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IMPACT OF HARNESS TRAINING ON SELECTED CORE STRENGTH VARIABLES AMONG THE VARSITY MEN PLAYERS

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Abstract:

This study aimed to examine the effects of harness training on leg and back strength among varsity male students. A total of 30 participants were selected and randomly divided into two groups: the harness training group and a control group. Group I, comprising 15 participants, followed a structured 12-week harness training program, while Group II (the control group) included 15 participants who did not undergo any specific training during the same period. Both groups had their leg and back strength measured using a dynamometer before and after the 12-week training. To determine significant differences between the groups, an analysis of covariance (ANCOVA) was performed, with a significance level set at .05. The statistical analysis was conducted using SPSS version 22.0. Results from the pre- and post-tests indicated significant improvements in leg and back strength for the harness training group. The analysis confirmed statistically significant differences between the two groups, suggesting that harness training effectively enhances core strength, boosts performance, and lowers the risk of injuries for athletes.

Key Words: Harness Training, Leg Strength, Back Strength, Core Strength.

Introduction:

Core strength is essential for various physical activities, ranging from simple tasks like walking and sitting to more complex athletic movements such as running, jumping, and lifting (Ma, et al., 2024). For athletes, a well-developed core contributes significantly to performance by enhancing balance, stability, and overall body control (Gong et al., 2023). A strong core is vital in preventing injuries, especially in areas such as the lower back and hips (Zemková & Zapletalová, 2021).

One effective method for building core strength is harness training. Unlike traditional exercises that target specific muscle groups, harness training involves resistance added to multiple movements, compelling the entire body to engage, particularly the core muscles. Athletes use a harness connected to resistance bands or other equipment, making basic exercises like squats, lunges, or sprints more challenging and requiring greater core activation, leading to improved functional strength (Clark et al., 2017).This type of training is particularly beneficial because it mimics real-life movements, engaging the core in a way that promotes not only strength but also coordination and balance, thereby enhancing sports performance (Upton, n.d.2011).

This study is based on the critical role of core strength in athletic performance and injury prevention. Core strength encompasses the stability and strength of muscles in the back, abdomen, and legs, making it crucial for athletes, especially those engaged in high-intensity sports like basketball. Using a dynamometer to measure muscle strength offers several advantages: it provides precise, accurate, and objective data in kilograms or pounds, ensuring consistent and repeatable results across trials. This non-invasive method ensures safety and allows for multiple measurements without discomfort. The dynamometer's versatility makes it suitable for assessing different muscle groups, such as leg and back strength, while being time-efficient, portable, and user-friendly. Its widespread acceptance in clinical and research settings adds credibility to the study findings. These features contribute to a rigorous, objective, and efficient evaluation of strength in studies like the impact of harness training on muscle strength. A robust core leads to improved balance, coordination, and overall movement efficiency, enhancing sports performance.

Despite the potential benefits of harness training, there is limited research specifically examining its effects on leg and back strength among varsity athletes. This study aims to fill this gap by investigating how harness training influences these critical strength variables. The rationale is to explore effective training methods for improving core strength in varsity athletes, aiding their athletic development, performance, and overall well-being. Varsity students are at a stage where building strength and preventing injuries is significant. Through this research, we aim to determine if harness training effectively enhances core strength variables and how it can help varsity athletes perform better and stay injury-free.

Objectives of the Study:

The study aimed to investigate the effects of harness training on selected core strength variables among Varsity male students.

Hypotheses:

It was hypothesized that there may be a significant difference between the harness training group and the control group in terms of core strength improvements.

Methodology:

The purpose of this study was to investigate the effects of harness training on leg strength and back strength among varsity men students at Annamalai University. The study involved the selection of 30 varsity men from Annamalai University, who were purposefully chosen based on their participation in varsity-level sports, ensuring a homogenous group in terms of athletic experience and physical fitness. To facilitate a comparative analysis of the training intervention, the participants were randomly assigned to two groups: the harness training group and the control group. Group I (Harness Training Group):This group consisted of 15 participants who engaged in a12-week structured harness training program designed to enhance core strength, specifically targeting leg and back strength. Group II (Control Group): The remaining 15 participants comprised the control

group, which did not undergo any specific training intervention during the study period. Both groups were assessed for leg strength and back strength using a dynamometer before and after the 12-week training period. To identify any significant differences between the two groups, a detailed analysis of covariance (ANCOVA) was conducted, setting a statistical significance level at .05. The statistical software SPSS version 22.0 was used as the foundation for this thorough investigation.

