INPLASY

The effectiveness of neuromuscular training in preventing sports injuries of different genders, body parts, and types in adolescents: a systematic review of meta-analysis

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ADMINISTRATIVE INFORMATION

Support - Non.

Review Stage at time of this submission - The review has not yet started.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY2024110054

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 12 November 2024 and was last updated on 12 November 2024.

INTRODUCTION

Review question / Objective Neuromuscular training is a relatively new comprehensive rehabilitation treatment method in recent years. Although its preventive effect on adolescent sports injuries is indisputable, its specific effects on gender, injury site, and type are still poorly understood. This study evaluated the clinical efficacy of neuromuscular training on adolescents of different genders, injury sites, and types through systematic meta-analysis.

Condition being studied The rate of sports participation among adolescents is very high, signi ficantly impacting their health. It provides psychos ocial benefits such as increased selfesteem, motor skill development, socialization, teamwork, compet itiveness, and stress reduction. However, sports ar e also a major cause of injury among adolescents, accounting for 30% of all adolescent injuries in ma ny countries . Annually, 35% of adolescents injured in sports require medical rehabilitation, with lower extremity injuries being the most common, constitu ting over 60% of all youth sports injuries . Sports in juries can lead to decreased participation and are a ssociated with all-cause morbidity, overweight or obesity, and post-traumatic osteoarthritis.

METHODS

Participant or population The study population consisted of youths of 21 years or younger, participating instructured/organized sport programs on a competitive level.

Intervention A neuromuscular training program (including componentssuch as balance, agility, strength, neuromuscular control) wasevaluated with no co-interventions (e.g., education) provided.

Comparator the study contained a control arm either performingusual practice routine or sham exercises without specific focuson neuromuscular control.

Study designs to be included An analytical design was used (RCTs, quasi-experimental trials,cohort studies).

Eligibility criteria Studies without original data (review articles)or without obtainable data for meta-analysis were excluded.

Information sources PubMed, Web of Science, EBSCO, and Scopus databases.

Main outcome(s) Any form of muscle, ligament, or bone injury in different genders, including acute or chronic injury dataAny form of muscle, ligament, or bone injury, including acute or chronic injurydata.

Quality assessment / Risk of bias analysis We analyzed risk of bias of included studies using the PEDroscale (Maher et al., 2003). This scale consists of eleven items,addressing internal validity (8 items), interpretability (2 items),and external validity (1 item). A point was scored for each itemclearly fulfilling the criterion, allowing a maximal score of 11points. Two reviewers (SST, ALR) independently performed thequality rating. Disagreements between ratings were discussedand solved via consensus. This process was piloted on threestudies not included in the review before actual quality rating wasperformed.

Strategy of data synthesis Statistical analyses were conducted using RevMan 5.4 and S tata 16.0 software. Multiple researchers verified dat a entry to ensure accuracy. The injury rate ratio (IR R) and corresponding 95% confidence interval (CI) were calculated, representing the effect estimate fo r each included study. The IRR was determined as follows: IRR = (number of injuries in the NMT group / player exposure) / (number of injuries in the contr ol group / player exposure). When player exposure time was unavailable, the IRR was calculated base d on the number of practice and game exposures. An IRR value less than 1 indicates a reduction in inj ury risk favoring neuromuscular training, with value s closer to 0 showing greater effectiveness. Hetero geneity among the included studies was quantitati vely analyzed using the I^2 statistic. When $I^2 \leq 50\%$, a fixed-effects model was used; otherwise, a random-effects model was employed. Sensitivity analyses tested the stability of the result s, and subgroup analyses by gender, injury site, an d type explored the impact of study characteristics on outcome variables and sources of heterogeneit. Publication bias was assessed using Egger's test.

Subgroup analysis Subgroup analyses by gender, injury site, and type explored the impact of study characteristics on outcome variables and so urces of heterogeneity.

Sensitivity analysis Sensitivity analysis of subgroups with I2>50% using Stata 16.0 software.

Country(ies) involved China.

Keywords Neuromuscular training; injury care; sports rehabilitation; meta-analysis.

Contributions of each author

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