THE STABILITY OF SPORTS PRECONDITIONS IN RELATION TO THE EFFECT OF SPECIFIC EXERCISE STIMULI

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- time stability
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- talent identification
- fitness assessment

Abstract:
The purpose of the study was to determine the time stability of sports preconditions in relation to the effect of specific exercise stimuli. The sample consisted of 6- and 7-year-old children who attended first grade of elementary school. Children who participated in pretest in September 2016 and posttest in March 2017 performed seven motor fitness tests. Test and retest scores achieved by child athletes and nonathletes were used to determine time stability of their sports preconditions. To evaluate differences and correlations between samples of paired data, we used partial correlations, MANOVA, and canonical correlation analysis. The results showed that pretest and posttest data on sports preconditions strongly correlated with each other in both athletes and nonathletes. The greatest difference in correlations between athletes and nonathletes was found for the coordination test of rolling three balls. We may conclude that the specific exercise stimuli have little effect on the time stability of sports preconditions of both child athletes and nonathletes at this age period. The study was conducted within the project VEGA 1/0997/16 “The structure of talent as a determinant underlying evaluation of sports preconditions”.

INTRODUCTION

Research in the talent identification of athletes within sport science has been of specific interest for approximately the last 20 years. Talent identification is defined as the process of recognizing current participants, at an early stage in their development, who have the potential to be excellent in a specific sport in adulthood. Although talent development has been of interest in recent years, there are limitations associated with many of the research designs used within this field [Till et al. 2016]. The studies showed that the professional growth of an athlete and their ability to become part of the elite athletes depend of identical measure on the two elements of huge importance. Firstly, on the genetic heritage and secondly, on the sports training athletes do. Nevertheless, these two elements should not ignore the influence of nutritional, psychological and environmental factors on successful athlete development [Quijada 2016]. The systems, models and programs designed to identify and provide for the development of talented young people in sport continue to evolve in their complexity and comprehensiveness. This approach is very often driven by national interests, national federations and club teams of doing well in various sports. As a field of enquiry talent identification and development demands a multidisciplinary approach and those that work directly with young athletes require a harmony of interdisciplinary understanding of the key disciplinary contributions [Cooke et al. 2010]. The process by which athletic growth is achieved among elite athletes is classified into four absolutely essential key stages: detection, identification, selection, and development of talent. This approach is the basis for demonstration of importance of consistent leadership in elite athlete training. Coupled with the notion of the “10 years, 10,000 hours” rule, where 10,000 hours of practice in 10 years are needed for the talent growth of an outstanding artist or athlete [Hirose, Seki 2015].

National governments and professional sport clubs are investing serious resources to accelerate the development process of young athletes. Currently, research and practical applications of talent development programs predominantly utilize a cross-sectional approach to predict future adult performance [Till et al. 2013]. Many sports clubs selectively enroll promising outlook players at a relatively very early age and provide specialized programs with the aim of developing and perfecting playing abilities. The selection, development and professional guidance of young athletes and players is thus a priority for many top clubs to maintain their sporting and financial status. Talent identification of young athletes often focuses on comparisons between youth athletes and professional athletes, and athletes classified by competitive elite. Evaluation of youth athletes is complicated because of individual differences in the timing and tempo of changes in body mass and body height, functional capacities and motor proficiency during puberty and the growth spurt. Age, maturity status and body size contribute significantly to variation in functional capacities (endurance, speed, power) but relatively little to variation in sport-specific skills [Vaeyens et al. 2006].

Determination of physical preconditions criteria for the field of sports activities is an integral part of sports training theory. Currently, the term precondition is often interchanged with terms such as ability, talent, geniality, or gift [Perič 2010]. There are many programs applied for talent identification and talent development in order to find future champions and to provide good conditions for them to grow [Vičar, Válková 2014]. At the present time it is not possible to determine the exact relative contribution of either genes or training process to elite sporting performance and it must be recognized that it is likely that the relative importance of training process may differ for different types of sports, such that in some sports, genetic factors may be more significant [Vaeyens et al. 2006].

On the other side, differences in the level of physical fitness, especially its manifestations depending on everyday physical activity, reflect well on conditions created for children [Resiak, Niedzielska 2011]. Physical inactivity among children has contributed to the public health burden of overweight and obesity. Increase risk for disease resulting from physical inactivity is very often related to this two problems, such as overweight and obesity. Children’s regular engagement in organized sports and physical education has steadily declined [Erwin, Castelli 2008]. Preschool and first grade age is a key time for the development of health behaviors, effective preventive interventions targeting this population are needed [Pérez 2013]. The high prevalence of childhood obesity and overweight remains of huge public health concern, despite a possible recent stabilization. The increase in overweight is associated with a concomitant decrease in physical fitness. Although, physical fitness is genetically influenced, data from large groups have reelevated the importance of environmental factors [Niederer et al. 2012].

