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AQUATIC AND LAND-BASED PLYOMETRIC TRAINING AFFECTS YOUNG BASKETBALL AND SOCCER PLAYERS' STRENGTH, SPEED, AND COORDINATION

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ABSTRACT

The researchers set out to examine how plyometric exercise affected the quickness, acceleration, and equilibrium of basketball and soccer players. The purpose of this research was to compare the outcomes of eight weeks of aquatic plyometric training to those of land-based training in young male basketball players in terms of leg muscle strength and a dynamic balancing test. A randomised pre-post study design was used to achieve so. Twenty male athletes from the sports of basketball and soccer were chosen to participate in the research. We draw the conclusion that plyometric training in water may be an excellent method for enhancing young athletes' speed and strength.

Keyword: Soccer, soccer players, Plyometric Exercise, Performance.

INTRODUCTION

There are a variety of contexts in which the term "training" is used. The term "training" is sometimes used interchangeably with "exercise" in the context of sports. To put it simply, training is any sort of physical activity with the goal of increasing proficiency or proficiency. Athletes must prepare for certain competitions by designing training plans. This increasing capacity for both talent and energy must be taken into account. It was American track and field coach Fred Wilt who came up with the word "plyometrics" in 1975. Ply and metric both have Latin origins that imply "increase" and "measure," therefore together they signify "measurable growth."

Plyometric or explosive jump training may be used to any activity that involves forceful, propulsive motions, such as football, volleyball, running, high jump, long jump, basketball, etc. Many coaches and training specialists employ plyometrics as a means of enhancing their athletes' sprinting ability, explosive power production, explosive responsiveness, and eccentric muscle control during kinetic activities. Common methods for enhancing basketball-specific performance markers like vertical jump height include plyometric and strength training regimens.

Plyometric and strength training regimens, either alone or in combination, have been demonstrated to improve basketball players' vertical and horizontal jumps. Very few studies have demonstrated how the training benefits of various plyometric or strength training techniques may be transferred to other abilities that are nevertheless crucial to the success of young basketball players, such as COD. Plyometric training seems to enhance COD while not dribbling a basketball, but whether it also improves COD when dribbling a basketball is unknown. Recent studies have indicated that strength training may also have a favorable

influence on the sprint performance of young basketball players, although plyometric training may be the most effective strategy for improving speed and agility.

Soccer is a team sport with two teams of eleven players each who compete against one another using a spherical ball. Plyometrics are jump training routines in soccer that emphasize producing peak muscle power in a short amount of time. When it comes to improving your soccer skills, plyometrics are among the best and easiest ways to go about it. Plyometrics, on the other hand, emphasize fast, explosive movements more in line with the essence of soccer than the slow, deliberate repetitions used in conventional strength training for sports. Every athlete can see the obvious correlation between improved vertical jump, lateral quickness, and overall explosiveness and greater on-field performance.

Players will appreciate the additional advantage of improved leaping ability to their striking ability because of the focus on jumping. Trainers and fitness experts agree on its primary advantages, which include the development of greater strength and power, the consolidation of muscle groups, the prevention of muscular atrophy, and the acceleration of the metabolic rate.

Although athletes have a propensity to overwork in the brief periods, the greatest outcomes come from doing more rapid repetitions. Do not exert yourself to the point of muscular strain and injury.

