

Effects of Contextual Interference (CI) In Basic Squash Shots Practice

Ebby Waqqash¹
Jeffrey Low²

¹Faculty of Sports Science and Recreation, Universiti Teknologi MARA

²Faculty of Sport Science and Coaching, Universiti Pendidikan Sultan Idris

Abstract

The purpose of this study was to compare block and random practice in learning basic squash shots. Eight university students were randomly assigned to two groups; the block practice group and the random practice group. The block practice group performed 10 minutes of forehand stroke, followed by another 10 minutes of backhand stroke. The random practice group played against themselves in a 1 on 1 real-match situation for 20 minutes. Three tests were administered to evaluate the participants' performance: pretest, posttest (acquisition) and retention test. Results showed the block practice ($M=16$, $SD=.816$) has better skill learning effect in the acquisition phase compared to random practice ($M=15.75$, $SD=2.22$). However, the random practice ($M=18.25$, $SD=2.22$) outperformed the block practice ($M=10.25$, $SD=1.26$) in the retention phase. Based on the finding of this study, unstructured and real-match situation practice facilitates better learning by reconstructing the learners' action plan each time a skill is performed.

Keywords: *Contextual interference, blocked practice, random practice, squash.*

Introduction

Practice conditions play an important role in learning and developing new skills especially among new learners. Practice conditions are mostly influenced by the order of practice. Blocked and random practices are the most common practice orders. According to Feghhi and Valizade, the manipulation of practice orders will lead to different level of contextual interference (CI); blocked practice (low level of contextual interference) and random practice (high level of contextual interference). Contextual interference is defined as a learning phenomenon which functional interference influences the memory improvement in performing certain tasks. Battig was the first to study the effect of a blocked versus random organisation of the learning material in verbal learning studies. Battig noted that organisation of practice activities that are random in order will require effortful cognitive processing and are considered as high CI effect while practice activities that are arranged in repetitive order (blocked) are considered as low CI effect as these activities do not require much cognitive process. Battig coined the term 'contextual interference' to reflect factors both practice tasks and the learner that could either hinder or

enhance learning (Battig, 1979; Magill & Hall, 1990). Motor learning researchers refer 'contextual interference' as the way interference is introduced into the practice schedule. Early understanding shows that high level of contextual interference leads to decreased performance in the acquisition stage. However positive effects are found in retention and transfer phase. This means high level of CI rather than low level of CI lead to better learning process when measured in retention or transfer phase.

Shea and Morgan investigated CI interference in laboratory setting in which involves three version of task (18 trials per version). The task involves the participant to pick up a tennis ball in respond of an illuminating colored light and knocking over three out of six wooden obstacles and immediately substituting the tennis ball. Two groups of individuals were compared in this study; blocked practice group and random practice group. The blocked practice group practiced all 18 trials in order according to the version (18 trials of one task version, followed by 18 trials of second version and proceeding to the third version). Conversely, the random group practice order was less systematic and randomized between the three versions of task. The results shows that the blocked practice group has improve faster on the task compared to random practice group. However, the retention test revealed the opposite. The random practice group resulted better in retention test (10 minutes and 10 days after practice period.) The findings of their study was the stepping stone which proves that random practice had facilitated retention training compared to blocked practice.

Zuvela, Males and Cerkez investigated the effects of contextual interference on specific athletic throwing skills (i.e., discus throw, shot put and javelin throw). The purpose of this study was to establish the effects of two experimental activities (blocked and random practice) on the acquisition of the specific athletic skills of the first year undergraduate students studying kinesiology. The results showed significant improvement for both types of practice in the acquisition of the athletic skills. However, participants assigned to random practice exhibited longer retention of the learned specific skills. This sample of subjects recruited in this study was students with no experience with the Discus Throw, Shot Put and Javelin Throw. The measurement of variables for this study was based on judgments of experience athletes. The measurement method is based on qualitative observation. The reliability of judge evaluation is important as it may influence the results. The authors did not mention how many judges were recruited for this study as the number of observers will affect the reliability of the qualitative data.

