one of the challenges faced by researchers in the last decade. Many researchers believe in using an Expert model, as the research evidence suggest that the observer perceives phenomena from the observation of the skill in terms of its coordination model (Schoenfelder-zohdi, 1992). The observer especially in

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order to evolve his motion model perceives the fixed aspects (intrinsic aspects) of coordination model of motion and uses it. If the observer perceives and uses information about unvaried models, it is logical that the quality of performance after show observation is related to the quality of the show (Magill, 2007). Therefore, the Expert model evolves the coordinated motor models earlier (Schoenfelder-zohdi, 1992). In addition to obtaining coordination information, the observer also perceives information about model strategies for solving motor problems; in fact, the observer in his initial attempts to perform skills imitates the strategy. Therefore, it seems that the Expert model is more useful than the beginner model. The studies that have been conducted on the observation of the Expert model have shown that this model facilitates learning a motor skill (Al-Abood et al., 2001; Ghobadi et al., 2013; Hatami, 2004). In fact, the Expert model provides the learner with an image of a motion model in accordance with the ideal motion (Wulf & Mornell, 2008).

On the other hand, some studies on the beginner model, that is, who does not have sufficient mastery of skills and is involved in the learning process, have shown that it facilitates learning of motor skills (Buchanan & Dean, 2010; Ste-Marie et al., 2012). It was also well documented in a study how a trainer can facilitate learning a skill by inducing people to observe the beginner model (Hebert & Landin, 1994). Hirose et al. (2004) also in the study on learning a new two hands coordination model confirmed the use of the beginner model, which is also said that because a beginner is prone to a large and frequent error than an Expert one, the observer has a greater chance of detecting these errors and learning them (Blandin & Proteau, 2000). This means that the observer is involved in solving the problem with more active ways. So the observer, with the involvement of a number of cognitive activities, is able to discover the error and correct that and this is important in the learning process (Lee & White, 1990), that is, although the beginner model is a good model for what a person should do, when he sees a beginner model, he will probably learn the task through improved error detection and error correction mechanisms. This is consistent with motor learning theories that emphasize the aspects of information processing in acquiring skills and correction of motion based on error awareness (Adams, 1971; Schmidt, 1975).

Studies to find the effectiveness of beginner and Expert models are still ongoing, but the question is whether in observational learning merely the model is important, or the characteristics of the observer are important as part of the observational learning process.

One of the most important characteristics of the observer is his imagination capability. The imagination capability is a common capability that athletes of various levels use to enhance multiple aspects of performance, including refining and modifying skills and strategies, adjusting emotions and activation levels, manage cognitive aspects and motivational behaviors (Cumming & Ramsey, 2008; Murphy et al., 2008).

Studies have shown that there are functional and neurological similarities between observational learning and imagination, both of which activate the areas of the brain that are related to the planning and performance of the motion (Buccino et al., 2001; Ehrsson et al., 2003). This relationship between imagination and observational learning in many studies (Williams, Cumming, & Edwards, 2011; Hall et al., 2009) has been studied and shows the positive and mutual relationship between these two categories, so that those with higher imagination capability may use observational learning much more. In this regard, Lawrence, Callow and Roberts (2013) examined the mediating role of imagination in the effectiveness of observational learning, with the formation of four groups of high imagination capability - observational learning, high imagination capability -control, low imagination capability - observational learning, and low imagination capability -control; it was found that the performance of the experimental groups was significantly better, and among them, the high imagination capability group was better. According to the materials mentioned in this study, we have attempted to examine the role of imagination capability in observing a Expert and beginner model, in order to determine which model is used by those with varied imagination capability.

Method

The research method is quasi-experimental in the field form.

Participants

The statistical population composed of all students of Imam Hassan Mojtaba (AS) School, among whom 60 students (30 students with high imagination capability and 30 students with low imagination capability) were selected based on imagination capability. They were divided in 6 groups (n = 10) of Expert model high imagination, beginner model high imagination, control group high imagination, Expert model low imagination, beginner model low imagination, and control group low imagination. All participants were right-handed with no experience in the field of basketball.

