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DOES THE CHANGE OF TESTING PROTOCOL HAVE AN INFLUENCE ON THE RELIABILITY IN MOTOR SKILL TESTS?

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Abstract

The aim of this research was to determine the effect of two different metric protocols, the present standard and a new protocol with a video demonstration of the task, on reliability and homogeneity of motor skills assessment tests for the students in primary education. The sample of participants comprised ofstudentsin the third and fourth grades from four elementary schools in the urban area of Petrinja and Sisak in Croatia. The total number of students that participated was 327, consisting of 186 boys and 141 girls aged 10.5 years. The students were divided in two subsamples, based on the protocol applied. The sample of variables consisted of 4 motor skills assessment tests: Shuttle-run, Partial Curl-up, 90° Push-ups, Back-saver sit and reach.The results of metric characteristics of composite testing in the field of motor skills have shown a high level of reliability, homogeneity and sensitivity of tests after both protocols were applied. Based on the reliability coefficient, the test called 90°Push-ups can be used further by using the video demonstration protocol, with a few trials before the application, while the test called Partial Curl-updoes not allow the use and application of the test in this form and using this method. The research shows that, with correction of some tests, the new protocol with the video demonstration has better results of metric characteristics of tests compared to the standard protocol.

***Keywords**:* metric protocol, student, elementary school, motor skill tests

Introduction

With the aim to determine the level of motor skills and physical condition of a subject, laboratory and field test are applied on a daily basis. The importance of motor skills is evident in the performance of everyday tasks, as well as all physical activities. The differences in the level of motor skills are specific for every individual (Mišigoj-Duraković, 2008), and individual differences, referring to growth dynamics and development, are a source of variability of shapes, functions and all abilities of human organism (Malina, Bouchard & Bar-Or, 2004, cited in Mišigoj-Duraković, 2008). Most of nervous structures and basic forms of motion are developed by the school age, which makes this age ideal for learning of basic abilities (Mišigoj-Duraković, 2008). The development of a child's motor skills can be improvedthe best inthe age of 4 to 10. Former research conducted with students are based on measuring motor abilities, but also fine and gross motor skills, during all the stages of a child's development. The main goal of every research is the insight into direction of development and the level of it, in order to react on time by applying and learning new motor structures. Motor development has a role of controlling parameter in the general child's development, because students need to be observed in all development stages and areas (Bushnel& Boudreau, 1993; Piek, Dawson, Smith, &Gasson, 2008). Also, a positive connection was discovered between thelevel of motor skills development andthe level of a child's physical activities (Cliff, Okely, Smith &McKeen, 2009; Fisheret al., 2004; Raudsepp& Pall, 2006). In order to study the motor development of a child thoroughly, measurement is conducted to determine the level of motor skills or to estimate the success of intervention program. Student’s understanding of the motor protocol, the instruction given during the process of learning and the demonstrations are crucial for the final result in testsfor motor status assessment (Hayes, Hodges, Scott, Horn&Williams, 2007; Sullivan, Kantak&Burtner, 2008), but they also affect the improvement and learning of certain forms of motion (Al-Abodd, Davids&Bennett, 2001; Horn, Williams, Scott&Hodges,2005; Laguna, 2008).

Different forms of information can be given to a participant to help him/her infinding solutions (Magill,1993; Magill &Schoenfelder-Zohdi, 1996).Instructionprovided through demonstration improves the quality of the visual information that later improves the trialof an aiming task (Scully & Carnegie, 1998). Demonstration is a method for motor skills learning, based on the capacity of nervous system to extract the important information from the model'sperformance that can turn into a motor order (Buchanan & Dean, 2010).Improvement and development of technology and higher availability of it, made the everyday use of technical devices in all social spheres of life a means inevitable for work. The use of video-taped demonstration as a way to share information with other people in the field of education is particularly interesting. In the past few years, alongside the standard protocol with "live" demonstration by teachers or students, the new forms of protocol, that can significantly improve learning and acquisition of motor skills, are in use.

