

SIKORSKI, Piotr, MALINOWSKI, Piotr, KOPCZYŃSKA, Urszula, KOPCZYŃSKI, Cezary, GURDAK, Kinga, DYDYK, Martyna, DYREK, Martyna, BŁASZCZAK, Ewa, WÓJCIK, Jakub and PARTYKA, Aleksandra. Unlocking Strength: The Powerful Impact of Ashwagandha (*Withania somnifera*) Supplementation on Resistance Training. *Journal of Education, Health and Sport*. 2024;68:50452. eISSN 2391-8306.

<https://dx.doi.org/10.12775/JEHS.2024.68.50452>

<https://apcz.umk.pl/JEHS/article/view/50452>

The journal has had 40 points in Minister of Science and Higher Education of Poland parametric evaluation. Annex to the announcement of the Minister of Education and Science of 05.01.2024 No. 32318. Has a Journal's Unique Identifier: 201159. Scientific disciplines assigned: Physical culture sciences (Field of medical and health sciences); Health Sciences (Field of medical and health sciences).

Punkty Ministerialne 40 punktów. Załącznik do komunikatu Ministra Nauki i Szkolnictwa Wyższego z dnia 05.01.2024 Lp. 32318. Posiada Unikatowy Identyfikator Czasopisma: 201159. Przypisane dyscypliny naukowe: Nauki o kulturze fizycznej (Dziedzina nauk medycznych i nauk o zdrowiu); Nauki o zdrowiu (Dziedzina nauk medycznych i nauk o zdrowiu). © The Authors 2024;

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The authors declare that there is no conflict of interests regarding the publication of this paper.

Received: 22.04.2024. Revised: 10.05.2024. Accepted: 14.05.2024. Published: 16.05.2024.

Unlocking Strength: The Powerful Impact of Ashwagandha (*Withania somnifera*) Supplementation on Resistance Training

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Abstract

Withania somnifera, commonly known as ashwagandha, has gained popularity in recent years among individuals interested in healthy lifestyles, natural medicine, and sports. This review aims to summarize the current knowledge regarding the effects of ashwagandha supplementation on various aspects of physical performance, particularly in the context of resistance training. Studies have shown that ashwagandha can positively impact muscle strength, with significant increase of muscle force and power output. Additionally, it has demonstrated potential in modulating body composition, with reduction of body fat percentage noted in certain populations. However, results of studies on ashwagandha's effect on muscle size remain inconclusive and may depend on various factors such as training status and individual responses. In terms of endurance, ashwagandha supplementation has been associated with improvement in maximal oxygen uptake, indicating enhanced aerobic capacity and delayed exhaustion during endurance activities. Furthermore, ashwagandha was shown to aid muscle recovery by reducing exercise-induced muscle damage and inflammatory

response, potentially accelerating the muscle regeneration process. Ashwagandha may also influence hormone levels, such as testosterone and cortisol, with potential implications for muscle growth and recovery. However, further research is needed to fully understand the mechanisms underlying these effects. Overall, ashwagandha supplementation appears to hold promise for enhancing physical performance and overall well-being. Further research is needed to elucidate optimal dosages, long-term safety, and potential interactions with other supplements or medications.

Keywords: ashwagandha, *Withania somnifera*, supplementation, resistance training, muscle strength

Introduction

Supplementation with *Withania somnifera* (*WS*), commonly known as ashwagandha, has gained popularity in recent years, especially among individuals interested in healthy lifestyles, natural medicine, and sports. Ashwagandha, also known as “Indian ginseng” or “Winter cherry” is a plant with a long history of use in Ayurveda, traditional Indian medicine, dating back thousands of years (1, 2). The biological properties of ashwagandha are attributed to a variety of natural ingredients, such as steroidal lactones called withanolides (3), and withanolide glycosides known as withanoides (4, 5). Additionally, it contains alkaloids, steroids, salts, flavonoids, and nitrogen-containing compounds. The biologically active substances have varying concentrations in different parts of the plant, but the most used part of ashwagandha is the root (6, 7).

For this reason, promising research is being conducted on the anti-inflammatory, anti-microbial, anti-stress, anti-diabetic, anti-ischemic, anti-hypoxic, anti-Alzheimer, antiparkinson, cardioprotective, hepatoprotective, neuroprotective, immunomodulating and adaptogenic properties of *WS* (3, 8). Due to its potential benefits for athletes, *WS* supplementation may appear intriguing in strength sports.

This review aims to summarize the current knowledge regarding the effects of ashwagandha supplementation on muscle strength, body composition, endurance, muscle recovery, hormone levels, and safety, particularly in the context of resistance training.

Impact on muscle strength

Ashwagandha has been shown to impact muscle strength, as demonstrated in a study involving 58 healthy and young male participants with little experience in strength sports. Supplementation with 300 mg of ashwagandha root extract twice daily resulted in a significantly greater increase in muscle strength in the treatment group, measured as the 1 repetition maximum of bench press and leg extension, compared to the control group receiving a placebo (9). It has also been demonstrated that high-dosage supplementation with *WS* alone, without engaging in physical exercise, can increase muscle force. In a study by Raut et al., a statistically significant increase in quadriceps strength and back extensor strength was observed after 30 days of using the supplement (10). Another clinical study, utilizing the Kinematic Measuring System (KMS)TM, assessed the average absolute power of the lower limbs during the execution of 10 vertical jumps. Following 8 weeks of supplementation with *WS*, without additional physical exercises, a statistically significant increase was observed (11).

