International Journal of Human Movement and Sports Sciences 12(4): 709-719, 2024 http://www.hrpub.org
DOI: 10.13189/saj.2024.120413

Effects of a Periodized Training Plan on the Fitness and Performance of Athletics

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Received May 12, 2024; Revised June 18, 2024; Accepted July 22, 2024

Cite This Paper in the Following Citation Styles

(a): *[1] Erwin R. Mañalac, Noel L. Dominado , "Effects of a Periodized Training Plan on the Fitness and Performance of Athletics," International Journal of Human Movement and Sports Sciences, Vol. 12, No. 4, pp. 709 - 719, 2024. DOI: 10.13189/saj.2024.120413.*

(b): *Erwin R. Mañalac, Noel L. Dominado (2024). Effects of a Periodized Training Plan on the Fitness and Performance of Athletics. International Journal of Human Movement and Sports Sciences, 12(4), 709 - 719. DOI: 10.13189/saj.2024.120413.*

Abstract This study focused on the effects of periodized training on athletic performance and fitness. The quasi-experimental research comprised 24 secondary-school track and field athletes aged 11-18. Sit-ups, trunk extensions, left hip extensions, 35-meter sprints, and vertical jumps were used to measure muscular strength and endurance. The experimental group received the 6-week periodized training plan: they started with warm-up or conditioning exercises to prepare the body for training, then did all the activities in the periodized training plan following the linear periodization model and finished with cool-down exercises to recover. The control group was untreated. Thus, the training program increased the experimental group's running performance and fitness compared to the control group. Periodized training enhanced physical fitness more than traditional training and targeting particular muscle areas improved athletic performance. The study's conclusions affect coaches, trainers, players, and policymakers. They recommend tailored training programs, identifying individuals who may require further help, and using control groups to appropriately assess training programs. The results may help policymakers encourage athletes and the public to engage in physical activity. Based on the results, coaches should create muscle-group-specific training programs.

Keywords Periodized Training Plan, Fitness, Athletic Performance, Experimental

1. Introduction

Periodization of training is now widely used in the fields of sports training and fitness program design [1]. Using training variables over time to enhance performance while minimizing injury and overtraining is the main focus of this methodical, non-linear approach to training [2].

The idea of a consistent training burden is at odds with periodization. Instead, it promotes structured cycles that present the body with varying difficulties over time. As a rule, throughout these iterations, trainers would change important factors like intensity, which describes the amount of weight or resistance used, the volume or the sum of all sets and repetitions executed [3]. The frequency or the number of weekly training sessions [2], as well as the specificity of the workouts chosen to focus on specific physical fitness areas [4], are also important factors to consider.

One of the primary goals of periodization is to achieve progressive overload, which encourages the body to adapt and develop, resulting in strength increases and enhanced performance, by deliberately adjusting these factors [5]. An additional consideration is specificity; by designing workouts around individual objectives, you may be confident that they will bring about the changes you want in your body [2]. Periodization helps reduce the danger of overtraining by allowing the body time to adapt and repair during recovery periods, which helps to avoid injuries and training plateaus. In conclusion, enhanced performance results from deliberate training cycles, including

concentrated periods that cause peak performance at designated times [1].

Each periodicity model has its own unique way of adjusting the training variables. The first type, linear periodization, gradually increases a single variable, like intensity, over the cycle [4]. The second paradigm is block periodization, which divides training into blocks targeting specific physical attributes like power or strength [2]. Another option in the undulating periodization model is that training volume and intensity change more frequently over a shorter period of time [6]. Considerations such as the athlete's degree of expertise, training objectives, and the particular activity or sport dictate the best periodization style.

Whether you're into weightlifting, bodybuilding, running, or cycling, periodization may help you reach your fitness goals. A methodical technique is required to implement periodization: one must first decide what to accomplish to become in shape, such as building strength or increasing endurance [2]. The macrocycle plan defines the entire training cycle, including the competition season [1]. We can implement the mesocycle design by breaking down the macrocycle into smaller training blocks with specific goals, such as strength growth or peak performance [2]. Microcycle programming involves devoting each mesocycle to a particular training week and then introducing modifications and rest periods into that schedule.

Periodization of training provides a systematic and evidence-based method for maximizing training benefits while minimizing dangers. Athletes and fitness lovers may get the most out of their training regimens by mastering their fundamentals, forms, and techniques of application.