Instruments

Imagination questionnaire

In order to measure the participants' imagination capability, Mental Illustration Questionnaire (MIQ-R) was used with internal reliability of 89% for vision sub-scale and 88% for motor sub-scale, and test-retest reliability and internal consistency of the motor imagination questionnaire were reported 87% and 89%, respectively. In two factors of motor imagination (77, 40), vision imagination (99.23) has the advantage of constructive reliability. The magnitude of the load factor was found in the subscales of motor skills from (53.0) to (78.0) and in the subscale of sight (from 56.0) to (78.0). Also, the results showed that internal consistency (73.0) and temporal reliability (77.0) and its subscales were approved (Sohrabi, Farsi, & Fooladian, 2010).

Basketball free throw test

Two scales of throw model and throw accuracy were used to score the throws. Amber (1996) Basketball Free Throw Test was used to check the accuracy of basketball throw. In order to check the accuracy of the free throw, the test used in the study (Wolf et al. 2005) was used, in which the score of the throw resulting in a goal is 5, the score of ball hit the ring is 3, the score of ball hit the board and ring is 2, the score of ball hit the board is 1 and air ball throw score is 0 (no hit the ring and board).

Throwing pattern score

Three evaluators as 1st and National Basketball instructors scored throwing pattern based on the test, the mean score of these three evaluators was recorded as a Throwing pattern score for the subjects.

Procedure

First, the imagination questionnaire was distributed among the volunteers participating in this study, and after selecting those with high and low imagination capability, they were asked to provide a form containing personal information such as age, education level, special sports, supreme hand, and vision health, along with a consent form to participate voluntarily in the study. Then, these subjects were divided into six groups according to the research plan. At that stage, each one had 10 throws after the initial free throwing training which were scored according to the throw model and accuracy. The participants in the study throw each week in two sessions and for four weeks (in total 8 sessions), in each session 30 throws (3 blocks of 10) in total 240 throws were repeated. The experimental groups at the beginning of each training block watched their own model video (the higher and lower imagination group with Expert model video and higher and lower imagination group with beginner model video). The video included an Expert or beginner model from two front and side angles with normal and slow speed. But the control group did not do anything at all within blocks, did not watch any kind of video and just had a short break. 24 hours after the end of exercise sessions, which included 10 throws, as in the pre-test conditions, post-test was performed.

Data Analysis

Before inferential analysis to evaluate the natural distribution of scores of dependent variables at each measurement level, Wilkes Shapiro test was used. In order to compare the groups, with the exclusion of the pre-test effect, multivariate covariance analysis (MANCOVA) and LSD follow-up test were used to compare the scores of the groups after the significance of the covariance analysis test.

Findings

The findings of the study are as follows:

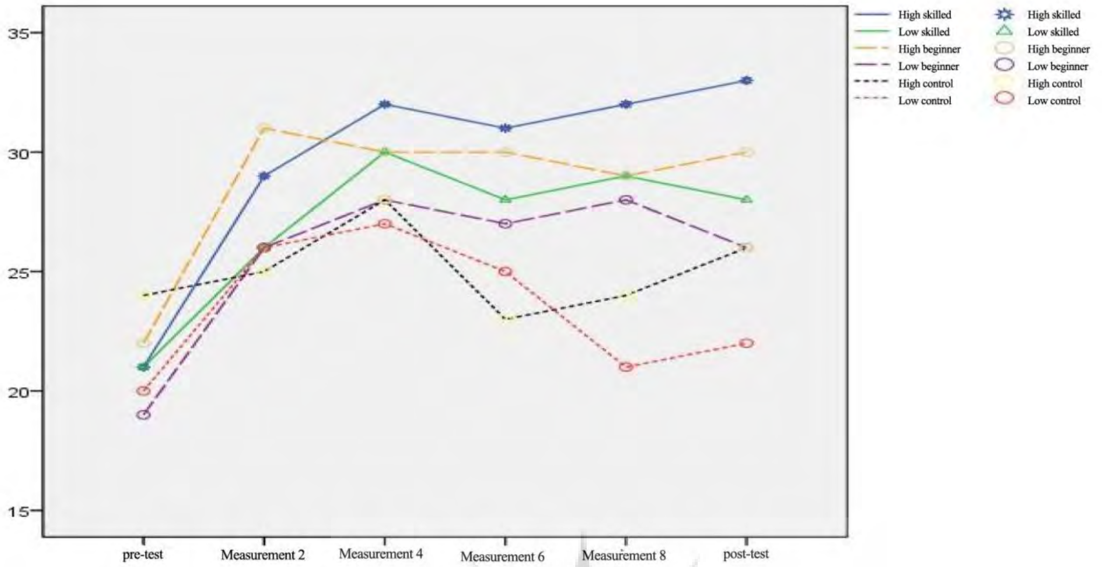

Figure 1.
The Trend of Changing the Accuracy Scores According to Different Measurement Stages in Different Research Groups

