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THE EFFECTS OF DIFFERENTIAL LEARNING TRAININGS ON TECHNICAL DEVELOPMENT OF BASKETBALL SCHOOL PLAYERS

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Abstract:
There are several different methods of learning motor skills, like traditional (linear) and differential (nonlinear) learning training. The traditional motor learning approach proposes that learners improve a skill just by repeating it. According to the teaching principles, exercises are selected along continua from easy to hard and from simple to complex. The differential learning approach is mainly characterized by taking advantage, for the purpose of learning, of fluctuations that occur, without movement repetitions and without corrections during the skill acquisition process. The purpose of this study is to examine the effects of differential training on technical development of between 10-12 year-old basketball players who have been continuing basketball education. Twenty-three (23) basketball players who were 10-12 years old from the youth basketball team (Under 13) of Istanbul Marmara University Basketball School were tested voluntarily in this study. In this study, the German Heidelberger Basketball Tests; tourniquet test, dribbling test, shooting test, and passing test were applied on the basketball field with synthetic surface of the Istanbul Marmara University in 2018. The Wilcoxon test for the comparison of pre- and post-tests of the groups were used for statistical analyses. In conclusion, the findings suggest that the differential learning group showed the improvement in performance. These findings may be useful for trainers and physical education teachers in the selection process of players and in preparing basketball training programs.

Keywords: differential learning, basketball, motor skill, training program, learning theory, basketball test

1. Introduction

In motor learning literature, there are several different methods of learning motor skills, like traditional and differential learning training and variability of practice is believed to be an effective method producing successful learning, retention and transfer of

learned motor skills. One of the methods is the differential learning approach proposed by Schöllhorn. (Lee and Simon, 2004; Shoenfelt, et al., 2002).

Inspired by Bernstein's (1967) hammering example, Schöllhorn investigated whether elite athletes could produce precisely the same movement twice. Schöllhorn (1999) suggested a learning theory that opposes the repetition of movement based on an ideal movement pattern: differential learning.

The differential learning approach takes advantage of fluctuations in a complex system by increasing them through 'no repetition' and 'constantly changing movement tasks' which add stochastic perturbations.

Differential learning utilizes the fluctuations in human motor behaviour to induce a self-organising process in the learner that takes advantage of individual movement and learning characteristics. Differential learning is a representative of variable practice. Once these exercises have been chosen for an intervention program, every exercise is repeated several times. One method to include variability in teaching is differential learning involving maximum variability between single repetitions (Schöllhorn 1999; Schöllhorn et al., 2010; Schöllhorn, Beckmann & Davids, 2010).

The differential learning approach is mainly characterized by taking advantage, for the purpose of learning, of fluctuations that occur, without movement repetitions and without corrections during the skill acquisition process. This approach can be considered as highly nonlinear because of learners' constantly performing the whole complex movement with permanently changing stochastic perturbations. (Schöllhorn, Hegen & Davids, 2012; Schöllhorn et al., 2009).

Within the differential learning (DL) approach, fluctuations during the motor learning process are a fundamental basis for motor learning. Building on non-linearity, differential learning is characterized by limiting movement repetition and promoting adaptive and functional task-specific behaviours (Schöllhorn, Mayer-Kress, Newell, & Michelbrink, 2009).

It is crucial to develop a skilful repertoire and the combination of these basic movements is essential to foster the new learnings that are required in basketball as well as in a variety of other sports.

Basketball requires the mastery of multiple skills that depend on a proper development of fundamental motor skills and fundamental game skills, regarded as the basis of physical literacy training (Smith, 2014).

Several experiments have shown higher skill acquisition rates for the differential learning approach in comparison to traditional linear approaches and, most intriguingly, display even better performance improvements in the retention phase of learning (Wagner and Müller, 2008; Schöllhorn, 1999).

However, available research in this area is still scarce and might be appropriate to assess differential-learning effects in dynamic and ecological contexts that require constant adaptation

The purpose of this study is to examine the effects of differential training on technical development of under 13-year-old basketball players who have been continuing basketball education.

2. Method

Twenty-three (23) basketball players who were between 10-12 years old from the basketball school (Under 13) of Istanbul Marmara University were tested voluntarily in this study. In this study, the German Heidelberger Basketball Tests (Kluas, 1988); tourniquet test, dribbling test, shooting test, and passing test were applied on the basketball field with synthetic surface of the Istanbul Marmara University in 2018.

A pre-test was followed by an eight-week training intervention. The group performed exercises as differential learning training for eight weeks, within the normal basketball school training program, and the training intervention consisted of sixteen sessions (two per week). In sessions, 20 repetitions for the tourniquet technique, 10 repetitions for the target-passing technique, 120 repetitions for the dribbling with the ball technique, and 15 repetitions for the shooting technique were performed. Each intervention lasted about 10-15 minutes.