Menayo, Moreno, Fuentes, Sabido, Garcia conducted a study about simultaneous treatments of blocked and random practice and their influence on learning process of four tennis shots. The researchers found improvement in the performance of the four tennis shots practiced in blocked and random practice conditions following the acquisition stage. However, random practices decreases accuracy in all retention tests compared to blocked practice which performance was significantly better in forehand test. The findings of this study are different with other previous studies where researchers discovered the benefits of random practice compared to blocked practice when long-term retention is evaluated. Menayo, et al. were able to implement a new intervention in the field of study (contextual interference) by investigating the effects of simultaneous treatment design (combination of blocked and random practice) on the acquisition and retention phase. However, these studies adopted purposive sampling to choose the participants because of the specific characteristic (e.g., experienced tennis players). According to Baumgartner and Hensley [4], the weakness of this purposive sampling is it can be highly prone to researcher bias. To further explain in applied setting, the athletes in the study

might have been already used to the type of tennis shots practiced. Thus the results might have yielded the expected outcome as compared to probability sampling techniques which was designed to reduce such biases.

In previous studies, most researchers discovered the benefits of random practice compared to blocked practice when long-term retention is assessed. However, Menayo, and colleagues discovered that random practices decreases tennis shot accuracy in retention tests compared to blocked practice. Furthermore, Fegghi, Abdoli and Valizadeh revealed that increase contextual interference will cause poorer performance in acquisition period. Squash is a very fast-paced sport whereby the environment is continuously changing and so movements have to be continually adapted. To date, findings on the effect of CI on applied settings are still at best, equivocal. Thus there is a need to investigate the effects of CI on squash shots. The purpose of this study was to measure the squash shot accuracy of the blocked versus random practice groups and to examine if there were any difference in squash shot accuracy between the blocked and random practice groups. The block practice condition was expected to have significant improvement compared to random practice on squash shot accuracy in the posttest (acquisition) whereas the random practice condition is expected to outperform the block practice in the retention test.

Materials and Methods

Participants

Eight students from UiTM Shah Alam were recruited to participate in this study. All of them had no previous experience in racquet sports. Informed consent was obtained from each participant before engaging in this study.

Procedures

All squash shot accuracy test and squash practices were conducted at UiTM Sports Complex Squash Arena. The participants were required to perform basic squash shots which consist of backhand and forehand strokes. For the pre-test, multiple targets were placed at the front wall. Each of the multiple targets had different scoring based on the difficulty for opponents to rebound the squash hit.

A detailed design layout of the squash accuracy scoring system was provided in figure 1. A ball feeder (standing behind the participant) was appointed to deliver the squash ball to the participants via rebound of the front wall. The participants were told to rebound the squash ball to the multiple targets for 30 repetitions.

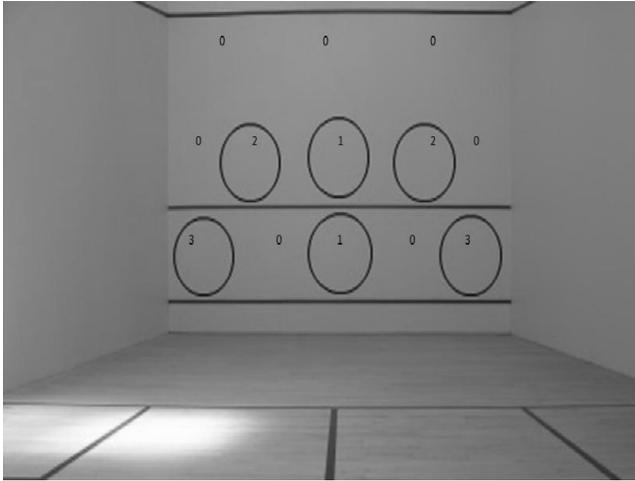


Figure 1: Design layouts for the squash shot accuracy scoring system

During the pre-test, two observers will be standing at each corner of the back court to record the successful trials. The participants were later divided into two separate groups; blocked and random group. Both groups had undergone altogether 9 sessions (3 sessions per week) of squash shot practice. Each session lasted for 20 minutes. The blocked group undergone 10 minutes of forehand shot practice and 10 minutes of backhand shot practice. The random group played a normal competitive squash game for 20 minutes. A post-test of similar procedure of the pre-test (hitting of multiple targets) was tested on both groups immediately after the participants last session.

