Contextual Interference Effect in Observational Practice on learning of Basketball Skills

Seyede Batoul Dadkhah¹, Masoume Shojaei², Mahin Farhadizad³

¹Master of Physical Education and Sport Sciences, Physical Education Teacher, Karaj, Iran
²Associate Professor of Physical Education and Sport Sciences, Alzahra University, Tehran, Iran
³Lecturer of Physical Education and Sport Sciences, Alzahra University, Tehran, Iran

*Corresponding Author Email: betty_dadkhah@yahoo.com

Abstract

The present study sets to investigate the effect of contextual interference in observational training on learning basketball two-hand chest pass and control dribble using a pretest-posttest design. A number of 60 novice female students, aged 10-11 years old, were randomly assigned into five groups: Physical blocked practice, observational blocked practice, physical serial practice, observational serial practice, and control. Physical practice groups were considered as role models for their counterpart observational practice groups. The subjects participated in the pretest following a 60-minute training session. The experimental subjects participated in 12 training sessions. One day after the training protocol was over, a transfer test was administered to all participants. Mixed/Split Plot ANOVA with repeated measures and dependent t test were run to analyze the data (P<0.05). The results showed a significant difference in all observational experimental subjects in terms of the form and outcome of skill performance between before and after the training program (P<0.05). In other words, observational subjects in all experimental groups learnt the skills in terms of both the form and outcome of performance. In a between-group comparison, the results showed a significant difference in the outcome of control dribble performance between Observational Blocked Practice and Observational Serial Practice (P=0.049). Mean score differences in favor of Observational Serial Practice supported the effectiveness of contextual interference only in the outcome of dribble performance. However, the findings did not support the effectiveness of contextual interference in the form and outcome of two-hand chest pass performance and the form of dribble performance.

Keywords: Contextual interference effect, Observational practice, Learning, Transfer test, Basketball skills.

Introduction

An important capacity of human is his delicate ability to apply various skills. Since skills constitute an important part of human life, scholars of education have long sought out the factors affecting performance (Magill, 2004). Sports coaches try to employ all the determinants of learning, particularly at early stages of learning, so that athletes may attain more sustainable learning and benefit from athletic skills. Over the last years, both coaches and researchers have set to develop training programs in order to improve learning and athletic performance. They have also shown an interest in skill display as one of the most powerful tools coaches use to transfer skill-related information to trainees in the short run. Coaches tend to display the skills since they believe that trainees would receive more information in a short time comparing with verbal description (Magill, 2004). The trainees’ then try to emulate the skill or activity they have observed others doing (Bagherpour, 2006). Optimal training techniques and training programs significantly contribute to maximizing the positive effects of learning-teaching process in motor skills (Blandin et al., 1994; Black, 2004). In this regard, observational learning and contextual interference may significantly contribute to learning sports skills and developing new training methods. Research has shown that contextual interference and observational training are independently effective so that each contributes to improved learning and the quality of training sessions. Therefore, the present study aims to investigate whether or not a combination of these two techniques adds to their effectiveness.
Methodology

The study adopted a quasi-experimental method and a pretest-posttest design of matched groups. The population of the study consisted of 60 novice female students aged 10-11 years old. The subjects were randomly selected and assigned into 5 groups: physical blocked practice, observational blocked practice, physical serial practice, observational serial practice, and control (N=12). All the subjects were first trained for the respective skills under the same condition. Then they participated in the pretest following 30 minutes training. The experimental subjects separately participated in a 12-session training program, 3 sessions per week, 40 minutes per session. In all training sessions, every physical blocked subject was coupled with an observational blocked subject while every physical serial subject was paired with an observational serial subject. That is, every observational subject watched her physical practice counterpart practicing the skills.

When a physical subject received feedback, the observers also heard it. The feedback was decided to be prescriptive. The relative frequency of feedback was the same for all subjects and followed the elimination method. To eliminate the order effect, half of the closed training subjects practiced control dribble in the first 6 sessions and two-hand chest pass in the latter 6 sessions while the second half of the subjects did the reverse. In the same vein, half of the physical serial practice subjects did the training with dribble-pass inter-trial variability while the second half did the training with pass-dribble inter-trial variability. One day after the training program was over, the transfer test was administered to all subjects, and the scores were recorded. Mixed/split plot ANOVA (SPANOVA) was used to compare the mean scores the groups obtained on the dependent variable before and after the training program. Dependent t-test was run to examine the effect of the training program on each group. Upon the inequality of variances and co-variances, Friedman t-test was run to do within-group comparisons while Kruskal-Wallis and Mann Whitney U tests were run to do between-group comparisons.

