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# The Effect of Harness Training on Increasing 400 M Short Distance Running Speed of PASI Athletes

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**Abstract:** This study aimed to assess the effect of harness training on the speed of 400-meter short-distance running among athletes from PASI in Bandar Lampung. Utilizing a quasi-experimental design, the research involved a sample of 6 athletes. The data analysis comprised conducting prerequisite tests and performing t-tests to evaluate the impact. The findings demonstrated a significant improvement in running speed due to harness training, with a calculated t-value of 8.164, which is notably higher than the tabulated t-value of 1.81. This substantial difference indicates a statistically significant effect. Therefore, it can be concluded that harness training has a considerable and positive influence on enhancing the 400-meter running speed of PASI athletes in Bandar Lampung.

**Keywords:** Athletics, Harness, Sprint

## A. Introduction

Engaging in sports offers significant health benefits, as regular exercise helps the body stay fit, healthy, and resilient against various illnesses. By consistently participating in physical activities, individuals can enhance their overall well-being and strengthen their immune system, reducing the risk of disease. Sports are very beneficial for body health by diligently exercising, the body will feel fit, healthy and protected from various disease attacks (Fajar, 2021). On the other hand, besides sports for health, sports also play an important role in achievements so that they can be recognized by other countries.

Training is a deliberate process aimed at enhancing athletes' performance to reach their highest potential. It involves systematically applying physical, technical, tactical, and mental challenges that are essential to the training regimen. This process must be conducted regularly, with progressively increasing intensity, and must be repeated consistently. The primary goal of training is to refine the organizational system and functions within the athlete to optimize their overall sports performance and effectiveness. This comprehensive approach ensures that every aspect of the

athlete's capabilities is developed to achieve peak performance. Training is crucial in determining an individual's level of achievement. Even individuals with natural talent will struggle to reach their full potential without a structured and well-designed training program. Effective training is essential for refining skills, enhancing performance, and achieving optimal results. Without it, even the most talented individuals may find it challenging to attain the desired level of success and performance in their respective fields.

Conversely, individuals who may lack natural talent in a specific sport can still achieve exceptional performance through structured and systematic training. With a well-designed training program, these athletes can develop their skills, improve their technique, and enhance their physical abilities, potentially reaching peak performance levels despite initial limitations in talent. Programmed training helps bridge the gap between inherent ability and achieved success, making it possible for less naturally gifted athletes to attain high levels of achievement. Even great people who have many achievements in the past did not escape programmed training, because the training process will not betray the results if the training process is done correctly. According to Harsono (2018) stated that training is a systematic process of practicing or working which is done repeatedly, with increasing the number of training or work every day.

Physical exercise involves intentional body movements performed by the muscles in a systematic, organized, and repetitive fashion, utilizing energy to enhance overall fitness (Pranata & Kumaat, 2022). According to this perspective, the training process must lead to progressive improvements, not only in physical fitness but also in psychological aspects, compared to previous training sessions. This means that as individuals engage in exercise, they should experience continual advancements in their physical capabilities and mental resilience, reflecting the effectiveness and growth of their training regimen. Evaluation is always carried out in every training so that the increase or decrease in the quality of training will be monitored, the results of which will be used to prepare the next training program. The general purpose of training is to help coaches, trainers, sports teachers to be able to apply and have conceptual abilities and skills in helping to reveal the potential of athletes to reach the peak (Sukadiyanto, 2011).

In the preparation and implementation of training programs, the principles of training should be considered. The principles of training include: the principle of readiness, individual, adaptation, overload, progressive, specific, variation, warming up and cooling down, long-term training, the principle of the opposite, not excessive, and systematic (Sukadiyanto, 2011). The long-term effects of exercise also have an effect on increasing the ability of the respiratory system, heart function, lungs, blood circulation, and blood volume. Exercise also affects physical abilities,

including increasing muscle endurance, strength, bone density power, and also strengthening tendons and ligaments. Exercise has a profound impact on physical abilities by enhancing various aspects of the body's functionality. Regular physical activity improves muscle endurance and strength, enabling muscles to sustain prolonged exertion and perform more effectively. It also contributes to increased bone density, which helps in preventing osteoporosis and maintaining skeletal health. Additionally, exercise boosts muscular power, enhancing overall performance in dynamic movements. Furthermore, consistent exercise strengthens tendons and ligaments, improving joint stability and reducing the risk of injuries. Collectively, these benefits underscore the importance of regular physical activity in promoting comprehensive musculoskeletal health and functional fitness.

