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| RESEARCH ARTICLE

Muscle Mass and Fat Reduction: Do Creatine and Whey Protein Supplementation Improve Fitness and Strength in Older Males?

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| ABSTRACT

Muscle loss during aging known as sarcopenia is the steady loss of muscle mass, consequent strength and related functioning, which commonly affects seniors in the population, potentially reducing the ability to perform daily tasks. It is progressively restrictive in physiological functioning, and supplementation with creatine and whey protein has become viewed as an intervention to minimize or reverse the loss. Creatine and whey protein have emerged as promising interventions for addressing muscle loss, especially when combined with consistency in training. This review study explores the synergistic impact of creatine and whey protein supplementation, combined with resistance training, on improving muscle mass, strength and fat loss, and overall physical performance in older males aged 50 to 75. The review studies the accompanying benefits, including psychological resilience, improved mood, and enhanced quality of life. The study aimed to synthesize evidence on the efficacy of creatine and whey protein in enhancing muscle hypertrophy and strength. It also aimed to evaluate optimal supplementation approaches, and identify gaps in current research, including long-term safety and adherence.The scope of this review study focused on analyzing peer-reviewed studies, systematic reviews, and clinical trials from PubMed, Scopus, and Google Scholar, using key terms that included creatine supplementation, whey protein, older adults, and resistance training. The review included individuals aged 50 to 75 and examined the effect of creatine and/or whey protein on muscle atrophy and hypertrophy, strength, fat loss, and psychological well-being. Studies without physical or psychological outcomes, or involving a younger population below 50 years were excluded. The research found that supplements of whey protein and creatine, when combined with resistance training, increased muscular hypertrophy, exercise endurance, and recovery. Whey protein contains leucine, which enhances muscle mass, while creatine boosts the intramuscular content of adenosine triphosphate to support recovery and function. Post-exercise supplementation was found to be better than pre-exercise supplementation. Some studies showed variable gains in muscles for older individuals, and were influenced by baseline protein diet or comorbidities. Supplementation also improved mental health by reducing anxiety and improving sleep and self-esteem. Supplementation with exposure to the sun also improved circadian rhythm and vitamin D synthesis, and mood stabilization. In spite of safety considerations, such as renal strain and gastrointestinal issues, evidence supports general safety when the recommended dosage is used. This review demonstrates that creatine and whey protein when combined with consistent training can reduce age-related physical decline and improve overall wellness in the older population. The review study shows significant findings in key areas of scientific literature that pertain to understanding adherence, optimal dosing, and psychological outcomes across diverse populations. Focusing on these key areas can help to refine supplementation guidelines that are beneficial for the aging demographic.

| KEYWORDS

Creatine, Whey Protein, Muscle Loss, Muscle Hypertrophy, Aging Process, Resistance Training, and Psychological Outcomes

| ARTICLE INFORMATION

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Introduction: Context and Relevance

Various studies have assessed the effects of creatine and whey protein supplementation on body composition and other associated health outcomes, revealing the interplay between supplementation, exercise, and daily living activities. Al-Sofiane et al. (2019)

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indicate that changes in body composition are of relevance for aged individuals because they affect their day-to-day performance and influence other health-related factors. The analysis of creatine and whey proteins as supplements for enhancing muscle strength and mass has received remarkable attention, with most studies focusing on their role in promoting protein synthesis during acute exercise stimulus, especially resistance training. Research shows that when combined with resistance training, creatine and whey protein supplements improve muscle strength and mass, and they are more impactful when used before and after training (Zahabi et al., 2020; Antonio & Ciccone, 2013). Additionally, research has found improvements among older people beyond the physical, namely enhancing mental health and quality of life. (Candow et al., 2023). This review investigates whether creatine and whey protein supplementation, combined with resistance training, significantly improves muscle mass, strength, and overall physical performance among older males. The analysis of previous literature shows that the combination of creatine, whey protein, and resistance training is associated with enhanced muscle strength and mass, improved endurance performance, and heightened physiological and psychological aspects among males aged 50 to 75.