Moreover, most elite athletes use a training technique known as periodization to help the body safely acclimatize to conditioning [7]. Repetition resistance, exercise selection, and activity selection can all be changed as part of the periodization concept. Additionally, each athlete's physiological and psychological capacities must be considered while the training load is gradually increased [8]. Hence, by periodizing their training, athletes can enhance their performance and lower their risk of overtraining. Therefore, to achieve elevated levels of performance, the complete training program must be periodized and planned.

Improvements in athletic capacity in high-performance sports are mostly attributable to advancements in training efficacy [9]. Additionally, consideration must be given to good fitness training to increase sports performance. Training for fitness strikes a balance between cardiovascular fitness, training for strength, stabilization of the core, balance training, flexibility, and stretching out the five pillars of optimum health [9]. Consequently, athletes should improve their physical fitness as well as their sports skills because physical fitness affects an athlete's health and well-being as well as their capacity to conduct aspects of daily activities and sports-related activities. Modern views on being physically fit also include the ability to maintain a healthy weight, a state of mental and emotional equilibrium, and the ability to do daily tasks with minimal fatigue [10].

According to several studies, engaging in physical activity can help a person become more physically fit. Muscular fitness is only one component of an overall fitness program. As you perform exercises that increase the strength, endurance, or duration of muscular use, your physical fitness improves. Strength and stamina in the muscles are other indicators of physical fitness; being able to lift heavy loads or keep going for longer without tiring indicates that your muscles are in good condition [11].

However, since not everyone is regularly engaging in physical activity, some people of all ages may have low levels of muscle fitness. Athletes with lower levels of muscle fitness reported 16% more stress and 11% less cognitive resources compared to those with higher levels of fitness, which may have an impact on athletic performance [12]. Furthermore, a lack of appropriate muscular fitness was related to a greater chance of gaining at least ten kilograms [13]. As a result, individuals may have trouble going about their regular routines, may get injuries when participating in sports, and may underachieve.

Moreover, previous research has indicated that for athletes to perform successfully and avoid injuries, muscular strength, and conditioning may be just as crucial as anaerobic power [14].

Athletes' ability to effectively deal with the challenge at hand and perform or play well in a sports competition will be affected by a lack of muscle fitness. Increasing one's strength and fitness might enhance one's ability to engage in basic athletic activities, including sprinting, jumping, and changing one's direction [14]. Hence, athletes need to develop their muscular fitness level for them to perform or play well at their best during the sports tournament and to improve their athletic performance. Previous studies revealed that strength or resistance training can enhance their muscular fitness. Combining training for muscle strength and endurance could improve athletic performance [15]. Youth athletes may gain the most from strength and endurance training to maximize their potential in each sport over the long run. Indeed, success in many sports is determined by elevated levels of muscular strength and endurance [16,17].

Consequently, most athletes and coaches are always on the lookout for strategies to have better results in training and less trouble with injuries. Training both muscle strength and endurance during the same training cycle is a promising way to improve athletic performance [15]. Based on their findings, they advised practitioners and coaches to incorporate both strength training (ST) and endurance training (ET) to improve physical fitness in young people who are not athletes and to increase endurance performance in young athletes [15].

The foundation of support for actions involving the upper and lower extremities must be adequate for an athlete

to perform at their best [18]. This structural backbone (i.e., the core or trunk) is made up of about twenty individual muscle pairs that stabilize the pelvis, hips, and lower back [19]. Some of the most important muscles in your core are the rectus abdominis (your abdominal muscles), the transverse abdominals, the multifidus, both the external and internal obliques, the erector spine, the pelvic floor muscles, and the abdominal muscles [19]. Many people do not realize that the glutes, traps, and lats are also part of their minor core muscles [19]. When doing dynamic tasks like running or lifting weights, this muscle group is expected to support the lumbar-pelvic-hip complex so that the chain of motion may function optimally and efficiently [20]. Furthermore, there is a wide range of applications for the muscles of the trunk, both in and out of training [20]. There is an important link between the strength of the core or trunk muscles and athletic performance [21]. Hence, coaches frequently try to strengthen the muscles that surround the spine in the hopes that doing so may improve athletic performance or prevent injury. Consequently, to enhance sports performance and prevent injury, many coaches and athletes gradually implement core training [22,23,24].

