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The effects of plyometric training on physical fitness and skill-related performance in dancer: A systematic review and meta-analysis

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ADMINISTRATIVE INFORMATION

Support - None.

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

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 6 February 2025 and was last updated on 6 February 2025.

INTRODUCTION

Review question / Objective This review and Meta-analysis served double functions. On the one hand, to summarise the current state of the literature on related topics, and on the other hand, to quantify the effects of PT on dancers for the purpose of determining the effects of PT on dancers' physical fitness and skill-related performance, expanding the content of the effects of PT on athletes, and increasing the number of methods for dancers' physical fitness training.

Condition being studied Dance is a very effective mixture of aerobic and anaerobic exercise. Aerobic exertion involves sustained low to moderate intensity exercise and anaerobic exertion involves high intensity exercise over a short period of time, consuming mainly muscle glycogen and liver glycogen.

Physical fitness has a significant effect on dancers, not only does it affect their performance, but it also

determines the effectiveness of their training, their risk of injury, their stage presence and their long-term career development.

Plyometric training is a form of exercise that improves strength, speed and power through explosive movements, utilising the stretch-shortening cycle (SSC) of the muscle, whereby the muscle is contracted immediately after experiencing a rapid stretch, thus increasing the muscle's power output.

Based on the above principles, plyometric training helps to increase the efficiency of a dancer's movement, thus allowing each movement to utilise the body's reserve energy more efficiently.

METHODS

Search strategy Databases searched included SPORTDisus, PubMed, Google scholar, and Web of Science, Scopus. Systematic research on the topic was conducted using the Boolean operations "AND" and "OR". The keywords were as follows:

("plyometric" OR "plyometric training" OR "plyometric exercises" OR "plyometric drill" OR "stretch-shortening exercise" OR "stretch-shortening drill" OR "stretch-shortening cycle exercise") AND ("dance" OR "dancer" OR "dancing" OR "dance player" OR "dance athlete" OR "dances" OR "dancers").

Participant or population Dancers were selected regardless of age or skill level.

Intervention Plyometric training or training that includes plyometrics for at least 4 weeks.

Comparator Including experimental and control groups.

Study designs to be included RCT, randomized control trial.

Eligibility criteria The selection criteria identified in the systematic review were as follows: Participants, healthy dancers, regardless of age and dance level. Intervention, the experimental group was plyometric training, or a training program that included plyometric training for a minimum of 4 weeks. Comparator, the experimental and control groups were included, the control group had no additional PT training. Outcome, at least one indicator related to physical fitness (strength, balance, agility, etc.) or dance skill (specialised jumps, spins, etc.). additional PT training. Outcome, at least one indicator related to physical fitness (strength, speed, balance, agility, etc.) or dance skills (specialised jumps, spins, etc.), with complete data. Study design, randomised controlled experiment.

Exclusion criteria: Participants, not dancers, or dancers with health problems. Intervention, not plyometric training, or intervention duration less than 4 weeks. Comparator, no control group, or control group with additional PT training. Outcome, no physical fitness or skill indicators involving dancers, baseline or other data were missing and querying the authors was fruitless. Study design, exclusion of non-randomised controlled trials, case studies, cross-section studies.

Information sources Databases searched included SPORTDisus, PubMed, Google scholar, and Web of Science, Scopus.

Main outcome(s) Indicators related to dancers' physical fitness and performance of dance skills.

Quality assessment / Risk of bias analysis Included studies are assessed using the Physiotherapy Evidence Database (PEDro).

Risk of bias analysis using RevMan software (Cochrane).

Strategy of data synthesis In the field of sports, the sample size for studying the physical fitness of dancers is relatively small. Meta-analysis (Higgins & Thompson, 2002) will be performed when the number of studies was ≥ 3 (or the number of experimental groups). On the contrary, the number of studies < 3 are analysed for narrative synthesis. RevMan software will be used to process the extracted data including mean (M), standard deviation (SD), and sample size (N). Then effect size (ES) and publication bias will be calculated using RevMan5.4 and Stata 16.

The mean (M) is mean difference, standard deviation (SD) is calculated by a formula (Chi et al., 2023). Effect sizes, interval values, and heterogeneity are obtained by plotting forest plots. I^2 will be utilized to test for heterogeneity, divided into three levels, "low", "moderate", "high" (Higgins et al., 2003). When $I^2 \geq 50\%$, a random effects model is used, when $I^2 < 50\%$, fixed effects model is used. Of course, it has also been shown that the random effects model is suitable to all degrees of heterogeneity (Deeks et al., 2019). The threshold for statistical significance is set at $p < 0.05$ (Page et al., 2021).

Subgroup analysis None.

Sensitivity analysis Exclusion-by-exclusion method: the literature is excluded sequentially, and the remaining literature is merged by Meta-analysis, and the original Meta-analysis results are assessed to see whether the original Meta-analysis results are significantly changed by certain studies by observing the changes in the merged results.

Country(ies) involved Malaysia.

Keywords plyometric training, physical fitness, skill-related performance, dancer, systematic review, meta-analysis.

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