INFLUENCE OF ANTHROPOMETRIC CHARACTERISTICS ON JUMPING PERFORMANCE IN YOUNG BASKETBALL PLAYERS IN BRITISH BASKETBALL LEAUGE

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Abstract

Talent identification programs have traditionally focused on identifying talented athletes for individual sports with discrete physical and physiological characteristics. Team sports have been less inclined to conduct talent identification and selection programs. It has been thought that success in team sports is more related to knowledge of game strategies and skills as well as performance characteristics, and therefore it may be more difficult to predict potentially talented athletes. The aim of this study was to determine the impact of several anthropometric characteristics on manifestations of explosive leg strength, expressed by three tests (standing long jump, triple jump on left leg and triple jump on right leg). The sample included 23 basketball players (aged 16±1) from Manchester Giants Academy, who were tested. Regression analysis from package SPSS 10.0 was used for data processing. The results showed that anthropometric characteristics do not have a statistically significant impact on the manifestation of explosive leg strength.

Key words: *anthropometric characteristics, explosive leg strength, basketball players.*

INTRODUCTION

Strength is the basic motor ability that has always attracted much attention from professionals and scientists. Every human motor activity necessarily requires a muscle strain, that is, the manifestation of force through strength, to a greater or lesser degree, which accounts for the special significance of the muscle strength and its development. According to Verhošanski, Šestakov, Novikov and Nićin (1992), the notion of strength is used as one of the quality characteristics of free human movements, which solve a specific motor task. Strength is the aspect of force, although it can be defined as an amount of work per period of time, and explosive strength is the ability to quickly achieve maximum strength. Explosive strength represents one of the determinants of success in all activities that require the emergence of maximum muscle force in a short unit of time (Newton and Kremer, 1994). Therefore, it is an important factor in activities where it is necessary to give great acceleration to the body weight, the weight of individual body parts or an outside object.

Motor ability - strength can be classified according to, and in relation to body weight, and thus we are able to distinguish between absolute and relative strength. The first one represents the maximum muscular force that a man can develop with his muscle weight, and the second, the amount of strength that he can develop per kilogram of his weight. The first is important for motor actions by which one overpowers a large external resistance, as in throwing, lifting, etc., and the other with exercises in body manipulation, in training with exercise equipment. In recent years more and more significance was given to competitors, who, in addition to their weight can develop even greater useful muscle strength, that is, the absolute strength. If, however, we want to move our own body, such as in gymnastics, sprinting or jumping, it is best that we have more corresponding relative strength.

Basketball is a complex technical game and performance differences between players of varying ability levels have been identified in the anthropometric and physiological domains. Previous research has indicated that anthropometric characteristics can be useful in the profiling of basketball players at the elite senior level (Hoare, 2000). Big number of researchers dealt with anthropometric characteristics of sportsmen, trying to reveal optimal morphological profile for specific sport activity. From the above, it is evident that the body weight gives a significant contribution to the need for the emergence of strength, and the subject of this study is the relationship between certain anthropometric characteristics and manifestations of explosive leg strength. The increase in strength during this time is most probably associated with increases in muscle fibre diameter and muscle cross sectional area (O`Brien et al., 2009).

The problem of this research was anthropometric characteristics and motor abilities. The aim of this study was to determine the influence of several anthropometric characteristics on manifestations of explosive leg strength, expressed by three tests (standing long jump, three single leg hops on left leg and three single leg hops on right leg).

METHODS

Subjects were 23 male basketball players from Manchester Giants Academy. All subjects had played basketball for at least 5 years (Mean body height 182.84 cm, body weight 75.04 kg). No subjects were currently suffering any lower extremity injury that would prevent them from completing the testing jumps. All subjects were informed of the experimental risks and signed an informed consent document prior to the investigation. The sample of tests consisted out of 5 predicting variables: body height (BH), body weight (BW), body fat (BF%), Arm Relaxed Girth (ARG) Mid-Thigh Girth (MTG) and 3 criteria variables: standing long jump (SLJ), three single leg hops on right leg (TSLHR) and three single leg hops on left leg (TSLHL). All tests were performed at Sports Arena of University of Central Lancashire, Preston, United Kingdom. All tests were performed with standard procedures which are explained in literature (Battinelli, 2007). The data gained were subjected to statistical analysis in the SPSS 10.0 package.

