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ORIGINAL

The effectiveness of various verbal information in learning backward roll

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A Study Design
B Data Collection
C Statistical Analysis
D Data Interpretation
E Manuscript Preparation
F Literature Search
G Funds Collection

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abstract

Background The aim of this study was to investigate the effectiveness of different types of verbal feedback in learning a backward roll.

Material/Methods The study included 29 participants aged 6-8 years who attended acrobatic gymnastics classes. They were randomly assigned to 3 groups. An experiment and judges' ratings were the main research methods. During the experiment the study participants were taught a backward roll. The experts evaluated the backward roll performance at the beginning (pre-test) and at the end (post-test) of the experiment as well as one week after the experiment (retention-test).

Results When teaching and learning the backward roll, an increase in mean values was noted in the post-test, with the highest increase in group P (16.7%). In the retention test, the highest increase was found in group E (16.2%), whereas the lowest one was observed in group P (15.2%) ($p > 0.05$).

Conclusions 1. Verbal feedback on errors proved the most effective in the process of learning the backward roll.
2. At early stages of learning, too much verbal feedback usually disturbs and hinders the process of acrobatic skill acquisition.
3. Further research is necessary to determine principles of teaching and learning simple and complex motor skills.

Key words Teaching and learning, feedback, sports acrobatics

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INTRODUCTION

Acrobatic gymnastics is one of the sports that demonstrate high complexity of exercises and links between them as well as routines. The process of motor teaching and learning plays a significant role, as it should be oriented at shaping motor habits of particular exercises and developing their profiles that are necessary at further training stages. In order for the process of teaching and learning to be effective, training loads should be adjusted to acrobats' levels of development, and the progress made should be controlled and evaluated [1, 2]. This is possible owing to various indices that ought to be selected according to young sports people's levels of psychomotor development [3, 4].

The process of teaching and learning motor skills has been analysed by a number of researchers [5, 6, 7, 8, 9, 10, 11]. For many years teaching theories have been verified and improved, and it has also been checked which ones will be the most effective in the learning process in sports with complex movement structure. The cognitive theory is said to be one of the leading theories. Currently, it plays the most important role in the process of teaching and learning motor skills. Extrinsic feedback is the foundation of this process. According to a lot of authors [12, 13], feedback provided after performing a motor skill is significant in the process of motor teaching and learning. It was found that limiting the frequency of extrinsic feedback to some trials only or delaying it exerted a positive influence on learning effectiveness. This is explained by the fact that learners are forced to activate intrinsic feedback that allows them to identify and correct errors [14]. It was agreed that a set of five trials (followed by overall feedback) is the most beneficial number of repetitions in teaching and learning motor skills. However, motor skills differ in terms of complexity. Therefore, it is not the optimal number for all motor skills. It was revealed that together with an increase in task complexity, the number of trials followed by feedback decreased [15].

Over the years attempts have been made at determining the influence of feedback on the effectiveness of teaching and learning complex motor skills [16, 17, 18]. Verbal, visual and verbal-visual types of feedback have been investigated. Landin [19] revealed that verbal cues contributed to considerably faster motor skill acquisition because the instructor focused on those aspects of movement that could be omitted when visual feedback was provided. There is a scarcity of evidence regarding which of the following types of verbal feedback is the most effective in the motor learning process: feedback on errors, on performance correctness or on errors and performance correctness combined.

The research carried out so far has usually concerned less complex motor skills. It was found that verbal feedback facilitated new motor skill acquisition [19]. Others added that verbal feedback on errors noted in a motor task followed by cues on how to correct them generated positive outcomes at an initial stage of learning [20]. It was also revealed that feedback on correct motor task performance was effective in non-specific tasks [21]. However, there is no hard evidence showing which type of feedback is the most effective. Due to the fact that each motor skill performance is different, the same type of verbal feedback cannot be used in all situations. Moreover, feedback provided in simple tasks should not be used in complex tasks [22].

There are insufficient data on the effectiveness of different types of feedback in tasks with complex movement structure. It was observed that too much extrinsic feedback was not beneficial as, when no such feedback was provided, the learner was incapable of making use of intrinsic feedback [23]. Furthermore, researchers highlight the fact that less feedback information affects the stability of learning outcomes [24]. Zatoń [12] revealed that in order to reduce the number of errors made when performing motor tasks, it is necessary to limit verbal feedback to single words or simple sentences. In turn, Dybińska [25] stated that concise verbal feedback may be useful when learning motor skills but it may also hinder this process. Laguna [17] emphasised that the choice of the most effective types of feedback was task-specific.