Impact on body composition

In a study comparing the effects of ashwagandha supplementation with placebo in individuals with limited experience in strength training, a difference in body composition was observed in both groups after 8 weeks of the prescribed training regimen. However, a greater reduction in body fat percentage was noted in individuals who received ashwagandha (9). In another study, which also compared the effects of ashwagandha with placebo in a group of sportsmen (cyclists), no significant difference was observed (12).

Another study compared two groups of subjects participating in the training program during the study – no difference in muscle size gain was observed between individuals in the group supplementing *WS* and those receiving a placebo (13). Assessing the influence of *WS* on changes in body composition can be difficult and may depend on various factors such as diet, workout intensity, health conditions, and individual responses. Therefore, further research is warranted to fully explore the effects of *WS* supplementation on body composition and muscle gain.

Impact on endurance

Maximal oxygen uptake (VO_2 max) is a measure of the body's ability to uptake oxygen and utilize it during intense physical activity. A higher VO_2 max typically indicates better aerobic endurance and physical fitness (14, 15). In a randomized control trial, it was proven that *WS* enhances VO_2 max as well as the quality of life in young athletes, without any significant adverse effects (16). In a study conducted on cyclists, who perform an endurance sport, it was found that supplementation of ashwagandha increased the VO_2 max and delayed athlete exhaustion during treadmill running (17). This was also confirmed in a meta-analysis from 2020 (18).

Impact on muscle recovery

Another benefit of ashwagandha supplementation is a significant decrease in exercise-induced muscle damage, as evidenced by the stabilization of serum creatine kinase levels (9). It was observed that supplementation of ashwagandha during resistance training helped reduce the levels of inflammatory markers such as tumor necrosis factor alpha (TNF- α) and Interleukin 6 (IL-6) but without statistical significance (19). The immunomodulatory effects of *WS* have also been described in diseases such as viral infections, diabetes mellitus, kidney dysfunction, liver injury, arthritis, and more (20). This suggests that ashwagandha may counteract excessive inflammation in muscles after training, thereby accelerating the muscle regeneration process (9). Furthermore, it was found that active ingredients, including withanolides, present in the extract of ashwagandha root, can stimulate the differentiation of muscle cells. It has been suggested that this process may have a positive impact on muscle regeneration after training by accelerating muscle tissue repair and growth (21). A study on *WS* supplementation and Delayed Onset Muscle Soreness has also been published. It demonstrated that ashwagandha enabled the preservation of peak power after prior intense training. However, the study's limitations indicated that it is unclear what is the cause of this phenomenon - whether it is a reduction in pain symptoms or the influence of *WS* supplementation on muscle strength (22).

Impact on hormone level modulation

Testosterone, dehydroepiandrosterone sulfate (DHEA-S), cortisol, insulin, and growth hormone play a crucial role in the adaptation of the body to strength training. Appropriate

levels of these hormones are essential for muscle building and maintenance, as well as recovery after training.

Supplementation of ashwagandha increases the concentration of testosterone and DHEA-S, as observed in aging males. Despite this, in a study by Lopresti et al., no influence of *WS* supplementation on cortisol or estradiol serum levels was observed (23). On the other hand, in another study conducted on a younger population of women and men, a reduction in both cortisol and DHEA-S levels was reported (24). Several other clinical trials, particularly those focused on reducing stress, also support the findings that *WS* supplementation can lead to a decrease in cortisol serum levels (25, 26, 27). A positive influence on sleep quality and total testosterone levels has also been reported (28, 29). The previously cited study by Lopresti et al. also demonstrated a positive effect on testosterone levels, but only in men (24). All these hormonal changes may lead to an increased metabolism and consequently, gain in muscle mass and strength.

Safety

It is considered that supplementation with ashwagandha is relatively safe. In a study where participants received a supplement containing 300 mg of *WS* root extract twice daily for 8 weeks, no adverse effects or abnormalities in basic vital signs, haematological parameters, or biochemical parameters were observed (19). Also, during another study where the same dose was administered for 10 weeks, no side effects were observed (30), as well as in a study using a dosage of 1000 mg per day (5). A study conducted on rats revealed that the administration of very high doses, up to 2000 mg/kg/day, to pregnant rats did not adversely affect the health of either the mother or the fetus (31). Only in one clinical trial, one participant reported experiencing increased libido, heightened appetite, and hallucinations accompanied by dizziness while consuming a dosage of 750 mg per day (10). Also, a case report published by Fry et al. suggested the possibility of transient adrenal insufficiency resulting from *WS* supplementation (32).

Conclusions

In conclusion, ashwagandha shows promising potential for enhancing health and fitness. Its historical use in traditional medicine aligns with contemporary research highlighting its benefits in various areas. Ashwagandha offers promise as a natural supplement for improving

physical performance and overall well-being, but careful consideration and monitoring are necessary for its effective and safe use.

Authors' Contributions: Conceptualization, P.S. and P.M.; Literature review, P.S., P.M. and U.K.; Writing – Abstract, P.S., C.K. and E.B.; Writing – Impact on muscle strength, P.S. and K.G.; Writing – Impact on body composition, J.W. and M.Dyr.; Writing – Impact on endurance, M.Dyd. and C.K.; Writing – Impact on muscle recovery, P.M. and U.K.; Writing – Impact on hormone level modulation, P.S. and A.P.; Writing – Safety and Conclusions, C.K. and E.B.; Editing and reviewing, P.S., P.M. and U.K.

All authors have read and agreed with the published version of the manuscript.

Funding Statement: This research received no external funding.

Conflict of Interest Statement: The authors declare no conflict of interest.

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