If the physical condition has been well trained, whatever type of sport we do, it can produce extraordinary muscle strength, one of the sports studied in this study is the athletics sport, namely sprinting with a distance of 400 meters. Basic Athletics movements which include walking, running, throwing and jumping are the oldest sports in the world, each of which has basic techniques, Basic athletics movements, such as walking, running, throwing, and jumping, represent some of the oldest and most fundamental sports in history. Each of these movements is characterized by its foundational techniques, which have been developed and refined over time. Walking involves a rhythmic, alternating movement of the legs, running focuses on speed and coordination, throwing emphasizes technique and force, and jumping requires power and precision. These core athletic activities form the basis of many competitive sports and physical exercises, reflecting their enduring significance in athletic development and history.Athletics is practiced globally due to its essential educational values, which significantly contribute to physical development. It often serves as a foundational element for enhancing performance in other sports and is a key indicator of a nation's progress. The discipline of athletics not only fosters physical conditioning but also establishes a benchmark for athletic excellence, reflecting the broader advancement of sports within a country (Prasetiyo & Nugroho, 2023).

Sprinting is a key discipline within the field of athletics and is an integral component of physical education programs. This branch of athletics focuses on short-distance races that require rapid acceleration and maximum speed. As a fundamental aspect of physical education, sprinting encompasses techniques and training methods designed to enhance explosive power, speed, and overall athletic performance. It is included in physical education curricula to develop students' physical capabilities, improve their fitness levels, and introduce them to competitive track and field events. Running is a series of jumps and in it there is a phase where both feet do not touch/support the ground. Sprinting or often called sprinting is a way to run where athletes must cover the entire distance at maximum speed and is done at full speed.

(Purnomo & Dapan, 2011) state that sprinting "covers a distance of between 50 and 400 m".Sprint running in general, the technical rules in short-distance running are racing from the start line to the finish line at full speed on each track (Adi, 2008) and the key to student success in speed and reaction time of the 50-meter run is when starting to run (start). The characteristics of sprint running movements at distances of 100 meters, 200 meters and 400 meters are the same, the difference lies in the regulation of energy released by the runner, sprinting events of 100 meters, 200 meters, and 400 meters share fundamental characteristics, such as explosive acceleration and high-speed running. However, the primary distinction among these distances lies in how runners manage and regulate their energy.

1. 100 Meters: This is a short, high-intensity sprint that demands maximum acceleration and speed. Runners focus on explosive power and maintaining peak speed throughout the race. The energy used is predominantly anaerobic, relying heavily on immediate energy reserves.
2. 200 Meters: This distance requires a blend of acceleration and speed endurance. Athletes need to reach a high-top speed and sustain it over a longer stretch compared to the 100 meters. Effective energy management involves balancing anaerobic power with the ability to maintain speed, necessitating efficient energy usage throughout the race.
3. 400 Meters: In this longer sprint, endurance becomes more crucial alongside speed. Runners begin with strong acceleration but must carefully manage their energy to sustain a high pace over the entire distance. This event involves both anaerobic and aerobic energy systems, requiring careful pacing and energy conservation to prevent premature fatigue and achieve optimal performance.

In essence, while the fundamental sprinting technique is consistent across these distances, the main difference lies in how athletes regulate their energy. Each distance demands a specific approach to balancing acceleration, speed endurance, and energy management. Based on the explanation of the description above, we can conclude that sprint running is running at maximum speed in releasing all the strength and speed of running from the start until the sprinter enters the finish line. The 400-meter sprint is a highly demanding race that requires athletes to exhibit remarkable speed and explosive power over a relatively short distance. This event challenges competitors to maintain top velocity from the starting block to the finish line, pushing their speed and endurance to the limits. Achieving success in this sprint necessitates both rapid acceleration and sustained high-speed performance throughout the entire race. To achieve peak performance, it is essential to have efficient muscle contractions that are both powerful and rapid. These contractions must be transformed into smooth and fluid movements to optimize running efficiency and speed. As noted by Purnomo & Dapan (2011), the process involves harnessing strong and quick muscle actions and seamlessly converting them into a coordinated and streamlined running technique.

The 400-meter run is a run that is done as fast as possible with maximum speed from start to finish to cover a distance of 400 meters in the shortest possible time. The primary factor that significantly influences performance in the 400-meter run is the runner's speed. This speed is crucial as it directly impacts the athlete's ability to cover the distance quickly and efficiently. To excel in this event, it is essential to focus on enhancing the runner's speed, as it determines their capacity to maintain a high velocity throughout the race. The effectiveness of the runner's speed is a key determinant of overall performance in the 400-meter run, making it a critical aspect to address in training and preparation. The 400-meter run when viewed from the running stages consists of several stages, namely: reaction and drive, acceleration, transition, maximum speed, maintenance speed 6 finish (Purnomo & Dapan, 2011).