Methodology:

This study systematically reviews the scientific literature, charting the effect of creatine and whey protein supplementation on muscle power, muscle bulk, and fat loss in men aged 50 to 75. Focused reviews can provide answers to wider research questions, collate the findings, and uncover overlying patterns and gaps in the extant state of knowledge aimed at providing a coherent comprehensive overview of the topics of interest. The review process included analysis of peer-reviewed articles, systematic reviews, and clinical trials in scientific journals, particularly those that engaged older adults (50 to 75 years) and tested the effects of creatine and/or whey protein supplementation. The inclusion criteria were: (i) older adults (50 to 75 years), (ii) examining the effects of creatine and/or whey protein supplementation, (iii) examining muscle hypertrophy, strength, or endurance performance, and (iv) articles on the psychological and social impact of supplementation. Studies that employed individuals under 50 years old, non-peer-reviewed articles, and those that measured no physical or psychological effect were excluded. The systematic literature search was conducted from PubMed, Scopus, and Google Scholar, with combinations of keywords including, but not limited to, creatine supplementation, whey protein, older adults, resistance training, muscle mass, and fat loss. Relevant articles were filtered, and data on supplementation regimens, physical and psychological measures, and interaction between exercise and supplementation were abstracted. The review emerged with patterns across the literature, gaps in current knowledge, and areas where further research is required to unlock the potential of creatine and whey protein supplementing to further improve health outcomes in older adults.

Results:

Current Perspectives on Whey Protein Supplementation and Muscle Mass

Whey protein is taken as an optimum source of protein for humans because of its greater bioavailability, solubility, and concentration of branched-chain amino acids (BCAA). Whey is also a high source of protein because it has enhanced leucine, which is associated with muscle protein synthesis (MPS) and reduction in muscle protein breakdown at rest and after exercise (Eliot et al., 2008). In young, well-trained individuals, consuming 25g of whey protein effectively sustained exercise-induced muscle protein synthesis (MPS rates for 3 to 5 hours following intense exercise). This dosage proved optimal for promoting a more favorable post-exercise anabolic response (Naclerio & Seijo, 2019). Whey protein's ability to stimulate MPS has led to its recognition as stimulating muscle mass in older adults. Recent research has shown that the presence of high leucine content makes whey protein stimulate muscle hypertrophy when combined with resistance exercise training (RET) (Naclerio & Seijo, 2019). For instance, a randomized controlled trial indicates that whey protein supplementation combined with RET significantly enhances skeletal muscle mass and strength and prevents sarcopenia in healthy older individuals (Mori & Tokuda, 2018). The participants who combined whey protein with RET gained about 5% muscle mass on average (Mori & Tokuda, 2018). However, a systematic review indicates that older adults exhibited an enhanced uptake of total protein ingestion, with an average rise in plasma leucine levels from 406 μmol/L to 490 μmol/L, along with increased MPS. Despite these changes, there was no significant improvement in muscle mass or strength (Colonetti et al., 2017). Thus, studies have shown that taking whey supplements pre- and post-resistance training exercises can improve muscle mass in older people.

Optimal absorption of whey protein to fully exploit these benefits depends on the dosage and timing. Larger changes in muscle mass are observed when daily protein intake exceeds >0.4 grams per kilogram of body weight. A single post-exercise dose of ~0.24 grams per kilogram of body weight is sufficient to maximally stimulate MPS (Naclerio & Seijo, 2019). Clinical trials confirmed the benefits of whey protein supplementation during RET and demonstrated that whey protein combined with resistance training produces increased handgrip strength and skeletal muscle mass than RET alone or RET combined with placebo supplementation (Mori & Tokuda, 2018). Whey protein applications may be optimized by combining this supplement with other nutrients. The combination of whey protein and creatine may have some potential to help combat sarcopenia and improve muscle health in older adult populations (Elstad et al., 2023). However, Eliot et al. (2008) analyzed changes in body composition of men aged 48 to 75 years after supplementing protein intake with whey and creatine, and a combination of the two products, and they found no significant changes in free-fat mass gained. The authors argued that the lack of changes could have been attributed to a lower

rate of protein synthesis. Overall, existing research demonstrates that optimal ingestion of whey protein combined with resistance training stimulates MPS.