Statistical Analyses

The data were analyzed using 2 Group (Blocked, Random) x 2 test (Pre, Post, Retention) ANOVA with repeated measures on the second factor. The alpha level required for significance for all test was set at $p < .05$. The statistical analysis was evaluated using the SPSS version 20.0.

Results

The mean and standard deviations for squash shot accuracy means and standard deviations for both groups (block and random) are presented in table 1.

Table 1: Squash shot accuracy means and standard deviations across three time periods (pretest, posttest, retention test) for block and random group.

Test	Group	Mean	Standard deviation (SD.)
Pre test	Block	4.75	.957
	Random	6.25	.957
Posttest	Block	16	.816
	Random	15.75	2.22
Retention test	Block	10.25	1.26
	Random	18.25	2.22

There was an interaction between test (pre, post, retention) and group (blocked, random), $F(1, 6) = 10.84, p < .05$. Overall, both groups (blocked and random) had better performance in the posttest and retention tests compared to the pre-test. In the pretest, the random group ($M=6.25, SD=.957$) was slightly better than the block group ($4.75, SD=.957$).

However, the block group ($M= 16, SD=.816$) shows better improvement than the random group ($M=15.75, SD=2.22$) in the posttest. Conversely in the retention test, the random group ($M=18.25, SD=2.22$) outperformed the block group ($M=10.25, SD=1.26$).

Generally speaking, the block practice has better skill learning effect in the acquisition phase (pre-test) compared to random practice. Nevertheless, the random practice shows significant improvement of skill acquisition compared to block practice in the retention phase.

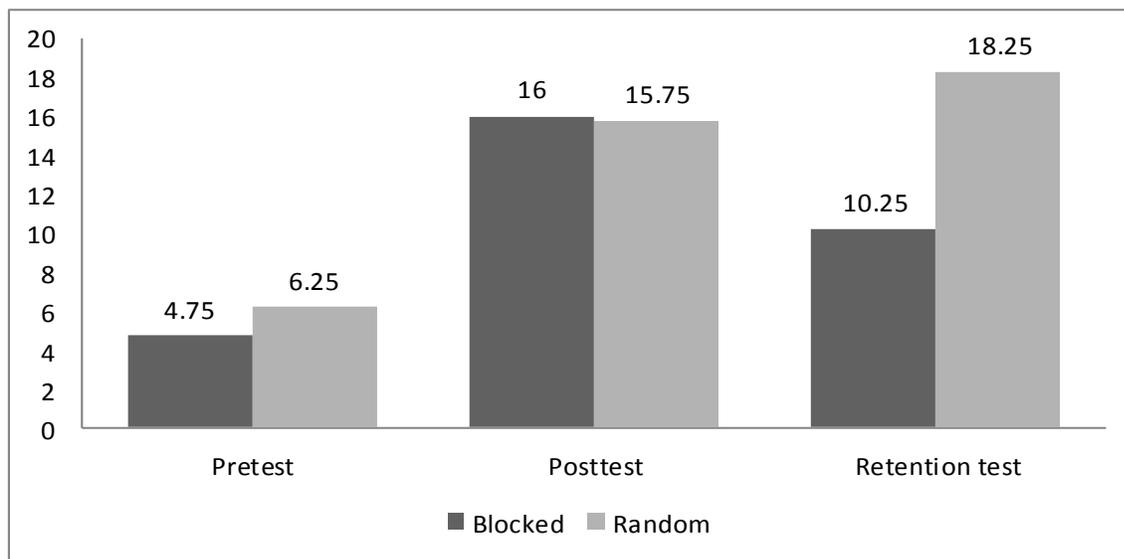


Figure 2: Means of squash shot accuracy across three time periods (pretest, posttest, retention test) for block and random group.

Discussion and Conclusion

The aim of this study was to investigate the effects of contextual interference (block and random

practice) on the acquisition and learning of basic squash shots (i.e, forehand and backhand stroke) among UiTM students with no prior background in the sport. In this study, the researcher compared blocked and random practice in acquisition and retention. The results showed that there were significant improvements when scores from acquisition (posttest) and retention test when compared with pre-test.

