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EFFECTIVENESS OF DIFFERENT TYPES OF FEEDBACK IN THE LEARNING OF COMPLEX MOVEMENT TASKS

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Abstract: The purpose of the study was to assess the effectiveness of different types of feedback applied in the learning of complex movement tasks. It included 13 children aged 7-8. A pedagogical experiment was the method applied in the study. Children randomly assigned to two groups participated in the study. The groups were as follows: visual stimulus GB_{VIS}=6 (height 120 cm ± 4.2 cm, body mass 20.3 kg ± 3.6 kg); verbal stimulus GB_{VER}=7 (height 118 cm ± 4.1 cm, body mass 19.3 kg ± 3.3 kg). The research conducted revealed that the effectiveness of learning symmetrical movement tasks by children aged 7-8 depends on the type of feedback provided. It was found out that in learning movement tasks visual feedback is more effective than verbal feedback.

Key words: effectiveness, feedback, learning, children.

Introduction

The process of learning movement tasks has interested many scientists for years; plenty of various learning theories have been formulated and the most effective of them seems to be the cognitive theory. In this theory the major role is ascribed to the notion of feedback since it has been proven that learning through feedback allows one to gain optimum results.

Each type of feedback on movement task being learnt plays a significant role, deciding about the speed and permanence of learning [1–3]. Feedback can be given to learners, during and after the task in a verbal, visual, kinesthetic or combined form.

In numerous studies, the effectiveness of different variants of feedback provision has been verified.

The attempts have also been made to explain the learning process and factors contributing to its effectiveness [4–9]. The most frequently analysed issues include: the type of feedback, e.g. verbal, visual, kinesthetic [10–13], the feedback organization – frequency and timing [10,14,15], the training type – physical or mental [16,17] and the training organization – e.g. the complexity of tasks, and contextual interference [11]. Most studies were conducted with the use of simple movement tasks, where principles of teaching not applicable to the learning of complex movement tasks were employed. There is too little research into the impact of different types of feedback on learning complex movement tasks. The very notion of a complex movement task is intricate. However, it is assumed that it is defined by a high degree of freedom and the fact that as a rule it is not possible to be acquired in one training session [18].

Also, the type of feedback provision in the process of learning movement tasks has been a subject of numerous studies [10,15]. They showed that a verbal instruction to a large extent facilitates making a specific movement as the teacher draws the pupil's attention to those aspects of the task which may be skipped in visual transmission [19]. Another conclusion was that if at the beginning of the learning process verbal instructions were used which contained information about mistakes and ways to correct them, their effect on learning outcomes was really positive [20]. Another case is with children. In teaching lower primary school children visual feedback proved the most effective [21].

In the case of unspecific movement tasks, the best effects are achieved through feedback containing information about those parts of the task which have been done correctly [22]. In young athletes, their mental state and self-confidence may be a result of verbal feedback concerning the mistakes and the ways to correct them [23].

To date, there has been a relative scarcity of research on the role of augmented feedback in the learning of complex skills. In fact, little scientific consensus exists about the role different types of feedback play in the learning of complex motor tasks.

Hence, the purpose of this study was to assess the effectiveness of different types of feedback (verbal, visual) applied in the learning of complex movement tasks.

Material and methods

Participants

The study included 13 children aged 7-8. Children randomly assigned to two groups participated in the study. The groups were as follows: visual feedback GB_{VIS}=6 (height 120 cm ± 4.2 cm, body mass 20.3 kg ± 3.6 kg); verbal feedback GB_{VER}=7 (height 118 cm ± 4.1 cm, body mass 19.3 kg ± 3.3 kg).

Procedures

A 6-week experiment was carried out. Training sessions took place three times a week (on Mondays, Wednesdays and Fridays). In total, each subject participated in 18 sessions. Each session lasted for 45 minutes. The subjects learnt to perform the following symmetrical movement task: in the standing position they put arms by their sides and then raised them to the side. After that they moved their arms to the front and upwards followed by the side movement to the initial position. They had not been familiar with this task before. Every training session involved performing 15 task repetitions in sets of 5 repetitions each. After each set the subjects received feedback. Group GB_{VIS} received feedback in the form of visual performance. Group GB_{VER} obtained verbal information.

Gymnastic judges rated their performance on a scale of 1 to 10 according to FIG. For each minor error they deducted 0-0.3 pts, for a medium one – 0.4-0.6 pts, while for a major error they deducted 0.7-1 pts from a maximal score of 10 pts. Pre-, post- and retention tests (24 hours after post-test) were administered.

Methods of statistic analysis

The ANOVA was used to estimate statistical significance of differences among measurements. The normality of distribution and homogeneity of variances were tested with the Shapiro-Wilk test. After the verification of the prerequisite, studied variables were analyzed using a two-way mixed-factor analysis of variance, Group (2) × Test Time (3), with the two experimental groups representing a between-subjects factor and the testing times representing a within-subjects factor. Probability level of $p<0.05$ was used as critical. For significant differences, Fisher post hoc test was used. The results were statistically analyzed using the Statistica program (StatSoft, Inc. (2005) STATISTICA (data analysis software system), ver. 7.1. www.statsoft.com).

