THE EFFECTS OF A 8 WEEKS COMPETING PERIOD ON BODY STRENGTH AMONG ELITE FEMALE HANDBALL PLAYERS

Kristina Petković[1], Saša Marković[1], Milena Avramova[2] and Emil Avramov[2]

[1]Faculty of sport and physical education, University of Nis, [2]NSA "Vassil Levski, Sofia"

ORCID

Kristina Petković - https://orcid.org/0000-0003-4327-4186

ABSTRACT

The aim of this study was to investigate the effects of a 8 weeks competing period on body strength (upper extremity, trunk and lower extremity) among elite female handball players. Fifteen female elite handball players (height: 1.73 ± 0.08 m; mass: 69 ± 8.9 kg; BMI 22.9 ± 2; training experience: 12.3 ± 6.2 yrs), playing in the first Serbian Handball League from two different clubs volunteered to participate in the present study. The research was longitudinal in nature, with an initial and final measuring. Tensiometric platform push-ups and hand grip tests were used to assess upper extremity strength, a sit ups test and a test to assess the static strength of the abdominal muscles were used to assess trunk strength, and Squat Jump and Counter Movement Jump were used to assess lower extremity strength. It can be concluded that the 8 weeks competing period can make some changes in body strength parameters tested in this research.

Key words: *team handball, body strength, competing period, elite female handball players*

INTRODUCTION

Handball is a collective sport in which, in addition to technical and tactical skills, factors for achieving better results and anthropometric characteristics, a high level of strength, muscle power and shot speed are extremely important (Gorostiaga et all,2006). One of the most basic technical elements in handball is a shot that achieves the ultimate aim of the handball game - to score as many goals as possible, but the importance of overplaying in the form of running, feinting, dribbling and stopping the opposite players must not be neglected. All these actions can be effectively implemented if the player is physically well prepared and is able to respond in the most correct way to the set tasks in situational playing conditions. By direct observation of a handball competition, it can be noticed that strength, as part of a set of motor characteristics of a players, is one of the more dominant abilities. Although it cannot be isolated from a set in which all traits are mutually correlated, it is necessary to influence its improvisation with various training processes and to establish its progression with special tests.

The combination of shot speed and precision is a condition for efficient goal scoring, because they create unfavorable conditions for the opposing goalkeeper for a quick and efficient defensive reaction (Gorostiaga et all, 2005). In order to improve the speed of the shot, it is necessary to work on improving the strength that the coaches do with different methods before and during the competition season.

With this research, we wanted to prove the effect of eight-week competition period on strength, without additional specific training to improve strength and other motor skills.

MATERIAL AND METHODS

The sample of participants consisted of 15 female handball players (height: 1.73 ± 0.08 m; mass: 69 ± 8.9 kg; BMI 22.9 ± 2; training experience: 12.3 ± 6.2 yrs), competing in the first national league of the Republic of Serbia. The female participants were female handball players of the Jagodina handball club from Jagodina (n=15). At the time of the experimental program, the female participants were at the top of their national competition ranking.

The tested group implemented a regular training plan and program that was based on the technique of attacking and defensive elements and tactics in defense and attack, both individually and collectively. The subjects had 8 training sessions a week for an hour and a half while the games were played on weekends (one game every weekend).

Force platform (Quattro Jump Bosco Protokol) was used to measure Counter Movement Jump and Squat Jump (Buckthorpe et all, 2012).

PAT 02 (Physical Ability Test) is a computerized system used to test the grip strength of the hand according to a standardized procedure (Dopsaj et all, 2011). The strength of the eccentric-concentric reaction of the upper extremities (push-ups) was measured on a tensiometric platform (Wang et all, 2017),

Sit ups test was used to test the strength of the abdominal muscles (Sudarov, 2007) and a test to assess the static strength of the abdominal muscles (static abdominal strength) (Okada et all, 2011).

The data analysis was carried out using the IBM SPSS Statistics 19 software (Statistical Package for Social Sciences, v19.0, SPSS Inc., Chicago, IL, USA).

A t-test of independent samples was used, for variables whose normality of data distribution was proved by the Kolmogorov-Smirnov test. Man-Whitney U test was used for variables whose normality of data distribution was not confirmed by Kolmogorov-Smirnov test.

Effect size (ES), were used to determine the effect between the groups, interpreted as: trivial, <0.2; small, 0.2–0.59; moderate, 0.6–1.19; large, 1.2–1.99; very large, >2 (Hopkins et all,2009).

RESULTS

Table 1. shows the difference between the initial and final measurements of the tested group, as well as the effect size of each variable.