Figure 1 shows the accuracy scores of subjects in six test groups in the pre-test and five other next tests. This Fig. shows the score of accuracy of the subjects in terms of the group and the measurement stages, and as shown in the Figure, some groups have better scores than the other groups.

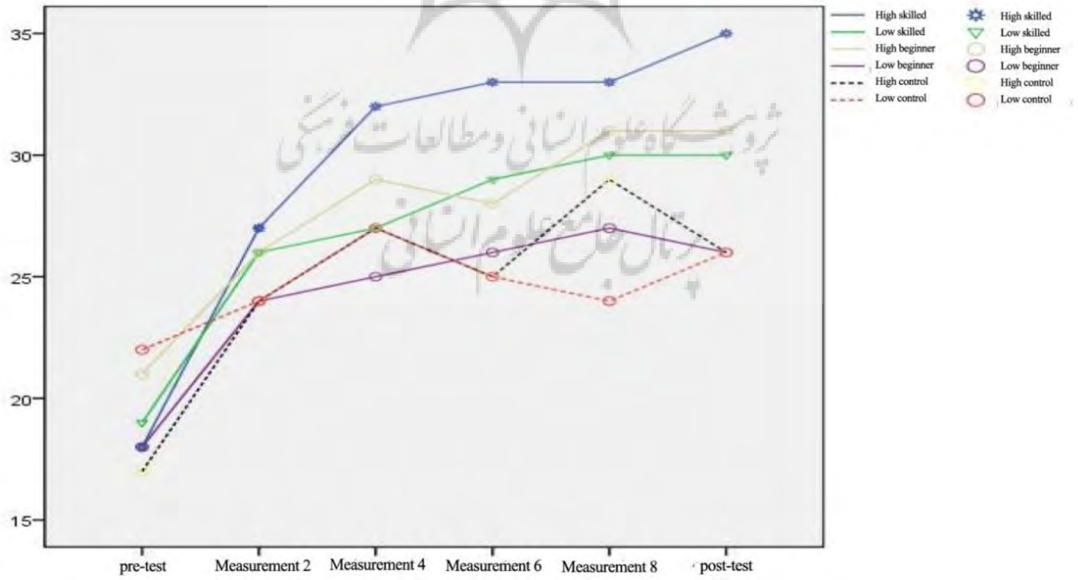

Figure 2.
The Trend of Changing the Scores of the Throw Model According to the Different Stages of Measurement in Different Research Groups

Also, the scores of the throw model have been studied and analyzed according to research groups in Fig. 2, which also shows that some groups have obtained distinct scores in the model. However, in order to study the significance or insignificance of these scores, inferential statistics tests were used to determine the observational effect of an Expert and beginner model on the acquisition and retention of free-throwing basketball skills in those with different levels of imagination capability. Before inferential analysis, Wilkes Shapiro test was used to examine the normal distribution of scores of dependent variables at each measurement level. The significance value obtained from this test in all of the comparisons was greater than 0.05 ($P > 0.05$), and showed that distribution of dependent variable scores in any of the groups used in this study was normal.

In order to compare the scores among the groups, a multivariate covariance analysis (MANCOVA) was used to exclude the effect of pre-test. However, before performing this test, the presumption of the normality of the variance-covariance matrix was also investigated in these data and showed insignificant results ($P > 0.05$).

Table 1.