One of the methods to provide information, as a way of learning of the task, is also a video demonstration by a modeling (an expert). The most usual form of providing instructions during the learning of motor task are a video demonstration by an expert or a direct demonstration (Doussoulin&Rehbein, 2011). Magill (1993), and also Magill &Schoenfelder-Zohdi (1996) confirmed in their research that participants can learn the skill by observing an expert without getting any detailed feedback. In the research by Ram, Riggs, Skaling, Landers &McCullagh (2007), modeling is defined as an intervention with external stimulation, such as "live" demonstration or a video demonstration, during which the observer learns the right way to perform the task by looking at the performance of someone else. According to Boyer, Miltenberger, Batsche&Fogel (2009), video modeling includes video clip of an expert performing a certain task that is later shown to a student or a sportsman. Modeling as a protocol that provides information about a basic motion or a task, has to be performed as a conceptual information about "what to do" and refers primarily to the performance trial (Zetou, Tzetzis, Vernadakis&Kioumourtzoglou, 2002, in Richardson and Lee,1999). Feedback in the form of a video enables a complete feedback about the performance and uses a model as demonstration of the correct performance, and expand the standard way of learning and improving by adding a visual component to a verbal feedback (Kelley, 2014).

Many studies have explored the effect of certain protocols on learning various skills, and compared the effects of the protocols on learning these skills as well. The most common protocol applied is the video demonstration by a model used for learning certain skills. The positive effects of video demonstrations, as well as faster learning based on the modeling's performance, with improvement of results compared to some other protocols, have been confirmed in many studies (Aiken et al., 2012; Atienza et al., 1998; Boyer et al., 2009; BenitezSantiago, 2011; Cheraghiodocheshmehet al., 2009; Guadagnoliet al., 2002; Hodges et al., 2003; Horn et al., 2005; Kelley, 2014; Laguna, 2008, Parsons et al., 2012; Rodrigues, Ferracioli&Denardi, 2010; Zetouet al., 2002). However, differences between protocols were not found in some studies(Al-Aboodet al., 2001; Emmenet al., 1985; Haguenaueret al., 2005; Horn et al., 2002; Jennings et al., 2013; Miller et al., 1988; Magill &Schoenfelder-Zohdi, 1996).

Based on the results of the presentresearch, we noticed the lack of knowledge about the effect of different metric protocols on reliability and homogeneity in tests for motor skill assessment, which is the aim of this research. Following the aim, the hypothesis of this research is that the application and the use of a new protocol for motor skill assessment with a video demonstration of the motor task will increase the level of reliability, homogeneity and sensitivity of the tests in comparison with a protocol that does not include a video demonstration of the motor task.

Methods

The participants for this research were students in the third and fourth grade from four elementary schools that belong to the urban area in the towns of Petrinja and Sisak. The total number of students that participated in the research was 327, out of which 186 boys and 141 girls, aged 10,5 that are145 cm tall on average and have the average weight of 38,7 kg. The students were divided in two subsamples, based on the protocol applied: Standard Protocol (183; 110males and 73females) and Video Demonstration Protocol (144; 76male and 68 female).

All the participants in this research attend regular classes of physical education, and did not previously have experience with most of the given motor tasks, and they were completely healthy during the tests.The research is approved by the Scientific and Ethical Committeeof the Faculty of Kinesiology, the University of Zagreb, the Senate of Zagreb University, while the head-masters of the schools mentioned above allowed the participation of their schools before the beginning of the research. After that, parents of each child signed the written agreement for the participation in the research and they were informed about the object and the aim of the research.

The sample of variables in this research included 2 anthropometric measures (body height and weight) and 4 tests for motor skill assessment (Shuttle-run, Partial Curl-up, 90°Push-up, Back-saver sit and reach).

Shuttle-run: a participant stands outside the start line in a high starting position, head turned towards the movement direction. On the sign "Ready! Steady! Go!", the student runs to get the sponge, pick it up, runs back to the start-finish line, puts the sponge behind the line, runs back to get the second sponge, takes it and runs back behind the start finish line. The task is done when the participant puts the second sponge behind the start-finish line (Malina, Bouchard & Bar-Or, 2004; Welk,& Meredith, 2010; Novak, 2010; Vrbik, 2015).

