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ADMINISTRATIVE INFORMATION

Support - None.

Review Stage at time of this submission - Completed but not published.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 27 December 2023 and was last updated on 27 December 2023.

INTRODUCTION

Review question / Objective The post-activation potentiation (PAP) exerts a positive influence on running performance. Nevertheless, there remains some controversy regarding the specific impact of different recovery intervals on running ability. Hence, this work employed a meta-analysis approach to systematically evaluate the effects of PAP at various recovery intervals on running performance.

Condition being studied The post-activation potentiation (PAP) effect has garnered considerable attention as a pre-activation strategy for the neuromuscular system in recent years. PAP represents a physiological effect of the neuromuscular system following high-intensity or maximal intensity activities, stimulating physiological changes in the nervous and muscular

systems through a series of maximal or near-maximal intensity exercises, consequently enhancing subsequent performance. High-intensity or maximal exercise stimuli through PAP can activate the nervous system, increase neural discharge rates, and elevate motor unit activation levels. PAP can lead to notable short-term enhancements in muscle strength and explosiveness, enabling athletes to generate force more effectively in subsequent activities. PAP may also positively influence skill improvement in sports, particularly those requiring rapid and agile reactions. For short-distance sprinters, engaging in maximal intensity explosive exercises before the start can enhance explosiveness and acceleration during the initial burst. In certain studies, short-duration, high-intensity explosive exercises have shown potential to improve speed and endurance in long-distance runners.

METHODS

Participant or population Healthy adolescents, adults, or athletes.

Intervention Post-activation potentiation (PAP).

Comparator Routine training.

Study designs to be included Randomized controlled trials (RCTs), crossover studies.

Eligibility criteria Literature clearly stating the recovery intervals; studies including parameters related to running ability, such as running speed, running time, and sprint time; Non-research literature types such as reviews, comments, editorial opinions, and book chapters are excluded.

Information sources The relevant literatures were searched in databases including CNKI, Wanfang, VIP, PubMed/MEDLINE, Web of Science, Scopus, SPORTDiscus, and PsycINFO, using specified subject keywords. The keywords comprised “post-activation potentiation,” “PAP,” “running performance,” “sprinting,” “interval training,” “intermittent exercise,” “recovery time,” “sprint ability,” “running ability,” and “intermittent time”. The combination search terms utilized Boolean operators such as “post-activation potentiation” AND “running performance,” “PAP” AND “sprinting,” “interval training” AND “running,” “intermittent exercise” AND “running performance,” ensuring comprehensive coverage of relevant studies. Synonyms and related terms for the subject keywords, such as “enhancement effect,” “interval time,” “break time,” were utilized to expand the search scope. Phrases or proper nouns were enclosed in quotes to ensure precision. Review articles were consulted, and their references were manually checked to prevent overlooking relevant literature.

Main outcome(s) Running ability measurement indicators: documenting the main measurement indicators utilized in the studies to assess running ability, such as running speed, 10 m sprint speed, 20 m sprint speed, and sprint time.

Quality assessment / Risk of bias analysis The quality of literature was assessed using the physiotherapy evidence database (PEDro) scale, a commonly utilized tool to evaluate the quality of rehabilitation and exercise therapy research.

Strategy of data synthesis The meta-analysis of included literature data was conducted using

RevMan5.3. Heterogeneity analysis: Initial assessment of literature heterogeneity was performed using a chi-square test, with a significance level set at $\alpha = 0.05$ and $P < 0.05$. Subsequently, quantitative assessment of heterogeneity results was carried out using I² within RevMan5.3. When I² 50%, a random-effects model (REM) was utilized. A funnel plot analysis was generated in RevMan5.3 to explore potential publication bias.

Subgroup analysis Analysis of related indexes of running ability under different interval time.

Sensitivity analysis One-by-one elimination method.

Country(ies) involved China.

Keywords recovery interval; post-activation potentiation; running performance; running time; sprint speed; meta-analysis.

Contributions of each author

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