The Results of Multivariate Covariance Analysis of the Observational Effect of an Expert and Beginner Model in Those with High and Low Imagination Capability to Acquire and Retain Skills

Changes' sources	Wilks Lambda	F	df1	df2	p	η2
Accuracy's pre-test	.75	8.48	2	51	.001	.25
Model's pre-test	.954	1.227	2	51	.302	.046
Group	.389	6.150	10	102	.0001	.376

As shown in Table 1, F value obtained from Wilkes Lambda with a value of 6.150 and freedom degrees of 10 and 102 is significant at the level of $p < 0.0001$. Accordingly, we concluded that observing an Expert and beginner model in those with high and low imagination capability has a significant effect on the acquisition and retention of basketball free throw skills. The value of this effect is .376 obtained for the source of the group change which is strong and indicates that the independent variable, which is the same observational effect of the models, has a significant effect on the dependent variables. The study results showed that the pre-test had a significant effect on the research process. Following the significance of the general hypothesis for a more detailed examination of the differences, the scores of the groups were evaluated by univariate covariance. These results showed that F value obtained for the difference between the groups in the scores of accuracy of 10.70 with degrees of freedom 1 and 52 was significant at the level of $P = 0.001$. This means that the difference in accuracy scores is significant. Also, F value obtained for the difference between the groups in the scales of the throw model, 6.18 with degrees of freedom 1 and 52 is significant at the level of $P = 0.001$. This means that the difference in the throw model scores is also significant.

Table 2.

The Results of LSD Follow Up Test to Compare the Scores of the Groups after the Significance of the Covariance Analysis Test

Dependent variable	1st group	2nd group	The difference of groups' mean	The difference of SD	Significance level
Follow up test to compare the scores of accuracy's post-test	High Expert	Low Expert	5.191*	1.692	.003
	High Expert	High beginner	3.816*	1.705	.030
	High Expert	Low beginner	6.509*	1.695	
	High Expert	High control	8.230*	1.741	
	High Expert	Low control	11.561*	1.771	
	Low Expert	High beginner	-1.375	1.691	.420
	Low Expert	Low beginner	1.318	1.688	.438
	Low Expert	High control	3.039	1.788	.095
	Low Expert	Low control	6.370*	1.719	.001
	High beginner	Low beginner	2.693	1.717	.123

Dependent variable	1st group	2nd group	The difference of groups' mean	The difference of SD	Significance level
	High beginner	High control	4.414*	1.770	.016
	High beginner	Low control	7.745*	1.733	
	Low beginner	High control	1.721	1.812	.347
	Low beginner	Low control	5.052*	1.730	.005
	High control	Low control	3.331	1.936	.091
Follow up test to compare the scores of model's post-test	High Expert	Low Expert	5.492*	1.776	.003
	High Expert	High beginner	4.711*	1.790	.011
	High Expert	Low beginner	8.986*	1.779	
	High Expert	High control	5.233*	1.827	.006
	High Expert	Low control	-8.265*	1.859	
	Low Expert	High beginner	-.781	1.775	.662
	Low Expert	Low beginner	3.493	1.772	.054
	Low Expert	High control	-.259	1.877	.891
	Low Expert	Low control	2.772	1.804	.130
	High beginner	Low beginner	4.275*	1.802	.021
	High beginner	High control	.522	1.858	.780
	High beginner	Low control	3.554	1.819	.056
	Low beginner	High control	-3.753	1.902	.054
	High control	Low control	3.032	2.032	.142

Table 2 shows the results of LSD follow-up test comparing the scores of the groups after the significance of the one-way covariance analysis test. Based on the information presented in this Table, it is clear that both the scores of accuracy and scales of the throw model in groups have a significant difference.

Discussion and Conclusion

The results of the present study showed that the experimental group (high imagination capability - Expert model, high imagination capability - beginner model, low imagination capability - Expert model, and low imagination capability - beginner model) had a higher basketball free throwing skill than that of the physical exercise group (control group). Studies have shown that observational exercise can create an important and unique relationship in learning, especially when combined with observational exercise, so that the combination of observational exercise and physical activity can be quite effective, and even effects on learning alone will be much higher a physical exercise (Shea et al., 2000).