Curl-up: a student is lying on the mat with his/her knees bent in 140°, with the hands extended along the body and palms facing the mat. Under the feet, the measuring tapeis put in the line with the top of the middle finger, and a piece of paper is put under his/her head. The student starts doing the task on the sign, lifting the head and shoulders while sliding with the hands on the measuring tape and putting the head back on the paper every time. The test is finished when 75 lift of the upper body is done, whenthe student repeats a mistake for the second time while doing the activity or is not able to continue the performance of the motor activity (Welk, & Meredith, 2010; Novak, 2010; Vrbik, 2015).

90°Push-ups: a student is in the position of back press with the hand in shoulder width or a bit wider, legs straight and spread a little, feet on the mat, back straight. The student goes down with the hands towards the mat until the upper arm is parallel with the floor, and then lifts up back to the starting position. The task is done when the studentis not able continue the task or the second correction is done during the performance (Welk& Meredith, 2010; Vrbik, 2015).

Back-saver sit and reach: astudent sits in front of the measuring device, one leg completely extended, while the other is bent in knee with the foot on the mat. The arms are extended to the front above the measuring scale with the palms put together, both facing the mat. With both palms the student bends forwards over the measuring tape and holds the last position for one second (Welk&Meredith, 2010; Vrbik, 2015).

The tests Back-saver sit and reach andShuttle-run were repeated three times, while other tests were done once.

The research was conducted at the regular classes of physical education in the school year 2013/2014, during May and the beginning of June. In the same period of time, lasting two weeks, the experiment was done in both groups in two treatments. The first treatment included the initial testing of all the students in the tasks. The second treatment consisted of testing after the treatment in each task, using the method of random choice and applying different metric protocols. Before doing the experiment, both groups of participants were prepared by doing a 5-minute warm up that included joint rotations and basic games appropriate for the age of the students.

Data analysis was performed using the Statistical Package for the Social Sciences (v13.0, SPSS Inc., Chicago, IL, USA). The metric characteristics of each test were determined in accordance with the experimental protocol:Reliability (Cronbach's α) – the method of internal consistency in the series of measuring and interclass correlations (ICC); test-retest method between the series of measures, and the coefficient of variability, while the homogeneity was measured with average correlations between the particles (AVR). The level of reliability of 1-item tests was determined by the test-retest method, based on the values of the correlations between the test results and the repeated test, while homogeneity was —determined by the t-test.

Results

Normality of data distribution for each variable was tested by Kolmogorov-Smirnov test in accordance with the protocol applied. The test confirmed that the distributions do not significantly differ from the normal distribution.Table 1 contains the results of the metric characteristics, reliability and homogeneity, multi-item motor skill tests in the initial measuring and after the use of both protocols. Reliability results and homogeneity show high values in all tests, both before and afterthe use of particular protocol. There is a decrease in values of Cronbach's α and the average correlation between the items in the protocol with video demonstration for the Shuttle-run test, as well as in the standard protocol. The increase of the standard measurement error occurred after the use of the protocol, while the decrease of the variability coefficientoccurred in the protocol with video demonstration.

In the assessment test of latent dimension of a motor skill, i.e. leg flexibility (Sit and Reach for the right and Sit and Reach for the left leg), there was an increase of Cronbach's α value and the average correlation between the itemsoccurred after the use of video demonstration protocol, while the variability coefficient and the standard measurement error decreased. Interclass correlation coefficient (ICC) in the standard protocol for the test called Shuttle-run is high, and it is ICC= 0,928 in the interval; 95% CI, 0,908-0,944, as well as in the video demonstration protocol where it was ICC = 0,908 in the interval; 95% CI, 0,878-0,931. In the test Back-Saver Sit and Reach for the right leg in the standard protocol, it was ICC = 0,978 and it is in the interval; 95% CI, 0,972-0,983, while in the video demonstration protocol it is ICC=0,988 in the interval; 95% CI, 0,984-0,991. In the test Back-Saver Sit and Reach for the left leg in the standard protocol, the ICC=0,975 in the interval; 95% CI, 0,967-0,980, while in the video demonstration protocol it is ICC=0,985 in the interval; 95% CI, 0,980-0,989.