Advantages and Disadvantages of Creatine Supplementation as a Regular Part of Fitness and Exercise Program

The widespread acceptance of the effect of creatine supplementation in workout programs and exercise is attributed to its clear benefits to muscle performance and recovery. By nature, creatine is produced within the body's tissues, especially the muscles, and thus, it is essential in energy production at the cellular level as it replenishes intramuscular adenosine triphosphate (ATP) during periods of high activity (Hall & Trojian, 2013). This energy production pathway means improved strength, endurance, and quick recovery from workouts. This view is supported by studies indicating that increased energy availability due to creatine supplementation enhances resistance training and high-intensity sports performance (Kreider et al., 2017). The benefits of regular intake of creatine include the fact that supplementation alone improves strength and muscle mass gains, especially during resistance training. This change extends across dissimilar demographics, such as older adults, among whom creatine enhances muscle function and physical performance by blunting losses in lean body mass associated with aging (Candow et al., 2019). Further, creatine assists in faster recovery due to a reduction in muscle damage and inflammation after a workout; hence, it would benefit both athletes and people in the fitness fraternity (Wax et al., 2021). However, Hall and Trojian (2013) highlight conflicting studies demonstrating a lack of any gain with creatine supplementation. Other research shows that there is little evidence that creatine increases muscle mass for people older than 65 (Antonio et al., 2021). Backx et al. (2017) also found that creatine did not increase muscle mass after a short period of leg immobilization. Despite the contradictory results, most studies demonstrate creatine supplementation's ability to promote muscle performance and increase mass.

However, the effectiveness of creatine, like whey protein, also depends on the supplementation strategy employed. Wax et al. (2021) indicate that the primary supplementation strategy involves starting with a loading phase, which involves consuming four separate 5g doses a day of creatine for five consecutive days to increase creatine content in the muscles from 20% to 40%, then followed by a maintenance dose of 0.03g/kg to maintain creatine store elevation. Although some studies suggest that the loading phase may not be required, this approach remains the most used in practice. Creatine supplementation has also been associated with adverse effects. For instance, taking a high amount of creatine supplementation has been linked to water retention, increased weight gain, and minor gastrointestinal complaints (Hall & Trojian, 2013). Prolonged use of creatine damages the liver and kidneys, suggesting that individuals who have conditions affecting the kidneys should be more cautious and consult healthcare professionals before adding creatine use to their regimen (Wax et al., 2021). Since creatine has proved to be nontoxic for a healthy individual when taken at recommended dosages, most studies regarding its long-term effects among individuals with specific diseases remain scanty (Almeida et al., 2022). Thus, even though creatine supplementation offers various benefits in terms of strength, endurance, and recovery during exercise, the user should also consider its adverse implications and their physiological status to guarantee its safety and effectiveness.

Sports Nutrition Perspectives on the Effects of Protein Supplementation in Men Aged 50 to 75 Years

Protein supplementation has gained considerable attention as an effective strategy to support health and physical performance in men aged 50 to 75. This demographic experiences unique nutritional needs due to age-related metabolic changes, including reduced efficiency of MPS and the natural decline in lean muscle mass known as sarcopenia (Granic et al., 2019). Therefore, older adults need protein more than younger individuals to maintain muscle health and overall functionality. However, it is not always easy to meet these increased protein needs through dietary intake alone, considering factors such as diminished appetite, nutritional constraints, limited access to high-quality protein sources, or poor MPS due to a decrease in testosterone and myosin heavy chain protein synthesis (Bauer et al., 2013; Hall & Trojian, 2013). There is evidence of the effectiveness of protein supplementation, combined with regular exercise, especially resistance training, in synergistically supporting older adults in maintaining their muscle mass.

A combination of resistance training and supplementation shows superior benefits for older people. Previous studies demonstrate that combining resistance training with post-exercise supplementation promotes greater muscle mass and strength gain than exercise alone (Jäger et al., 2017). Studies on whey protein supplements and creatine supplements, such as the one by Antonio and Ciccone (2013), reveal that supplementation with creatine post-workout is more beneficial in comparison to pre-workout supplementation concerning free-fat mass (FFM) and fat mass. Creatine benefits individuals at this stage because of its ability to increase muscle fiber size, enhance myosin heavy chain protein synthesis, activate satellite cells, and increase the concentration of ATP and phosphocreatine (Antonio & Ciccone, 2013). Moreover, a comparison of different protein sources reveals that whey protein is preferable for supplementation because of its high leucine content and rapid absorption rate and is particularly effective in stimulating MPS in this age group (Mori & Tokuda, 2018). Other protein sources, like casein and plant-based protein, may be used for supplementation but have some weaknesses. Caseins are digested slowly and plant-based protein must be consumed in adequate quantities and requires a combination of different sources to achieve a complete amino acid profile (Moore et al., 2015). Therefore, adults aged 50 to 75 may require creatine to enhance muscle performance and protein digestion and whey protein to stimulate MPS, leading to increased FFM.