Results

A significant difference was observed in all experimental groups in terms of the form and outcome of performance comparing the scores obtained before and after the training program (P<0.05). That is, all experimental subjects learnt the skills in terms of both the form and outcome of performance.

A between-group comparison showed a significant difference only in dribble task performance between observational blocked practice and observational serial practice (P=0.049). Mean score differences in favor of observational serial practice group supported the effectiveness of contextual interference only in the outcome of dribble performance. However, the findings did not support the effectiveness of contextual interference in the form and outcome of two-hand chest pass performance and the form of dribble performance.

Table 1. Pretest-posttest comparison of the form and outcome of task performance in the research groups.

<table>
<thead>
<tr>
<th>Model of control group (two-hand chest pass)</th>
<th>Model of control group (control dribble)</th>
<th>Performance outcome of control group (two-hand chest pass)</th>
<th>Performance outcome of control group (control dribble)</th>
<th>Performance outcome of control group (two-hand chest pass)</th>
<th>Performance outcome of control group (control dribble)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model of observational block (two-hand chest pass)</td>
<td>Model of observational block (control dribble)</td>
<td>Performance outcome of observational block (two-hand chest pass)</td>
<td>Performance outcome of observational block (control dribble)</td>
<td>Performance outcome of observational block (two-hand chest pass)</td>
<td>Performance outcome of observational block (control dribble)</td>
</tr>
<tr>
<td>Model of observational block (two-hand chest pass)</td>
<td>Model of observational block (control dribble)</td>
<td>Performance outcome of observational block (two-hand chest pass)</td>
<td>Performance outcome of observational block (control dribble)</td>
<td>Performance outcome of observational block (two-hand chest pass)</td>
<td>Performance outcome of observational block (control dribble)</td>
</tr>
<tr>
<td>Model of observational block (two-hand chest pass)</td>
<td>Model of observational block (control dribble)</td>
<td>Performance outcome of observational block (two-hand chest pass)</td>
<td>Performance outcome of observational block (control dribble)</td>
<td>Performance outcome of observational block (two-hand chest pass)</td>
<td>Performance outcome of observational block (control dribble)</td>
</tr>
<tr>
<td>Model of observational block (two-hand chest pass)</td>
<td>Model of observational block (control dribble)</td>
<td>Performance outcome of observational block (two-hand chest pass)</td>
<td>Performance outcome of observational block (control dribble)</td>
<td>Performance outcome of observational block (two-hand chest pass)</td>
<td>Performance outcome of observational block (control dribble)</td>
</tr>
<tr>
<td>Model of observational block (two-hand chest pass)</td>
<td>Model of observational block (control dribble)</td>
<td>Performance outcome of observational block (two-hand chest pass)</td>
<td>Performance outcome of observational block (control dribble)</td>
<td>Performance outcome of observational block (two-hand chest pass)</td>
<td>Performance outcome of observational block (control dribble)</td>
</tr>
<tr>
<td>Model of observational block (two-hand chest pass)</td>
<td>Model of observational block (control dribble)</td>
<td>Performance outcome of observational block (two-hand chest pass)</td>
<td>Performance outcome of observational block (control dribble)</td>
<td>Performance outcome of observational block (two-hand chest pass)</td>
<td>Performance outcome of observational block (control dribble)</td>
</tr>
<tr>
<td>Model of observational block (two-hand chest pass)</td>
<td>Model of observational block (control dribble)</td>
<td>Performance outcome of observational block (two-hand chest pass)</td>
<td>Performance outcome of observational block (control dribble)</td>
<td>Performance outcome of observational block (two-hand chest pass)</td>
<td>Performance outcome of observational block (control dribble)</td>
</tr>
<tr>
<td>Model of observational block (two-hand chest pass)</td>
<td>Model of observational block (control dribble)</td>
<td>Performance outcome of observational block (two-hand chest pass)</td>
<td>Performance outcome of observational block (control dribble)</td>
<td>Performance outcome of observational block (two-hand chest pass)</td>
<td>Performance outcome of observational block (control dribble)</td>
</tr>
<tr>
<td>Model of observational block (two-hand chest pass)</td>
<td>Model of observational block (control dribble)</td>
<td>Performance outcome of observational block (two-hand chest pass)</td>
<td>Performance outcome of observational block (control dribble)</td>
<td>Performance outcome of observational block (two-hand chest pass)</td>
<td>Performance outcome of observational block (control dribble)</td>
</tr>
</tbody>
</table>

Table 2. Results of between-group comparisons.