Table 1. Metric characteristics of multi-item tests after the use of different protocols

	Standard protocol				Video demonstration protocol			
	Cronbach α	AVR	CV	SEM	Cronbach α	AVR	CV	SEM
SR I	0,937	0,832	9,39	0,251	0,929	0,816	10,79	0,266
SR F	0,928	0,815	9,94	0,268	0,908	0,775	10,58	0,303
BSRR I	0,970	0,916	23,45	0,173	0,983	0,950	25,43	0,130
BSRR F	0,978	0,938	24,31	0,148	0,988	0,964	25,27	0,110
BSRL I	0,976	0,932	23,91	0,155	0,980	0,942	28,06	0,141
BSRL F	0,975	0,928	25,45	0,158	0,985	0,956	19,43	0,122

Cronbach α – reliability coefficient; AVR – average correlation between items; CV – coefficientof variation; SEM – standard error of measurement; SR I – Shuttle-run (initial measuring); SR F – Shuttle-run (measuring after the protocol); BSRR I – Back-save sit and reach for the right leg(initial measuring); BSRR– Back-saver sit and reach for the right leg (measuring after the protocol); BSRL I – Back-saver sit and reach for the left leg (initial measuring); BSRL F – Back-saver sit and reach for the left leg (measuring after the protocol)

The reliability level of the standard protocol in the 1-item tests using the test-retest methodwas not sufficient, based on the values of correlation between the test results and the repeated test. The correlation value in the 90°Push-up test was r=0,739, while in the Curl-up test it was r=0,626. Homogeneity of the tests was measured by the t-test and the tests showed a high

level of homogeneity, since the differences were insignificant (90°Push-up t= 1,379; p= 0,169 and Curl-upt= 1,386; p= 0,167). The test-retest method used in the video demonstration protocol for the 90°Push-up test indicated sufficient correlation coefficient, and it was r=0,857. In the same protocol for the Curl-up test, the value of the correlation coefficient was insufficient, i.e. r= 0,721. The tests did not occur homogeneous, considering the significant differences of the tests after the use of video demonstration protocol(Push-up t= -6.525; p< 0.01; Curl-up t= -8.006; p<0.01).

Discussion

In this research, we used the tests that are constructed to assess a latent dimension of repetitive force, agility and flexibility. The tests were taken from the battery of test (Welk&Meredith, 2010) that are used for physical condition assessment of the American students. We presented the analysis of metric characteristics and tests with the aim to determine reliability and homogeneity, but also to illustrate how the tests are applicable to the assessment of the motor skill level of the students in primary education. Some of the tests, such as the Shuttle-run, and the Curl-upshowed sufficient homogeneity and reliability coefficients even in the previous studies of different age categories of students and young people (Novak, 2010; Malinaet al., 2004). Also, the tests similar in the structure of use to the tests for assessment of force, agility and flexibility dimension had sufficient metric characteristics in the previous studies(Findaket al., 1996; Metikoš, Hofman, Prot, Pintar, &Oreb, 1989; Prskalo, Jenko, Petračić, Šerbetar&Šuker, 2007). The group of tests for the motor skill level assessment, used in this research, has not previously been used in our country with this kind of population, and their metric characteristics have not been analyzed.

The results of metric characteristics of composite tests in the field of motor skills indicated a high level of reliability, homogeneity and sensitivity of tests when both protocols were used. Reliability coefficient (Cronbach's α) for the total sample, taking into account both boys and girls, ranges from 0,922 to 0,983, in the standard protocol it is in the range of 0,928 to 0,978 and in the video demonstration protocol it is 0,908 to 0,988.These values of reliability level of tests are satisfactory, according to the criteria of Momirović, Štalec& Wolf (1975) for the limit of 0,80 and more, Malacko and Popović (1997) for the limit of 0,85 and more, and according to Mužić (1973) and Hopkins (2000) for the limit of 0,90 and more. Interclass correlation coefficient (ICC) in all motor skill tests is very high (0,91-0,99). Similar results in some similar, or even the same variables for motor skill assessments occurred in the research by Cole et al. (2000) with the ICC=0,95-0,98) and Novak (2010), with the ICC = 0,93-0,99).

