INFLUENCE OF EXERCISE HURDLES OF VARIOUS LOADS ON INCREASING EXPLOSIVE POWER FOR PHYSICAL EDUCATION

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INFLUENCE OF EXERCISE HURDLES OF VARIOUS LOADS ON INCREASING EXPLOSIVE POWER FOR PHYSICAL EDUCATION

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Abstract:
This study aimed to identify the effect of hurdle hop training jump exercise goal against various loads to increase explosive power. Hurdle hop training samples of each group's goal using a vest medium load, namely 50%, 60%, and 70% of the maximum capacity. The study used a randomized control group pre-test–post-test design. Ninety students of SMA Negeri Makassar were divided into three groups of 30 each and were subjected to similar pre- and post-tests. The results showed that hurdle hop training loads of 50%, 60%, and 70% increased the power ($p < 0.05$). The 50% training load resulted in significantly greater improvement than the 60% and 70% training loads ($p < 0.05$).

Keywords: hurdle hops, medium load, explosive power

1. Introduction

To improve sports performance, training quality and quantity are crucial. Therefore, a training program must be delivered systematically with appropriate measurable growth. A trainer is required to have insight into the foundation of the theoretical and supportive training techniques to improve the training system and ultimately lead an athlete to achieve maximum performance.

The planning of a training program developed by a trainer should include physical, technical, tactical, and mental aspects of the exercise to which athletes must pay attention and must perform carefully (Harsono, 1988). To achieve the four aspects of interrelated exercise, none of the above aspects should be ignored.

Components of the physical aspect – strength, speed, endurance, agility, agility, power, balance, coordination, and accuracy – strongly support the maximum athletic performance; (Pyke, 1991; Sajoto, 1988) therefore, it can be stated that the physical aspect is the foundation for other aspects.

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Performance in long jumping is influenced by horizontal and vertical styles. To become airborne and land well, the prefix and take-off must be performed perfectly. Running fast during the prefix and achieving maximum power at take-off is a very important factor (Schmolinsky, 1983) since it involves carrying of the highest possible weight and approaching the ideal 45-degree angle that results in maximum distance (Pate, Rotella, & McClenaghan, 1984).

For long jump success, power from the leg muscles is required (Bernhard, 1986). Therefore, sprinters and jumpers require great leg muscle power (Baley, 1982). Power is the combination of strength and velocity that is commonly used in movements that require short-term strong and rapid muscle contractions (Fox, Bowers, & Foss, 1988). Weight training can be used to generate the power required through exercises and physical conditions. High-quality weight training can be achieved through the weight itself and the ballast provided externally, such as with barbells, dumbbells, and load vests (Soeparmo, 1988).

The exercise model for enhancing long jump performance with the power and speed required to increase explosive power involves performing exercise hurdles while wearing a vest. The load vest has the potential to increase muscle power (Rushal & Pyke, 1992).

Considering that power involves a combination of strength and speed, increasing the explosive power using weight training should not only emphasize the load, but should also affect the lifting speed (Harsono, 1988).

Weight training is designed to increase strength, power, and muscle endurance (Costill, 1994). One form of weight training that is special for the long jumper is an exercise hurdle with an additional load using a load vest in an attempt to increase explosive power capacity (Quinn, 2010).

The classification of loading according to Harre involves using a medium load to increase the explosive power (Rushal & Pyke, 1992). To increase power in acyclic sports such as the long jump, weight training using a vest is recommended (Bompa, 1991).

Exercise with useful load stimuli (Rushal & Pyke, 1992). A medium load is classified as 50–70% of one's maximum load-carrying ability (Harre, 1982). The maximum ability is the ability of the muscle to maximally overcome the maximum resistance (load). Thus, the maximum load is one that can be lifted once or twice (Harsono, 1988). This raises allegations against effectiveness and efficiency at achieving explosive power improvement objectives.

Load training is a physical training with internal and external loads (Sudarsono, 2012). Developing a physical training program, especially a burdened training program, is not an easy task. While preparing the training program, one should pay attention to the factors that affect the training results. Determining the dose (i.e. correct load) is very important to ensure that the desired results are achieved. If the training dosage is not appropriate, then the increase in ability will not be achieved (Aki & Paul, 1998).

The selection of load spans of 50%, 60%, and 70% of maximum capacity is based on physiological considerations (ability of muscle and nerve adaptation) and the ease of

carrying the vest loads. Strength training can increase 10 times after an exercise program 6–10 weeks in length (Pate, et al., 1984). The choice of a loaded form of training hurdles is based on the consideration of training equipment with a goalkeeper familiar to high school students, is not difficult to obtain, and can be performed in groups.

This study aimed to identify the best medium load on exercise hurdles to achieve improved long jump performance. The objective reason for the selection of loads in the medium category is that the long jump motion requires the internal aspects of the biomotor, the explosive power of the leg muscles. Explosive power limbs can perform strongly and quickly due to the cross-bridge movement of myofibril filament actin and myosin. When the weight is heavy, the movement becomes slow; when the weight is light, explosive power to lift the weight point is impossible, but the loads of 50%, 60%, and 70% can effectively and efficiently increase the jumper's explosive power.

The benefit of the study is that it can be used to design an effective and efficient exercise program to enhance the explosive athletic branched power for the long jump.