The results of the present study showed that one of the most important discussions regarding the use of observational learning in addition to the observation model is the observer characteristics that have been discussed less. The results of this study showed that, regardless of the type of model (Expert and beginner), those with high imagination capability have better performance than those with low imagination capability, in other words, the two groups of high imagination capability – Expert model and high imagination capability - beginner most benefit from observational learning. This finding confirmed the results reported by Lawrence, Callow, and Roberts (2013), which examined the mediating role of imagination in the effectiveness of observational learning, and concluded that the performance of experimental groups was significantly better, among which the group The better illustration has been improved. Also, these findings confirmed Bandura's cognitive mediation theory of how the skill show influences its learning. When a person observes a model, he translates the observed motion information into memory symbolic passwords. These passwords form the basis of a mental image in memory. The reason for translating motion information into a cognitive memory image is that the brain review and organizes the information, and then the memory image is used as a guide to perform the skill and standard for the detection and correction of the error. To perform the skill, the person should first find a memory image and then translate it into appropriate motion control passwords to allow the organ to move (Magill, 2007). The more ability to encrypt and create a memory image, the greater the use of observational learning for the acquisition of skills. In this regard, researchers have shown that those with high imagination capability are capable of creating clear and accurate high-resolution images (Lawrence, Callow, & Roberts, 2013) and probably one of the reasons for the superiority of those with high imagination capability to use more the observational model compared to those with low imagination capability.

It is also a challenge to the ecological perspective (dynamic systems). Scully and Newell (1985) proposed the idea of "direct perception" of Gibson (1979), who presented a different view on observational learning. In fact, they put forward the dynamic view of the model that is known as the successor to Bandura's view. The dynamic view addresses the need for symbolic encryption (memory modeling stage) between modeled motion observation and physical motion.

Instead, he says that the visual device is capable of processing the visual information autonomously, in such a way that the device moves to act on what the visual device detects. The visual device receives information from the model and forces the body to behave in a particular way. So there's no need to turn this information into cognitive passwords and keep them in memory. With such a claim, there should be no significant difference between those with different imagination capabilities, which, given the difference in the use of observational learning in these ones, is a challenge to this theory and emphasizes Bandura's cognitive mediation theory.

Another important topic that is a large part of the literature of observational research is the "model type" that is shown to a person. This study by examining the observation of an Expert and beginner model in those with high levels of imagination capability showed that those with high imagination capability most benefit from observing a Expert model and then a beginner model. This finding is consistent with the studies by Horn et al., (2007), Hatami (2004), Arab Ameri (2004), Wulf and Mornell (2008), and inconsistent with studies by Buchanan and Dean (2010), Zarghi et al. (2011), and Ste-Marie et al. (2012). Based on the prediction of cognitive theory, the skills that have Expert models are better for coding the shows in mind and thus improve the level of learning. Studies have shown that observing an Expert model facilitates the acquisition of coordination for the observer (Horn et al. 2007). In fact, the Expert model, which is a perfect example of an exercise or a proper motor strategy, is likely to enable the observer to obtain an accurate presentation or perception of the original plan (Sheffield, 1961). The advantage of an Expert model is that the learner is provided with an image of a motion model in accordance with an ideal motion (Wulf & Mornell, 2008). When representation is planned, an Expert model is a good example for a correct performance, and can be a great help to improve learning skills, but this does not mean that the beginner model does not lead to more learning, because the use of the beginner model engages the observer in more active ways to solve the problem. As a result, the observer, with the involvement of a number of cognitive activities, is able to detect and correct the error and this is important in the learning process (Lee & White, 1990), that is, although the beginner model is not a good model for what a person should do when a person observes a beginner model, he will probably learn the task through improved error detection and error correction mechanisms. This is consistent with motor learning theories that emphasize the aspects of information processing in acquiring skills and motion correction based on error awareness (Adams, 1971; Schmidt, 1975). But since the participants in this study were all beginners and the priority of beginners in the learning process is to collect information about the performance and acquisition of a general model of motion (the skill function of observational learning), and according to Adams, the training model should be provided correctly and properly in order to develop a strong perceptual drive, accordingly an Expert model should be used when showing skills. An expert model with the provision of the necessary information in this field will provide more help in improving skills learning than the beginner model.

With examining the difference between observing an expert and beginner model in those with low imagination capability, the results showed that no significant difference was found between these two models in those with low imagination capability. This finding suggests that those with low imagination capability due to the weakness in creating clear memory images and using them are not able to properly use the show models (either Expert or beginner) compared to those with high imagination capability. Therefore, we need motor imagery training because it can play an important role and have a positive effect on the improvement of skill performance of novice learners in the early skill acquisition stage (Kim et al., 2017) The significance of this finding is that it emphasizes on the characteristics of the observer as an important part of the observational learning process, meaning that only the characteristics of the model are not the determinant factors in observational learning, but the learner's (observer) skill show techniques, type of task, and etc. are among the factors that can influence observational learning.

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