Reliable tests have a low coefficient of variation (CV) and a high interclass correlation coefficient (ICC), with an insignificant measurement error (Moir, Sanders, Button &Glaister, 2005), which was mostly confirmed in this research as well. Homogeneity coefficient , assessed

by the average correlation between items (AVR), ranges from the lowest value of 0,78 in the test Shuttle-run with the video demonstration protocol used, to the value of 0,96 in the test Back-saver sit and reach for the left and the right leg, also in the video demonstration protocol. The results of the homogeneity coefficient values are considered satisfactory and we conclude that the object of measurement is the same for every item, especially for the test Back-saver sit and reach for the right and the left leg in the video demonstration protocol. The value of homogeneity coefficient (AVR) of 0,78 in the Shuttle-run test in the video demonstration protocol is also considered satisfactory and a homogeneous test, since the same value was measured in the similar agility assessment test in the research by Jukić et al. (2008), based on the population of soldiers.

For the same test, the homogeneity coefficient in the standard protocol is 0,82. The reason for the higher homogeneity in the Shuttle-run test with the standard protocol can be found in the better initial result of both sexes and lower standard deviation. The high level of coefficient, homogeneity and reliability in both tests (SR,BSRR and BSRL) can be explained by the following facts, considering the approach to testing that was defined precisely and clearly for every protocol, and was the same for each participant in a particular protocol. Also, we should keep in mind that the participants may have previously learned similar structure and form of motion at physical education classes. One of the things that can have an effect on the homogeneity coefficient in the Shuttle-run test is a child's trial to imitate model's performance. Since the performance methods of this task are slightly longer and more complex, some students were "confused" at the moment of picking up the sponge during the performance (which hand to use for picking up the sponge and which side to turn to). The slightly longer time of student'staskperformance probably caused fatigue, thatoccurred at different moment for every child, and thus caused the fatigue of the central nervous system (CNS) and muscles.

The consequence of the CNS and muscle fatigue is the above mentioned "confusion", and also the lower results. One of the very important reasons that should not be ignored is inappropriate footwear that, in combination with the dusty ground, leads to sliding. The consequence of sliding was taking more space given for the test performance by crossing the lines or kicking the sponge with a leg, which ended up in crossing the borders given in the test. All these things caused lower results, but also the lower reliability coefficient at the same time. Considering all the flaws discovered in this test, that should be taken into consideration in future research, the new test method shouldbe used to check the performance of the test, whether by making the tasks familiar or by increasing the number of items. Furthermore, the external influence such as noise or a large number of students did not affect the test reliability, so,eventually, it did not have an effect on the students' performance (Williams et al., 2009).

The video demonstration protocol had a higher level of reliability in the Back-saver sit and reach for the left and the right leg test (0,985 and 0,988), compared to 0,975 and 0,978 in the standard protocol, while the Shuttle-run test in the standard protocol had a higher level of reliability with 0,928 and 0,908 in the video demonstration protocol. It shows that the Shuttle-run

test has a better homogeneity and reliability in the standard protocol, so it is suggested to use that protocol for this particular test.

Reliability coefficient of 1-item tests was determined by the test-retest method. The correlation result of the 90°Push-up test in the video demonstration protocol is r=0,86, which makes the test reliable. The homogeneity of the test was assessed by the t-test that resulted in a significant difference (t= -6,525 ; p< 0,01), and the same can be done with variation analysis (Božanić, 2011). The significant difference indicates that the test is heterogeneous. The reasonfor the difference and the confirmation of heterogeneity lead to conclusion that motor learning at that agehas the biggest effect on the test. In addition, t-test showed a significant difference (t= -8,006; p< 0,01) even in the Curl-up test in the same protocol. Because of the reliability level, i.e. the result of the correlation coefficient (r = 0,72)from the test, and the heterogeneity of the test, this test is not considered satisfactory for further use in the same way.

Based on the descriptive indicators that show the increase of the results, the possible effect of fatigue can be eliminated as one of the indicators for the lower result, while motor skill learning can be the actual reason. The solution for all these problems could be trials that would make the tests familiar, and decrease the effect of learning at the same time. Tsigilis&Theodosiou (2008) also made this conclusion in their research, and suggested preliminary introduction with the test 2-4 weeks before the measurement. The effect of familiarization would certainly be evident in the Curl-up test, considering the frequency of use of the usualtest,that differs in structure of motion. In the standard protocol, test reliability of 90°Push-ups was r=0,74 and it is not considered satisfactory, as well as the correlation of r=0,63 for the Curl-up Test. For both tests, homogeneity was determined by t-testand it did not show significant statistical differences.

