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Effects of Observational Practice and Gender on the Self-efficacy and Learning of Aiming Skill

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Abstract: The purposes of the present investigation were to study the effects of observational model and gender on the learning and self-efficacy of dart throwing skill. Forty eight novice girls and boys from PE classes were divided into two observational and physical practice groups, randomly. In acquisition phase and in retention and transfer tests, they practiced 60 trials and 12 trials, respectively. The results of acquisition phase showed that there was significant main effect of gender and the follow-up results demonstrated that the males had more accurate performance and more self-efficacy score than females ($p<0.05$). There were no significant differences between observational and physical groups on throwing accuracy and self-efficacy ($p>0.05$), but the males had more accurate performance than females in retention and transfer phases. In conclusion, observing a model can result in acquiring and learning of a skill as well as the executing a skill because of the role of self-efficacy and observational model is more effective for males than females for learning facilitation.

Key words: Observational learning, physical practice, skill acquisition, self-efficacy

INTRODUCTION

The modeling that relates on observational learning can produces a memory effect in the observer through looking at movement and imitating the performer and then the observer can executes the movement independently (Schmidt and Wrisberg, 2004). This process accomplishes before actual movement (Schmidt and Lee, 2005) and has an important role in the acquisition and the learning of skills (Kluka, 1999; McCullagh and Weiss, 2001). The learning effect of model is not a new question, in spite of different theories have been proposed but its effect on the learners is debate and there are many questions that remained unknown. For example, according to dynamic system approach, the visual system is capable to process visual information automatically and without need to code in memory for controlling coordinative movements (Magill, 2004). Heyes and Foster (2002) and Black *et al.* (2005) have revealed that in the timing task, the learning benefits of observed model is similar to physical practice. Therefore, an observer could to learn skills as same as the homogeneous skill performer. However, Black and Wright (2000), Rose and Tyry (1994) and Douglas *et al.* (1992) have revealed that the modeling can facilitates the learning and error detection capability processes, but its effect is not as same as physical practice. Thus, this challenge has remained whether the effects of observational practice on the learning is similar to physical practice.

Another topic can be pose in this regard, is the task (skill) nature. Some studies have demonstrated that there are positive relationships between task difficulty and the frequency of model demonstration, the movement pattern in simple tasks can learn with the least information processing and fewer efforts (Williams *et al*., 1999). So in the present investigation that the dart throwing skill is used that has fewer movement elements and environmental regulation and with more fine motor control, it is expected that the observing a model is beneficial as physical practice. Thus, one of the important questions of present study was to clarify whether the role of observational model on the learning of motor skill is similar to physical practice.

Bandura is proposed one of the important scientific viewpoints for modeling. In his proposed theoretical framework, the observing a model can foster self-efficacy- the belief of successful executing a specific task. The vicarious experience is one way for acquiring self-efficacy that result through in observing movement execution of other performers (McCullagh and Weiss, 2001). In this investigation, the effectiveness of observational practice has been studied on the basis of Bandura's cognitive psychology theory. This question is important because the observational modeling has many benefits for motor skills such as psychological and educational and these two roles have been studied in the present investigation together.

One of the mediator variables that has motivational role in observational learning is gender. The males prefer to compete with the skill level of the model more than the females and this trend make them better performance and have more efficacies (Williams *et al*., 1999). In addition, the learning role of gender in motor skills is socio-culture (Kluka, 1999) and in present study the gender differences is considered according to self-efficacy theory. Previous studies (McCullagh and Weiss, 2001) have shown that the reason for gender differences is self-efficacy. Other evidences also have revealed that the males were more confident and efficient than females (Gao and Harrison, 2004; Maoano and Ninot, 2004) because they have more achievement motivation (Gill, 1999) and competitiveness (Bahram and Shafizadeh, 2001). Therefore, it's seems that the gender differences on performance and observational learning is related to least efficacy expectations of females. So, another goal of current study was to determine the role of model's gender on the learning and self-efficacy of motor tasks. Since the gender is a cultural variable and its affect is different in different societies, thus its association with the learning of motor skills in the educational settings is important to realize according to interactional approach in sport psychology.

MATERIALS AND METHODS

Participants: The subjects were 48 undergraduate students (24 males and 24 females) from Physical Education Department of Tehran Teacher Training University were naïve for task and without prior experience and information about research purposes. They selected voluntarily from motor learning course at second semester of 2006 and divided randomly into two practice groups.

Task and procedure: The experiment task was dart-throwing skill in which subjects should to aim to score target (0 to 10 point) that located 2 m farther in front of them with over-arm pattern principles and right hand.

Prior to acquisition phase, each subject performed 6 trials as their pre-test score. Then they matched according to skill level and gender and divided into physical and observational practice groups. Each physical and observational group yoked one by one and participated in the experiment room together. The physical practice group standard behind the target line and together with observational practice group who seated the left side of the performers listened to dart-throwing skill instructions. Physical practice group thrown 6 darts and observational practice group only looked their performance and outcomes.