Henceforth, it is the belief of many strength coaches and personal trainers that an athlete's performance and safety can be improved by focusing on developing their core strength because they believe that a weak core will negatively affect the way energy is transferred, leading to diminished athletic ability and an increased likelihood of injury for those with less developed muscle groups [25]. Athletic performance was severely impacted, and the risk of upper extremity injuries increased due to inadequate core stability [26]. Having strong limbs but a weak core may negatively impact athletic performance due to inefficient movement patterns and reduced force output caused by insufficient muscle summation via the core [27]. Core training's guiding principle is that athletes will perform better when they have more core stability.

Hence, training programs that emphasize core stability and strength have become more popular because the core is both the anatomical and functional center of the body, as well as its powerhouse [28]. The core creates all motion, which is then sent to the extremities. As a result, the focal point of any athletic training program should be core stability [29]. Building stronger and more resilient abdominal muscles is the goal of core stability training [29]. Furthermore, core stability training aims to increase the muscle being activated, power, and stamina of the core muscles so that you can better stabilize your spine and generate strength during activity [30]. Moreover, previous studies suggested that the prevention of athletic injury and improving athletic performance involved core stability training [26].

However, a lack of muscular capability, poor limb coordination, muscular weakness, or a mixture of these characteristics may underlie core instability [31,32,25]. Consequently, according to some studies, athletes who want to play sports more effectively must strengthen their core through core stability training as well as incorporate speed, power, and endurance training [25]. Given the widespread use of core stability training (CST) in the fitness and sports sectors, more data is needed to improve the execution of training programs [33]. Hence, athletes can increase the benefits of their training that improve their performance, reduce their risk of injury, and maintain a varied training program by periodizing their training [34]. Furthermore, periodization is an effective way to mix up sessions, which helps athletes avoid getting bored or reaching a plateau in their training. The most common and effective method for athletes to adopt as part of a periodization program to enhance their abilities is to change the volume and intensity of their workouts [34]. Additionally, when used as an athlete's maintenance strategy, maintenance in training can result in considerable improvements in physical performance [35]. Prescribed exercises should be conducted at the appropriate intensities with enough rest periods afterward [35]. Moreover, a 6-week muscle-building routine leads to substantial improvements in both the athletes' muscular strength and their performance in the 800-meter run [36].

Managing and coordinating an athlete's training to achieve peak performance at the most important competition or to manage performance over a lengthy in-season is the purpose of the underlying sports periodization theory. This also demonstrates the connection between a player's degree of excitement and his or her performance. Further, the periodization theory suggests that performance does not deteriorate while arousal levels are increasing [37]. According to the periodization idea, an athlete's performance can potentially improve as their degree of arousal gets higher. To design a training program that will increase the athletes' arousal and, in turn, their performance, the researcher must first identify the performance gaps using pre-testing to gain a clearer understanding of their baseline level of fitness and performance.

Based on the aforementioned literary works, we can conclude that athletes with poor or low fitness levels face difficulties or problems in performing their tasks or activities, thereby affecting their athletic performance. As a result, by examining the pre- and post-test scores of the control and experimental groups, as well as the effects of a periodized training plan on athletes' fitness and performance of athletes, this research seeks to assess the effectiveness of a training program.

2. Materials and Methods

All study procedures were approved by the School Division Superintendent of DepEd-City of San Fernando, Pampanga and the School Head of Del Rosario Integrated School (e028). This research tested hypotheses on the relationship between a dependent and independent variable using a quasi-experimental method [38]. All participants

underwent pre-testing, but only the experimental group received the intervention and completed the 6-week training program, while the control group continued their traditional training.

Table 1 shows what the experimental group did to put the periodized training plan into action: athletes followed a periodized training plan, which consisted of a series of phases designed to help them reach their goals. These phases included a warm-up or conditioning phase to assist the body in adapting to the training, a training phase utilizing the linear periodization model, where the intensity of the 6-week periodized training program progressively increases throughout the cycle, and a cool-down phase to aid in athletes' recovery. Post-testing then studies the impact of the intervention or treatment on the participants' pre-existing fitness and performance.