From that point of view, we can conclude that the tests are homogeneous, but not precise enough for measuring. Besides that, the tests do not have a sufficient level of sensitivity and as such they are not adequate for comparison of participants at that age. This conclusion is based on the result variability, i.e. standard deviation, which should be the arithmetic average value of 1/3 of the participant’s result.The phenomenon that is present in both test and both protocols is certainly the given possibility to perform the task during the testing by the participant only one time.

After the analysis and the insignificant differences of descriptive parameters and metric characteristics of the tests while using both protocols, it is possible to conclude that the Shuttle-run test can be suggested for motor skill assessment, i.e. agility assessment of students in primary education, by applying both metric protocols. The flexibility assessment test, called Back-saver sit and reach for the left and the right leg, can be applied for the result assessment of students in primary education by using the video demonstration protocol.Based on reliability coefficient, the test called 90°Push-ups is suggested for further use by applying the video demonstration protocol, with a few trials prior to the use of theprotocol, so that students could learn the

structure of task performance to a certain extent. The results of Curl-up test do not allow further use and application of the test in the form and the method described, especially since the similar tests for motor skill assessment of students (Sit and reach and Curl-up) were previously proven to have a good reliability and validity by Vlahović, Babin&Bavčević (2007). However, they mention that certain improvements of measurement protocols and test is necessary in order to improve diagnostic procedures in kinesiology.The tests used in this research have shown good metric characteristics, so they can be used further and expand the existing battery of tests for motor skills level assessment of students in primary education, with a few trials or a previous learning (90°Push-ups) or certain corrections in the test performance (Curl-up). After the analysis, based on all the data from this research, the given hypothesis can be partially accepted, and verified again in the future research, with corrections and learning prior to the performance of particular tests.

References

Aiken, C. A., Fairbrother, J. T.& Post, P. G. (2012). The Effects of Self-Controlled Video Feedback on the Learning of the Basketball Set Shot.*Frontiers in Psychology*, *3* (338), 1-8.

Al-Abood, S.A., Davids, K.&Bennett, S.J. (2001). Specificity of task constraints and effects of visual demonstrations and verbal instructions in directing learners' search during skill acquisition. *Journal of Motor Behavior*, 33(3), 295-305.

Atienza, F.L., Balaguer, I. & Garcia-Merita, M.L. (1998). Video modeling and imaging training on performance of tennis service of 9- to 12-year-old children. *Perceptual and Motor Skills*, 87, 519-529.

BenitezSantiago, A.S. (2011). Using Video Feedback to Improve Martial-Arts Performance. *Graduate Theses and Dissertations.*College of Behavioral and Community Sciences. University of South Florida

Boyer, E., Miltenberger, R. G., Batsche, C.& Fogel, V. (2009). Video modeling by experts with video feedback to enhance gymnastics skills. *Journal of Applied Behavior Analysis*, *42*(4), 855–860.

Božanić, A. (2011). Vrednovanje i analiza razvoja motoričkih znanja u ritmičkoj gimnastici, Doktorska disertacija, Split: Kineziološki fakultet Sveučilište u Splitu

Buchanan, J. J.& Dean, N. J. (2010). Specificity in practice benefits learning in novice models and variability in demonstration benefits observational practice. *Psychological Research*, *74*(3), 313-326.

Bushnell, E.W. & Boudreau, J.P. (1993). Motor development and the Mind: The Potential Role of Motor Abilities as a Determinant of Aspects of Perceptual Development. *Child Development*, 64(4), 1005-1021.

Cheraghidocheshmeh, M., Mossavi, Y., Noroozy, D.&Izadi, M. (2009). The comparison of effect of video-modeling and verbal instruction on the performance in throwing the discus and hammer. *Procedia Social and Behavioral Sciences* 1, 2782-2785.

Cliff, D.P., Okely, A.D., Smith,L.M.&McKeen, K. (2009). Relationships between fundamental movement skills and objectively measured physical activity in preschool children. *Pediatric Execise Science*, 21, 436-449.

