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The Impact of Using the Daily Undulating Periodization (DUP) Model on Power Improvement

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Abstract

This study aims to examine the impact of Daily Undulating Periodization (DUP) on power improvement. The research method used in this study was a one-group pre-test–post-test design. The sample consisted of 15 undergraduate students from the Sports Science program at Universitas Pendidikan Indonesia, class of 2022. The study was conducted over a period of 8 weeks, beginning with a pre-test, followed by training sessions held three times per week for a total of 24 sessions, and concluded with a post-test. The research was carried out at the Fitness Laboratory of Universitas Pendidikan Indonesia. After the final test, the researcher analyzed the pre-test and post-test data using normality and homogeneity tests, as well as a paired sample t-test. The results of the normality test indicated that the data were normally distributed, with pre-test values for the Medicine Ball test at 0.335 > 0.05 and post-test values at 0.063 > 0.05; for the Vertical Jump test, pre-test values were 0.484 > 0.05 and post-test values were 0.405 > 0.05. The homogeneity test results showed that the data were homogeneous, with p = 0.358 for the Medicine Ball variable and p = 0.709 for the Vertical Jump variable. Based on the analysis, the experimental group in the Medicine Ball test showed a significant improvement, with a significance value of 0.001 (p < 0.05), indicating that DUP training had a significant effect on power enhancement.

Keywords: daily undulating periodization; training model; muscle, power; weight training.

Introduction

Sports achievement is a factor that can elevate the dignity and reputation in the eyes of family, club, city, province, nation, and even internationally. Achievement in sports can be obtained if the existing development system is well planned, executed properly, and structured (Bayu Laksana et al., 2017). The achievement of an athlete can be developed through training in their specific sport branch according to their interests and talents. If an athlete wants to excel in the sport they love, they must train diligently under the supervision of a professional coach in their field. A professional coach must have a training plan to develop an athlete to reach the highest level of achievement.

However, the problem faced in Indonesia or internationally is that competitions or tournaments are held very close to each other, so athletes need to prepare their condition well and increase their power so they can perform well in every competition they participate in.

Talking about an athlete's physical condition, physical ability is important and serves as the main pillar in developing and enhancing technical skills, tactics, and mental strength (Aco, 2016). One of the main components of physical condition is power. Power plays a crucial role in the success of almost all sports branches. Sports like volleyball, basketball, soccer, and also floor gymnastics require power in every movement and technique (Riyadi, 2016).

Discussing techniques in every sport means dealing with strength and speed. The strength and speed of muscle contractions involve dynamic and explosive muscles that generate maximum muscle force in a short period (Aco, 2016). Power is one level of training for athletes that involves muscles working at high intensity but for a short duration, adjusted to the 1 RM (maximum strength). Power is a physical component that athletes must possess to exert explosive strength in the shortest possible time (Ismoko & Sukoco, 2013).

Among many sports branches mentioned above, the most dominant and important physical ability is the power of the leg muscles, which must be strong and fast to produce explosive force, whether in running or stepping in performing techniques in sports games. Biomotor components like speed and leg muscle power are components that coaches must consider when designing training programs, especially physical conditioning training (Utamayasa, 2020).

To achieve physical ability and increase power, efficient and correct training programs or methods must be applied. In training methods, the most complex issue is how to achieve peak performance on a scheduled date and time. Athletes with prime physical conditions will experience improvements in circulatory system performance, heart function, strength, flexibility, stamina, speed, agility, and power (Rosdiana et al., 2022).

Undulating periodization is described as frequently varying intensity and volume on a daily, weekly, or biweekly basis, generally using maximum repetition time to plan training intensity (Muchammad Rizki Nurfauzi, 2018). Coaches must follow training norms when designing training plans. In sports achievement, there are several forms of training plans commonly used by coaches to help athletes reach their peak performance, usually called training periodization. The most commonly used periodization models by coaches are traditional and non-traditional periodization. Non-traditional periodization also includes various forms, one of which is Undulating Periodization (Sidik, 2022).

In undulating periodization, training time is divided into three forms depending on how far the training distance is toward an achievement in a competition. One of these is Daily Undulating Periodization (DUP) (Dermawan, 2018). Through this training, athletes can improve their physical components to reach their peak achievement. Compared to traditional periodization, undulating periodization with greater training variation is recommended to be more optimal for experienced athletes and team sports athletes (Wardani, 2023).

Several studies show that manipulating volume and intensity in undulating periodization provides various stimuli and recovery periods that are more conducive to strength development (Sidik, 2011). All types of training and periodization are very challenging for athletes aiming to reach their peak performance, especially when competitions are held very frequently, even every three months. Therefore, efficient training methods are needed to enable athletes to achieve successive achievements in a short time.

The purpose of this study is to examine the impact of Daily Undulating Periodization (DUP) on improving lower body muscle power and to assess the impact of DUP on improving upper body muscle power.

Methods

The approach used in this study is a quantitative approach. The quantitative approach involves converting observation results into numerical form, which are then analyzed using statistical techniques.

Research Design

This section explains the methods and designs used in the research. Explain in detail the relevance of the reasons for using the method and design. In this quantitative study, the method used is the experimental method. The research method is a technique used to conduct research that directly attempts to influence a certain variable in an appropriate way. In experimental research, the effect of the independent variable on the dependent variable can be determined under controlled conditions. An experiment is understood as trying to find and confirm, so the researcher must be able to control all variables that may affect the outcome except for the predetermined independent variable.

This experimental research method is the best method to identify or test hypotheses about cause-and-effect relationships. The design used by the author in this study is the one-group pretest-posttest design. In the one-group pretest-posttest design, one group is measured or observed not only after receiving a type of treatment but also before (Jack R. Fraenkel, Norman E. Wallen, 2012). Therefore, the researcher wants to know the impact of using the Daily Undulating Periodization (DUP) model on power improvement.