LITERATURE AND REVIEW

Theresa Nkiru Uzor et al (2019) One of the worldwide problems for successful sustainable development in Africa is ensuring good health and wellbeing for the population. Sports are crucial for the health and happiness of people of all ages. Plyometric exercise, which may be done by anyone of any age, has several health advantages, including but not limited to weight loss, stress reduction, and improved cardiovascular health. One of the many advantages of plyometric exercise is that it boosts metabolism, causing a person to burn more calories even at rest and resulting in weight loss. Plyometrics is a kind of high-intensity interval training used by coaches and athletes to increase explosiveness and speed. A plyometric exercise begins with a brief period of muscular lengthening (eccentric phase) and is immediately followed by a series of contractions (concentric phase) of the same muscles and connective tissue. Running, however, is the purest form of plyometric exercise and can be done safely by a broad range of people. Plyometric training has the potential to benefit athletes, but coaches sometimes unintentionally cause more damage than good when implementing it. They might be doing effective workouts but with improper sets, repetitions, and recovery time. In this article, we'll look at the many kinds of plyometrics, the reasons why you should use them, and the precautions you should take while designing a plyometric workout. Also included are solutions to frequent problems and warnings against making typical blunders while using plyometric exercise. Plyometric training calls for a great deal of concentration and coordination from the coach, thus it's important that they grasp the significance of this fact. To get the most out of this sort of training and minimize the danger of damage, it is crucial to avoid typical pitfalls including poor progression, bypassing the requirements, faulty landing, and excessive plyometrics. Especially in light of the recent increase in cardiovascular ailments, plyometric training in Nigeria has the potential to turn the country's fortunes around for the better and save substantial amounts of money.

A. Bento Devaraj et al (2016) This research aimed to compare the effectiveness of plyometric training, skill training, and combined training on the sprint times of male ice hockey players. Sixty male hockey players from the 2014-2015 school year who competed in inter-university events at Thiruvalluvar University Vellore were chosen at random to serve as subjects. The participants were divided into four equal groups of fifteen (n=15). Plyometric training was given to Group-I, Skill training to Group-II, a combination of Plyometric and Skill Training to Group-III, and a Control group was given to Group-IV. All three Experimental groups had their training periods capped at twelve weeks, and their weekly session counts were capped at three. Training sessions for Combined Plyometric and Skill Training were limited to every other week for a whole year. In this investigation, 50-meter timed runs were used to measure Speed as the dependent variable. Each participant was given a battery of pre- and post-training tests to ensure improvement in the targeted areas. Quantitative information was gathered, and an ANCOVA test was used to examine the results. The significance of the paired-mean difference was determined using Scheffe's post hoc test. As a general rule, we used a 5% significance threshold throughout. The research indicated that the experimental groups that engaged in plyometric training, skill training, or both had substantial increases in their speed compared to the control group who did not engage in any training. In addition, compared to both

Plyometric Training and Skill Training, the Combined Plyometric and Skill Training group demonstrated significant improvements in Speed.

Pratyakshi Munshi, et al (2022) Although plyometric and whole-body vibration have been shown to boost performance, few studies have examined their acute impact on the occurrence of post-activation potentiation. This research set intended to compare the short-term physical performance effects of plyometric exercises to whole-body vibration training for collegiate basketball players. Twenty-four collegiate male basketball players participated in this randomised crossover study. The individuals did plyometric exercises and whole-body vibration routines after a 48-hour rest period. Countermovement Before and after plyometric and whole-body vibration training, the individuals' vertical jump, speed, and agility were measured at 4, 8, and 12 minutes. Studies have demonstrated that countermovement jump height and agility time may be enhanced by plyometric and whole-body vibration training. The plyometric group showed considerable improvement over the control group in measures of countermovement jump height and agility, whereas the whole-body vibration group ran faster. In any case, these distinctions did not reach statistical significance between the two groups ($p > 0.05$). Plyometric and whole-body vibration workouts were shown to have similar effects on post-activation potentiation, with the latter leading to enhanced physical performance.

Hamid Arazi et al (2012) The goal of this research was to see how much of an effect plyometric training has on teenage basketball players' vertical jump and agility. Allotted at random were 18 young male semi-professional basketball players to either a plyometric training group, a land plyometric training group, or a control group. The plyometric training groups participated in a regimen of three weekly 40-minute plyometric training sessions for a total of eight weeks. Players were tested on their vertical leap and agility both before and after training or rest. Data from tests of leaping and agility showed no statistically significant differences ($p>0.05$) between the AP and LP, as analyzed by a two-way analysis of variance and a Tukey post hoc test. In both the AP and LP experimental groups, there was a substantial pre- to post-training increase in performance on all test variables (p0.05). All metrics showed statistically significant improvements in the AP group against the CON. The LP only outperformed the CON in one area: the Vertical Jump Test. Jumping and agility improvements in young basketball players were comparable to, if not greater after, an 8-week aquatic-based plyometric training program compared to a land-based plyometric training program.