To comprehend the process of motor teaching and learning better, further research on the effectiveness of different types of feedback with a special focus on verbal cues is needed.

Therefore, the aim of this study was to investigate the effectiveness of different types of verbal feedback in learning a backward roll.

MATERIAL AND METHODS

Twenty nine children aged 6-8 years attending acrobatic gymnastics classes at the 'Żak' School Sports Club in Biala Podlaska took part in the study. They were randomly assigned to 3 groups. The first group (height 128.5 ±8.5 cm; weight 28 ±6.2 kg; age 7.3 ±1.3 yrs) consisted of nine persons (n = 9). The second group (height 126.5 ±5.5 cm; weight 25 ±4.9 kg; age 7.5 ±1.2 yrs) included ten subjects (n = 10), and the third group (height 128 ±4 cm; weight 24 ±4.1 kg; age 7.5 ±0.5 yrs) consisted of ten study participants (n = 10). The children under investigation were at an early stage of acrobatic training. They were already able to perform the forward roll with the supported squat as the initial and final position. Prior to teaching these elements, large muscle group strengthening exercises and flexibility exercises were implemented.

An experiment and judges' ratings were the main research methods. A 4-week experiment was carried out, during which the participants learnt a backward roll with the supported squat as the initial and final position. Training sessions took place three times a week and lasted 90 minutes each. After a group warm-up, the children were individually taught a new acrobatic element. During each session they performed three sets of five repetitions. After each set the groups were provided with different types of verbal feedback. The first group received verbal feedback on errors committed when performing the backward roll (group E). The second group was given feedback on task performance correctness (group P), while the third group was provided with feedback on errors and performance correctness combined (group E-P).

The teaching of the backward roll was divided into three parts according to the phase structure of the movement: the preparatory phase, the main phase and the final phase. The analytical method of teaching the backward roll was employed. During the first session the exercise was performed by an expert and then each participant was asked to do this motor task. On this basis, the level of their technical preparation was assessed. Afterwards, the study participants were taught the backward roll according to methodological

standards described by Szot [26]. During the first six sessions basic exercises were used, e.g. a roll on one's back from the tuck position in sitting to the tuck position in lying, L-sitting backward roll on an inclined plane with and without assistance, backward roll on the free exercise floor with assistance [26]. During the next session young acrobats performed the backward roll from the supported squat without any assistance on the free exercise floor. If necessary, additional exercises were implemented, e.g. tucking with pulling the knees to the head in a supine position [26]. According to the phase structure of the movement, during the first sessions the focus was on teaching movements in the preparatory phase. The sessions that followed were devoted to teaching elements of the main phase and improving elements of the preparatory phase. After that, the movements of the final phase were introduced and the elements of the main phase were practised. The final sessions aimed at practising the backward roll as a whole. At the end of the experiment (the last session), learning outcomes were evaluated (post-test). One week after the experiment, the retention test was carried out. The motor skill was performed five times. During the post-test and retention test no feedback was provided.

The evaluation of motor skill performance was made by three experts who were licensed judges of acrobatic gymnastics. The performed element was rated on the basis of the technical model on the scale from 1 to 10 according to the rules and regulations of the International Gymnastics Federation (FIG). The scores of the three judges were averaged. From the maximum score of 10 points, the judges deducted 0.1–0.2 pts for small errors, 0.3–0.5 pts for medium errors and 0.6–1 pts for large errors. The judges took away points for the following errors: improper head positioning, improper leg positioning (flexed knees, legs separately), no tucking, lack of performance dynamics and incorrect landing.

The Shapiro-Wilk test was used to assess the normality of distribution and the homogeneity of variance. ANOVA was employed to estimate significant differences between measurements. The level of significance was set at $p < 0.05$. Fisher post-hoc test was applied to assess significance of differences between mean scores. Statistical analysis of the results was carried out with Statistica programme (STATISTICA, version 12).

RESULTS

Mean scores of three groups (E, P and E–P) were analysed. Figure 1 illustrates relative increases in mean values of scores received for the execution of the backward roll in groups E, P and E–P.

In the process of learning the backward roll, the post-test revealed relative increases in mean values in groups E, P and E–P (11.6%, 16.7% and 15.3%, respectively). The differences between the groups were not significant ($p > 0.05$) (Tab. 1).