Participants

Participants are individual subjects involved in the research who are needed to obtain data and to initiate and design the study (Elmasri, 2017). The participants in this study were 15 first-year students of the Sports Science study program, class of 2022, at the Indonesia University of Education, taken from a total population of 106 students.

Instrument

An instrument is a good measuring tool used to obtain accurate data (Makbul, 2021). The instruments used in this study were a meter stick to measure lower limb muscle power (Vertical Jump) and a medicine ball to measure upper limb muscle power.

Procedure

The researcher will conduct the study through the following steps: first, formulating the research problem as questions to be answered through data collection and investigation. Second, preparing the research requirements by arranging the borrowing of equipment from the fitness laboratory at the UPI gymnasium and obtaining permission to conduct research at the site. Third, administering a pretest consisting of vertical jump test, medicine ball test, and 1 RM measurement as a reference for designing the training program before treatment. Fourth, providing treatment with the undulating periodization training model for 24 sessions over 8 weeks, with each session lasting 60 minutes. Fifth, conducting a posttest consisting of vertical jump and medicine ball tests after the treatment to evaluate progress compared to the pretest. Sixth, analyzing the collected data to determine the research outcomes. Seventh, concluding the findings based on data analysis and offering suggestions for future research to improve upon the current study.

Data Analysis

Data analysis was conducted using the Paired Sample T-test. The Paired Sample T-test is a test performed to compare the difference between two means from two paired samples, assuming that the data are normally distributed. This test was used to compare the level of improvement in lower limb muscle power and upper limb muscle power, preceded by tests for normality and homogeneity.

Results

The data obtained from the research are raw data, so they must be processed and analyzed statistically (Dr. Sandu Siyoto, SKM., M.Kes, 2015). "Data analysis is a series of activities including reviewing, grouping, systematizing, interpreting, and verifying data so that a phenomenon gains social, academic, and scientific value." In this section, the researcher presents the results of data analysis in a simple form as a summary of data processing using IBM SPSS Statistics version 26 software.

The results of the data analysis and the findings will be explained by the author in Table 1.

Descriptive data analysis aims to explain and describe the characteristics of each variable studied, where the form of the data depends on the type, such as numerical data used in calculating the mean, median, standard deviation, interquartile range, minimum, and maximum (Sabri, 2019). Based on the explanation above, descriptive analysis is a statistical analysis that illustrates or explains the data used and collected. The results can be presented in the form of graphs or tables.

The table above shows the results of descriptive statistical data analysis with several findings. First, the value of N indicates the sample size, which is N = 15. Then, there are the mean values from each test result, as well as the standard deviation values that describe the data within the sample.

Based on the table above, the experimental group using the medicine ball, which had received the treatment, showed a significance value of 0.001 < 0.05, thus H_0 is rejected. It can be

Tabel 1

Paired Samples t-Test for Medicine Ball Throw and Vertical Jump Performance (N = 15)

Variable Pair	Pretest		Posttest		*t*	*df*	*p*
	M	SD	M	SD			
Medicine Ball Throw (m)	3.36	0.27	4.18	0.11	-13.26	14	< .001
Vertical Jump (cm)	221.53	8.10	273.13	8.67	-28.07	14	< .001

concluded that the undulating periodization model using Daily Undulating Periodization (DUP) has an effect on increasing power. This can also be seen in the graph below, which shows a significant change/improvement.

After obtaining the results of the analysis from the research conducted and tested on 15 participants/students, it was found that this study showed an effect of the undulating periodization model using Daily Undulating Periodization (DUP) on the improvement of power. This is the reason the researcher chose to use the daily undulating method (DUP), as undulating periodization allows for more frequent manipulation of training volume and intensity. This also enables an appropriate ratio of recovery, thereby helping to prevent overtraining (Ernandes et al., 2012). In this study, the researcher applied high variations in volume and intensity through a daily training program with changes occurring three times a week. Furthermore, the researcher structured each session with specific manipulations: on Monday, 30% intensity with 12–14 repetitions aimed at hypertrophy, 80% intensity with 4 maximum repetitions for neural adaptation, and 60% intensity with 8 maximum repetitions for power development (Rahadian, E.P, 2021).

The research on the impact of the Daily Undulating Periodization (DUP) model on power improvement showed that this periodization model had a significant effect on increasing both upper body and lower body power, with a significance value of 0.001, which is less than 0.05. This means the DUP training method has a significant impact on power enhancement. The researcher supports this statement with the empirical results presented above.

Discussion

To achieve optimal physical ability and increase power during a training regimen, it is essential to implement an efficient and accurate training program or method. One of the most complex challenges in training methods is how to achieve peak performance on a scheduled date and time. Athletes who possess excellent physical condition will experience improvements in their circulatory system and heart function, as well as increases in strength, flexibility, endurance, speed, agility, and power (Rosdiana et al., 2022). Undulating periodization is characterized by frequent variations in intensity and volume—daily, weekly, or biweekly—and typically uses maximum repetition schemes to plan training intensity (Muchammad Rizki Nurfauzi, 2018).

Conclusionss

Based on the data analysis conducted, the Daily Undulating Periodization (DUP) training method has shown a significant effect on increasing muscle power. The research findings indicate that the application of the DUP model contributes to a notable improvement in both lower and upper body power. Specifically, there is a significant increase in lower body muscle power as a result of the DUP training model. Likewise, the use of this periodization model also significantly enhances upper body muscle power. These results confirm that the DUP method is effective in improving overall muscular power, making it a beneficial training approach for athletes seeking to optimize their physical performance.

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