Table 1. Six-Week Periodized Training Program

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
Workout 1 (Monday)	Workout 1 (Monday)	Workout 1 (Monday)	Workout 1 (Monday)	Workout 1 (Monday)	Workout 1 (Monday)
-Warm-up -Dead Bugs: 1min. -Back Bridging: 1min. -Alternating split lunge jump: 1min. -Quadruped: 1min -High knees running: 1x20m -Cool-down	-Warm-up -Dead Bugs: 1.30 min. -Back Bridging: 1.30min. -Alternating split lunge jump: 1.15min. -Quadruped: 1.30min -High knees running: 2x20 -Cool- down	-Warm-up -Dead Bugs: 2min. -Back Bridging: 2min. -Alternating split lunge jump: 1.30min. -Quadruped: 2min -High knees running: 3x20m -Cool-down	-Warm-up -Dead Bugs: 2.30 min. -Back Bridging: 2.30min. -Alternating split lunge jump: 1.45min. -Quadruped: 2.30min -High knees running: 4x20m -Cool- down	-Warm-up -Dead Bugs: 2.45min. -Back Bridging: 2.45min. -Alternating split lunge jump: 2min. -Quadruped: 2.45min -High knees running: 5x20m -Cool- down	-Warm-up -Dead Bugs: 3min. -Back Bridging: 3min. -Alternating split lunge jump: 2.15min. -Quadruped: 3min -High knees running: 6x20 -Cool- down
Workout 2 (Tuesday)	Workout 2 (Tuesday)	Workout 2 (Tuesday)	Workout 2 (Tuesday)	Workout 2 (Tuesday)	Workout 2 (Tuesday)
-Warm-up -Core Crunches: 33x15reps -PronePlank: 1min. -Wall Sit: 1min. -Superman: 1min. -Bounding: 1x20m -Cool-down	-Warm-up -Core Crunches: 3x20reps. -Prone Plank: 1.30 min. -Wall Sit: 1.30 min. -Superman: 1.30 min. -Bounding: 2x20m -Cool- down	-Warm-up -Core Crunches: 3x25reps. -Prone Plank: 2min. -Wall Sit: 2min. -Superman: 2min. -Bounding: 3x20m -Cool-down	-Warm-up -Core Crunches: 3x30reps. -Prone Plank: 2.30 min. -Wall Sit: 2.30 min. -Superman: 2.30 min. -Bounding: 4x20m -Cool- down	-Warm-up -Core Crunches: 4x30reps. -Prone Plank: 2.45min. -Wall Sit: 2.45min. -Superman: 2.45min. -Bounding: 5x20m -Cool- down	-Warm-up -Core Crunches: 5x30reps. -Prone Plank: 3min. -Wall Sit: 3min. -Superman: 3min. -Bounding: 6x20m -Cool- down
Workout 3 (Wednesday)	Workout 3 (Wednesday)	Workout 3 (Wednesday)	Workout 3 (Wednesday)	Workout 3 (Wednesday)	Workout 3 (Wednesday)
-Warm-up -High knees running: 1x20m -Butt kicks running: 1x20m -A skips: 1x20m -Lunge to high skip: 1x15reps (R&L) -Alternating split lunge jump: 1min. -Cool-down	-Warm-up -High knees running: 2x20m -Butt kicks running: 2x20m -A skips: 2x20m -Lunge to high skip: 2x15reps (R&L) -Alternating split lunge jump: 1.15min. -Cool-down	-Warm-up -High knees running: 3x20m -Butt kicks running: 3x20m -A skips: 3x20m -Lunge to high skip: 3x15reps (R&L) -Alternating split lunge jump: 11.30 min -Cool-down	-Warm-up -High knees running: 4x20m -Butt kicks running: 4x20m -A skips: 4x20m -Lunge to high skip: 4x15reps (R&L) -Alternating split lunge jump: 1.45min. -Cool-down	-Warm-up -High knees running: 5x20m -Butt kicks running: 5x20m -A skips: 5x20m -Lunge to high skip: 5x15reps (R&L) -Alternating split lunge jump: 2min. -Cool-down	-Warm-up -High knees running: 6x20m -Butt kicks running: 6x20m -A skips: 6x20m -Lunge to high skip: 6x15reps (R&L) -Alternating split lunge jump: 22.15min -Cool-down