Table 1. *Statistical results*

Variables	Levene's Test for Equality of Variances		T-test for Equality of Means	Mann-Whitney U test	ES (90% CI)
	F	**Sig**	**P**	**P**	
SJ	0,025	0,875	0,739		0,12 (-0,60; 0,84)
CMJ	0,471	0,489	0,420		0,30 (-0,43; 1,01)†
HG	0,250	0,621	0,521		0,09 (-0,63; 0,80)
PU	0,022	0,882	0,815		0,24 (-0,49; 0,95)†
SUT	2,426	0,131	0,117		0,59 (-0,16; 1,31)†
SAST				0,205	0,24 (-0,48; 0,95)†

*Legend: **F** - value of the F-test for testing the significance of differences in arithmetic means; **Sig.** - magnitude of equality of variances; **p** - significance of differences of arithmetic means between two groups; Mean Difference - the mean value of the difference ES - effect size; **CI** - confidence intervals; * statistically significant difference P <0.05; † small effect; ‡ moderate effect; § great effect; **SJ** - Squat Jump; **CMJ** - Counter Movement Jump; **HG** - hand grip; **PU** – Push-ups; **SUT** - Sit ups test; **SAS** - Static Abdominal Strength test.*

The results of the independent t-test showed that there was no statistically significant difference in all tested variables after the training-competition period in the period of eight weeks. The effect determined a minimal effect in the variables Counter Movement Jump, Push-ups, Sit ups and Static Abdominal Strength test.

DISCUSSION

Strength is a basic motor ability that is developed and applied in different activities of exercise and training, and accordingly there are different types (or forms) of manifestation of strength, which are formed on the basis of the criteria of their action (Malacko & Rađo, 2004). Handball is a game where dominates an explosive type of power, which is defined as the ability to express maximum power in a maximum short time (Stojiljković, 2003). Different types of jumps in both defensive and offensive actions (e.g jump shot), quick reactions in the form of running counters or realizing half-counters and many other situational elements are closely correlated with explosive strength as well as other motor abilities that cannot be isolated separately. With this research, we wanted to determine whether only a regular training plan and games played once a week can cause a positive change in the tested strength variables of the lower, upper extremities and torso. The lack of statistical significance between the results of the initial and final measurement gave us the information that during the competition season there are no significant changes in the form of an increase in strength, and thus the overall form of the player. It is generally known that physical form is built in the preparation period, when players are

exposed to a special training program of stronger intensity compared to the program that players apply during the competition season. Elements of technique and tactics were a fundamental part of the structure of the training plan and program of the handball players of the handball club "Jagodina" during the experimental treatment. Strength training aimed to maintain the previously prepared form, which would prevent possible injuries caused by a drop in muscle tone. Even in studies that examined the effects of a specific type of training (neuromuscular training) that was in addition to regular training, there was no significant improvement in strength after the experimental treatment for 5 to 7 weeks (Holm et all, 2004).

Chelly, Hermassi, Aouadi & Shephard (2014) obtained similar results in our study, testing a control group that practiced only a regular training plan and program for eight weeks during the competition season. The results of the tests of maximum force, jumping, muscle volume and speed of throwing the ball remained almost unchanged, which happened in our research for all tested variables. The trivial effect that occurred in the CMJ, PU and abdominal strength tests cannot be considered significant, and it can be concluded that the training plan and program of the tested handball players maintained the previously achieved form. If keeping form was the main aim of the creator of this type of training program, it can be considered effective.

Research by Granados, C., Izquierdo, M., Ibáñez, J., Ruesta, M., & Gorostiaga, E. (2008) proved that the entire competition season can contribute to the improvement of physical fitness. Significant increases (P G 0.05–0.01) was showed in bench press (12–21%) and half-squat (7–13%) muscle power output, vertical jumping height (12 T 7.2%), throwing velocity (8 T 5.9%). No changes were observed in sprint and endurance running. The research involved 16 elite handball players played in the Spanish National First Division League, and all its players were professional. The results of this research did not show that a competition period of eight weeks can cause some changes in the strength of elite handball players of the Serbian National First Division League, which does not mean that changes would not exist if the entire competition season was covered for experimental treatment. Eight weeks of the training cycle and eight official matches was not a long enough period for significant changes in the tested variables of handball players' strength. The Spanish handball players trained in the mentioned research for 45 weeks and had 29 games, which proved to be a sufficient period of time to increase the percentage of different types of strength that are represented in handball. They finally concluded that competition and training games should be considered as a high-intensity stimulus for enhancing certain physical fitness and anthropometric characteristics in elite female handball players. Considering that this research had a five times shorter period of time compared to the research of the Spanish researchers, it can be considered as not long enough to improve the

strength of top handball players. However, it should not be overlooked that the training program in these two studies was not identical but was similar in load size.

Trivial effects in the tests of explosive power of the hand and arm of handball players show that changes are possible and expected for a longer training and competition period, and that for some future research the task is to determine the effects after half and after the entire competition season.

CONCLUSION

The presented results did not show a significant difference in the strength tests of the upper, lower extremities and torso after eight weeks of the training-competition period. It can be concluded that eight weeks of practicing a regular training program is conditioned by competition and in which, for that reason, there is no additional increase in intensity and load when it comes to regular strength training. The regular training plan in Serbia, in almost all clubs, during the competition is aimed at practicing technical and tactical elements designed by the coach and maintaining the physical form of the players in order to better respond to the set tasks of the competition. The training cycle is considered successful if, after the end of a competition, the team reaches the goal it set before the start of the competition and if it remains in the same and healthy composition for that period. The proposal for future research is to determine whether, after the whole season, there are changes in all the motor characteristics of elite handball players and what is the range of changes if it turns out that they exist.

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Corresponding author:

Milena Avramova

National sports academy Vasil Levski, Sofia

Faculty of Pedagogy

Basketball, volley-ball, handball Department

E-mail: milena-avramova@abv.bg