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A comparison of blocked and random practice on acquisition of swimming skills

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ABSTRACT

The purpose of the present research was to study the effect of contextual interference on the acquisition of complex and continuous swimming skills. 20 girls with an age of 8-10 participated in the research and successfully performed the basic swimming skills. The participants were randomly divided into two practice groups: blocked practice and random practice. Each group participated in 36 exercise sessions and acquisition tests were administered on the 7th, 15th, 24th, and 32nd sessions. The data was analyzed using mixed ANOVA at the 0.05 significance level and in PASW software. The results suggested the effectiveness of both blocked and random practice on the acquisition of the skills. In general, the results indicate that contextual interference can have a positive effect on the performance of swimming skills.

Keywords: contextual interference, blocked practice, random practice, acquisition, swimming skills

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INTRODUCTION

Motor skills form a major part of human life. For many years trainers and scientists have tried to identify the factors that affect skill acquisition and performance. It is evident in the progress of all branches of science including physical science predicting future results and performance have critical role and increasing the use of other computational science is growing at such predictions [1].

The contextual interference effect was introduced by Magill (1990) was applied to motor learning by Coker (2003) as a driving factor in performance and learning of motor skills [2, 3]. Contextual interference is the random presentation of different tasks in one training session. The contextual interference (CI) effect depends on the order of tasks or the manner of presenting the tasks [4]. Blocked, random, and serial practice can all create different levels of CI effect and can thus be located along the contextual interference continuum.

Lowest levels of CI at one end of the continuum are created by blocked practice. At the other end of the continuum, there are high levels of CI created by varied practice with random, unpredictable order (random practice). In serial practice where a moderate level of CI is created, a certain prearranged series of tasks are repeated and practiced. Field studies have shown that higher CI (random practice) increases the learning of tasks which are similar rather than distinct [5]. However, it has been reported that a training program with medium and high CI has not been effective in learning of three volleyball skills [5]. In addition, a meta-analytic research by Gelber (2005) suggested the little difference between blocked and random practice. However, Gelber supports the effect of contextual interference in applied settings and believes that the CI effect in these conditions is created regardless of the properties or the nature of tasks [4].

Brady (2008) reported the robust effect of contextual interference in basic research and its weaker effect in applied settings. He believes that it is impossible to generalize this effect to applied settings due to the complexity of motors skills as compared to laboratory tasks [6]. This inconsistency between basic and applied results can be explained by the difficulty of tasks as shown in Jelsma and smith (2003) who observed an interaction between task difficulty and contextual interference [7]. They showed that contextual interference may produce delayed automatization of task performance and, as a result, increases controlled processing. As mastery and automatization in laboratory tasks occurs with fewer trials as compared to applied tasks, the CI effect will be more distinct and certain.

Magill (2006) and Jarus (1999) suggested Gentile's skill learning model as the appropriate strategy [8, 9]. Its suggests that blocked practice can be more effective for novices as they learn basic motor patterns and identify the cues. Hebert et al., (1996) approved the suggestion of Magill and Hall and observed that contextual interference can be more effective and controllable when the motor program is more developed. The two extremes of the CI continuum have often been examined, but Landin and Herbert came to the conclusion that a mixed program may incorporate the best characteristics of high and low contextual interference. Age, skill level, and task difficulty are important factors in creating the CI effect [10].

Studies carried out on CI in children and adolescents have led to different results. Some studies have reported the CI effect in 8-9 years old participant (Bortoli et al., 2001), while other studies found no such effect in 5, 7, and 11 year old children [11, 12]. Brady's review (1998) of the research on the CI effect showed that a low-CI training program leads to greater learning in children [6]. Some studies, however, have reported contradictory results. For instance, Jarus (2001) and Smith (1997) studied the effect of cognitive process (CI effect) and skill difficulty on the acquisition, retention, and transfer of motor skills. 96 children (7.5-9.5 years old) participated in a task of throwing beanbags under high, low, and medium contextual interference in either a complex or simple task. The results indicated that the children in the random group completing the simple task outperformed the blocked group [12, 13]. However, in the complex task, no difference was found between the two practice groups during both the retention and transfer phases [13].

Also Zetou et al. (2007) considered the CI effect in both blocked and random practice as beneficial for learning volleyball skills [15]. There is little evidence regarding the effect of CI on explosive tasks such as throwing or striking an object. The positive effect of contextual interference has not been observed by Magill (2006) in badminton serve [8]. Similar results have been reported in volleyball skills [11, 5]. In some studies, a combination of both methods has proven to be helpful. Herbert (1996) in tennis skills showed different effects in the dominant and non-dominant hands [10].

A review of the research on contextual interference effect shows that most of these studies have focused on isolated skills [14, 16]. Moreover, little research has examined the effect of CI on continuous and complex skills [14, 16]. Therefore, the present research compares two common methods of teaching swimming which correspond to blocked and random practice and in this approach swimming skills (front crawl, back crawl, breaststroke, and butterfly stroke) which are divided into more detailed components (leg and arm strokes, breathing, leg-arm coordination, and overall coordination) are all considered as one skill. In this approach, all the leg strokes are instructed first. Then, all the arm strokes, breathing, leg-arm coordination, and overall coordination are instructed respectively. However, involves blocked practice (repeated practice of the same skill) where swimming skills are taught separately.