Table 1 continued

Workout 4 (Thursday)	Workout 4 (Thursday)	Workout 4 (Thursday)	Workout 4 (Thursday)	Workout 4 (Thursday)	Workout 4 (Thursday)
-Warm-up -Power skips for height: 1x20m -Power skips for distance: 1x20m -Bounding: 1x20m -Prone Plank: 1min. -Wall Sit: 1min. -Cool-down	-Warm-up -Power skips for height: 2x20m -Power skips for distance: 2x20m -Bounding: 2x20m -Prone Plank: 1.30min. -Wall Sit: 1.30 min. -Cool-down	-Warm-up -Power skips for height: 3x20m -Power skips for distance: 3x20m -Bounding: 3x20m -Prone Plank: 2min. -Wall Sit: 2min. -Cool-down	-Warm-up -Power skips for height: 4x20m -Power skips for distance: 4x20m -Bounding: 4x20m -Prone Plank: 2.30 min. -Wall Sit: 2.30 min. -Cool-down	-Warm-up -Power skips for height: 5x20m -Power skips for distance: 5x20m -Bounding: 5x20m -Prone Plank: 2.45min. -Wall Sit: 2.45min. -Cool-down	-Warm-up -Power skips for height: 6x20m -Power skips for distance: 6x20m -Bounding: 6x20m -Prone Plank: 3min. -Wall Sit: 3min. -Cool-down
Workout 5 (Friday)	Workout 5 (Friday)	Workout 5 (Friday)	Workout 5 (Friday)	Workout 5 (Friday)	Workout 5 (Friday)
-Warm-up -High knees running: 1x20m -Long Jump: 1x20m -Repeated long jumps: 1x20m -Bounding: 1x20m -Cool-down	-Warm-up -High knees running: 2x20m -Long Jump: 2x20m -Repeated long jumps: 2x20m -Bounding: 2x20m -Cool-down	-Warm-up -High knees running: 3x20m -Long Jump: 3x20m -Repeated long jumps: 3x20m -Bounding: 3x20m -Cool-down	-Warm-up -High knees running: 4x20m -Long Jump: 4x20m -Repeated long jumps: 4x20m -Bounding: 4x20m -Cool-down	-Warm-up -High knees running: 5x20m -Long Jump: 5x20m -Repeated long jumps: 5x20m -Bounding: 5x20m -Cool-down	-Warm-up -High knees running: 6x20m -Long Jump: 6x20m -Repeated long jumps: 6x20m -Bounding: 6x20m -Cool-down

Furthermore, with the pretest-posttest method, the researcher was able to evaluate each participant twice: once in the control condition and once in the treatment condition. This allowed for a quasi-experimental examination. It is plausible to infer that the intervention contributed to the observed improvement when there is an increase between the pre- and post-test averages [39].

To determine whether an intervention was successful in achieving its intended outcome, researchers often use a pretest-post-test design, which involves measuring the dependent variable both before and after the intervention [39]. Given that the researcher's criteria for participant selection are well defined, the researcher reasoned that a quasi-experimental study design with pre- and post-test techniques would be appropriate here. As a further advantage, this design is excellent for evaluating the efficacy of an intervention or treatment by comparing results from a series of pre-tests, interventions, and post-testing [40].

Twenty-four track and field athletes from a top integrated public school in San Fernando, Pampanga, participated in the study. The athletes' ages ranged from eleven to eighteen, according to DepEd Memorandum No. 005, s. 2023, titled Conduct of the 2023 Palarong Pambansa. There were four men and four women at sprinting, middle, and long distances.

3. Results and Discussion

Between the pre- and post-tests, there was a statistically significant difference in the experimental and control groups' running times and levels of fitness. The periodized training plan influences and helps to enhance the athletes' performance and fitness, as demonstrated by the study's findings, which show gains in both fitness and performance were seen in the experimental group.

In Table 2, you can see the participants' pre-test scores for each component. Sit-up testing is a useful measure of abdominal and hip-flexor muscle strength and endurance, and these results suggest that the participants in both groups had similar levels of strength and endurance in these muscles. The results also suggest that there may be differences in the sit-up test performance between male and female participants, as the classification criteria for the test were different for each sex. Overall, this research uncovered important information on the use of the sit-up test in evaluating the strength and endurance of the abdominal and hip-flexor muscles. These insights can be useful in developing training programs and interventions that target these muscles and improve their strength and endurance. Inadequate abdominal and hip flexor strength, excess body fat, unstable footing, poor posture, and other health issues can all make it difficult, if not impossible, to complete the sit-up test to one's satisfaction [41].