Cole, T.J., Bellizzi, M.C., Flegal, K,M. & Dietz, W.H. (2000). Establishing standard definition for child overweight and obesity worldwide: International survey. *British Medical Journal*, 320, 1-6.

Doussoulin, A. & Rehbein, L. (2011). Motor imagery as a tool for motor skill training in children. *Motricidade*, 7(3), 37-43.

Emmen, H.H., Wesseling, L.G., Bootsma, R.J., Whiting, H.T.A.&van Wieringen, P.C.W. (1985). The effect of video-modeling and video-feedback on the learning of the tennis service by novices. *Journal of Sports Sciences*, 3 (2), 127-138.

Findak, V., Metikoš, D., Mraković, M.&Neljak, B. (1996). Primijenjena kineziologija u školstvu (Norme). Hrvatski pedagoško – književni zbor, Zagreb.

Fisher, A., Reilly, J.J., Kelly, L.A., Montgomery, C., Williamson, A., Paton, J.Y.&Grant, S. (2004). Fundamental movement skills and habitual physical activity in young children. *Medicine & Science in sport & execise*, 684-689.

Guadagnoli, M., Holcomb, W.& Davis, M. (2002). The efficacy of video feedback for learning the golf swing. *Journal of Sports Sciences*, 20, 615–622.

Hayes, S.J., Hodges, N.J., Scott, M.A., Horn, R.R.& Williams, A.M. (2007). The efficacy of demonstrations in teaching children an unfamiliar movement skill: The effects of object-orientated actions and point-light demonstrations. *Journal of Sports Sciences*, 25 (5),559-575.

Hodges, N. J., Chua, R.& Franks, I.M. (2003). The role of video in facilitating perception and action of novel coordination movement. *Journal of Motor Behavior*, 35 (3), 247-260.

Hopkins, W.G. (2000). Measures of Reliability in Sports Medicine and Science. *Sports Medicine*. 30 (1), 1-15.

Horn,R.R., Williams A. M., Scott, M. A.& Hodges, N. J.(2005). Visual Search and Coordination Changes in Response to Video and Point- Light Demonstrations Without KR. *Journal Of Motor Behavior*, *37*(4), 265-274.

Jennings, C.T., Reaburn, P.&Rynne, S.B. (2013). The effect of self-modelling video intervention on motor skill acquisition and retention of novice track cyclist's standing start performance. *International Journal of Sports Science and Coaching*, 8 (3).

Jukić, I., Vučetić, V., Aračić, M., Bok, D., Dizdar, D., Sporiš, G.&Križanić, A. (2008). Dijagnostika kondicijske pripremljenosti vojnika, Kineziološki fakultet Sveučilišta u Zagrebu

Kelley, H. (2014). Using Video Feedback to Improve Horseback Riding Skills. *Graduate Theses and Dissertations.*College of Behavioral and Community Sciences, University of South Florida

Laguna, P. L. (2008). Task complexity and sources of task-related information during the observational learning process. *Journal Of Sports Sciences, 26*(10), 1097-1113.

Magill, R.A. (1993). Modeling and verbal feedback influences on skill learning. *International Journal of Sport Psychology*, 24 (4), 358-369.

Magill, R.A. & Schoenfelder-Zohdi, B. (1996). A visual model and knowledge if performance as sours of information for learning a rhythmic gymnastic skill. *International Journal of Sport Psychology*, 27, 7-22.

Malacko, J. & Popović, D. (1997). Metodologija kineziološko antropoloških istraživanja. Priština: Fakultet za fizičku kulturu Univerziteta u Prištini

Malina, R., Bouchard, C.&Bar-Or, O. (2004). *Growth, maturation, and physical activity*, 2nd ed. Human Kinetics.

Metikoš, D., Hofman, E., Prot, F., Pintar, Ž.&Oreb, G. (1989). Mjerenje bazičnih motoričkih dimenzija sportaša. Zagreb: Fakultet za fizičku kulturu Sveučilišta u Zagrebu.

Miller, G.& Gabbard, C. (1988). Effects of Visual Aids on Acquisition of Selected Tennis Skills. *Perceptual and Motor Skills*; 67, 603-606.