The Differential Group (DG) trained according to the differential learning approach, performing tourniquet, target-passing, dribbling with the ball, and shooting techniques with blocked order in one training session.

The core idea of the differential training group was to increase the fluctuations of techniques in order to make the athletes more stable against disturbances and in order to provide the athletes with the possibility to seek and explore functional movement patterns. The fluctuations were increased by infinite variations in each technique as well as by avoiding movement repetitions and by providing no corrective feedback. Movement variations were characterized by variations in the standing leg, in the kicking leg, in the arms, in the trunk, in the head and the ball, referring to the angles, the angular velocity and the rhythm of each joint movement. To exemplify: the standing leg had to be placed well before the ball, well behind it, or well to the side of the ball; the knee joint in one shot had to be stiff, while in the other it was kept very flexible or alternating between stiffness and flexibility after each shot (Schöllhorn, Hegen & Davids, 2012)

2.1 Statistical analysis

Descriptive statistics are presented as arithmetic means(X), standard deviations(SD), and minimums(Min.) and maximums(Max.). The Wilcoxon test for the comparison of pre- and post-tests of the groups and the Pearson correlation test for the reliability of repeat of basketball tests were used. A result was considered to be significant if p was less than 0.05.

3. Results

The descriptive statistics of pre-test and post-test analysis of tourniquet, dribbling, shooting and passing measurements of the differential training group in the study are displayed in Table 1.

Table 1: Descriptive statistics of pre-test and post-test of tourniquet, dribbling, shooting and passing measurements of the differential training group

		X	SD	Min.	Max.
Tourniquet (point)	Pre-test	6,04	2,24	3	10
	Post-test	6,74	2,02	4	10
Dribbling (second)	Pre-test	14,55	1,65	11,48	17,55
	Post-test	13,95	1,80	10,54	17,44
Shooting (point)	Pre-test	6,04	2,32	3	10
	Post-test	6,78	1,70	4	11
Passing (point)	Pre-test	11,52	2,31	7	15
	Post-test	12,65	2,30	7	16

Descriptive statistics of the participants were presented in Table 1. Applied tests and mean value of results for the players were tourniquet test (pre-test:6,04±2,24 point., post-test:6,74±2,04 point), dribbling test (pre-test:14,55±1,65 sec., post-test:13,95±1,80 sec.), shooting test (pre-test:6,04±2,32 point, post-test:6,78±1,70point), passing test (pre-test:11,52±2,31 point, post-test:12,65±2,30 point).

Table 2 shows the pre-test and post-test analysis of tourniquet, dribbling, shooting and passing measurements of the differential training group in the study are displayed in Table 2.

Table 2: Wilcoxon analysis of pre-test and post-test tourniquet, dribbling, shooting and passing measurements of the differential training group

		X	SD	Z	p
Tourniquet	Pre-test	6.04	2.24	-3.258	0.001
	Post-test	6.74	2.02		
Dribbling	Pre-test	14.55	1.65	-4.198	0.000
	Post-test	13.95	1.80		
Shooting	Pre-test	6.04	2.32	-2.512	0.012
	Post-test	6.78	1.70		
Passing	Pre-test	11.52	2.31	-3.839	0.000
	Post-test	12.65	2.30		

A significant differences were found in tourniquet (Z=-3,258, p=0.001), dribbling (Z=-4,198, p=0.000), shooting (Z=-2,512, p=0.012), and passing (Z=-3,839, p=0.000), performances between the pre-and post-test in the differential training group ($p<0.05$).

Also significant relationship were found in the Pearson correlation test for the reliability (α) of repeat of basketball tests ($p<0.05$); tourniquet (r=,941), dribbling (r=,963), shooting (r=,840), and passing (r=,946) performances between the pre-and post-test in the basketball technique tests ($p<0.05$).

4. Discussion and Conclusion

The purpose of this study is to examine the effects of differential training on technical development of under 13-year-old basketball players who have been continuing basketball education.

In this study, a differential learning approach to teaching four basketball techniques was investigated. The club players (23) were able to complete their participation in all test and intervention events. The small number of participants could give the study the character of a pilot study for youth basketball players.

Differential trainings two times a week for eight weeks produced significant difference in development of players' basketball techniques. Players were able to improve their performance in all tests and techniques. There were statistically significant differences between pre-test and post-test in performances of players ($p<0.05$).

Practice conditions provide opportunities to increase the focus of attention, and consequently the identification of relevant information patterns and possibly explain the decrease in the number of unsuccessful actions (Memmert, 2011).

In the majority of cases, the differential learning approach resulted in better skill acquisition and better learning rates in participants (Schöllhorn et al., 2009; Wagner and Müller, 2008). Some studies have also demonstrated increased learning rates using a variable practice approach compared to a repetitive practice approach (Schöllhorn et.al., 2012; Schöllhorn, Michelbrink, Welminski & Davids, 2009).