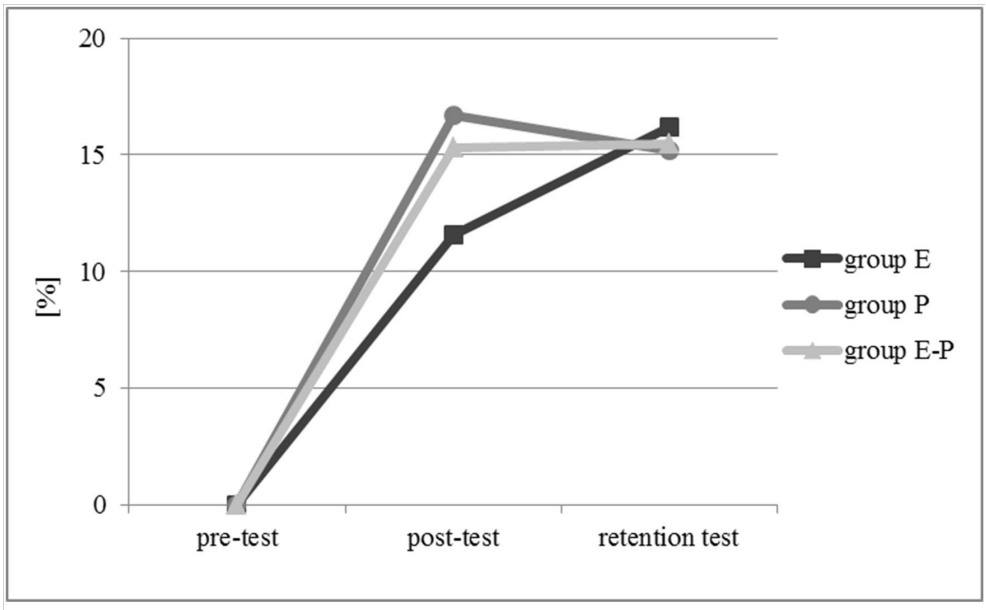

Fig. 1. Relative increases in mean values of scores [%] received for the execution of the backward roll in the pre-test, post-test and retention test

Table 1. Level of significance of differences between relative increases in scores given by the experts [%] in the post-test (for the Fisher test)

	E 8.35	P 8.55	E-P 8.38
E		0.379	0.894
P	0.379		0.452
E-P	0.894	0.452	

One week after the experiment, the retention test revealed the greatest relative increase in group E (16.2%), whereas group P demonstrated a decrease in the mean value of scores (15.2%). The differences between groups E, P and E-P were not significant ($p > 0.05$) (Tab. 2).

Table 2. Level of significance of differences between relative increases in scores given by the experts [%] in the retention test (for the Fisher test)

	E 8.69	P 8.44	E-P 8.4
E		0.351	0.26
P	0.351		0.864
E-P	0.26	0.864	

The analysis of variance (ANOVA) revealed that verbal feedback on errors, correctness as well as errors and correctness combined significantly differentiated mean scores of the groups ($F = 9.386$, $p = 0.000001$).

DISCUSSION

The teaching and learning of motor skills is a complex process that is crucial in sport, physical education and rehabilitation. In order for the process to be more effective, researchers constantly seek teaching theories that would produce the desired learning outcomes regarding motor skills of different complexities. In recent years, the emphasis has been put on the cognitive theory, in which feedback plays a key role [12, 13, 23, 27].

Despite all the research carried out so far, there is still a scarcity of empirical evidence regarding which types and content of feedback are effective when learning complex motor skills [16, 28]. Due to the fact that feedback is considered essential in the process of teaching and learning motor skills, it has become one of the most commonly analysed variables influencing the effectiveness of learning motor skills [12, 13, 23], together with the structure of feedback provision, the structure of training [29] and the type of training. Zatoń [12] revealed that verbal cues are fundamental in the process of acquiring new motor skills. Therefore, the present study focused on this type of feedback.

The majority of studies on teaching and learning motor skills conducted to date have concerned simple tasks [21, 30]. Thus, it is hard to transfer those findings to the learning of motor skills in physical education or sport because complex structures of movement dominate in these areas. Moreover, experiments regarding the process of teaching and learning complex skills have been carried out [13, 17, 26]. However, there is still a scarcity of data on which type of feedback ought to be used most often and what content ought to be provided to the learner. This problem occurs mainly in sports with a complex structure of movement such as acrobatic gymnastics.

Thus, the findings of the present study made it possible to gain knowledge regarding the effectiveness of different types of verbal feedback when learning a complex motor skill, i.e. the backward roll. The study focused on the content of verbal feedback concerning errors, performance correctness as well as errors and correctness combined when performing this acrobatic element.

