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Independent and combined effects of caffeine and creatine on sprinting performance: a systematic review

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ADMINISTRATIVE INFORMATION

Support - LR22A020002,2022Z196, ZKKY2023001, No.2023001, No.2022-F15, No.2022-F22, 2022J065.

Review Stage at time of this submission - Data analysis.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202520050

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 9 February 2025 and was last updated on 9 February 2025.

INTRODUCTION

Review question / Objective This study aims to systematically assess the effects of caffeine, creatine, and their combined use on sprinting performance in track and field athletes, with a focus on potential sex-based differences in supplement response. The target population includes sprint athletes, with interventions involving caffeine supplementation, creatine supplementation, and a combination of both. A comprehensive search of databases such as Web of Science, PubMed, and Scopus yielded 18 studies that met the inclusion criteria. The results suggest that caffeine enhances sprint performance by activating the central nervous system, leading to improved reaction time, especially during the initial and acceleration phases of a sprint. Creatine, on the other hand, supports explosive power and stamina by increasing muscle phosphocreatine reserves. Both caffeine and creatine supplementation can significantly improve sprinting performance when used in appropriate dosages and at the correct timing. The effectiveness of these supplements is influenced by individual physiological variations, dosage, and timing.

Condition being studied This study aims to evaluate the effects of caffeine, creatine and their combination on the performance of sprinting in track and field through a systematic review. The study focuses on exploring the potential influence of gender differences on the responses to supplements. The target population of the study includes sprinters, and the intervention measures include caffeine supplementation, creatine supplementation, and their combination.

METHODS

Participant or population Healthy subjects.

Intervention Caffeine and creatine supplementation and their combined use.

Comparator Caffeine, creatine supplementation and their combined use, the three are compared with each other.

Study designs to be included The studies were of a randomized controlled design and included a placebo group to compare the effects of caffeine or creatine with those of a placebo.

Eligibility criteria The inclusion criteria for this systematic review were as follows:(1) only studies published in English were included; (2)the studies examined the effects of caffeine or creatine, and in combination, on sprinting performance; (3) the studies were of a randomized controlled design and included a placebo group to compare the effects of caffeine or creatine with those of a placebo; (4) the specific dose of caffeine or creatine was explicitly reported in the studies; (5) studies addressing the effects of caffeine and creatine supplementation on sprinting performance; (6) the study was published between January 1, 2000, and November 1, 2024; and (7) supplement ingestion was performed before testing. Studies that met the preliminary inclusion criteria were imported into EndNote 21.4 (Clarivate Analytics, New York, NY, USA). The full texts of all the studies were reviewed to identify and remove duplicates. The literature search was conducted independently by two authors (B.X. and [second author]) and included only English-language studies. Disagreements during the screening were resolved through discussion.

Information sources The Web of Science, PubMed, and Scopus databases were used to collect literature published between January 1, 2000, and November 1, 2024. The following combinations of keywords were used to search the databases: running, caffeine, creatine and athletic performance.

Main outcome(s) The effects of caffeine and creatine supplementation on sprint performance are influenced by several factors including dosage, timing, and individual variability. When properly supplemented, both caffeine and creatine effectively enhance sprint performance. Research indicates that men may experience more pronounced benefits from creatine supplementation, whereas women generally show greater improvements with caffeine supplementation. For caffeine, the recommended dosage is 6 mg/kg of body weight, while creatine supplementation typically begins with a 20-gram loading phase followed by a maintenance phase of 3–5 g per day.

Quality assessment / Risk of bias analysis This review assessed the quality of each study using the Physiotherapy Evidence Database (PEDro) scale, a validated tool for assessing the internal validity of randomized controlled trials that examine the key components of randomization, blinding, and statistical methods.

Strategy of data synthesis None.

Subgroup analysis None.

Sensitivity analysis None.

Country(ies) involved China.

Keywords Athletic performance, Caffeine, Creatine, Combined used, Supplementation.

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