Despite the benefits of creatine and whey protein, such as growth in muscle mass for individuals aged 50 to 75 years, effective protein supplementation remains a problem. For instance, it is crucial to recognize that dietary habits influence supplementation efficacy. Ten Haaf et al. (2018) note that participants among nonfragile, community-dwelling older adults who already consume adequate protein may not significantly improve muscle mass or strength. Conversely, those with inadequate dietary protein may experience more pronounced benefits from supplementation. Moreover, the economic status of individuals also influences the impact of supplementation, as it can enhance or impede access to a quality supplement. Cultural attitudes and misbeliefs toward supplementation may also hinder or encourage their intake. For instance, residence in a rural setting presents the challenge of access to supplements. In such cases, there is a need to educate and offer affordability initiatives by providing distribution networks and facilitating the delivery of supplementation among this demographic (Phillips, 2017). It is widely accepted that protein supplementation is a worthy instrument in addressing the nutritional and fitness requirements of men aged 50 to 75, particularly where resistance training is involved.

Effects of Pre- Verses Post-Workout Supplementation of Creatine Monohydrate on Body Composition and Strength

Both pre- and post-exercise supplementation have better outcomes in increasing body composition and strength. A comparison between pre- and post-exercise supplementation suggests that post-exercise supplementation may provide a slight advantage in promoting greater increases in muscle mass and strength, possibly because of the increased sensitization of muscle toward nutrients post-exercise, which could increase creatine uptake (Antonio & Ciccone, 2013). Nevertheless, pre-exercise supplementation also improves performance during brief high-intensity exercise sessions by promoting the availability of immediate energy (Candow et al., 2019). Regardless of timing, regular supplementation with a standard dose of 3-6g/day appears effective, while splitting doses throughout the day can help minimize potential side effects such as gastrointestinal discomfort (Hall & Trojian, 2013; Kreider et al., 2017). Consequently, creatine intake is associated with improved muscle strength and muscle mass, and it is slightly more effective when taken post-exercise.

The effects of stopping creatine supplementation are another essential consideration when using creatine for muscle strength improvement. Previous research reveals that individuals who have stopped using creatine abruptly may experience a gradual decline in creatine stores, which is associated with a reduction in muscle hydration and a slight decrease in strength and endurance performance (Australian Institute of Sport, 2021). Kreider et al. (2017) also indicate that no evidence shows that stopping using creatine leads to reduced endogenous creatine production or its long-term suppression. An evaluation of creatine cessation with reduced-volume training revealed no significant change in strength and lean tissue mass, but it showed a considerable reduction in muscle endurance (Australian Institute of Sport, 2021). This retention of muscle strength and mass shows that creatine acts as an adjunct instead of a standalone solution for muscle development. For the aging population, long-term use of creatine is associated with benefits such as counteracting age-related muscle loss and improving functional capacity, especially when combined with protein supplementation and resistance training. Although cessation of creatine use is associated with a slight decrease in benefits, its long-time use is considered safe and effective when combined with resistance training (Candow et al., 2021). Therefore, continuous creatine intake as part of an ongoing fitness program can help sustain muscle health and quality of life in the aging population.

Benefits and Impact on Daily Living Activities, Spiritual, and Social Well-Being

The use of creatine and whey protein supplements has been found to promote muscle mass, muscle strength, and endurance performance, especially when combined with resistance training. The synergistic impact of both supplements and the lack of significant side effects reflect a positive impact on the performance of daily activities, as well as spiritual and social well-being. Regarding emotional and mental health, studies demonstrate that improvement in fitness and strength among older adults has profound psychological benefits, such as enhanced confidence and self-esteem and reduced anxiety and depression. Specifically, Mahindru et al. (2023) note that regular exercise is associated with better sleep, reduced depression and anxiety in both clinical and non-clinical patients, improved mood and quality of life, managed cravings, and decreased psychotic symptoms. Additionally, research has revealed that creatine use can support cognitive health and improve memory processing speed, and overall brain function, whereas whey protein is linked to both negative and positive health benefits, such as liver and kidney damage, change in digestive microbiota, impact on bone mass, and behavioral and emotional changes (Candow et al., 2023; Cava et al., 2024). Therefore, supplementation and fitness programs have both physiological and psychological impacts on older people.