According to (Kurniawan, 2012) the start in sprint running itself is divided into three types, namely long start (elongated start), medium start (medium start), and short start (bunched start). Here is an explanation of each:

1. Long Start (Elongated Start): Long start is usually used in races with longer distances or in training. At this start, the runner sets their starting position with a longer stride and a more forward body position. Advantages, runners to have a stronger push and stable momentum, suitable for races that require gradual acceleration.
2. Medium Start (Medium Start): Medium start is a compromise between long start and short start. The runner is in a relatively more balanced position with sufficient initial push but not completely short. Advantages, gives the runner a balance between initial thrust and the ability to accelerate quickly, often used in medium-distance sprints.
3. Short Start (Bunched Start): In a short start, the runner assumes a more bent-over starting position and the feet are closer together on the starting blocks. This provides an explosive initial thrust. Advantages, fast acceleration from the starting position, very effective for short-distance sprints where a strong initial thrust is essential.

Each type of start has advantages and disadvantages depending on the type of race and the runner's technical needs. Proper training and adjustments will help runners determine which start is best for them. Athletics is a foundational sport taught in schools, encompassing a diverse range of disciplines such as running, jumping, throwing, and walking (Asdar, 2019). To excel in athletics, individuals must cultivate exceptional physical abilities, technical proficiency, and a high level of physical fitness. The ultimate objective in athletics is to realize peak performance and maximize one's potential.Athletics is one of the elements of physical education and health and is a component of overall education that prioritizes physical activity, fostering a healthy lifestyle and developing physical, mental, social and emotional

skills that are harmonious, in tune and balanced (Muharram, 2015).
Athletics, as a component of physical education and health, is a crucial element that emphasizes the importance of physical activity in fostering a well-rounded and healthy lifestyle. Athletics is not just about physical exertion; it is a comprehensive educational tool that supports holistic development. It integrates various aspects of personal growth physical, mental, social, and emotional helping individuals to lead balanced and fulfilling livesIn the realm of physical education and health, athletics is crucial for equipping individuals with the skills and attributes necessary to excel in various aspects of their lives. It contributes significantly to overall development by fostering physical fitness, improving coordination, and enhancing mental resilience. Through participation in athletics, individuals gain valuable experiences that support their well-being, boost their confidence, and prepare them to handle diverse challenges effectively. This comprehensive involvement in athletics helps individuals build a strong foundation for success across multiple life domains.

In Indonesia, athletics is governed by a central organization known as the All Indonesia Athletics Association (PASI). The establishment of this governing body can be traced back to the early 1910s when athletics was first introduced to Indonesia as part of the educational curriculum during the Dutch East Indies period. This period marked the beginning of structured athletic training and competition in the country, laying the groundwork for the formation of PASI as the principal organization overseeing the development and management of athletics in Indonesia (Medikantyo, 2021). According to Saputro (2014), an athlete is a unique individual distinguished by their specific talents and personal attributes. They display particular behavioral tendencies and personality traits that are influenced and shaped by their personal experiences and background. These characteristics are developed through their life experiences, including their upbringing, training, and personal challenges, which collectively contribute to their distinctiveness as an athlete. Furthermore according to (Hawindri, 2016) an athlete is an individual who has undergone specialized training or possesses a high level of skill in various physical attributes, including strength, power, balance, agility, flexibility, and endurance. This extensive skill set allows the athlete to excel across various sports and physical activities. It showcases not only their proficiency in specific skills but also their capability to combine these attributes effectively to achieve peak performance.

Harness training, often referred to as sled harness training, is a specialized training technique designed to improve the speed of the 400-meter run. As described by Dikdik (2011), this method is aimed at enhancing speed, strength, and endurance. In this training approach, athletes use a harness or belt that is attached to a sled or resistance load. By pulling the sled or load, athletes experience increased resistance during their movements. This resistance training method falls under dynamic

strength training, as it incorporates additional load to challenge and strengthen the muscles. Harness training effectively targets key physical attributes needed for boosting running speed, helping athletes develop the necessary strength and endurance for improved overall athletic performance. Furthermore, it is explained by Hermanu, (2010) in the sports coaching journal book, namely: Harness training is a form of training that is known to be quite good for sprinting, until now, affective harness training in improving speed endurance. It is assumed that all forms of maximum strength training, power, and strength endurance can be developed through harness training. According to (Starrett, & Cordoza, 2015) harness training is a specialized form of training that utilizes a harness system attached to the athlete. This harness system is designed to provide resistance by either pulling the athlete or applying resistance in different directions. The primary goal of harness training is to simulate specific conditions that challenge the athlete's speed, strength, and endurance. Using resistance training, athletes can significantly improve their athletic performance and target specific muscle groups for enhancing their sports-specific skills. This type of training allows athletes to strengthen and condition key muscles, leading to better overall performance in their respective sports.

