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EFFECT OF STRENGTH TRAINING ON STATIC BALANCE IN BASEBALL ATHLETES

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Abstract

The purpose of this study was to investigate the effect of strength on the static balance of Pakistani baseball athletes. This study shows how elite Pakistani baseball players' static balance may improve following a 12-week strength training pre/post-intervention. The participants were separated into two groups of ten: the experimental group and the control group. The experimental group completed 12 weeks of strength training, whereas the control group received no treatment. The Romberg test was used to measure the participants' static balance in four different positions: standing on both feet with eyes open, standing on both feet with eyes closed, standing on the dominant leg with eyes closed, and standing on the nondominant leg with eyes closed. The experimental group's static balance improved significantly following the 12-week strength training intervention. The study's findings demonstrated that 12 weeks of strength training significantly improved Pakistani baseball players' static balance. Furthermore, the strength training program had a substantial and good impact on the static balance of Pakistani baseball players. It is suggested that the Pakistan Baseball Federation implement strength training and focus on improving static balance in order to improve various aspects of Pakistani baseball players' performance.

Keywords: Strength Training; Static Balance; Baseball Athletes.

Introduction

Baseball has grown in popularity across the world, engaging athletes, and fans alike with its unique team-sport qualities (Ozmen & Aydogmus, 2016). Baseball is the national sport of the United States. Techniques used in this sport, such as throwing, fielding, or hitting, require a controlled weight shift. Baseball demands balance in every position,

including catcher, hitter, pitcher, shortstop, base runners, and deep fielders (Laudner et al., 2019). Balance is crucial on all parts of the baseball field, but it is particularly essential on the pitcher's mound (Leeds et al., 2022).

Balance is the ability to maintain the body's equilibrium (Harteveld, 2011). Maintaining equilibrium requires a complicated interaction between visual processes, movement coordination, and muscular activity (Cherepov et al., 2021). There are two primary types of balance: static and dynamic. Static stability refers to maintaining a steady condition and providing protection, whereas dynamic balance is essential for retaining equilibrium during movement. Balance management is essential for both sports and daily activities (Tabrizi et al., 2013). Balance is essential for a variety of sports disciplines, including ball games and gymnastics. Insufficient balance can cause several injuries, including ankle sprains, elbow inflammation, hand and wrist injuries, brain trauma, and ligament strains. Furthermore, impairments in lower extremity strength and postural control have been associated with an increased risk of incurring sports-related injuries (Mohammadi et al., 2012).

Objectives

1. To determine the difference among baseball athletes (Control and experimental group) in terms of static balance during the Pre-test.
2. To assess the effect of strength training on static balance among baseball athletes.
3. To compare the difference among baseball athletes (control and experimental group) in the pre-test and post-test.

Research Methodology

Research Design

The researcher opted for a Quasi-Experimental design with a purposive sampling technique.

Participants

As per inclusion and exclusion criteria, participants aged between 18 and 25 years with a BMI of 18.5 to 24.9 were selected with elite-level or national/international exposure.

Following the application of inclusion and exclusion criteria, twenty participants (20) were chosen for this experimental study. Both the experimental group and the control group were composed of ten participants each. Participants in the experimental group (EG, n=10) underwent a 12-week training protocol

to assess the impact of strength training on the static balance of baseball athletes in Pakistan, while the remaining ten (10) participants were assigned to the CG (control group).

Training Protocol

The researchers adapted the strength training protocol originally designed by A. Eugene Coleman for 52 weeks of strength training for baseball athletes, with a specific focus on enhancing balance. Additionally, the researchers incorporated elements of the strength training plans developed by Joe Lopez on November 24, 2022, aimed at improving balance for various positions in baseball, including catchers, pitchers, first basemen, second basemen, third basemen, shortstops, and outfielders. These strength training protocols were integrated into their training regimens to enhance balance, prevent lower extremity injuries, and improve stability, especially when athletes needed to balance on one leg or execute movements involving jumping and running in multiple directions.

For the Romberg test, the researcher performed the complete test and verbally instructed the complete test before measurements. Participants were given three (03) attempts to try the instructed and demonstrated procedure. After that, the fourth (04th) attempt was then recorded for pre-and post-test. The participants were asked to remove their shoes and stand with both feet together and instructed the participants to hold their arms next to their bodies or cross in front of their bodies. The first stage of the test involves asking the participants to keep their eyes open while the researcher assesses the time for the participant's body movement relative to a balanced position.

The second stage involves instructing the participants to stand erect with their eyes closed while the researchers noted balance impairment/sway for a duration of 30 seconds. Swaying of the body was observed. However, this indicated a proprioceptive balance correction due to a lack of visual or vestibular compensation. Loss of balance can be defined as increased body swaying, foot movement in the direction of the fall, or falling. Following are the measurements of postural sway and muscle activation. (A) Standing on both legs with eyes open. (B) Standing on both legs with eyes closed. (C) Dominant single-leg standing with eyes closed. (D) Non-dominant single-leg standing with eyes closed.

Statistical Analysis

In this study, the statistical program, SPSS version 26, was used to examine the static balance data. To acquire the intended findings, different statistical tests,

including mean, standard deviation, independent sample t-test, and paired sample t-test, were used.