The analysis of relative increases in mean values in the backward roll performance revealed differences between mean results in groups E, P and E–P. In the post-test, the greatest relative increases in mean results were found in group P, while the smallest ones were noted in group E. Despite the differences between groups E, P and E–P, no significance was observed ($p > 0.05$). In the retention test, differences between relative increases in mean values of experts' evaluations were found (in favour of group E). However, the differences were not significant ($p > 0.05$). Drawing on the findings, it was stated that feedback on performance correctness proved the most effective in the post-test. This may indicate that the feedback provided was not large in volume because at the initial stage of the learning process the subjects committed a considerable number of errors. This is in line with the research results which showed that too much feedback hindered the learning of motor skills [23, 31]. In turn, the retention test revealed that the best learning outcomes were seen in the group that received feedback on errors. It may point to the effect of delayed learning, during which learners had to make use of intrinsic feedback. This was possible owing to the fact that they knew what kind of errors they committed most often at an earlier stage of the learning

process [31]. A decrease in the mean score in the group receiving feedback on performance correctness may stem from the fact that the information provided was not clear, so they may not have been able to spot their own errors. The findings of the present study contradict the results obtained by Salmoni, Schmidt and Walter [23], whose studies proved that less feedback also brings about better retention of the learning outcomes.

The experiment revealed that the effectiveness of learning the backward roll depended on the type of verbal feedback provided. It may be assumed that the process of learning complex motor skills is different for each task [17, 18]. The findings are in line with Zatoń's observations [12], who claimed that key verbal cues provided when acquiring new motor skills made it possible to enhance the effectiveness of learning particularly at the initial stage of forming movement habits. Also Dybińska [25] noted that verbal feedback in the form of simple sentences or single words might be helpful in learning motor skills or might hinder this process, which is borne out by our study. Sadowski et al. [27] and Potop et al. [10] observed that, in addition to the type of feedback, it is necessary to focus on key elements of sports technique which determine the quality of complex motor task performance.

Despite the fact that the present study provided new data regarding the effectiveness of verbal feedback, the issue of motor skill learning effectiveness was not fully investigated. Therefore, further research is needed to examine and explore this aspect.

CONCLUSIONS

1. Verbal feedback on errors proved the most effective in the process of learning the backward roll.

2. At early stages of learning, too much verbal feedback usually disturbs and hinders the process of acrobatic skill acquisition.

3. Further research is necessary to determine principles of teaching and learning simple and complex motor skills.

REFERENCES

[1] Sawczyn S. Podstawy kontroli obciążeń treningowych w gimnastyce sportowej [Basis of control of training loads in artistic gymnastics]. Gdańsk: AWFiS; 2008. Polish.

[2] Zaporozhanov VA, Kochanowicz K, Kochanowicz A. Improvement of comprehensive assessment of specially trained childhood and adolescence gymnasts. Pedagogics, Psychology, Medical-Biological Problems of Physical Training and Sports. 2014;10:3-7.

[3] Griggs G, McGregor D. Scaffolding and mediating for creativity: suggestions from reflecting on practice in order to develop the teaching and learning of gymnastics. Journal of Further and Higher Education. 2012;36(2):225-241.

[4] Kochanowicz A, Kochanowicz K, Pilewska W. Rozwój fizyczny a sprawność fizyczna gimnastyków w wieku 6–12 lat [Physical development and physical fitness of 6–12-year-old gymnasts]. J Health Sci. 2013;3(16):307-323. Polish.

[5] Boloban VN. Sistema obuchenia dvizheniam v slozhnykh uslovijakh podderzhania statodinamicheskoj ustojczivosti. Autorefereat – doctoral thesis. Kiev; 1990. Russian.

[6] Karniewicz J, Kochanowicz K, Sawczyn S. Technika wykonania i metodyka nauczania ćwiczeń gimnastycznych na drążku [Technique of performance and methodology of teaching gymnastic exercises on the bar]. Gdańsk: AWF; 1996. Polish.

[7] Sawczyn S, Kruczkowski D. Gimnastyka na etapie przygotowania początkowego (8-12 lat) [Gymnastics at the preparatory stage (8-12 years old)]. Trening. 1998;2-3:227-235. Polish.

[8] Horn RR, Williams AM. Observational learning: Is it time we took another look? In: Williams AM, Hodges NJ, editors. Skill acquisition in sport: Research, theory and practice, London: Routledge; 2004; 75-206.