<table>
<thead>
<tr>
<th>Test</th>
<th>Sum of squares</th>
<th>df</th>
<th>Mean square</th>
<th>F</th>
<th>Sig.</th>
<th>Practical significance</th>
<th>Statistical power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groups (model of control dribble)</td>
<td>1324.923</td>
<td>4</td>
<td>331.231</td>
<td>2.406</td>
<td>0.061</td>
<td>0.159</td>
<td>0.651</td>
</tr>
<tr>
<td>Groups (model of control dribble)</td>
<td>17.521</td>
<td>4</td>
<td>4.380</td>
<td>0.482</td>
<td>0.749</td>
<td>0.036</td>
<td>0.155</td>
</tr>
<tr>
<td>Groups (model of two-hand chest pass)</td>
<td>1324.923</td>
<td>4</td>
<td>331.231</td>
<td>2.406</td>
<td>0.061</td>
<td>0.159</td>
<td>0.651</td>
</tr>
</tbody>
</table>
The present study was conducted to investigate the effect of contextual interference as a training strategy on observational learning of basketball two-hand chest pass and control dribble. The results revealed that observational training contributed to learning motor skills in general and child motor learning in particular. However, observational training did not support the effectiveness of contextual interference except in the outcome of dribble performance. According to Bandura’s social-cognitive theory, observation of task performance leads to a cognitive representation of the task (Gill, 1999). Consistent with this theory and the findings reported by Black and Wright (2000), Black et al., (2005), Deakin and Adams (2000) and Landin and Herbert (1994), the observational subjects could learn the skills in terms of both the form and outcome of performance even without physical training. Consistent with Black (2004) and Bird and Rikli (1983), contextual interference in observational training was found effective only in the outcome of dribble performance; however, it did not prove effective in the form and outcome of two-hand chest pass performance as well as the form of dribble performance. This is consistent with the findings of Dornier et al., (1999), Jarus and Gutman (2001), Meira and Tani (2001), and Jarus and Gutman (1999). These researchers reported that contextual interference did not prove entirely effective in some age groups, especially children, and in some simple and complicated tasks.

The results supported the effectiveness of contextual interference in observational training in the outcome of control dribble performance but not in the outcome of two-hand chest pass performance. The effectiveness of contextual interference in the outcome of control dribble performance corresponds to the findings of Porter and Magill (2010) and Granda and Montilla (2003) who, like the present study, studied a fundamental motor skill. They reported that a variable training program proved useful for children.

Considering the outcome of two-hand chest pass performance, one should note that these two skills reflect different natures. Two-hand chest pass is a single skill so that one little mistake in an attempt could lead to missing the ball and eventually missing the time that was allocated to the transfer test. However, dribble is a continuous skill. Therefore, the present inconsistency may relate to the different nature of these two tasks. Black (2004) organized the learning of relative and absolute timing in the form of variable observational training and reported different findings on the relative and absolute timing as they had different natures.

The results did not support the effectiveness of contextual interference in observational training in the form of two-hand chest pass and control dribble. Optimal skill learning requires careful attention to different components of the skill. Human has limited capacity to process peripheral information. Therefore, the amount of processing allocated to two simultaneous tasks is influenced by limited capacity of attention. As a result, there will be interference between the two tasks in terms of the required attention capacity. The trainee needs to divide attention between training variability and observational training effectively. In the present study, the observational subjects could have failed to maintain a high level of attention during training. During model performance, there are ample pieces of information to consider so that the participants might have failed to notice the important details despite the trainer’s feedback (Schmidt & Lee, 1999). Besides, the subjects might have paid little or no attention to the model due to their low age. This may be confounded by little attention capacity in young people (Williams et al., 1999). Before gaining benefit from random training, children need to develop motor ideas (Slapper et al., 1999). However, the subjects were deprived of any physical training in the present study so that they were less involved in problem-solving activities and did not reach appropriate memory representation to develop motor ideas (Magill, 2004). It is likely that restructuring process, forgetting the action plan, and the recall of motor plan did not occur completely so that forgetting and restructuring were not effective enough. Simple tasks adjust the effect of contextual interference. Still, this effect was not observed in the individuals who had practiced complex tasks (Bird & Rikli, 1993). In the present study, a combination of two-hand chest pass, as a specialized skill, with control dribble, as a fundamental motor skill, resulted in findings inconsistent with previous findings on adults due to limited attention capacity in the subjects, which complicated the tasks.