Results

As per the analysis of the results, the experimental group showed a considerable improvement in static balance. Furthermore, the t-test findings showed that the experimental group saw a significant improvement in static balance after 12 weeks of strength training intervention. Based on this data, it can be concluded that the 12-week strength training program was quite successful in improving static balance.

Table 1. Mean ± SD (pre intervention)

Variables	Control (n=10) x±SD	Experimental (n=10) x±SD
SB (Standing on both feet with eyes open)	27.10±2.76	27.80±2.78
SB (Standing on both feet with eyes closed)	20.50±5.27	22.80±4.44
SB (Standing on Dominant leg with eyes closed)	9.70±3.30	10.00±5.47
SB (Standing on Non-Dominant leg with eyes closed)	11.30±3.43	10.40±3.02

Key: X: Mean, SD: Standard Deviation, SB: Static balance, measurements are in seconds

Table 2. Mean±SD (post intervention*)*

Variables	Control (n=10) x±SD	Experimental (n=10) x±SD
SB (Standing on both feet with eyes open)	27.40±3.09	30.00±0.00
SB (Standing on both feet with eyes closed)	21.60±4.88	27.00±2.98
SB (Standing on Dominant leg with eyes closed)	9.80±3.08	20.00±5.37
SB (Standing on Non-Dominant leg with eyes closed)	11.50±3.20	14.70±3.36

Key: X: Mean, SD: Standard Deviation, SB: Static balance, measurements are in seconds

Table 3. Paired t-test results (pre and post intervention)

Variables	Control (n=10)		Experimental (n=10)	
	t-value	p-value	t-value	p-value
Pre-Post SB (Standing on both feet with eyes open)	0.56	0.58	2.65	0.01
Pre-Post SB (Standing on both feet with eyes closed)	1.05	0.30	2.98	0.00
Pre-Post SB (Standing on Dominant leg with eyes closed)	0.14	0.88	5.20	0.00
Pre-Post SB (Standing on Non-Dominant leg with eyes closed)	-0.62	0.54	2.17	0.04

Key: X: Mean, SD: Standard Deviation, SB: Static balance, measurements are in seconds

Discussion

This study investigated the effect of strength training on the static balance of Pakistani baseball athletes. The major goal was to determine how a 12-week strength training program affected the static equilibrium of professional baseball players. Strength

training, often known as resistance training or weight training, is a type of physical exercise that uses external resistance to increase muscle strength, power, and endurance (Hunter et al., 2004). Moreover, strength training is a crucial component of comprehensive training regimens for athletes, fitness enthusiasts, and individuals aiming to improve their physical capabilities (ACSM, 2009).

This study underscored the importance of strength training for baseball players since it not only improves muscle strength and power but also helps establish static balance, as demonstrated by the Romberg test. The study found that improving the total strength of the stabilizer muscles and lower extremities helps baseball players regulate postural sway and enhance static balance. (Mohammadi et al., 2012) reported similar results after six weeks of strength training using the Romberg test.

The participant's ability to sustain static postures for prolonged periods and tolerate external forces was greatly enhanced by the strength training. Studies by (Paterno et al., 2004) and (Young et al., 2010) also investigated the effects of strength exercises and reported a significant increase in static balance. The results of this study demonstrated a statistically significant improvement in static balance as measured by the Romberg test. Muscle activation via strength training strengthened critical muscles such as the biceps femoris, psoas major, sartorius, and illiacus, all of which play important roles in maintaining stability on one leg while managing flexion on the other. Similar results were found by (Mohammadi et al., 2012) in their study on the effects of six weeks of strength training using the Romberg test, which demonstrated that strengthening the muscles involved in maintaining body balance significantly improved athletes' static balance.

Contributing to the best possible performance and injury avoidance for Pakistani baseball players, this study is essential in meeting their balancing demands. It focuses especially on injuries brought on by athletes falling because they do not have enough balance. Sports performance always depends on the capacity to carry out certain motions, and this study helps to improve the abilities required for such actions. Additionally, this research helps to mitigate damage to the lower extremities caused by the body's incapacity to maintain balance. Due to the range of hits and pulls, they may receive from various angles; baseball players are especially prone to injury. Baseball players may greatly benefit from improved balance when it comes to absorbing hits or collisions from all directions.

Conclusion

The primary aim of this study was to find out how 12 weeks of strength training affected Pakistani baseball players' static balance. Since balance refers to the capacity to maintain the center of support of the body, it is a crucial component that underlies performance, particularly in the context of complicated motions. Furthermore, when comparing the pre-test and post-test findings for the control and experimental groups after the training intervention, the control group did not show any notable improvements in static balance. Additionally, the results demonstrated a statistically significant improvement in static balance between the experimental and control groups in the post-test as compared to the pre-test data. Overall, the findings show that 12 weeks of strength training resulted in a considerable improvement in baseball athletes' static balance after the intervention. In conclusion, this study shows that strength training is essential for improving static balance as well as for stabilizing lower extremities and reaching bodily stability.

Consent Form

An informed consent was signed by the participants who willingly contributed to the study over the 12 weeks of the duration.

Approval(s)

Before conducting the study, the researcher obtained formal approval from the Departmental Supervisory Committee (DSC), Department of Sports Sciences and Physical Education, University of Haripur, Khyber Pakhtun Khuwa, Pakistan.

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