INPLASY PROTOCOL

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A systematic review and net meta-analysis of the effects of different warm-up methods on the acute effects of lower limb explosive strength

Li, FY[1]; Guo, CG; Li, HS; Xu, HR; Sun,P[4].

Review question / Objective: **(1)Subjects are mostly athletes in various sports;(2)According to the needs of the study, the study subjects were divided into experimental and control groups; (3)Reverse countermovement jump, 20-m sprint run and 30-m sprint run were selected as ending indicators;(4)The study design included RCTs and an own before-and-after controlled trial design.**
Condition being studied: **Muscle stretch (MS) has received much attention as an important part of the preexercise warm-up 2, but the effect of stretching on explosive power remains controversial; for example, a large number of previous studies have shown that static stretching has a negative effect on subsequent performance 3, 4, while dynamic stretching has a beneficial effect 5, although in recent years, there have been, in contrast 6, 7, with the advent of combined stretching methods 8, some subjective researcher bias between studies, as well as differences in outcome indicators, leading to some variation in the effect values of intervention results, thus affecting the accuracy of the results. The advent of the foam rolling (FR) technique 9 has led to an increasing number of coaches and athletes promoting this technique and abandoning the original stretching method. Therefore, there remains a lack of clarity regarding which warm-up method is more appropriate for explosive performance, what the dose-effect relationship is, and what the effects of different warm-up methods are.**

INPLASY registration number: This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 08 March 2023 and was last updated on 08 March 2023 (registration number INPLASY202330031).

INTRODUCTION

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METHODS

Participant or population: The subjects included in the study were mainly athletes.

Intervention: The intervention program for the experimental group included static stretching, dynamic stretching, ballistic stretching, PNF stretching, foam rolling and static-dynamic stretching, Control group with light aerobic exercise or no exercise.

Comparator: The intervention program for the experimental group included static stretching, dynamic stretching, ballistic stretching, PNF stretching, foam rolling and static-dynamic stretching, Control group with light aerobic exercise or no exercise.

Study designs to be included: The study design included RCTs and an own before-and-after controlled trial design.

Eligibility criteria: 1) study subjects -- healthy adolescents with sports experience, free of other injuries and disease conditions prior to the intervention; 2) interventions -- experimental group only different warm-up methods of intervention; 3) control group -- no warm-up exercise or light aerobic running; 4) study outcomes -- the jump index was selected as countermovement jump (CMJ), the sprint index was selected as the 20-m sprint and the 30-m sprint; and 5) study design -- due to the specificity of the warm-up method intervention (short intervention time), the study design included RCTs and an own before-and-after controlled trial design. There were no significant differences between the experimental and control groups at baseline.

Information sources: Web of Science、Google Scholar、PubMed、Elsevier、CNKI、WANFANG、WEIPU.

Main outcome(s): Static stretching, dynamic stretching, ballistic stretching, PNF stretching, foam rolling and static-dynamic stretching as an end indicator.

Quality assessment / Risk of bias analysis: Methodological quality was assessed using the Methodological Index for Non-randomized Studies(MINORS) scalethe Newcastle-Ottawa scale (NOS) scale. publication bias tests were performed using Deek's funnel plot.

Strategy of data synthesis: Bayesian MeSH meta-analysis was performed using R software running the gemtc package in the R studio environment in conjunction with Stata software, version 13.0. The outcome indicators in this study were continuous variables, and the mean difference (MD) and 95% confidence interval (95% CI) were used as effect size indicators. Each model was set using four Markov chains for initial values, and the number of iterations was

set at 20000, with the first 5000 used for annealing. Model inconsistency was diagnosed using R software, and Brooks-Gelman-Rubin diagnostic plots were plotted to quantitatively evaluate the convergence of the models. Local inconsistency was tested using the nodal separation method. Finally, heterogeneity was tested using I2 to measure the magnitude of heterogeneity under the random-effects model, with I2 ≤ 50% indicating low interstudy heterogeneity and I2 > 50% indicating high interstudy heterogeneity. The network relationships were mapped using Stata software, version 13.0, and analysed for risk of publication bias; the metrics were ranked by surface under the cumulative ranking (SUCRA), where 0 ≤ SUCRA ≤ 100%, 100% representing the most effective warm-up method and 0 the worst and least effective. Finally, subgroup analyses were conducted to explore the effects of moderating variables.

Subgroup analysis: The study was planned to include stretching time,mean age,study population,sample size,Year of publication,quality of literature as moderating variables for subgroup analysis.

Sensitivity analysis: Sensitivity analysis was carried out by stata software to reflect the sensitivity of this study through the change in effect size by removing one of the literature.

Country(ies) involved: China.

Keywords: warm-up methods; explosive lower limb strength; acute effects; reticulation meta-analysis.

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