A significant advantage was also reported for differential training group in soccer and hurdle sprint training (Schöllhorn, 2006), and shot put (Beckmann and Schöllhorn, 2003).

In Savelsbergh et al (2010) study, the differential learning group showed the most improvement in speed skating performance. Schöllhorn et al. (2012), considering the results of football technique tests in their study, offer clear evidence for the superiority of the differential learning approach.

According to Bozkurt (2018) study on technical performance of young football players' after Differential Learning (DL), results indicate that DL improved technical performance rates of players.

The differential-learning approach might be especially relevant for youth players who should be exposed early to suitable opportunities to acquire functional and transferable movement skills (Santos, Mateus, Sampaio, & Leite, 2016).

In conclusion, the findings suggest that the differential learning group showed the improvement in performance.

Further research is required for determining the optimum number of differences that would be functional during training. In addition, these results need to be verified with other and larger samples. These findings may be useful for trainers and physical education teachers in preparing basketball training programs.

References

Lee, T. & Simon, D., (2004) Skill Acquisition in Sport. Research, Theory and Practice. London: Routledge, 29-44.

Shoenfelt, L.E., Snyder, A.L., Maue, E.A., McDowell, C.P., Woolard, D.C. (2002). Comparison of Constant and Variable Practice Conditions on Free-Throw Shooting. Perceptual and Motor Skills, 94:3, 1113-1123.

Schöllhorn W.I., (1999) Individuality - a neglected parameter? (germ. Individualität - ein vernachlässigter Parameter?) Leistungssport; 29: 7-11.

Schöllhorn, W.I., Beckmann, H., Janssen, D., & Drepper, J. (2010). Stochastic Perturbations in Athletics Field Events Enhance Skill Acquisition. Motor Learning in Practice. A constraints-led approach, London: Routledge, 69-82.

Schöllhorn, W.I., Beckmann, H., & Davids, K. (2010). Exploiting system fluctuations. Differential training in physical prevention and rehabilitation programs for health and exercise. Medicina (Kaunas), 46(6), 365-373.

Schöllhorn, W.I., Hegen, P., & Davids, K. (2012). The Nonlinear Nature of Learning –A Differential Learning Approach. The Open Sport Science Journal, 5, 100-112.

Schöllhorn, W.I., Michelbrink, M., Welminski, D., & Davids, D. (2009). Increasing stochastic perturbations enhance skill acquisition and learning of complex sport movements. In D. Araujo, H. Ripoll, & M. Raab (eds.), Perspectives on Cognition and Action in Sport (pp. 59-73). Hauppauge, NY, United States: Nova Science.

Schöllhorn W.I., Mayer-Kress G., Newell K.M., Michelbrink M., (2009). Time scales of adaptive behavior and motor learning in the presence of stochastic perturbations. Hum Mov Sci.; 28: 319-33

Smith, W. (2014). Fundamental movement skills and fundamental games skills are complementary pairs and should be taught in complementary ways at all stages of skill development. Sport, Education and Society, 1–12.

Wagner H., Müller E., (2008). The effects of differential and variable training on the quality parameters of a handball throw. Sports Biomech; 7: 54-71.

Kluas, Bös. (1988). Heidelberger Basketbol Test-Entwicklung und Evaluation eines leistungsdiagnostischen Routineverfahrens, Elektronische Ressource (online); Gedruckte Resource,17-24

Memmert, D., (2011). Creativity, expertise, and attention: Exploring their development and their relationships. Journal of Sports Sciences, 29: 93-102.

Schöllhorn W.I., Michelbrink M., Beckmann H., Trockel M., Sechelmann M., Davids K., (2006) Does noise provide a basis for the unification of motor learning theories? Int J Sport Psychol.; 37: 34-42.

Beckmann, H. & Schöllhorn, W.I. (2003). Differential learning in shot put. In: W. Schöllhorn, C. Bohn, J. Jäger, H. Schaper, M. Alichmann (eds.): Mechanics, Physiology, Psychology. First European Workshop on Movement Science. Köln: Sport Buch Strauß.68.

Geert J.P. Savelsbergh, Willemiek J. Kamper, Jorine Rabius, Jos J. De Koning, and Wolfgang Schöllhorn (2010). A new method to learn to start in speed skating: A differencial (sic) learning approach. Int. J. Sport Psychol., 41: 415-427

Bozkurt, S., (2018). The Effects of Differential Learning and Traditional Learning Trainings on Technical Development of Football Players. *Journal of Education and Training Studies*, 6(4):25-29

Santos, Mateus, Sampaio, & Leite, (2016). Do previous sports experiences influence the effect of an enrichment programme in basketball skills? Journal of Sports Sciences, 35(17): 1759-1767