Mišigoj-Duraković, M. (2008). Kinanthropology-biological aspects of physical exercise. Zagreb, Faculty of Kinesiology, University of Zagreb.

Moir, G., Sanders, R., Button, C. &Glaister, M. (2005). The Influence of Familiarization on the Reliability of Force Variables Measured During Unloaded And Loaded Vertical Jumps. *Journal of Strength and Conditioning Research*, 19(1), 140 – 145.

Momirović, K., Štalec, J.&Wolf, B. (1975). Pouzdanost nekih kompozitnih testova primarnih motoričkih sposobnosti. *Kineziologija,* 5 (1-1), 169-192.

Mužić, V. (1973). Metodologija pedagoškog istraživanja. Zavod za izdavanje udžbenika, Sarajevo

Novak, D. (2010). Razlike u kinatropološkim obilježjima učenika petog razreda u odnosu na makroregionalne i urbanoruralne značajke Republike Hrvatske, Doktorska disertacija, Zagreb: Kineziološki fakultet

Parsons, J.L. & Alexander, M.J.L. (2012). Modifying spike jump landing biomehanics in female adolescent volleyball athletes using video and verbal feedback. *Research in Developmental Disabilities*, 33 (4), 1076-1086.

Piek J.P., Dawson, L., Smith, L.M.&Gasson, N. (2007). The role of early fine and gross motor development on later motor and cognitive ability. *Human movement science*, 27(5), 668-681.

Prskalo, I., Jenko, S., Petračić, T., Šerbetar, I. & Šuker, D. (2007). Motor Skills of Boys and Girls at the Age of 9 and 10. 1st Special Focus symposium on Kinesiological Education in PreSchool and Primary Education, 95-101.

Ram, N., Riggs, S.M., Skaling, S., Landers, D.M.&M$_c$Cullagh, P. (2007). A comparison of modelling and imagery in the acquisition and retention of motor skills. *Journal of Sports Science*, 25(5), 587-597.

Raudsepp, L. & Pall, P. (2006). The relationship betveen fundamental motor skills and outside-school physical activity of elementary school children. *Pediatric Execise Science*, 18, 426-435.

Rodrigues, S.T., Ferracioli, M.C.&Denardi, R.A. (2010). Learning a complex motor skill from video and poin-light demonstrations. *Perceptual and Motor Skills*, 111, 307-323.

Scully, D. M.& Carnegie, E. (1998). Observational learning in motor skill acquisition: A look at demonstrations. *Irish Journal of Psychology*, 19 (4), 472-485.

Sullivan, K.J., Kantak, S.S.&Burtner, P.A. (2008). Motor Learning in Children: Feedback Effects on Skill Acquisition. *Physical Therapy*, 88(6), 720 – 732.

Tsigilis, N. &Theodosiou, A. (2008).The Influence of Multiple Administration of a Psychomotor Test on Performance and Learning.*Journal of Strength and Conditioning Research*, 22(6), 1964 – 1968.

Vlahović, L., Babin, J. & Bavčević, T. (2007). Metric Characteristic and Basic Parameters of Distribution of Some Motoric Tests of Pupils in Primary Education. 1st Special Focus symposium on Kinesiological Education in PreSchool and Primary Education, 66-72.

Vrbik, I. (2015). Effects of different testing protocols on motor skill tests in primary education, *Graduate Theses and Dissertations.*, Zagreb, Faculty of Kinesiology, University of Zagreb.

Welk, G.J. & Meredith, M.D. (2010). Fitnessgram/Activitygram Test Administration Manual, Updated 4th ed. Champaign, IL: Human Kinetics.

Williams, H.G., Pfeiffer, K.A., Dowda, M., Jeter, C., Jones, S.&Pate, R.R. (2009). A Field-Based Testing Protocol for Assessing Gross Motor Skills in Preschool Children: The Children's Activity and Movement in Preschool Study Motor Skills Protocol. *Measurement in Physical Education and Exercise Science*, 13 (3), 151-165.

Zetou, E., Tzetzis, G., Vernadakis, N.&Kioumourtzoglou, E. (2002). Modeling in learning two volleyball skills. *Perceptual and Motor Skills*, 94, 1131-1142.

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