Notably, although creatine and whey protein have shown significant benefits, they also come with some problems, including kidney and liver function and gastrointestinal health. Candow et al. (2019) found that although creatine has no adverse impact on liver and kidney functions, people with kidney problems should use it cautiously and consult a physician when starting supplementation. However, some users have reported experiencing gastrointestinal discomfort, such as bloating and diarrhea, when consuming high doses. As a result, it is advisable to adhere to recommended dosages or divide daily intake into smaller doses (Candow et al., 2019). Moreover, Cava et al. (2024) arrived at a similar conclusion, which suggests taking caution with protein intake in case of hepatic

and renal compromise. Therefore, creatine and whey protein benefit older people, but they should be used cautiously by people with hepatic and renal problems.

Notable physical and physiological impacts consist in increased muscle mass and strength, which lead to higher energy levels, enhanced endurance, and improved daily functioning. The supplementation of whey protein, creatine, and regular training among older men aged 50 to 75 reduces the risk of falls and injuries and enhances balance, bone density, and muscle integrity, which are essential factors for maintaining independence during aging (Mo, 2024). In addition, fitness programs with supplementation foster spiritual and social well-being because participating in structured exercise routines improves an individual's quality of life by promoting a sense of purpose. These fitness programs provide opportunities for social interaction, leading to community connection and reduction in feelings of isolation. Exercise and supplementation contribute to holistic health by addressing the interconnectedness of body, mind, and spirit. Therefore, the benefits of fitness and creatine supplementation extend well beyond strength and endurance, positively impacting emotional, mental, physical, spiritual, and social domains.

Additionally, intentional exposure to sunlight enhances physical and mental well-being by complementing the effect of exercise and supplementation. For example, exposure to sunlight triggers the production of serotonin, a neurotransmitter that is positively associated with reduced depression and anxiety levels. Improvements in moods among older people enhance their energy levels, promote more engagement in daily activities, and improve overall quality of life (Taniguchi et al., 2022). Further, exposure to natural light, especially when performing outdoor activities, increases vitamin D levels in the body, which positively enhances overall well-being, especially when addressing chronic conditions such as cancer, although measures should be taken to protect individuals from skin burns and related conditions (Raymond-Lezman & Riskin, 2023). Intentional exposure to sunlight enhances mood, reduces depression and anxiety and increases vitamin D levels.

Exposure to sunlight also plays a crucial role in regulating circadian rhythms, an internal clock that controls sleep-wake cycles. Proper alignment of circadian rhythms is essential for optimal physical and mental health and critical for individuals engaging in physical exercises (Figueiro & Pedler, 2023). Studies show that when individuals are exposed to sunlight, especially in the morning, they can synchronize these rhythms, thereby improving their sleep and cognitive function, and enhancing emotional stability (Burns et al., 2021). On the contrary, disruption of circadian rhythms is associated with depression and metabolic disorders. Therefore, exposure to sunlight is linked to healthy circadian rhythms which improves physical and mental health providing a connection between sunlight and enhanced overall well-being (Figueiro & Pedler, 2023). The evidence shows that incorporating sunlight into daily routines, exercise, and supplementation offers holistic health that promotes physical vitality, emotional resilience, and social connectivity. The combination ensures quality of life across all domains, including physical, mental, spiritual, and social.

Discussion and Conclusion:

Supplementation with whey protein and creatine has become a significant strategy for overcoming the specific physical and metabolic challenges of men in the 50- to 75-year age group. The range of studies reviewed indicates that whey protein promotes MPS, muscle mass, and recovery when combined with resistance training. The high leucine content and fast digestion rate associated with whey protein is advantageous, particularly for older adults who face typical age-related decline in muscle mass and strength. On the other hand, creatine supplementation has also been shown to increase strength, muscle mass, cognitive function, and functional capacity. As a result, it represents a valuable intervention for ensuring continued independence and quality of life among aging populations. However, significant gaps in the literature remain. Although the short- and medium-term benefits of whey protein and creatine supplementation are well documented, very few studies have investigated the long-term effects of such dietary strategies on physical and cognitive health and overall health outcomes in older adults. Consequently, several questions remain unanswered regarding the potential cumulative impact of long-term supplementation, including safety, adherence, and maintenance of benefits post-intervention.

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