THE MATERIAL AND METHODOLOGY

The sample consisted of 6- and 7-year-old children (n = 43) who attended first grade at elementary schools. Children in the experimental and control groups were recruited using the intentional sampling method. The experimental group consisted of 12 boys and 11 girls who engaged in organized after-school sports activities. The control group consisted of child nonathletes, 10 boys and 10 girls, who did not engage in any after-school organized sports activities (Table 1).

Table 1 Sample characteristics

Sex	Control group	Experimental group
Boys	10	12
Girls	10	11

Children, who participated in pretest in September 2016 and posttest in March 2017, performed seven motor fitness tests. Collective agreement between elementary school and parents was signed before testing and experiment were conducted. Experiment took place from September 2016 to March 2017. Children in the experimental group engaged in organized after-school sports activities for 60 minutes twice a week (Tuesday and Friday). Children participated in 42 exercise sessions in an indoor gym. The training program performed by the experimental group was aimed to develop and improve general motor fitness, conditioning abilities (endurance), conditioning-coordination abilities (strength and agility) and coordination abilities (flexibility). At the beginning of each exercise session children warmed up by slow jogging, playing chasing games or sports games, which were followed by dynamic stretching exercises. In the main part of the exercise session, children performed strength, speed, coordination, and endurance exercises. At the end of each exercise session, children performed static stretching exercises, slow jogging, including breathing exercises. Pretest and posttest scores for both child athletes and nonathletes were used to determine time stability of their sports preconditions.

Children were first measured for body height and body mass. To determine motor performance, seven motor tests were administered: standing long jump, flexed arm hang, sit-ups in 1 minute, shuttle run agility test (4x10 meters), stand-and-reach, repeated routine with a stick and rolling of three balls.

Pretest and posttest scores for both child athletes and nonathletes were used to determine the time stability of their sports preconditions. To evaluate differences and correlations between samples of paired data, we used partial correlations, MANOVA, and canonical correlation analysis.

RESULTS AND DISCUSSION

A variety of motor tests have been experimentally administered to test particular motor abilities. However, research has shown that their feasibility is problematic particularly due to ignoring the specifics of motor development at this age period. Every study that deals with fitness assessment in children who attend first grade at elementary school is a partial attempt to devise a test battery with the highest degree of standardization for particular variables possible. This concerns their use and the number, which is limited by the ability to perform the tests [Ružbarská, Turek 2007].

Using correlation analysis, we assessed relationships between pretest and posttest scores for the experimental and control group, including the entire sample. The results showed that pretest and posttest data on sports preconditions strongly correlated with each other for both athletes and nonathletes. The greatest difference in correlations between athletes and nonathletes was found for the coordination test of rolling three balls. We assume that the reliability of this test was not sufficient (Table 2).

Table 2 Partial correlations

CORRELATIONS	BH	BM	RRWG	FAH	SLJ	SRA	SU	ROTB	SAR
Overall correlation	.97	.89	.80	.77	.79	.70	.57	.50	.91
Experimental group	.95	.86	.80	.72	.74	.75	.65	.30	.92
Control group	.98	.93	.80	.86	.87	.62	.57	.60	.90

Note. *BH - body height, BM - body mass, RRWG - repeated routine with a stick, FAH - flexed arm hang, SLJ - standing long jump, SRA - shuttle run agility test, SU - sit ups in 1 minute, ROTB - rolling of three balls, SAR - sit-and-reach*

To determine the difference between particular tests scores at test and retest, we applied MANOVA, the multivariate analysis of variance. Results of MANOVA did not show any significant differences. Wilks' Lambda test was also used to determine the difference between pretest and posttest for both experimental group and control group (Table 3).

Table 3 Results of Wilks' Lambda – pretest and posttest

Wilks' Lambda	*Test Value*	*Prob Level*	*p* < .05
Wilks' Lambda Pretest	.66	.097	Accept
Wilks' Lambda Posttest	.79	.49	Accept

To maximize correlations relationship between variables, canonical correlation was used. Canonical correlation showed highly close relationship between experimental group and control group at pretest and posttest. Canonical correlation score for the hypothetical variable was .98 at the level of significance $p < .01$ (Table 4).

Table 4 Canonical correlations

Variate number	Canonical correlation	Prob Level	Wilks' Lambda
1	.98	.0000	.00001
2	.94	.0000	.00023

Note. *1- the best results of hypothetical variable, 2- second best results of hypothetical variable*

CONCLUSIONS

The purpose of the study was to determine time stability of sports preconditions in relation to the effect of specific exercise stimuli. The results showed that pretest and posttest data on sports preconditions strongly correlated with each other for both athletes and nonathletes. Influence of spontaneous natural development plays an important role in the study. We may conclude that the specific exercise stimuli over the period of six months had little effect on the time stability of sports preconditions for both child athletes and nonathletes at this age period.

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