IMPROVED METHODOLOGY FOR ASSESSING THE PHYSICAL PREPARATION AND PHYSICAL DEVELOPMENT OF GIRLS' HANDBALL PLAYERS

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Abstract

The article comprehensively assessed the physical development and physical fitness of 14–16, developed an improved training methodology based on the results obtained, and its effectiveness was substantiated by pedagogical experience. A set of anthropometric indicators, speed-strength qualities, aerobic and anaerobic endurance and agility tests were used. In the experimental group, the indicators of 30 m running, long jump from a standing position, shuttle run and ball throwing were statistically significantly improved compared to the control group ($p<0.05$). The methodology is recommended for use in children and youth sports schools and reserve Olympic sports colleges for handball.

Keywords: handball, girls, physical training, physical development, biological age, plyometrics, interval training, test, methodology.

Login

Modern handball is a highly intensive, repetitive game involving jumping, acceleration, stopping, changing direction, throwing, and contact movements. In women's handball, the number of intensive movements, contact situations in blocking and defending, and an increase in heart rate to 80–90% of maximum have been reported (Michalsik et al., 2014; Karcher & & Buchheit, 2014). Therefore, the player's aerobic and anaerobic capabilities, explosive power, agility, and throwing power are considered to be key factors determining the outcome of the game (Manchado et al., 2013; Wagner et al., 2014).

Adolescence is a period of rapid morphofunctional changes in girls, including accelerated growth, changes in body composition, the onset of menstruation, and a temporary decline in neuromuscular coordination. Girls of the same calendar age may differ significantly in their level of biological maturation (Malina et al., 2004; Mirwald et al., 2002). Therefore, it is incorrect to determine the load based solely on calendar age, and it is necessary to simultaneously assess physical development and fitness and individualize the load (Lloyd & Oliver, 2012).

In practice, however, coaches often use a single training plan, control tests are conducted unsystematically, and there is a lack of standardized indicators for girls. This reduces the effectiveness of managing the training of teenage girls in handball and determines the relevance of the topic.

Research objective: to develop an improved training methodology based on assessing the physical development and physical fitness of female handball players and to determine its effectiveness.

Research objectives:

1. Analysis of scientific and methodological literature on the topic and selection of evaluation indicators.
2. To determine and develop criteria for assessing the physical development and level of physical fitness of girls.
3. Develop an improved methodology, test it in pedagogical experience, and prove its effectiveness.

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Scientific Innovation: A system for assessing physical development and preparation for female handball players, taking into account the level of biological maturity, and a methodology for gradually adjusting the load based on test results have been proposed.

Practical significance: the developed test set and methodology will serve as a guide for coaches in selection, load planning, and training control.

Material and methods

Study participants. The study involved [number] of female handball players aged 14–16 years with at least [2] years of sports experience. They were randomly assigned to the experimental (n=[14]) and control (n=[14]) groups. Written informed consent was obtained from the participants' parents, and the study was approved by the ethics committee of [institution name] (report No. [1], [date]). Those who were excluded from training due to injury or illness were not included in the analysis.

Methods.

- Analysis of scientific and methodological literature and pedagogical observation.
- Anthropometry: height, body weight, body mass index (BMI), chest circumference, arm length; biological maturity was assessed by age of onset of menstrual cycle and the Myhrwald method.
- Pedagogical tests: 30 m run (s), long jump (cm), vertical jump (cm), 3×10 m agility test (s), 20 m shuttle run (Leger test), 1 kg softball thrown overhead (m), handball throw distance (m).
- Load monitoring: heart rate (heart rate monitor) and subjective fatigue scale (RPE, 1–10).
- Pedagogical experience: with parallel groups, [12] weeks, [3] sessions per week, [90] minutes each.
- Mathematical and statistical methods: arithmetic mean (M), standard deviation (SD), Student's t-test (for dependent and independent samples), effect size (Cohen d); confidence level $p<0.05$. Data [SPSS / Excel / Jamovi] are valid in Icelandic.

Content of the improved methodology

The methodology consists of four interrelated blocks, each block having its own task and control criteria.

Block 1. Initial diagnostics and individual eyelashes. Before the start of the training, all girls undergo anthropometric and test assessments, the level of biological maturity is determined. According to the results, the girls are divided into three subgroups (previous, medium, high training) and the load volume and intensity are determined accordingly.

Block 2. Speed-strength and plyometric training. In the first 20–25 minutes of the main part, high jumps, hurdles, single-leg jumps, ball throws, and ball relays are performed. Free time intervals: 60–80 in weeks 1–4, 80–120 in weeks 5–8, 100–140 in weeks 9–12, 60–80 in weeks 100–140. Special attention is paid to exercise technique, knee and ankle stability.

Block 3. Special endurance in the interval method. 4–6 series of exercises are used with a 1:2 work-rest ratio close to game conditions (e.g., 20 s work, 40 s rest); during the work period, offensive-defensive passes with the ball, short-distance accelerations and changes of direction are introduced. Intensification is the best way to maximize 85–92.

4 blocks. And the load adjustment is monitored. An intermediate test is performed every 4 weeks. If the girl's result is better than expected, with an average RPE of more than 8 points, the load volume is reduced by 10–15 percent; If the result is good and the RPE is more than 6 points, the intensity is increased. Injury prevention exercises (strengthening the muscles of the shoulder and knee joints, balance) are included in each workout.

The control group [trained] in the traditional way; the total training volume was equal in the two groups.

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Results and discussion

At the beginning of the experiment, no significant differences were observed between the groups in terms of physical development and fitness indicators ($p>0.05$), indicating the homogeneity of the groups.

At the end of the experiment, the 30 m run in the experimental group improved by an average of 0.21 s (from 5.38±0.18 s to 5.17±0.16 s, $p<0.05$), the long jump from a standing position by 11 cm (from 166±9 to 177±8 cm), the vertical jump by 3.4 cm, and the ball throw by 0.8 m. The result in the 3 × 10 m agility test decreased by 0.32 s, and the distance covered in the shuttle run increased by 150 m. In the control group, the changes were small and statistically insignificant ($p>0.05$). The difference between the groups was medium-large in terms of effect size (Cohen's d=0.9).

In terms of physical development indicators (height, weight, BMI), harmonious growth within the age norms was noted in both groups (height on average 1.2 cm, weight 1.6 kg). During the experiment, there were 1 injury in the experimental group and 3 in the control group.

The results are consistent with scientific evidence on the effectiveness of plyometric and speed-strength training in adolescents and the need for individualized training (Lloyd & Oliver, 2012; Bompa & Haff, 2009). The fact that interval training is close to game conditions provides specific endurance gains is consistent with the data of Manchado et al. (2013) and Wagner et al. (2014). Limitations of the study: sample size, duration of the experiment, and the effect of the menstrual cycle were not separately controlled for; long-term follow-up is planned in the future.

Conclusion

1. A comprehensive assessment of physical development and physical fitness in female handball players, taking into account the level of biological maturity, allows for precise management of the training process.
2. The methodology, which included individual lash, plyometric, and speed-strength exercises, 1:2 interval work, and monitoring every 4 weeks, significantly increased speed-strength, agility, and specific endurance performance compared to the control group ($p<0.05$).
3. It is recommended to use the proposed methodology and test set in handball training groups.

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