It was predicted that the block group would outperform the random group during acquisition. In acquisition, as the researcher expected, the block group performed better than the random group. Nevertheless, the random group also showed some improvement in the acquisition. It is consistent with the general effects of contextual interference and many studies have found similar results. Shea and Morgan discovered a similar finding as this study as they have found that the blocked practice group has improve faster on the task compared to random practice group. The most likely reason for block practice condition has better improvement than the random practice in the acquisition phase is because of the task difficulty. According to Fegghi and Valizade, block practice is often very straight forward and relatively easy thus most practice conducted was successful. Random practice is more challenging thus increasing the errors and decreases the rate of successful practice. Furthermore, repeated errors in random practice will lead to frustration hence may demotivated the learner.

In retention, consistent with Menayo, et al. and Zuvela, et al., the researcher predicted that the random practice group will outperform the block practice group. Furthermore in the retention test, the performance of block practice group suffers significant drop after the acquisition phase (posttest). According to Lee and Wishart, the idea of applying contextual interference to enhance performance is based on the existence of a working memory. It is believed that changing of task characteristic in a non-predictable sequence requires extra practice demands. As a result, frequent reconstruction of working memory takes place and longer memory retention occurs. Block practice conditions do not require these memory operations thus forgetting the skills acquired is likely. In addition, block groups were forced to perform repeated bouts of similar task, which facilitated boredom and reduce cognitive engagement.

In summary, it is clear that the block practice is only effective for short-term gain in performance improvement. Conversely random practice although may disrupt immediate performance will have better retention benefits of practice compared to block group. In applied settings, even though random practice condition has been proven to improve retention, poor performance during practice tends to reflect poorly on the learner, instructor and coaches. Thus, the optimum training condition may consist of the combination of block and random practice. For future studies it is recommended to investigate the effects of simultaneous treatment effects of contextual interference (block and random practice) on skill acquisition.

References

- Barreiros, J., T. Figueiredo, and M. Godinho, *The contextual interference effect in applied settings*. European Physical Education Review, 2007 **13**.
- Battig, W.F., *Facilitation and interference* In E. A. Bilodeau (Ed.). Acquisition of skill 1966: p. 215–244.
- Battig, W.F., *Intratask interference as a source of facilitation in transfer and retention*. In J. F. Voss (Ed.). Topics in learning and performance, 1972: p. 131–159.
- Baumgartner, A.T. and D.L. Hensley, *Conducting and Reading Research in Health and Human Performance*. Fourth ed. 2006: McGraw-Hill.

- Fegghi, I., B. Abdoli, and R. Valizadeh, *Compare contextual interference effect and practice specificity in learning basketball free throw*. Procedia - Social and Behavioral Sciences, 2011. **15**(0): p. 2176-2180.
- Fegghi, I. and R. Valizadeh, *Systematically Increasing Contextual Interference is Beneficial For Learning Single Task*. Procedia - Social and Behavioral Sciences, 2011. **30**(0): p. 2191-2193.
- Girard, O. and G.P. Millet, *Neuromuscular Fatigue in Racquet Sports*. Neurologic Clinics, 2008. **26**(1): p. 181-194.
- Lee, D.T. and R.L. Wishart, *Motor Learning Conundrums (and Possible Solutions)*. National Association for Kinesiology and Physical Education in Higher Education, 2005. **57**: p. 67-78.
- Maslovat, D., et al., *Contextual Interference: Single Task Versus Multi-task Learning*. Motor Control, 2004: p. 213-233.
- Menayo, R., et al., *Simultaneous treatment effects in learning four tennis shots in contextual interference conditions*. Perceptual and Motor Skills, 2010: p. 661-673.
- Shea, J.B. and R.L. Morgan, *Contextual interference effects on the acquisition, retention, and transfer of a motor skill*. Journal of Experimental Psychology: Learning, Memory and Cognition, 1979. **5**(1): p. 79-187.
- Žuvela, F., B. Maleš, and I. Čerkez, *The influence of different learning models on the acquisition of specific athletic throwing skills*. Physical Education and Sport, 2009. **7**: p. 197-205.

Corresponding Author

Jeffrey Low (PhD)

Faculty of Sport Science and Coaching, Universiti Pendidikan Sultan Idris, Tanjong Malim, 35900, Perak, Malaysia: jeffrey@upsi.edu.