The experiment has consisted of acquisition, retention and transfer phases. In acquisition phase, only the physical practice group performed the 60 trials of task, but in the retention and transfer phases that executed 24 h later, the two groups performed the 12 trials of task. In the retention test, the distance from the target was similar to acquisition, but in the transfer test the distance added 1 m.

The dart-throwing self-efficacy questionnaire that developed by the author according to Bandura's guideline scored 10-point Likert scale and its reliability through Cronbach alpha was computed 90. Two groups in pre-test, middle and later of acquisition and transfer phases completed the questionnaire.

Data analysis and statistical methods: A 2(gender)*10(block) mixed factorial design was used for throwing performance in acquisition that repeated measure on last factor. A 2(gender)*2(group) factorial design was used for retention and transfer performance. The follow-up test was Newman-Keuls post hoc test.

A2(gender)*2(group)*3(time) mixed factorial design have been used for self-efficacy score in acquisition and retention with repeated measure on last factor. A 2(gender)*2(group) factorial design was used for transfer self-efficacy. The follow-up test was Least Significant Differences (LSD) test. Significant level was determined at $p<0.05$.

RESULTS

The pre-test results have shown that there are no significant differences between groups on self-efficacy and dart-throwing accuracy ($p>0.05$). Thus the groups were homogenous initially.

Self-efficacy score: The results of mixed factorial design in acquisition revealed that the main effects of gender ($F_{1,44} = 4.58$, $p<0.05$) and block of trials ($F_{2,44} = 10.8$, $p<0.01$) were significant, but other effects were not ($p>0.05$), (Fig. 1).

The LSD follow-up results showed that the male had better score than females. In addition, the pre-test score was lower than mid-acquisition and late acquisition and mid-acquisition score was lower than late acquisition score.

The Analysis of Variance (ANOVA) in the transfer phase showed that the main effects of gender and practice group and interaction of them were not significant ($p>0.05$).

Throwing accuracy: The results of mixed factorial design in acquisition revealed that the main effect of gender ($F_{1,44} = 27.28$, $p<0.01$) was significant (Fig. 2), but other effects were not ($p>0.05$). The LSD follow-up results showed that the male had more accurate than females. In

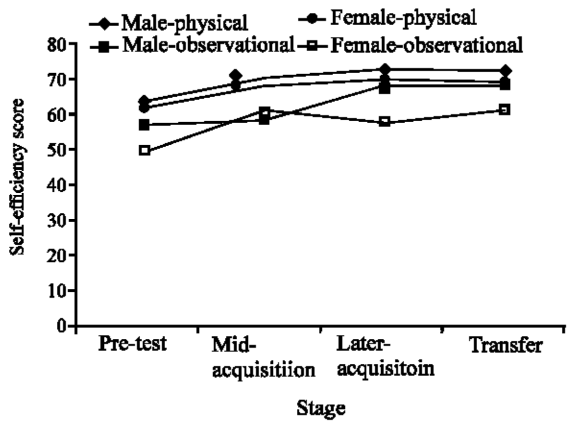

Fig. 1: The self-efficacy score of groups in different stages of experiment

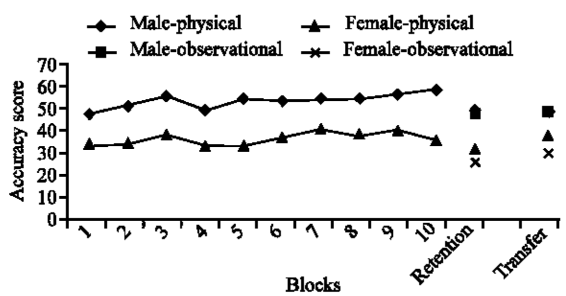

Fig. 2: The accuracy score of groups in different phases of experiment

the retention, ANOVA have shown the significant differences ($F_{3,44}$ = 9.38, p<0.01) between the groups. The Newman-Keuls follow-up test revealed that the accuracy score of males in the physical and observational groups were higher than females (p<0.05) in the physical and observational groups. However, in within genders the two practice groups were not different, significantly (p>0.05). The transfer results showed that there were significant differences ($F_{3,44}$ = 4.91, p<0.01) between the groups. The Newman-Keuls follow-up test revealed that the accuracy score of males in the physical and observational groups were higher than females (p<0.05) in the physical and observational groups. However, in within genders the two practice groups were not different, significantly (p>0.05).

DISCUSSION

The main goal of present investigation was to study the effect of observational practice on the learning of motor skills. The scores of retention and transfer phases have compared between physical and observational groups to meet this goal. Present results have shown that in two phases, the two type of practice were not different. Thus the physical practice was not superior to observational practice in acquisition of skill. In fact, observing a skill is beneficial as well as performing of it in the acquisition of motor idea.

This finding confirmed the previous research results on the positive effect of modeling on the learning. For example, SooHoo *et al.* (2004), Ram *et al.* (2004), McCullagh and Meyer (1997) in squat skill, Liu and Jensen (2004) in pedaling skill, Black and Wright (2000) in sequential-timing key-pressing task, Rose and Tyry (1994) in shooting skill, Weeks and Choi (1992) in coincidence-timing task, Lirg and Feltz (1991) in Bachman ladder task, Weir and Leavit (1990) in dart-throwing skill have shown that the model can facilitate the acquisition and learning of skills.