The participants of the present research were studied in two groups (blocked and random practice groups) during 32 practice sessions. This study tries to examine the factors that affect contextual interference in swimming using a systematic framework. Thus, the present research aims to find what type of practice (high or low contextual interference) has the greatest effect on the acquisition of swimming skills (front crawl, back crawl, breaststroke, and butterfly stroke) in 8-10 years old girls.

MATERIALS AND METHODS

The present research is quasi-experimental in terms of its method and applied in terms of its purpose. A mixed factor design was employed to examine between-group and within-group differences. The studied sample consisted of 20 girls who had successfully passed the basic swimming test. All the participants were 8-10 years old and were completely healthy. The participants were randomly divided into a blocked practice and a random practice group.

The participants were evaluated by the standard "Learn to Swim" test. This test consists of four levels: Octopus, Goldfish, Angelfish, and Shark. Each of these levels has its own steps, content, and distance and the individual passes to the next level once they have learned the previous level. The scores of the participants were recorded by

three experienced swimming trainers. In this test, swimming skill was scored on a 5-point scale where 1 represented poor performance and 5 represented good performance. First, the participants became familiar with the test. After two training sessions, the preliminary test (Octopus 3) was administered. Then, they participated in 32 training sessions, 1.5 hours per session, and the tests were administered on the 7th, 15th, 24th, and 32nd sessions.

RESULTS

According to the results of mixed analysis of variance, there was no significant difference between the effects of blocked practice and random practice on acquisition of swimming skills in 8-10 years old girls, and this suggests the effectiveness of both approaches. The results of Mauchly's sphericity test showed that the observed variance-covariance matrices of the dependent variable are not similar in the measurement stages ($p = 0.05$). Thus, the results were examined through multivariate tests (Pillai's Trace).

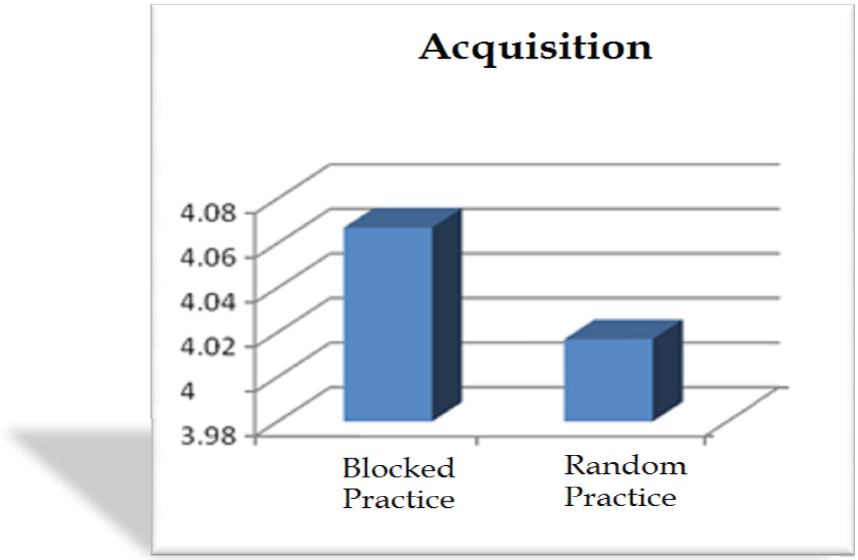

Figure 1: Mean acquisition scores of the practice groups

Table 1: A comparison of the mean acquisition scores of the two practice groups

		Sum of Squares	DF	Mean Squares	F	Sig.
Acquisition	Comparison	0.013	1	0.013	0.057	0.814
	Error	3.979	18	0.221		

DISCUSSION AND CONCLUSION

The acquisition scores of the participants showed that both blocked and random practice can be effective for learning swimming skills, although the blocked practice group had a better performance than the random practice group. This is consistent with the findings of French et al. (1990) and Bortoli et al. (1992) for overhead pass and forearm pass skills respectively, and with the results of Jarus (1997), Smith (2006), Zetou et al. (2007) and Lotfi (2004). However, the results of the present research are inconsistent with the findings of Herbert et al. (1996), and Coker (2003), for these studies have reported the advantage of high contextual interference over low CI. One of the possible reasons for lack of any significant CI effect in the present research as compared to these contradictory studies is the differences in the tasks (Magill, 1990) for it appears that applied settings are less affected by contextual interference (Magill, 1986; French et al., 1990; Bortoli, 1991). Also the differences in the characteristics of the tasks and the participants cannot be overlooked. The participants of the present research were novice children and had less physical strength; therefore, it was difficult for them to properly execute the movements and based on cognitive effort, fatigue leads to reduced mental work that is required for decision making and reduces the cognitive and motor processing involve in controlling the movements [14]. Moreover, most researchers in the area of contextual interference believe that there is a positive relationship between the period of exercises and the CI effect. Perhaps if the training sessions continued for a longer period, the difference between these two approaches would become clearer (Gelber, 2005). Finally, the difference in the practice environment and the higher resistance of

aquatic settings can be considered as other factors that affected the CI effect by increasing cognitive load as well as the required processing activities.

In conclusion, considering the results of the present study, both blocked and random practice methods are recommended for better swimming performance in children. Given the lack of a significant difference between the two groups in acquisition scores, it seems that factors such as training volume, environment, etc. can affect swimming performance. Finally, we suggest that other studies be carried out to examine the effect of contextual interference on acquisition of swimming skills with respect to such moderating factors as the number of practice sessions, age, type of tasks, and task characteristics.

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