Table 1: Criterion Measure

S.No	Test	Instrument	Measurement
1	Leg Strength	Dynamometer	Kilograms
2	Back Strength	Dynamometer	Kilograms

Table 2: Harness Training Schedule

Week	Training focus	Exercises	Reps/set	Distance	Rest
01-Feb	Base Endurance	Easy runs with harness Belt	6-8 rep x 3 set	50 mt	60-90 sec
3	Building Stamina	Interval run with harness belt	8-10 reps x 3 set	50 mt	90 sec
4	Building Stamina	Tempo runs with a harness belt	6-8 rep x 3 set	50 mt	90 sec
5	Speed Development	Fartlek with a harness belt	8-10 rep x 3 set	50 mt	90-120 sec
6	Speed Development	Hill repeat run with a harness belt	8-10 rep x 3 set	50 mt	90-120 sec
7	Endurance	Long and with a harness belt	10-12 rep x 3 set	50 mt	120 sec
8	Strength	Progressive runs with a harness belt	10-12 rep x 3 set	50 mt	120 sec
9	Peak Speed	Sprint interval	10-12 reps x 3 set	50 mt	120 sec
10	Endurance	Tempo runs with a harness belt	6-8 reps x 3 set	50 mt	120 sec
11	Race Simulation	Simulation runs with a harness belt	12-15 rep x 3 sets	50 mt	120 sec
12	Taper And Recovery	Easy runs with harness belt	6-8 reps x 3 set	50 mt	60-90 sec

Ethical Guidelines Implemented for Data Collection in the Research Study:

In conducting this research on the impact of harness training on core strength variables among varsity men students, several ethical guidelines were implemented to ensure participant protection and data integrity. Informed consent was obtained from all participants, ensuring voluntary involvement, and they were allowed to withdraw at any time without consequence. Participant confidentiality was maintained by anonymizing data and securing personal information. Tests were conducted in private, safe environments under professional supervision to minimize any physical risks, and participants were regularly monitored for their well-being. The study adhered to non-coercion principles, ensuring that participation was entirely voluntary, and transparency was maintained regarding how the data would be used. The research complied with institutional and national ethical guidelines, with approval obtained from Annamalai University. These measures safeguarded the participants' rights and ensured the ethical handling of the data collected.

Analysis of the Data:

Table 3: Analysis of Covariance of the Data on Leg Strength of Pre and Post-Test Scores of Harness Training Group and Control Groups

Test	Harness Training Group	Control Group	Source of Variance	Sum of Squares	DF	Mean Squares	Obtained 'F' Ratio
Pre Test							
Mean	87.8	90.46	Between	53.33	1	53.33	0.16
S.D.	19.23	16.75	Within	9112.13	28	325.43	
Post Test							
Mean	104.26	91.33	Between	1254.53	1	1254.53	5.06*
S.D.	14.63	16.33	Within	6934.26	28	274.65	
Adjusted Post Test							
Mean	105.36	90.23	Between	1705.45	1	1705.45	58.53*
			Within	786.72	27	29.13	

* Significant at .05 level of confidence.

(The table values required for significance at .05 level of confidence for 1 and 28 and 1 and 27 are 4.20 and 4.21 respectively).

The table presents an analysis of covariance (ANCOVA) for the leg strength of the Harness Training Group and the Control Group, based on pre-test and post-test scores. In the pre-test, the Harness Training Group had a mean of 87.80, while the Control Group's mean was 90.46, with an obtained F ratio of 0.16, which is not significant (below the critical value of 4.20). This indicates no significant difference in leg strength between the groups at the start. However, in the post-test, the Harness Training Group's mean increased to 104.26, compared to the Control Group's mean of 14.63, resulting in a significant F ratio of 5.06 (above the critical value of 4.21), indicating a notable improvement in leg strength due to the training. In the adjusted post-test, the Harness Training Group had an adjusted mean of 105.36 compared to 90.23 for the Control Group, with a highly significant F ratio of 58.53. This confirms that harness training had a significant and positive impact on leg strength.