Table 2. Pre-test results of the participants' fitness level before the implementation of a periodized training plan

		Experimental Group			Control Group		
Fitness Tests		Percent (%)	Frequency	Descriptive Rating	Percent (%)	Frequency	Descriptive Rating
Sit-up		58.3	7	Average	41.7	5	Average
		41.7	5	Poor	58.3	7	Poor
Trunk extension strength	Lumbar	100	12	Good	100	12	Good
	Thoracic	100	12	Good	100	12	Good
Left hip extension strength		25	3	Good	25	3	Good
		75	9	Fair	75	9	Fair
35m Sprint		8.3	1	Average	8.3	1	Fair
		16.7	2	Fair	91.7	11	Poor
		75	9	Poor			
Vertical Jump		16.7	2	Above Average	8.3	1	Above Average
		66.7	8	Average	50	6	Average
		16.7	2	Below Average	41.7	5	Below Average
Left side Bridge Test		41.7	5	Average	33.3	4	Average
		58.3	7	Poor	66.7	8	Poor

Additionally, the spine's flexibility and alignment depend on the back's extensor muscles. Using the trunk extension strength test, the researcher assessed the two groups' back extensor flexibility and strength. Specifically, the lumbar and thoracic regions were assessed separately. The lumbar region test determined that all individuals in the control group and the experimental group were in excellent health by raising their umbilicus above their belly button. However, their bodies waved during the execution of the test, indicating that there is room for improvement in their flexibility. Similarly, 100% of the participants in both groups were recorded as good in classification since they were able to maintain a level with obvious effort in performing the trunk extension strength on the part of the thoracic region. This indicates that both groups have good strength and flexibility in their back extensor muscles.

This study's results imply that participants in the control group, as well as the experimental group, possessed good levels of back extensor muscle strength and flexibility. However, there is room for improvement in their flexibility in the lumbar region. This highlights the importance of incorporating exercises that target the flexibility of the back extensor muscles to improve overall spinal health. The trunk extension strength test may also be used to evaluate the elasticity of the back extensor muscles, making it useful in both clinical and research settings. These results may help guide the design of effective treatments to enhance the health of the spine by strengthening and elongating the back extensor muscles. There are many reasons why someone can have difficulties with the trunk extension strength test, and one of them is that the person's chest is tight, which makes it difficult for them to have enough thoracic and lumbar extension of the trunk [42].

Other factors were evaluated in this research by using a left hip extension strength test. The test was used to evaluate the strength, endurance, and balance of the hip-extensor muscles. These findings suggested that most participants performed poorly during the left hip extension strength test. The participants' poor results on the left hip extension strength testing may be attributable to the pandemic. With national lockdowns implemented in some provinces, the athletes spent more time sitting down and experienced a lack of physical activity since they were unable to continue their regular training or activities. This decrease in physical activity likely led to a reduction in the strength, endurance, and balance of their hip- extensor muscles, resulting in poor performance during the test. Athletes and coaches may take a few things away from this research. Firstly, it's important to maintain a regular exercise routine even during lockdowns to prevent muscle weakness and loss of function. Secondly, coaches should incorporate exercises that specifically target the hip-extensor muscles to improve their strength, endurance, and balance. Finally, early identification of muscle weakness can help prevent injury and improve overall athletic performance. Insufficient exercise is one of the causes of a person's difficulty performing the hip extension strength test since insufficient exercise might result in weak hip extensors [43]. Muscle atrophy, sometimes referred to as muscular degeneration and weakening, can occur because of underusing the hip muscles [43]. Moreover, staying seated for lengthy periods can weaken the psoas muscle,

which adds to the list of reasons why doing a hip extension strength test is challenging [43]. This is so that the muscle does not exert itself as much as it would if the individual were standing [43].

Another purpose of this research was to assess the maximal speed of an experimental group to that of a control group utilizing the 35-meter sprint. The results were classified into three categories: average, fair, and poor based on the time taken to complete the test. Data were analysed using descriptive statistics. The study results indicated that most participants in both groups showed poor running performance. This may be due to weak leg muscles because of a lack of physical activity or training during the pandemic. Participants who recorded average or fair performance may have engaged in physical activity or training at home during the pandemic, which may have contributed to their better performance. The findings of this study suggested that physical activity and training are essential for improving running performance. This is particularly important during the pandemic, where limited access to fitness facilities may have hindered physical activity. Fitness professionals should guide home-based workouts and exercise programs to help individuals maintain their fitness levels during pandemics or other crises that may limit access to fitness facilities. Furthermore, policymakers should encourage the public to engage in physical activity and provide opportunities for people to exercise in their local communities. High leg rigidity is also necessary for high running speed, even though muscle power is required for acceleration and maintaining maximum velocity during sprint performance [44].