Results

The ANOVA with repeated measures analysis revealed a significant effect of Test Time ($F(2,22)=6.12$; $p=0.007$). There were no effects of Group ($F(1,11)=0.99$; $p=0.340$) as well as Group × Test Time interaction ($F(2,22)=0.62$, $p=.545$). Means and standard deviations are displayed in Figure 1.

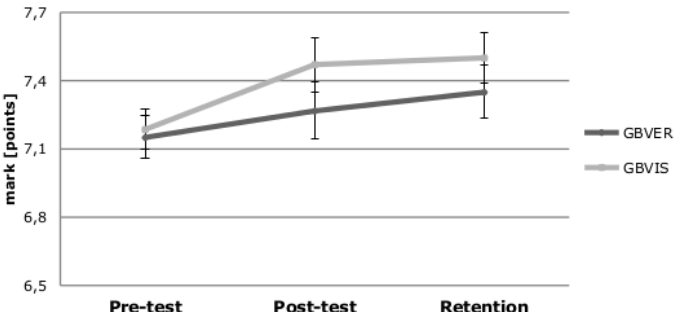

Fig. 1: Means and standard deviations of experts' marks across test times (pre-test, post-test and retention) in the group with verbal information (GB_{VER}) and in the group with visual information (GB_{VIS}).

The relative increases in judges' ratings are displayed in Figure 2.

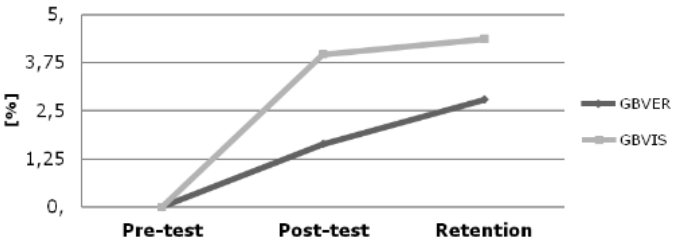

Fig. 2: Relative improvement in judges' ratings.

Post hoc comparison indicated that significant improvement in performance was observed only in the group with visual information (GB_{VIS}). The ratings observed in the post-test were significantly higher than in the pre-test (4%; $p<.012$) and further increase in ratings to 4.4% during retention ($p<.007$) pointed to the improvement of the task performance, yet insignificant between retention and post-test measurements ($p=0.788$). All judges' ratings observed in the group with verbal information (GB_{VER}) improved insignificantly ($p>0.05$).

Discussion

It is important to understand what information (verbal, visual and kinesthetic), how often and precise the coach should provide to facilitate the learning of complex motor skills.

The type of feedback provided to the learner attempting to acquire complex motor tasks is one of the most often analysed. There is a bulk of research providing strong experimental evidence about verbal, visual and kinesthetic feedback [7, 10, 11, 13]. Researchers have been trying to explain the learning process and find the factors which contribute

to its effectiveness [4–7, 9, 24]. Although there is considerable strong evidence of the correct methods for teachers to provide feedback to learners, significantly less is known about the effectiveness of instruction and demonstration in learning gymnastics routines. In our study, visual or verbal feedback was provided to children learning the complex movement task.

Post hoc comparison indicated that significant improvement in performance was observed only in the group (GB_{VIS}). The ratings observed in the post-test were significantly higher than in the pre-test (4%; $p<.012$) and further increase in ratings to 4.4% during retention ($p<.007$) pointed to the improvement of the task performance, yet insignificant between retention and post-test measurements ($p=0.788$). All judges' ratings observed in the group with verbal information (GB_{VER}) improved insignificantly.

The results obtained are consistent with the observations made by Dybińska [21], who proved the effectiveness of visual feedback among lower-primary school children in the acquisition of new movement tasks.

Our research results are in line with those obtained by Kernodle and Carlton [20], who proved that at the initial stage of learning verbal instruction leads to positive learning out-comes. However, it needs to be emphasized that providing verbal feedback alone is not as effective as visual one.

The above-mentioned remarks can be referred to everyday teacher's tasks and the teaching/learning process of movement tasks, where a common problem is the choice of the type, contents and amount of feedback given to pupils. The recurring dilemma whether to use verbal or visual instructions is a false assumption. It can be supposed that using only one type of feedback is not too effective and although applying various types of feedback brings various effects, they were usually of no statistical significance. The increased variety of feedback may mean more information and learners' awareness of each body segment movement, which facilitates the achievement of the task goal. It is also worth remembering that favoring one source of feedback, irrespective of its type, leads to lower effectiveness of learning movement tasks if this specific type of feedback is withdrawn and replaced with another one.

Conclusions

1. The effectiveness of learning complex symmetrical movement tasks by children aged 7-8 depends on the type of feedback provided to the learners.
2. In the process of learning movement tasks by children aged 7-8, visual feedback proved more effective than the verbal one, which means that demonstration should dominate the process of learning movement tasks at this age.

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