Robert G. Lockie et al (2018) This research looked at how college-aged women's soccer players' linear speed and lower-body strength were related to their ability to quickly shift directions. Data from three Division I and two Division II schools were analysed. The 10-meter dash was used to measure linear speed, the vertical jump, the height of the jump, peak anaerobic power in watts, and the power-to-body-mass ratio were used to assess power, and the modified T-test and the COD deficit were employed to measure COD speed. Independent samples T-tests demonstrated statistically significant differences between groups, and effect sizes were calculated. Coefficient of determination (COD) velocity, linear velocity, and power were all correlated with each other using Pearson's correlation coefficients, allowing regression equations to be derived. The 505, COD deficit, VJ height, PAPw, and P:BM of Division I athletes were all higher ($d = 1.09$-2.21). When compared to players from other divisions, those from Division II had a significant advantage in the MTT ($d = 1.51$). Both the COD deficit and the 505 linked with the 10-meter sprint and the vertical jump. These conclusions were backed up by the regression data. The strength of Division I athletes was on display in the 180° 505 assignments, where they also demonstrated superiority in the 505 and COD deficit. Lower-body strength and the ability to abruptly shift directions 180 degrees are two skills that Division II athletes should work on.

MATERIAL AND METHODS

This study set out to examine the relative benefits of water and land plyometrics for the development of young male basketball players. Twenty professional basketball and football players had pre- and post-tests of leg muscle strength, sprint speed, and dynamic balance before and after 8 weeks of aquatic or land plyometric training in a randomized, between-groups design.

Participants were randomly assigned to one of three groups: aquatic plyometric training, land plyometric training, or a control group. Table 1 summarizes the characteristics of the study individuals.

Table 1. Baseline physical characteristics. Data are means (±SD).

	APT (n=8)	LPT (n=6)	CON (n=6)
Age (y)	18±0.60	18.03±1.38	20.4±0.64
Body Mass (kg)	75.66 ±3.93	67.5±1	60.25±7.03
Height (cm)	180.28±4.58	182.41±7.24	175.33±4.67
Sport experience (y)	4.75±2.23	4±2.7	5.66±2.58

APT= aquatic plyometric training group. LPT= land plyometric training group. CON= control group.

Experimental design

Eight weeks of training at three sessions per week were completed by both groups. The experimental group engaged in mat and water-based lower-extremity plyometric workouts, whereas the control group did not. The participants kept up with their regular basketball workouts throughout the trial. Subjects were not allowed to employ weight training in conjunction with the plyometric training program and had not engaged in any kind of plyometric training in the prior six months. Every Saturday, Monday, and Wednesday for eight weeks, with a 48-hour break in between each workout. Plyometric training consisted of four separate activities, including ankle leaps, speed marching, squat jumps, and skipping, which the individuals in the plyometric groups really did. This investigation used a step loading training paradigm that included fatigue, adaptation, a leap, peak adaptation, and a decrease in load (Table 2). Group APT did their plyometrics from 3:30 to 5:30. In contrast, the LPT group engaged in plyometric training from 5:30 to 7:00. The aquatic plyometrics group practiced in the pool with around 70% of their bodies submerged in the water. The water in the pool was consistently heated to 27 or 28 degrees Celsius. A 3 cm thick mat was used for land plyometric training at the gymnastics club. The duration of each workout was 40 minutes. Every workout began with 5 minutes of jogging, followed by 5 minutes of stretching and ballistic exercises, and then 5 minutes of stretching motions to end the workout. Per session, 60 seconds of rest between sets and three minutes between each leap on provided enough recuperation. Subjects exercised at their utmost potential and capability throughout plyometric sessions.

Administration of the test and collection of data

After reading about the study in full, the participants signed a permission form indicating that they are participating in the study. Twenty participants were chosen at random and split between an experimental group that received three sessions of plyometric training per week for six weeks and a control group that received no training whatsoever during the same time period. After six weeks of training, each group was given a post-test to see whether or not there was a significant change in the players' speed, agility, and anaerobic power as a result of the program. Based on the findings of the following, we were able to accomplish the following research objectives: Mathematical dissection.