Additionally, the experimental and control groups both participated in vertical jump testing to measure the explosive power of the lower limbs. Test results were categorized as below average, average, and above average based on the participants' performance. Based on these results, when comparing the experimental group to the control group, there was a greater number of athletes in the experimental group who were rated as above average and a smaller number who were rated as below average. The results imply that the participants in the experimental category had more explosive power in their lower limbs compared to the participants in the control category. Furthermore, a greater number of athletes in the control group classified as below average is a cause for concern, as it indicates a potential issue with the participants' lower limb strength and explosiveness. These findings have implications for training programs and exercise interventions that aim to improve lower limb explosive power. For example, programs could be designed to target the specific weaknesses identified in the control group to improve their overall performance. It is also worth noting that the data collected was based on relatively small sample size, and further research with larger sample sizes may be necessary to confirm these findings. When you take a long break from exercising, your body gradually loses muscle memory and becomes less effective at the activity [45]. Naturally, your jump will decrease if you take an extended break from training for a few weeks or more than usual [45]. Additionally, getting heavier or fatter is also a factor in having difficulties performing a vertical jump because, in some sports, like powerlifting or strongman, fat may have some anatomical advantages, but it should never be used in activities that entail jumping [45]. Hence, losing body fat is one of the easiest methods to see improvements in vertical jumping.

Lastly, the left-side bridge assessment is a well-known method to measure core muscle endurance, which is an essential factor in athletic performance and daily life activities. The left-side bridge test findings indicated that, compared to the inactive control group, who did not engage in any physical activity, the experimental group's particular exercise routine significantly improved their core muscular endurance. Better results were seen in the experimental group compared to the control group, demonstrating lengthier duration of time during which they remained in the left bridge place because of their exercise routine. The control group's results indicated that their core muscle endurance was relatively weak; during the test, their bodies leaned forward and backward.

This finding highlights the importance of training programs and exercises that target core muscle endurance, which is essential for overall physical health and athletic performance. If the torso leans forward or backward when doing the side plank or side bridge test, it shows weak muscular endurance, balance, and poor form or posture because side planks balance is put to test and to master this balancing act, correct form or right posture must be ensured [46]. If it's not, you risk having your torso collapse forward or backward when doing the side plank. Hence, strengthening weak core muscles, and a good core stability exercise or training program makes a big difference in dynamic stability and core muscular endurance [47].

In summary, the results of post-testing indicate in Table 3 that there were improvements in the fitness level of the athletes who participated in the experimental category. This merely indicates that the athletes' fitness levels increased as a direct result of the training program, and that the training program's whole, which lasted for a total of six weeks, was successful and had the potential to enhance the athletes' physical fitness.

Table 3. Post-test results of the participants' fitness level after the implementation of a periodized training plan

		Experimental Group			Control Group		
Fitness Tests		Percent (%)	Frequency	Descriptive Rating	Percent (%)	Frequency	Descriptive Rating
Sit-up		75	9	Very Good	58.3	7	Average
		25	3	Good	41.7	5	Poor
Trunk extension strength	Lumbar	100	12	Normal	100	12	Good
	Thoracic	100	12	Normal	100	12	Good
Left hip extension strength		100	12	Normal	25	3	Good
					75	9	Fair
35m Sprint		50	6	Very Good	25	3	Fair
		50	6	Good	75	9	Poor
Vertical Jump		16.7	2	Excellent	8.3	1	Above Average
		41.7	5	Very Good	50	6	Average
		41.7	5	Below Average	41.7	5	Below Average
Left side Bridge Test		41.7	5	Excellent	33.3	4	Average
		41.7	5	Good	66.7	8	Poor
		16.7	2	Average			

There is evidence to support the idea that training increases athletes' total physical fitness [48]. This finding is presented in support of the conclusion reached by the research [48]. In addition, athletes' physical fitness, namely their muscular strength, endurance, speed, and agility, may all be enhanced by implementing a carefully developed training program that is based on the findings of their research [49]. In addition to this, functional training has been shown to have a significant influence on a number of aspects of physical fitness, including agility, balance, muscular strength, muscular endurance, power, and speed [48].

