



## POTENTIAL OF HYPER-GRAVITY TRAINING TO IMPROVE SPORTS PERFORMANCE IN ENDURANCE ATHLETES

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### ABSTRACT

Professional athletes utilized modern methods like hyper-gravity training to improve their performance. In order to improve sports performance, hyper gravity (H.G.) tends to be the only countermeasure that may be utilised to stack or challenge bone, muscle, and the cardiovascular and vestibular systems. In hyper-gravity training, we use weighted vests as a form of wearable resistance that allows an overload to be evenly distributed near an individual's centre of mass, potentially increasing the ability to produce ground reaction forces and power production. Versatile reaction to preparing with high loads has both neurogenic and myogenic components. Hyper-gravity training has a beneficial effect on developing muscle strength, quickness at sprinting, balance, power, agility, and platelet function. Weighted vest training has shown excellent results, with athletes able to increase their performance by 10% after just three to ten weeks of training.

**Keywords:** Training, Athletes, Male, Groups, performance, Soccer

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## 1.INTRODUCTION

Among nonconventional power planning systems, heavenly outcomes have been attained with hyper-gravity (i.e., weighted vest) getting ready, where updates of 10% and, shockingly, more have been gotten in 3-to 10-week intercessions in contenders (Bosco et al., 1985). In addition, it is vital that the greater part of the recently referenced hyper-gravity interventions were driven on pre-arranged contenders, in whom reduced planning responses are typically not strange. Adding weighted vesthas shown find success in like manner in fixed and old age in longer involvements. Plus, balance upgrades have been represented in women with postmenopausal. The interventionswith fixed subjects have used added planning programs despite the weighted vests. Because of the valuable thought of the stacking, hyper-gravity planning might conceivably additionally foster

power planning, concerning further creating skill to jump (Rantalainen et al., 2012).

several examinations uncovered that Hyper-gravity further fosters the lower-body power (Barr et al., 2015) that can happen for the subjects of the ongoing survey which helped them during run running.

## 2. SEARCH STRATEGY

Search was performed at the beginning of feb,2024 on PubMed and google scholars' databases. A combination of keywords and medical subject headings including "Hyper-gravity training", "Resistance training", "weighted vest", "Sports performance", "Resistance training and sprinting speed", "Resistance training and Balance", "Resistance training and Agility", "Resistance training and Endurance". The affiliated information in this research project was attained from both review articles and clinical trials published from the year 2001-2024.

As Selection criterion, it was decided that articles involved in the research needed to describe at least 1 possible factor associated with the same. The articles which were written in English.

The search strategy identified 27 potentially relevant articles on PubMed and 38 on Google Scholar amounting to a total of 70 articles. After title and abstract review, only 29 articles were considered relevant and retained for analysis.

## 3.MECHANICS OF HYPER GRAVITY TRAINING

Hyper-gravity Preparing (HT) that delivers a vague persistent pressure, past the adjustment of the particularity of preparing pressure created by a regular preparation implies followed by a recuperation, expected to create further transformation to improve running speed (Ghosh et al.,2022). Versatile reaction to preparing with high loads has both neurogenic and myogenic parts. Improvement saw toward the start of preparing for hazardous power has been credited to a neurogenic element, while as the preparation proceeds myogenic reaction turns out to be more significant (Bosco et al.,1985) Simultaneously with the reduction in lumbar spinal firmness during HG, an expansion in lumbar muscle action and a levelling of the lumbar shape happened. The expansion in physiological interest with a weighted vest was far more noteworthy in males than females. To be sure, the expansion in VO<sub>2</sub> take-up, pulse, and energy consumption was each of the a few times more noteworthy with the weighted vest in men than females. Moreover, these progressions advanced a shift towards more noteworthy carb oxidation in men and a more prominent expansion in blood lactate, just saw in men. While proof proposes that lactate isn't a reason for exhaustion (Robergs, et al., 2004), it is regardless a decent sign of expanded glycolytic digestion and expanded physiological and metabolic pressure in men.

#### 4.RESULTS

The point of this study is to address the inquiry that, can capability of hyper-gravity preparing to further develop sports execution in perseverance competitors is successful. There are extremely restricted examinations zeroing in on the impacts of opposition preparing on solid strength in players. Notwithstanding, it is essential to explain the issue as far as deciding the connection among safe and non-safe plyometric preparing and adjusting the preparation program as per the outcomes. See table 4.1