Figure 1: Bar Chart for Leg Strength

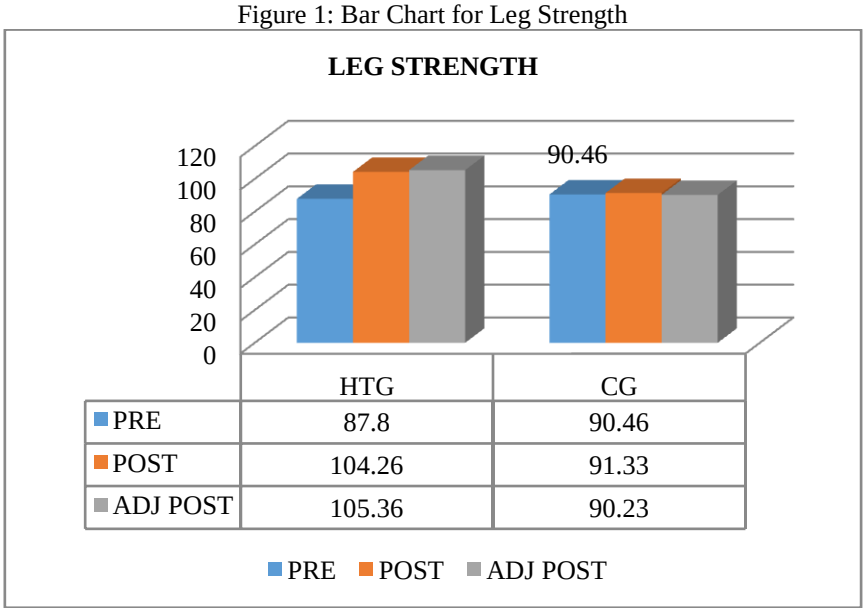


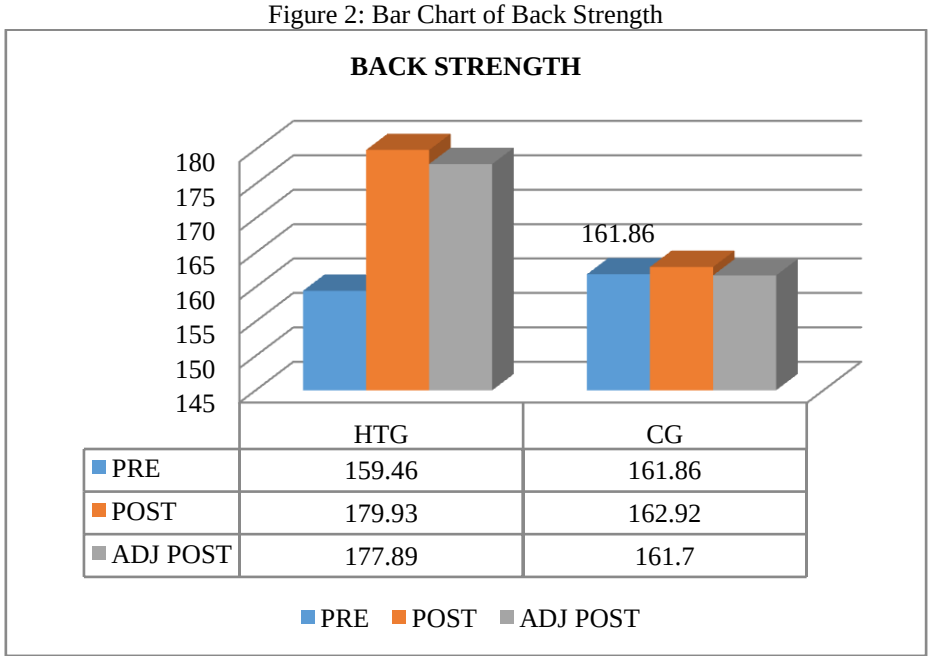
Table 4: Analysis of Covariance of the Data on Back Strength of Pre and Post-Test Scores of Harness Training Group and Control Groups

Test	Harness Training Group	Control Group	Source of Variance	Sum of Squares	DF	Mean Squares	Obtained 'F' Ratio
Pre Test							
Mean	159.46	161.86	Between	43.2	1	43.2	0.14
S.D.	17.5	17.19	Within	8433.46	28	301.195	
Post Test							
Mean	176.93	162.92	Between	1526.53	1	1526.53	5.90*
S.D.	14.73	17.31	Within	7240.26	28	258.58	
Adjusted Post Test							
Mean	177.89	161.7	Between	1954.36	1	1954.36	28.38*
			Within	1858.79	27	68.84	

* Significant at .05 level of confidence.
(The table values required for significance at .05 level of confidence for 1 and 28 and 1 and 27 are 4.20 and 4.21 respectively).