2. Material and Methods

This study was prospective with a randomized control group pre-test–post-test design. The treatment variable was exercise hurdles using a medium weight vest. The medium-load weight vest used by the sample had a load weight ranging from 50% to 70% of maximum capacity capability or 50% loaded hurdle exercises, 60% loaded hurdle exercises, and exercise hurdles with a 70% load of maximum ability. The response variable is the explosive power capability. The power's explosive capability is the jumping motion to lift the highest weight point straight up with the focus of leg muscle strength. The population of this research included 90 students of SMA Negeri 10 Makassar who were randomly divided into three groups: (III) 50% load exercise hurdle burden (A); (II) 60% load exercise hurdle burden (B); and (I) 70% load exercise hurdle burden (C).

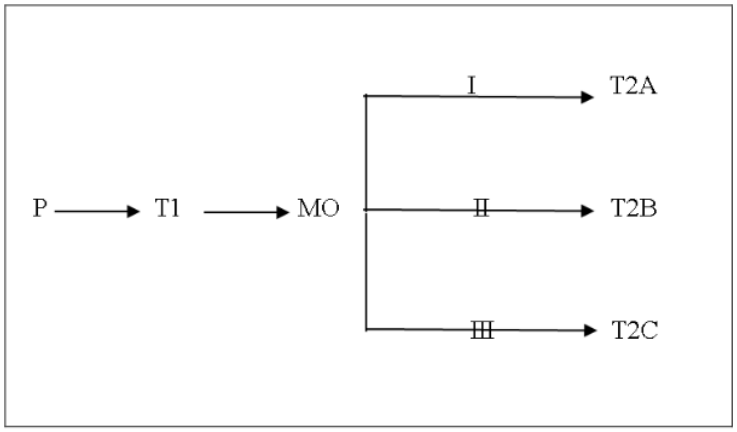

Figure 1: Research Design

Data collection techniques measured the explosive power capacity using the instrument vertical jump test with the validity of 0.78 and reliability of 0.93 (Nurhasan, 2007). The experiment was performed with exercise frequency three times per week for each group for 10 weeks. The data analysis design used the paired t-test, variance analysis test, and Duncan's average advanced test.

3. Results

Exercise influence hurdles of 50%, 60%, and 70% of maximal ability differed significantly ($F = 32.403$; $p < 0.05$). The three treatment groups analysed using Duncan's mean follow-up showed that 50% load exercise hurdles had a larger explosive power increase than 60% and 70% load exercise hurdles ($p < 0.05$). The 60% exercise hurdle burden showed a greater increase than the 70% exercise hurdle burden ($p < 0.05$).

4. Discussion

The results showed an explosive increase in power caused by exercise hurdles using a variety of medium loads. This is due to the implementation of exercise hurdles with the burden being done in an explosive way.

The model of exercise hurdles involves plyometric exercises. This exercise prefers load intensity to exercise quality. In the study, treatment used 5–10 hurdles with a goalkeeper of the same height to allow the movement to be performed quickly with controlled intensity. Due to the high training intensity, 50% of the maximum ability will spur maximal performance. This condition applied to the research sample will result in an optimal body adjustment process. Physiologically, this exercise is better able to improve the explosive quality of limb power.

The changes that occur due to exercise are caused by physiological adaptations that include changes in the anatomy of the muscles and nervous system. The difference in muscle contraction strength depends on the activated unit of motion, which is determined by the initial muscle length and strain at the time of contraction (Lamb, 1984).

In this model of physically challenging exercise hurdles, the gluteus maximus, biceps femoris, semitendinosus, semimembranosus, gastrocnemius, soleus, anterior peroneus longus, tibial plantar, and calcaneal flexor are involved. Essentially, these muscles comprise the inferior extremities and play a significant role in performing hurdles, so the final results of this study show that the exercise hurdles performed at 50% of maximal ability more significantly increase explosive power than those at 60% or 70% of maximal ability ($p < 0.05$). This is due to the 50% load of maximal ability on the exercise hurdles better allowing adaptation of the muscle fibres to overcome the load. Nerve fibres are more capable of delivering impulses along muscle fibres. Embodiments of increased ability of muscle fibres and trained nerve fibres are displayed along with improved explosive power enhancement.

The results of this study show that the use of 50% maximum load is most effective at increasing explosive power because this weight is between the element of strength and speed. This implies that if the load exceeds the threshold of stimulation (threshold stimulus), then the muscle will form a maximum strength element. The muscles will not be able to contract quickly if the load is lifted maximally. If the load is lifted lightly, it can form the speed (Baley, 1982). In a light-loaded resistance exercise, the dominant factor is speed, whereas in a heavy-loaded resistance exercise, the dominant factor is power (Rushal & Pyke, 1992).

Thus, to generate power, both components are very important. The plyometric exercise of a springboard with a grid and incline affects the lower-limb explosive force and strength (Rahayu, 1993).

Therefore, weight training using weight 50% of one's maximal ability is highly recommended. To increase explosive power, the load used is approximately 50% of the maximum capability lifted immediately without interruption (Harsono, 1996).

5. Conclusion

The use of a moderate load hurdle exercise, i.e. 50%, 60%, or 70% of maximal ability, can significantly increase explosive power ($p < 0.05$). In particular, training involving a 50% load is very effective at increasing explosive power ($p < 0.05$).

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