Based on the analysis, comparing the calculated t-value with the tabulated t-value indicates that a statistically significant effect is present when the calculated t-value exceeds the tabulated t-value. This comparison helps determine whether the observed results are meaningful and not due to random chance. If the calculated t-value surpasses the tabulated t-value, it confirms that the effect observed in the study is statistically significant and supports the hypothesis being tested.In this particular instance, the obtained t-value of 8.164 is notably higher than the tabulated t-value of 1.812. This considerable discrepancy demonstrates a clear and substantial effect. Consequently, we can confidently infer that harness training has a pronounced and significant impact on enhancing the 400-meter running speed of athletes from PASI Bandar Lampung.

## B. Methods

In this study, a quantitative research method was employed to investigate the impact of harness training on athletic performance. Quantitative research is a systematic scientific study of the parts and phenomena and the causality of their relationships. Quantitative research is defined as a systematic investigation of phenomena by collecting data that can be measured by performing statistical, mathematical or computational techniques. Quantitative research is mostly done using statistical methods that are used to collect quantitative data from research studies. Quantitative research is different from qualitative research. Quantitative research provides more measurable information.

This is because there is data that can be used as a basis for producing more measurable information. In quantitative research, the relationship between researchers and research subjects is not questioned. This is because the results of the study depend more on the instruments used and the measurable variables than on the close emotional involvement between researchers and research subjects. According to Emzir (2009), quantitative approach is an approach that primarily uses the postpositivist paradigm in developing science (such as thinking about cause and effect, reduction to variables, hypotheses and specific questions using measurement and observation and theory testing), using research strategies such as experiments and surveys that require statistical data.

According to Bryman (2016), a sample is a smaller group selected from a larger population for the purpose of conducting research and drawing conclusions or generalizations about the whole population. Bryman (2016) underscores the importance of meticulously designing sampling methods to ensure that the chosen sample accurately represents the larger population, thereby allowing the research findings to be reliably generalized. In this study, researchers carried out experiments and provided treatments to a sample consisting of 6 athletes from PASI Bandar Lampung.The research utilized a one-group pretest-posttest design. As outlined by Sugiyono (2018), this methodological approach involves assessing a specific dependent variable by measuring it both before and after the implementation of an intervention or treatment. The pretest is conducted initially to establish a baseline measurement, while the posttest is administered following the intervention to evaluate any changes or effects resulting from the treatment. This design allows researchers to analyze the impact of the intervention on the variable of interest by comparing the results from before and after the treatment.

This approach is frequently employed in quasi-experimental research to evaluate the effectiveness of different interventions or treatments. Researchers collect data through measurements taken before the intervention, known as the pretest, and again after the intervention, referred to as the posttest. By comparing these two sets of measurements, researchers can determine the impact of the intervention and identify any significant changes that have occurred as a result. This method allows for a detailed assessment of how the intervention influences the dependent variable over time.

This method provides a systematic way to evaluate how well the intervention achieves its intended effects. This involved carrying out an initial assessment before implementing the treatment to effectively gauge the impact of the intervention. The research was designed using a one-group pretest-posttest approach. This involved carrying out an initial assessment before implementing the treatment to effectively gauge the impact of the intervention. The 400-meter running speed test was used as

the primary assessment tool. Prior to data analysis, a normality test was conducted to ensure the data met the necessary assumptions. Subsequently, a t-test was performed to assess the hypotheses derived from the study.

## C. Results and Discussion

The data for this study were derived from two separate 400-meter running tests. After collecting the data from each test, the results were organized and subjected to statistical analysis. For the initial 400-meter running test, which involved a sample of 6 participants, the average time recorded was 25.59 seconds. The standard deviation of these times was 0.489 seconds, indicating the degree of variation among the results. Additionally, the total of all recorded times for this initial test was 140.76 seconds. The final measurements for the 400-meter running test, conducted with a sample of 6 individuals, revealed the following results: The average time recorded for the 400-meter run was 22.94 seconds. The standard deviation of these times was 0.525 seconds, reflecting the variability in the test results. Additionally, the total sum of all recorded times for the 400-meter run was 126.17 seconds.