[9] Niźnikowski T. Nauczanie ćwiczeń o złożonej strukturze ruchu przy oddziaływaniu na węzłowe elementy techniki sportowej [Teaching exercises of a complex structure of movement while affecting nodal elements of the sports technique]. Monografie i Opracowania, Nr 8, Biała Podlaska: ZWWF; 2009. Polish.

[10] Potop VA, Grad R, Omelyanchik OA, Biegajlo M, Boloban VN. Element nodes of sports equipment double back flip factions and double back flip hunched performed gymnast in floor exercise. Pedagogics, Psychology, Medical-Biological Problems of Physical Training and Sports. 2014;7:23-30.

[11] Lim S, Ali A, Kim W, Kim J, Choi S, Radlo SJ. Influence of self-controlled feedback on learning a serial motor skill. Perceptual & Motor Skills: Learning & Memory. 2015;120(2):462-474.

[12] Zatoń K. Przekaz słowny na lekcjach wychowania fizycznego [A verbal message at Physical Educationlessons]. Studia i Monografie 48. Wrocław: AWF; 1995. Polish.

[13] Sadowski J, Mastalerz A, Niźnikowski T. Benefits of bandwidth feedback in learning a complex gymnastic skill. J Hum Kinet. 2013;37:183-193.

[14] Schmidt RA. Motor Learning and Performance. Champaign, Ill.: Human Kinetics; 1991.

[15] Schmidt RA, Lange C, Young DE. Optimizing summary knowledge of results for skill learning. Hum Mov Sci. 1990;9:325-348.

[16] Hughes M, Franks IM. Notational analysis in sport. London: E&FN Spon; 1997.

[17] Laguna P. Task complexity and sources of task-related information during the observational learning process. J Sport Sci. 2008;26:1097-1113.

[18] Niźnikowski T. Efektywność uczenia się złożonych czynności ruchowych a rodzaj informacji zwrotnej [The effectiveness of learning complex motor activities and the type of feedback]. Monografie i Opracowania Nr 18. BiałaPodlaska: WWFiS; 2013. Polish.

[19] Landin D. The role of verbal cues in skill learning. Quest. 1994;46:299-313.

[20] Kernodle MW, Carlton LG. Information feedback and the learning of multiple-degree-of-freedom activities. J Motor Behav. 1992;24:187-196.

[21] Lee AM, Keh NC, Magill RA. Instructional effects of teacher feedback in physical education. Journal of Teaching in Physical Education. 1993;12: 228-243.

[22] Wulf G, Shea CH. Principles derived from the study of simple skills do not generalize to complex skill learning. Psychonomics Bulletin. 2002; 9: 185-211.

[23] Salmoni AW, Schmidt RA, Walter CB. Knowledge of results and motor learning: a review and critical reappraisal. Psychological Bulletin.1984;95: 355-386.

[24] Schmidt RA, Wulf G. Continuous concurrent feedback degrades skill learning: Implications for training and simulation. Human Factors. 1997;39: 509-525.

[25] Dybińska E. Optymalizacja informacji wizualnej jako czynnika usprawniającego uczenie się i nauczanie czynności pływackich dzieci 10-letnich [Optimization of visual information as a factor supporting the learning and teaching of swimming activities among 10-year-old children]. Studia i Monografie No 25. Kraków: AWF; 2004. Polish.

[26] Szot Z. Ćwiczenia zwinnościowo – akrobatyczne i skoki [Nimbleness-acrobatic exercises and jumps]. Warszawa: COS, 1997. Polish.

[27] Sadowski J, Mastalerz A, Niźnikowski T. Bandwidth feedback in learning complex motor skills. 12th International Scientific Conference of Sport Kinetics, Kraków; 2011.

[28] Wulf G, Shea CH, Lewthwaite R. Motor skill learning and performance: a review of influential factors. Med Educ. 2010; 44:75-84.

[29] Kamp J, Duivenvoorden J, Kok M, Hilvoorde I. Motor skill learning in groups: Some proposals for applying implicit learning and self-controlled feedback. RICYDE. Revista Internacional de Ciencias del Deporte. 2015;39(11):33-47.

[30] Lee AM, Keh NC, Magill RA. Instructional effects of teacher feedback in physical education. J Teach Phys Educ. 1993;12:228-243.

[31] Tzetzis G, Votsis E, Kourtessis T. The effect of different corrective feedback methods on the outcome and self-confidence of young athletes. J Sport Sci Med.2008;7:371-378.

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