Some theories have tried to explain the effectiveness of model. The Bandura's social-cognitive theory believed that the different cognitive processes such as memory retention and reproduction stimulated through the model that result in learning. According to ecological perspective, the modeling can help the learner to take a better perception from the skill before the actual action, and then converts the picture into motor commands (McCullagh and Weiss, 2001). Others (Blandin and Proteau, 2000; Black and Wright, 2000) believed that the modeling develops the error-detection through increasing of memory trace.

The psychosocial theories also have been proposed along with motor learning theories for the positive effects of modeling. The Bandura's self-efficacy theory is one of the important theories that have suggested the relationships between efficacy expectancy and performance. Self-efficacy that results in through several sources such as performance accomplishment, vicarious experiences and physical and mental control can enhance the effort, persistence and trend (Gill, 1999; Williams, 2001). The current findings have shown that the self-efficacy increased from pre-test to transfer phase, but there were no significant differences between physical and observational practice groups. On the other hand, the self-efficacy increment did not dependent on the type of practice. This result have demonstrated that the lack of differences between two practice groups on throwing accuracy have related to self-efficacy. In fact, the observing of a performance through a learning model in acquisition phase increased the perception of self-belief in execution of specific skill that facilitated the performance of retention and transfer phases without any worries about the outcomes. Weiss *et al.* (1998) in the learning of swimming skill in children and Clark and Ste-Marie (2007) also reported the self-efficacy increment following the modeling. Thus, the self-efficacy had a mediator role in relationships between model and performance. Present findings have supported the Bandura cognitive psychology theory and have revealed that the self-efficacy has mediator role in the learning of motor skills. In addition, in contrary to previous findings (Black and Wright, 2000; Rose and Tyry, 1994; Douglas *et al.*, 1992) that have shown that the effectiveness of modeling on the learning of motor skills is not as same as physical practice, the current findings supported another researches that have shown the similarity of model and physical practice in the learning of motor tasks(Heyes and Foster, 2002; Black *et al.*, 2005).

Another goal of present investigation was to study the effect of gender on observational learning. The present findings have shown that the males were better than the females in all experiment phases in spite of any differences between them in pre-test. So, the later differences between them can be related to performance gap but not skill priority (dart-throwing skill initial differences).

However, the gender differences in motor skills is not a new issue and its reasons relates to variant factors such as, physical size, evaluation criterions, movement experiences and cultural settings (Schmidth and Lee, 2005). The prior movement experiences is one valid factor from above factors, because in spite of selecting physical education students as subjects that have better movement repertoire than others, but the basic movement pattern of throwing is different between the males and females. The motor development researches have demonstrated that the males are more mature than the females on developmental pattern of throwing at all ages (Haywood and Getchell, 2001; Gallahue and Ozmon, 2002; Issacs and Payne, 2002). It's seems that, the gender differences was not related to the outcome of movement (accuracy) but the process of movement (pattern). Since the development of throwing pattern is dependents on socio-cultural and environmental variables such as previous experiences (Haywood and Getchell, 2001), the males better performance have been acquired from their enriched movement experiences of living contexts.

The issue of gender differences has been considered from two different viewpoints. The first viewpoint is self-efficacy. The important question is that whether the performance differences of the males and the females is related to self-efficacy. Gao and Harrison (2004) in dart-throwing skill have revealed that the males had better performance and self-efficacy than the females. The present findings, also demonstrated that the self-efficacy score of males in acquisition phase were higher than females, but there were no significant differences between them in the transfer phase. Therefore, the self-efficacy priority of males in acquisition was not generalized to transfer test and did not facilitate the performance of transfer test, because the supplement analysis by multiple regression method have shown that in within gender groups the self-efficacy score of transfer phase was significant predictor of transfer performance and the acquisition score of self-efficacy were not the significant predictor of next day (retention and transfer tests).

The second viewpoint is model-observer interaction. The current findings have revealed that the males in observational practice group outperformed than females in same practice group. Thus, the observational practice for males was more beneficial than the females that result in better performance and learning. The previous research findings also have shown that the trends of males for modeling have been more than females. For example, Gould and Weiss reported that the sex similarity of model and observer had a positive effect on the self-efficacy and learning (McCullagh and Weiss, 2001). Other researchers (Williams *et al.*, 1999) have shown that the males were more trends to compete with the model's skill level than females and have been concluded that the relationships between the model and the observer is affected by gender. But, George, Feltz and Chips in 1992 have not shown the effect of gender of model on performance (McCullagh and Weiss, 2001). Meaney *et al.* (2005) also showed that the skill transfer and learning strategies in females and learning model were better than the males and skilled model. In summary, the gender has a significant effect on the observational learning that have confirmed in present investigation.

In conclusion, present findings have supported the previous research findings on the role of observational model in the learning and self-efficacy of motor skills and also confirmed the gender is a mediator in the relationships between the model and performance and the males benefit from the observed model more than the females. These findings have obtained from non western societies but can verify the proposed theories which supported in the western societies. But further studies are needed to demonstrate the role of gender in the observational learning.

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