Table 2. Plyometric training protocol Plyometric drills and reps

Training Week	Ankle jump	Speed marching	Squat jump	Skipping drill	Sets	Total
Wk 1	15	8	8	8	3	117
Wk 2	17	9	9	9	3	132
Wk 3	19	10	10	10	3	147
Wk 4	22	11	11	11	3	165
Wk 5	17	9	9	9	3	132
Wk 6	19	10	10	10	3	147
Wk 7	22	11	11	11	3	165
Wk 8	25	12	12	12	3	183

Statistical analyses

Data are shown as means and standard deviations. Players in basketball were analyzed using SPSS version 16.0, whereas soccer players were analyzed with SPSS version 21. Researchers used one-way ANOVAs with repeated-measures, followed by Tukey post hoc testing, to determine whether or not there were statistically significant differences between the APT, LPT, and control groups. The significance threshold was established as $P \leq 0.05$.

DATA ANALYSIS

This research looked at how well participants did in strength, speed, and balance tests after 8 weeks of plyometric training in both water and on land. It was shown that APT led to greater gains in strength and sprint time compared to LPT. But the LPT group showed more progress in dynamic balancing than the APT group. There was no statistically significant difference between the APT and LPT groups, despite the fact that the APT group improved more on the 1RM leg press than the LPT group. Depending on the training stimulus and the specificity of the plyometric and weight training activities used, strength performance may increase with weight training and complex training. Only a few of studies have looked at how APT affects strength performance. Isokinetic strength testing was used to examine the effects of 8 weeks of aquatic and land plyometric training on peak torque production; the study was conducted by Robinson et al. Thirty-one college-aged women, with a mean age of 20.5, participated in the research. The swimming pool depth ranged from 4 to 4.5 feet, and the workouts were done three times a week for eight weeks, for a total of eight 50-minute sessions, with a minimum of 360 repetitions and a maximum of 630 repetitions. Both teams saw increases in peak torque, according to the research.

This study's findings supported the idea that combining land-based and aquatic plyometrics may boost sprint times. Training using plyometrics, which emphasizes the use of stretch-shortening cycles, has been linked to improvements in both 30- and 40-meter sprint times. Researchers found that the dynamic balancing test might be improved by LPT more so than by APT. Plyometric training and its influence on equilibrium is little studied. Consistent with previous research, the current findings suggest that plyometric exercise may enhance balance ability in adults and women. As this research shows, the reduced impact on the joints and the reduced weight-bearing stress on the legs during APT mean that proprioceptors are not being exploited to their full potential, and hence APT does not enhance dynamic balance more than LPT.

Statistics show that plyometric training makes a significant effect in the agility of soccer players. Due to the specificity of the physical traits needed for agility and the effectiveness of plyometric training to meet those demands, it is possible that the nature of these factors accounts for the dramatic gain in agility. The training plan was made in such a manner that it incorporated a variety of limb motions that challenged the players to rapidly overcome their own body weight using the extensor and flexor muscles of their legs. This allows the players to quickly change direction. The training improves the individuals' capacity to deliver force to the ball in a more balanced manner. Better cardiovascular and neuromuscular efficiency may be to thank for this massive improvement. Short bursts of high-intensity running require the runner to overcome their own body weight in order to keep up with the ball as it changes directions quickly and in unexpected ways. Plyometric training allowed these muscles to develop the cardiovascular-neuromuscular coordination, enhanced contractile force generating capability, and ability to sum the forces at numerous joints during whole-body motions with high intensity and quickness necessary for the game.

CONCLUSIONS

The current study's findings suggest that 8 weeks and 6 weeks plyometric training may improve young athletes' strength, speed, and balance performances in basketball and football, respectively. The APT may provide the ideal conditions for enhancing performance while reducing the likelihood of muscle, bone, and joint problems. More targeted activities to improve soccer players' linear speed might be included in the proposed training plan.

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