**TABLE 4.1**

Author/s	Aim	No. Of Participants	Days/ Weeks	Interventions	Outcome Measures	Conclusion
Eric et al,2016	To find the effect of Hyper gravity training on Sprinting Speed and Shuttle run Performance.	9	Three Weeks	Hyper-gravity Training with Weighted Vest and Non- Hyper gravity training (NHT).	Power clean, Single counter movement jump, four continuous counter movement jumps, shuttle run, ground contact time	Enhanced short running task performance and ground contact time
Macadam et al, 2019	To find Acute and longitudinal effects of weighted vest training on sprint-running performance	113	Eight days to seven weeks	Vest loads used ranged from 5% to 40% BM	Acceleration phase, contact time, effect size, flight time, maximum velocity phase, step frequency, step length, stride frequency, stride length	weighted vest sprinting, contact and flight times were more affected by loading as opposed to step frequency and step length.
Freitas-Junior et al.2019	Effect of weight vests on the internal load in volleyball athletes	18	Six weeks	plyometric training with weight vests (PVG), technical-tactical training with weight vests	Session-RPE method	The use of weight vests with 7.5% body mass was not sufficient to cause differences in perceived Internal Training load therefore, Hyper-gravity training can be proved as a beneficial technique for improving sports performance.
Rahimi et al.2005	The effects of plyometric, weight and plyometric-weight training on anaerobic power and muscular strength	48	Six weeks	plyometric exercises	t-test Bonferroni post hoc test	time for running the 50 yards had decreased increase in the vertical jump height
Yang et al.2007	Effect of artificial gravity as potential countermeasure to microgravity	14	one week	Electromyographic Kinematics activities of selected joints and muscles	insole force sensors. Hip, knee and ankle angles were measured using electrogoniometers	HG squats can produce very high foot forces that are comparable to those produced during 10RM squats
Sidik 2022	The Improvement of Power Endurance and Aerobic through Interval Method by Using Vest Jackets	17	One week	resistance vest jacket	Bleep Test T test Multistage Hurdle Jump Test and aerobic test	increased power endurance and aerobic abilities
Ohsson-2020	Increased weight loading reduces body weight and body fat in obese subjects	72	Three weeks	Measurement of weight before and after the experiment	Fishers exact test T test U test Body mass index 8h use of the weight vest	High load treatment resulted in a more pronounced relative body weight loss compared

## 5.DISCUSSION

Performance on the physical plane is correlated with balance, agility, speed, and power. The majority of the time, HT training has been touted as an innovative way to enhance balance control. The traditional methods of implementing strength training involve either resistance training or plyometric training. In a 12-week period, improvements in jumping performance have been roughly 8%, but minimal developmental change in the performance. Hypergravity training has produced excellent results, with athletes seeing progressions of 10% and higher after three to six weeks of intervention. Moreover, trained athletes underwent hyper-gravity therapies. It has been demonstrated that weight-loaded vests are beneficial for both elderly and inactive people. Furthermore, following a weighted vest intervention, postmenopausal women have shown improved body control. In terms of improving leaping performance, hyper-gravity training compares positively to traditional power training due to the functional character of the loading (Rantalainen et al., 2012).

It was determined that the experimental subjects' improvement was due to their quick adaption to the high gravity field simulation. According to Eric et al. (2016), adaptation has reportedly taken place in both metabolic and neuromuscular systems. During the twelve-week sprint training intervention, both the hyper-gravity and non-hyper-gravity training groups (HGTG & NGTG) better than control group, both with and without the use of weighted vests. 2) However, in terms of sprinting speed, the HGTG outperformed the NGTG by a wide margin (Ghosh et al., 2022). Results showing an improvement in direction-changing ability are consistent with those who reported a notable improvement in direction-changing ability. Superior players of men group in the game of soccer were trained through ten weeks plyometric and short sprint training programme (Aloui et al., 2021). It was found that hyper-gravity training with appropriate capacity and strength improved both the jumping performance and the ability to change directions with weighted vest training. An additional advantage in terms of agility should be anticipated by athletes who play ball games. According to the literature currently in publication, wearing a 5-to 10% body weight vest during training sessions has been shown to enhance sports performance. However, overuse injuries have also been documented in female athletes (Rantalainen et al. 2012). Rugby players can improve their running speed and performance with just one week of HT training (Barr et al., 2015). However, it's crucial to realise that improving a player's sprinting speed requires a variety of modifications, including changing the type and length of their sports. But research shows that there isn't an increase in vertical force generation during training (Gleadhill et al., 2021).

## 6. CONCLUSION

Effect on various components has been absorbed, it is evident that variation in neuromuscular functions and in metabolic processes has been seen that lead to increase in muscle strength. As the load externally is added on the body of the players, the required force for the initiation and execution of a movement increases due to the increased gravity condition of the players on the earth's surface which increases sprinting speed of athletes. Results of improved agility are reported, enhancement in change of direction ability after loaded and unloaded plyometric and short sprint training were observed, improved jump performance is caused by neural factors such as intermuscular coordination and more motor unit allotment. Furthermore, use of extra weight during jumping allowed players to apply more force against gravity. This mechanical adjustment generates higher force which increases muscle power. Hence weighted vest seems to be very effective in sports training,

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