The table presents the analysis of covariance (ANCOVA) for back strength in both the Harness Training Group and Control Group, based on their pre-test and post-test scores. In the pre-test, the Harness Training Group had a mean of 159.46, while the Control Group's mean was 17.50, with an F ratio of 0.14, which is not significant (below the critical value of 4.20). This indicates that there was no significant difference between the groups before the intervention. In the post-test, the mean for the Harness Training Group increased to 176.93, and for the Control Group to 162.92, resulting in a significant F ratio of 5.90 (above the critical value of 4.21), showing that the harness training had a positive effect on back strength. In the adjusted post-test, the Harness Training Group had an adjusted mean of 177.89, while the Control Group had 161.70, with a highly significant F ratio of 28.38, confirming a substantial improvement in back strength due to the harness training intervention.

Figure 2: Bar Chart of Back Strength



Result and Discussion:

The results for leg and back strength showed significant improvements in the harness training group compared to the control group, confirming the positive impact of harness training on core strength.The findings of the current study, which demonstrate the significant impact of harness training on back strength, are consistent with previous research that emphasizes the efficacy of harness-based training programs in improving muscular endurance, strength, and overall athletic performance.

(Devika & Johnson, 2017) provide strong evidence that harness training, when combined with core exercises, can significantly enhance muscular endurance in basketball players. Their study, which involved 48 male basketball players, demonstrated that those in the experimental groups (including harness training and core exercises) showed substantial improvement in muscular endurance compared to the control group. This aligns with the current study's observation of improved back strength in participants who underwent harness training, supporting the idea that this type of resistance training effectively targets key muscle groups.

(Cross et al., 2013) explored the impact of weighted vest loading during sprinting and found that while vest loads increased vertical ground reaction forces (GRF-z) during the maximum velocity phase, they had a less pronounced effect during the acceleration phase. Although their study focused more on kinetic and kinematic adaptations rather than direct strength outcomes, their findings still support the broader concept that resistance-based training (such as harness or vest loading) can improve key physical metrics in athletes. This provides further justification for the positive effects observed in the current study, where harness training led to significant improvements in back strength.

(Wallis et al., 2002) examined the use of a bowling harness in modifying technique and found that it significantly reduced the separation angle and spinal twist during bowling, though the effects did not persist after the removal of the harness. This study highlights the short-term benefits of harness-based interventions in improving specific physical and technical aspects of athletic performance, reinforcing the notion that harness training can be an effective tool for enhancing strength and technique, at least in the short term. These findings lend credence to the current study's conclusion that harness training positively impacts back strength in a measurable and statistically significant manner.

Constraints and Prospects for Future Research:

The current study faces several constraints, including a relatively small sample size that limits the generalizability of the findings to a broader athletic population. The short-term assessment of back strength lacks insight into long-term retention of training benefits, as suggested by studies like Wallis et al. (2002), which found that some gains may diminish over time. External variables such as diet and previous training experience were not fully controlled, potentially influencing the results. On the other hand, the study opens up several prospects for future research. Comparative studies with other resistance training modalities, such as those highlighted by Devika & Johnson (2017) and Cross et al. (2021), could help identify the specific advantages of harness training. Advanced biomechanical analysis tools, including 3D motion capture and electromyography (EMG), would offer a deeper understanding of muscle activation and joint mechanics during harness training. Future studies should consider long-term performance tracking, particularly to assess its impact on injury prevention and athletic performance in competitive environments. Investigating the effects on female athletes and the psychological responses to this demanding form of training also present valuable areas for further research. Addressing these constraints and prospects will help better establish the utility of harness training across diverse athletic contexts.

Conclusion:

The conclusion of this study highlights the significant impact of harness training on back strength, as demonstrated by the marked improvements in post-test and adjusted post-test scores compared to the control group. The results indicate that harness training can be an effective method for enhancing muscular strength, particularly in the lower back, which is crucial for athletic performance. The study also suggests that the application of harness training in sports could be further optimized by integrating other training modalities, as evidenced by the success of combined approaches in prior studies. However, the study's limitations, including its short duration and small sample size, suggest that further research is needed to assess the long-term effects and broader applicability of harness training across different athletic populations. Future research should also explore its impact on other physical attributes such as speed, endurance, flexibility, and coordination, which are crucial components of overall physical fitness. Its role in enhancing athlete performance across various sports disciplines, along with its potential in injury prevention and rehabilitation, should be further investigated. This would provide valuable insights into how harness training can be optimized not just for strength gains but also for improving holistic athletic performance and reducing the risk of sports-related injuries. By addressing these areas, future studies can offer more comprehensive evidence on the effectiveness of harness training in improving physical fitness and performance.

Conflict of Interest:

The authors declare no conflict of interest regarding the publication of this study.

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