Children and adults need different training programs (Slapper et al., 1999). Children need educational support while acquiring skills (Armon-Bates et al., 2000). However, developing a training program using observational training may not provide appropriate educational support in the acquisition stage, particularly in the acquisition of specialized skills such as basketball two-hand chest pass and the form of skill performance. Moreover, complex task conditions including children’s limited capacity, observational training without physical practice, concentration on learning the form of the skill and/or selection of a specialized skill could increase the learning difficulty. Therefore, they could prevent the acquisition of cognitive processes and impair learning processes (Jarus & Gutman, 2001; Laguna, 2004).

### Discussion and Conclusion

The present study was conducted to investigate the effect of contextual interference as a training strategy on observational learning of basketball two-hand chest pass and control dribble. The results revealed that observational training contributed to learning motor skills in general and child motor learning in particular. However, observational training did not support the effectiveness of contextual interference except in the outcome of dribble performance. According to Bandura’s social-cognitive theory, observation of task performance leads to a cognitive representation of the task (Gill, 1999). Consistent with this theory and the findings reported by Black and Wright (2000), Black et al., (2005), Deakin and Adams (2000) and Landin and Herbert (1994), the observational subjects could learn the skills in terms of both the form and outcome of performance even without physical training. Consistent with Black (2004) and Bird and Rikli (1983), contextual interference in observational training was found effective only in the outcome of dribble performance; however, it did not prove effective in the form and outcome of two-hand chest pass performance as well as the form of dribble performance. This is consistent with the findings of Dornier et al., (1999), Jarus and Gutman (2001), Meira and Tani (2001), and Jarus and Gutman (1999). These researchers reported that contextual interference did not prove entirely effective in some age groups, especially children, and in some simple and complicated tasks.

The results supported the effectiveness of contextual interference in observational training in the outcome of control dribble performance but not in the outcome of two-hand chest pass performance. The effectiveness of contextual interference in the outcome of control dribble performance corresponds to the findings of Porter and Magill (2010) and Granda and Montilla (2003) who, like the present study, studied a fundamental motor skill. They reported that a variable training program proved useful for children.

Considering the outcome of two-hand chest pass performance, one should note that these two skills reflect different natures. Two-hand chest pass is a single skill so that one little mistake in an attempt could lead to missing the ball and eventually missing the time that was allocated to the transfer test. However, dribble is a continuous skill. Therefore, the present inconsistency may relate to the different nature of these two tasks. Black (2004) organized the learning of relative and absolute timing in the form of variable observational training and reported different findings on the relative and absolute timing as they had different natures.

The results did not support the effectiveness of contextual interference in observational training in the form of two-hand chest pass and control dribble. Optimal skill learning requires careful attention to different components of the skill. Human has limited capacity to process peripheral information. Therefore, the amount of processing allocated to two simultaneous tasks is influenced by limited capacity of attention. As a result, there will be interference between the two tasks in terms of the required attention capacity. The trainee needs to divide attention between training variability and observational training effectively. In the present study, the observational subjects could have failed to maintain a high level of attention during training. During model performance, there are ample pieces of information to consider so that the participants might have failed to notice the important details despite the trainer's feedback (Schmidt & Lee, 1999). Besides, the subjects might have paid little or no attention to the model due to their low age. This may be confounded by little attention capacity in young people (Williams et al., 1999). Before gaining benefit from random training, children need to develop motor ideas (Slapper et al., 1999). However, the subjects were deprived of any physical training in the present study so that they were less involved in problem-solving activities and did not reach appropriate memory representation to develop motor ideas (Magill, 2004). It is likely that restructuring process, forgetting the action plan, and the recall of motor plan did not occur completely so that forgetting and restructuring were not effective enough. Simple tasks adjust the effect of contextual interference. Still, this effect was not observed in the individuals who had practiced complex tasks (Bird & Rikli, 1993). In the present study, a combination of two-hand chest pass, as a specialized skill, with control dribble, as a fundamental motor skill, resulted in findings inconsistent with previous findings on adults due to limited attention capacity in the subjects, which complicated the tasks.

Children and adults need different training programs (Slapper et al., 1999). Children need educational support while acquiring skills (Armon-Bates et al., 2000). However, developing a training program using observational training may not provide appropriate educational support in the acquisition stage, particularly in the acquisition of specialized skills such as basketball two-hand chest pass and the form of skill performance. Moreover, complex task conditions including children’s limited capacity, observational training without physical practice, concentration on learning the form of the skill and/or selection of a specialized skill could increase the learning difficulty. Therefore, they could prevent the acquisition of cognitive processes and impair learning processes (Jarus & Gutman, 2001; Laguna, 2004).

### References


