SPECIAL PHYSICAL PREPARATION FOR BASKET TO HANDSTAND ON PARALLEL BARS

(Preliminary communication)

Bonka Dimitrova\textsuperscript{1}, Maria Gikova\textsuperscript{2}, Neli Tankusheva\textsuperscript{3}, Marina Petrova\textsuperscript{4}, Iliya Yanev\textsuperscript{5} and Emil Stoimenov

\textsuperscript{1,2,3,4}National Sports Academy “Vassil Levski”, Sofia, Department of Gymnastics, Sofia, Bulgaria
\textsuperscript{2}National Sports Academy “Vassil Levski”, Sofia, Anatomy and Biomechanics Department, Sofia, Bulgaria
\textsuperscript{3}National Sports Academy “Vassil Levski”, Sofia, M.A.Program “High Sport Performance”, NSA, Sofia, Bulgaria

Abstract

The higher level of technical preparation of elite gymnasts predetermines a suitable level of development of their physical qualities for successful performance of structurally different gymnastic exercises. Physical preparation as a part of the multi-factor training process (Gaverdovskiy (Гавердовский), 2002, Sasoev (Сасоев), 2010, Hadjieв, Андонов, Добрев & Петров (Хаджиев, Андонов, Добрев & Петров), 2011) should be optimized to meet the greater requirements, taking into account the coordination complexity of modern gymnastics. Therefore the aim of our study was to prepare a special physical preparation routine for the main exercise – basket to handstand on parallel bars. The routine of exercises with elastics we have presented reflects the structure of movements in the basic phase and the work regime of participating muscles. It was included as a preliminary experiment in the initial specialized sport preparation of boys aged 9-10, which accelerated the learning process. Performance of these basic motor activities will help to master and perfect the respective motor habit. They will be the catalysts in the educational training process.

Keywords: artistic gymnastics, specialized physical training, parallel bars.

INTRODUCTION

Modern artistic gymnastics is characterized by complexity and beauty (Shilyahtov (Шилайтов), 2003). The high level of technical preparation of elite gymnasts requires a corresponding high level of development of physical qualities for successful execution of structurally different gymnastic exercises. Physical training as a part of the multi-factor training process (Gaverdovskiy (Гавердовский), 2002, Sasoев (Сасоев), 2010, Hadjieв, Андонов, Добрев & Петров (Хаджиев, Андонов, Добрев & Петров), 2011) should be optimized to meet the higher needs, taking into account the coordination complexity of the modern gymnastic routines. In the ontogenetic development, motor coordination abilities of the individual to build new exercises in his motor program reaches its maximum at the age of 11-12. This age has been specified by many authors (Smolevskiy & Gaverdovskiy (Смолевский & Гавердовский), 1999, Lalaeva (Лалаяева), 2000, Lyah (Лях), 2010, etc.) as the most appropriate for purposeful sport training, especially with sports where technical training is a part of competitive training. Artistic gymnastics is one of those sports. It is important for gymnasts to master more difficult exercises in order to achieve top results using minimal effort about that (Solodyannikov (Солодяникоы), 2005, Semenov (Семёнов), 2010). This is related to the optimization of specialized physical preparation with different apparatuses on the basis of their relevant kinematic characteristics (Solodyannikov (Солодяникоы), 2005, Antiperov (Антипиров), 2008, etc.). Special exercises for physical qualities must reflect the specific muscle work during basic movements and their complications (Sasoев (Сасоев), 2010, Lalaeva (Лалаяева), 2000). According to Sherin (Шерин) (2013), the better mastery of complex gymnastic exercises depends properly selected exercises, similar in structure, for development of physical qualities needed for a specific motor habit. Therefore the aim of our study was to prepare a special physical preparation routine for the main exercise – basket to handstand on parallel bars. To achieve our aim, we set the following tasks:

- To make a kinematic analysis of the exercise in our study.
- To make an anatomical functional analysis based on our kinematic analysis.
- To prepare a special physical preparation routine for basket to handstand on parallel bars.

METHODS

The object of our study is the exercise basket to handstand on parallel bars, and the subject is to prepare a special program for physical training based on the ana-
alyzed main movements. In the course of our work we used the following methods: literary analysis, kinematic and anatomic functional analysis and expert evaluation.

RESULTS AND DISCUSSION
The best visual performance of basket to handstand on parallel bars was determined by means of expert evaluation (Fig. 1). Kinematic and anatomic functional analysis was made on the selected exercise into phases corresponding to the preparatory, the main and final movements.