After the description of the research data was known, the next step was to determine the prerequisite test, namely the normality test as follows:

**Table 1. Normality Test**

| Variable | N | L calculate | L table | Conclusion |
|---|---|---|---|---|
| (X) | 6 | 0.170 | 0.265 | Normal |
| (Y) | 6 | 0.184 | 0.625 | Normal |

Based on the data presented in the table above, the results of the normality test for both the initial and final tests of the 100-meter run show that the calculated L value for the initial test is 0.170, which is less than the L table value of 0.265. Similarly, for the final test of the 400-meter run, the calculated L value is 0.184, which is also below the L table value of 0.265. This indicates that the data for both tests is normally distributed. Given that all the variables under consideration follow a normal distribution, the next step is to perform the hypothesis test using the t-test, as outlined below.

**Table 2. Hypothesis Test**

| Variable | T calculate | T table | Conclusion |
|---|---|---|---|
| Latihan harness | 8,164 | 1,81 | Significant |

Based on the analysis results presented above, a comparison between the calculated t-value and the tabulated t-value reveals the following: If the calculated t-value exceeds the tabulated t-value, it signifies a significant effect. In this instance, the calculated t-value is 8.164, which is considerably higher than the tabulated t-value of 1.812. This substantial difference indicates that the effect is statistically significant.

Consequently, we can confidently conclude that harness training has a considerable impact on enhancing the 400-meter running speed of athletes from PASI Bandar Lampung.

This study investigates the effects of harness training on the 400-meter sprint performance of six athletes from PASI in Bandar Lampung. The analysis of the data reveals that hypothesis testing confirms a significant positive impact of harness training on sprint performance. Specifically, the use of harness training has been effective in improving the athletes' times in the 400-meter sprint. However, it is crucial to consider additional factors that affect overall athletic performance. These include the development of physical conditioning through targeted muscle groups, which are particularly engaged during resistance or load-bearing activities. Moreover, a key aspect of training is to prioritize injury prevention, ensuring that athletes remain healthy and safeguarded while participating in their training programs. This holistic approach helps athletes not only enhance their performance but also maintain their physical well-being throughout their training regimen.

In the context of sports, muscle strength is a fundamental biomotor component essential for nearly every athletic discipline and plays a crucial role in achieving peak performance. Sprinting, specifically, involves running at top speed, utilizing the full extent of an athlete's strength and speed from the starting point until crossing the finish line. For a sprint to be effective and fast, it demands a swift reaction time, strong acceleration, and a highly efficient running technique. These elements are integral for optimizing sprinting performance and ensuring that the runner can maintain maximum speed throughout the entire race. Sprinters need to master an effective sprint start and sustain their maximum speed for the entire duration of the race. Developing a powerful and efficient start is crucial for gaining a competitive edge, while maintaining peak velocity throughout the sprint is essential for optimal performance.

The principle of harness training adheres to the concept of dynamic strength training. Harness training involves using equipment to provide resistance during running exercises, or as part of training for acceleration, power, and endurance. This training method utilizes a harness or similar device to create resistance, thereby enhancing the development of strength and performance in these areas. According to NSCA-National Strength & Conditioning Association (2021) discuss various strength and conditioning training techniques, including the use of harnesses in the context of strength and speed training. Harness training is designed to enhance an athlete's muscular propulsion and strength, particularly for movements that involve acceleration. By employing a harness attached to a weight or pulling system, athletes can simultaneously refine their running technique and build strength. This specialized exercise method introduces additional resistance through the harness,

which helps to improve the athlete's overall strength, propulsion, and movement efficiency. The added resistance challenges the muscles and enhances their performance, contributing to more effective acceleration and better running mechanics.

## D. Conclusions

The discussion of this study focuses on the impact of harness training on the 400-meter sprint performance of six PASI athletes from Bandar Lampung. The research findings reveal that the hypothesis testing indicates a significant effect of harness training on improving sprint results. Specifically, harness training has been shown to enhance 400-meter sprint performance. However, it is important to also consider other factors that contribute to athletic performance. These include the physical condition components developed through muscle groups, which are engaged during activities involving resistance or load. Additionally, attention must be given to injury prevention to ensure that athletes remain protected and can maintain their physical health while undergoing training.

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