RESULTS

The descriptive statistics of the all subjects are shown in Table 1. As we were concerned for measured anthropometric characteristics, we can state that they are very similar to research performed by Petrovic (2010), Hoare (2000), Schiltz et al (2009), Temfemo et al (2009) and that the whole sample is quite consisted.

Table 1. Descriptive statistics of the entire research sample.

Variables (N=23)	Min	Max	Mean	SD
BH (cm)	169.0	197.0	182.84	7.84
BW (kg)	55.0	109.0	75.04	13.12
BF (%)	5.10	27.90	14.04	5.61
ARG (cm)	24.0	36.0	29.02	3.41
MTG (cm)	45.00	65.00	53.54	5.48
SLJ (cm)	204	281	231.95	25.71
TSLHR (cm)	552	740	605.14	149.99
TSLHL (cm)	503	770	617.59	151.05

Legend: BH – Body Height, BW – Body Weight, BF – Body Fat, ARG - Arm Relaxed Girth, MTG – Mid-Thigh Girth, SLJ – standing long jump, TSLHR - three single leg hops on right leg, TSLHL - three single leg hops on left leg.

In the Table 2 are shown the results of regression analysis which was used to calculate influence of anthropometric characteristics on variables which explained jumping performance. Whole system of applied variables, as well as individual variables, does not have statistically significant influence, because all values are more than 0.05.

Table 2. Regression analysis of whole sample.

	SLJ		TSLHR		TSLHL	
	f	p	f	p	f	p
BH	.249	.807	.131	.897	-.201	.843
BW	.692	.499	.025	.980	.924	.369
BF	-.994	.335	-.393	.700	-.863	.401
ARG	.000	1.000	.335	.742	-1.053	.308
MTG	.143	.888	-.307	.763	1.355	.194
	F=.525	P=.754	F=.117	P=.987	F=1.248	P=.333

Legend: BH – Body Height, BW – Body Weight, BF – Body Fat, ARG - Arm Relaxed Girth, MTG – Mid-Thigh Girth, SLJ – standing long jump, TSLHR - three single leg hops on right leg, TSLHL - three single leg hops on left leg.

DISCUSSION AND CONCLUSIONS

In this research, the applied motor space variables were responsible for the motor ability defined as the strength, or more precisely, as the explosive strength. Many factors or criteria are causal to a large extent; such as the strength, as well as the explosive strength. It originates from the neuro-muscular system (Gamble, 2010; Abernety, Wilson, Logan, 2003), which according to the relevant requirements, converts chemical energy into kinetic. Thus, the strength produced in the neuro-muscular system works against one external force that is present either as its own weight (relative strength), the weight of an object (requires absolute strength), or as the frictional resistance of air or surface (ground) which, for example, occurs while running.

Theoretical predictions (Astrand and Rodahl, 1986; McMahon, 1984) and experimental findings (Jarić et al., 2005, Mihajlović et al., 2011) show that there is positive correlation between the muscle strength and the body weight, while the height of the jump has no impact to the body height. The previous research brings different conclusions on this issue. Kukolj (2004) notes that the connection between the body weight and height and tests for explosive strength of legs results differ in statistical terms. Findings of research which are done by Temfemo et al. (2009) and Schiltz et al. (2009) show that anthropometric characteristics are not significant predictors in manifestation of explosive strength of legs. That means that results which the basketball players achieved are independent from their anthropometric characteristics. So, further progress related to improving strength and conditioning performances of young basketball players can be made by increasing their physical attributes, but not to be related to changes in variables which we were measure. From this research results, we can conclude that the system of prediction variables does not have statistically significantly influence on the manifestation of explosive strength. Contribution of elastic energy stored in the tendons and possible mechanism which can increase vertical and horizontal jumping abilities and better energy efficiency is a problem of authors PhD research which is on-going on Manchester Metropolitan University. Hopefully, soon will be published the first data from that research with explanation how and which biomechanical factors can predict success in sport activities and how to use them in the best manner.

Considering the present findings, physicians, coaches and sport authorities should be aware of these issues and should be patient in order to avoid an unequal selection and minimise the dropout of the youngest players.

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