Phase of preparatory movements (0-31 frames)
The initial position for the exercise basket to handstand on parallel bars is a handstand. The grip on the apparatus is performed by the surface and deep flexors of the finger (m. flexor digitorum superficialis et profundus), the long and short flexors of the thumb (m. flexor pollicis longus et brevis), the adductor of the thumb (m. adductor pollicis) and the muscle opposing the thumb (m. opponens pollicis). Wrist joints are stabilized by the joint isometric action of wrist flexors and extensors (m. flexor carpi radialis et ulnaris, m. extensor carpi radialis longus et brevis, m. extensor carpi ulnaris). The shoulder girdle is in maximum anteflexion, stabilized by its own group of muscles – the trapezius muscle (m. trapezius), the ectopectoralis muscle and the latissimus dorsi muscle (m. pectoralis major and m. latissimus dorsi), the serratus anterior muscle (m. serratus anterior) moves the socket of the scapula. The backbone is extended and supported by the deep autochthonous back muscles (m.
iliocostalis, m. longissimus dorsi, m. spinales). In the hip joint there is maximum extension and adduction. Unfolding is accomplished by the large gluteus muscle (m. gluteus maximus), and the posterior thigh muscles (m. semimembranosus, m. semitendinosus, m. biceps femoris), supported by the adductor of the thigh (m. adductor magnus). Adduction is performed by the medial thigh muscles (m. pectineus, m. adductor longus, brevis, magnus, m. gracilis). The knee joint is extended by the quadriceps thigh muscle (m. quadriceps femoris). During the entire performance of the exercise, the feet are extended by the posterior crural muscles (m. triceps surae, m. tibialis posterior, m. flexor digitorum longus and m. flexor hallucis longus) and lateral crural muscles (m. peroneus longus et brevis).

Initially the gymnast’s body moves down to horizontal position in support, using the shoulder joints as the axis of rotation while the body (slightly bent) remains extended (Fig.1). The angle of the shoulder joints decreases progressively (f.23 – 82°), retro flexion as a result of the body weight and of the impact of latissimus dorsi and teres major muscles, also the deltoides muscle and the triceps brachii muscle. The angle of the hip joints remains almost without change – about 180°. From horizontal position (f.23) there is a bend in the hip joints from the impact of the iliopsoas muscle and the rectus femoris muscle. That is the point when the gymnast using his muscle power and gravity, moves off balance. The angle of the shoulder joints continues to decrease until the centre of gravity goes under the level of the bars (f.31 - 47°). During the entire phase the speed of movement of the centre of gravity gradually increases reaching its maximum around the end of this phase in frame 29 – 2,291 m/sec.

**Phase of main movements (31- 47 frames)**

Bending of the hip joints continues until the centre of gravity crosses the lower vertical. When the centre of gravity goes under the hanging point (f. 39), the angle of the hips reaches its lowest value – 30° (maximal flexion). After that there is extension of the hip joints due to the gluteus maximus muscle, the hamstring muscles (m. semimembranosus, m. semitendinosus, and m. biceps femoris) and the thigh adductor (m. adductor magnus). While the athlete’s body moves across the lower vertical axis, the speed of the centre of gravity increases under the influence of body inertia and its own muscle power. Both have the same direction of movement at that moment. It reaches maximum value in frame 43 – 4,036 m/sec. Under the influence of gravity, the athlete’s body gradually loses its inertia and its speed of movement decreases. The angle of the shoulder joints remains the same until the shoulders go over the bars.

**Phase of final movements (47- 62 frames)**

The beginning of this phase corresponds to the loss of hand contact with the bars. The angle of the hip joints is relatively constant – about 180°, while in the shoulder joints it increases by the end of the phase. The speed of the centre of gravity decreases by the final part of the phase, which is a handstand. There is anteflexion in the shoulder joints created by the pectoralis major muscle, the elbow joint is extended due to the triceps brachii and anconeus muscles. The hip joints and back bone are also extended (see muscles in initial position).

Each phase in this provisionally divided exercise is important for the correct technical execution of specific motor skills. However, the main movements phase is most important. That is why the selection of special exercises in the physical preparation routine for basket to handstand on parallel bars is based on it.

Special physical preparation routine for basket to handstand on parallel bars:

1. From initial position – a stand, hands down, holding the ends of an elastic pulled straight, which goes under the feet – raise the arms forward to upward (Fig.2).
2. From initial position – horizontal body lean, arms raised holding elastics pulled straight – arms move forward and down, then backward (Fig.3)
3. From initial position – lie flat on the back, arms forward down, holding elastics pulled straight – raise the arms from forward to upward (Fig.4)
4. From initial position – a hang on the parallel bars, raise the lower limbs to pike hang (Fig.5).

The special physical preparation routine with elastics presented above is based on the structure of movements in the main phase of basket to handstand on parallel bars, and it takes into account the work regime of muscle groups involved in it. It should be performed before and during the process of learning of the exercise in this study. It was included as a preliminary experiment in the initial specialized sport preparation of boys aged 9-10, which improved the learning process. Practicing these basic motor activities will help to master and perfect this motor skill. They will act as a catalyst in the training process. In order to support our statement with more evidence, we are going to organize a pedagogical experiment with a larger group of gymnasts.

**CONCLUSION**

The research we have carried out:
- Has shown the need of sufficient knowledge on the biochemical structure of exercises and the muscle groups involved in it.
- Has proved that special physical preparation on different apparatuses in artistic gymnastics is a real opportunity for the optimization of sport preparation.

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