The data that are shown in Table 4 revealed that the training plan that was executed in the study had a considerable influence on the running abilities of athletes, particularly those who were included in the experimental category of the study. It appears that the training plan was successful in achieving its aim of enhancing participants' running performance as evidenced by the fact that the running times in the experimental group improved in comparison to the control category.

The results of the study might have significant implications for running coaches and trainers, as well as athletes who compete in running competitions. According to the findings, training programs that are tailored to the specific needs of athletes and that include regular performance evaluations are likely to result in considerable gains in the athletes' ability to run. In addition to this, the study emphasizes the significance of including control groups in studies in order to appropriately evaluate the efficacy of different training methods.

Table 4. Performance of the participants before and during the program implementation

No.	Group	Running Events	Age	Sex	Test before the training	Results – every after 2 weeks of training (100m) (sec.)		
					(100m) (sec.)	2nd Week	4th Week	6th Week
1	Experimental	Sprint	15	Male	17.04	16.19	14.28	12.27
2	Experimental	Sprint	13	Male	18.27	17.89	15.39	13.37
3	Experimental	Sprint	15	Female	15.82	14.38	13.03	12.93
4	Experimental	Sprint	15	Female	17.03	16.19	14.28	13.01
5	Experimental	Middle Distance	14	Male	17.18	16.53	14.43	12.13
6	Experimental	Middle Distance	15	Male	15.14	14.78	13.04	11.93
7	Experimental	Middle Distance	14	Female	18.28	17.89	15.12	13.86
8	Experimental	Middle Distance	13	Female	16.18	15.53	14.09	13.24
9	Experimental	Long Distance	13	Male	16.38	15.88	13.24	11.98
10	Experimental	Long Distance	15	Male	16.87	15.73	13.64	11.96
11	Experimental	Long Distance	13	Female	16.13	15.78	14.11	13.08
12	Experimental	Long Distance	14	Female	16.38	15.88	14.32	13.04
13	Control	Sprint	14	Male	15.89	15.87	15.91	15.9
14	Control	Sprint	15	Male	17.52	17.48	17.54	17.52
15	Control	Sprint	15	Female	16.87	16.82	16.91	16.88
16	Control	Sprint	14	Female	15.89	15.91	15.87	15.89
17	Control	Middle Distance	13	Male	15.7	15.68	15.71	15.76
18	Control	Middle Distance	15	Male	15.08	15.12	15.16	15.06
19	Control	Middle Distance	13	Female	17.52	17.56	17.53	17.49
20	Control	Middle Distance	12	Female	14.7	14.74	14.72	14.76
21	Control	Long Distance	15	Male	14.39	14.41	14.37	14.43
22	Control	Long Distance	15	Male	15.33	15.36	15.28	15.41
23	Control	Long Distance	13	Female	15.08	15.12	15.16	15.14
24	Control	Long Distance	13	Female	15.38	15.41	15.39	15.43

4. Conclusions

From the results of the study, conclusions drawn were as follows:

(1) The study revealed that most athletes performed poorly on the running and left hip extension strength tests, which may have been influenced by the pandemic's reduced physical activity. On the other hand, all participants had good back extensor muscle strength and flexibility, but they needed to improve their flexibility. The study highlights the importance of incorporating exercises targeting specific muscle groups to improve overall athletic performance and maintain spinal health.

(2) The study found that the experimental group of athletes performed better in various physical tests compared to the control group. The results indicate that specific exercises can significantly improve athletes' physical performance, highlighting the importance of personalized training programs and identifying individuals who may need additional support.

(3) The study showed that a tailored training program was effective in enhancing the running performance of participants, particularly in the experimental group, compared to the control group. The results suggest that implementing control groups in research is essential for accurately evaluating the effectiveness of training programs.

(4) The results showed that those in the experimental group who followed the periodized training plan for the whole six weeks had the greatest improvements in fitness. However, the control group experienced a downgrade in fitness levels in most of the tests due to

a lack of motivation as a result of the traditional training. Previous studies showing that periodized training may result in greater increases in athletes' physical fitness compared to standard or traditional training were corroborated by these findings.

(5) The study found that a 6-week periodized training program led to statistically significant improvements in physical fitness, particularly in the experimental group. The results support previous research indicating that periodized training can lead to larger improvements in athletes' physical fitness compared to traditional training.

Acknowledgements

The authors of the study highly appreciate the commitment and hard work of the participants throughout the period of this investigation. ERM acknowledges the support of the National University, Philippines.

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