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The Impact of Flexibility Interventions on Golf Performance: A Systematic Review

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ADMINISTRATIVE INFORMATION

Support - No.

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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 17 August 2025 and was last updated on 17 August 2025.

INTRODUCTION

Review question / Objective The objective of this systematic review is to evaluate the effect of flexibility training on golf performance in adult golfers, including both professional and amateur players. Specifically, the review will focus on flexibility interventions such as static stretching, dynamic stretching, PNF stretching, yoga, and self-myofascial release (SMR), comparing these interventions to no intervention or alternative training methods (e.g., strength training or endurance exercises). The outcomes of interest include improvements in golf performance metrics, particularly club head speed (CHS), driving distance, swing accuracy, and injury reduction. The review will include randomized controlled trials (RCTs), cohort studies, and other relevant experimental designs that investigate the impact of flexibility training on these performance indicators.

Condition being studied The condition being studied is limited flexibility and range of motion (ROM), particularly in the hips, trunk, and shoulders, and how it affects golf performance. Flexibility is a key component of physical fitness that influences the ability to move a joint through its full range of motion. In the context of golf, limited flexibility in these key areas can impair the golf swing, reducing efficiency and power generation, and potentially increasing the risk of injury. Golfers with restricted ROM may struggle to achieve optimal swing mechanics, which are crucial for maximizing driving distance, swing accuracy, and overall performance. Therefore, the condition being studied is the impact of flexibility limitations on golf performance and how interventions aimed at improving flexibility can influence these performance metrics, including club head speed, driving distance, and injury reduction.

METHODS

Participant or population The population being studied includes adult golfers, both professional and amateur, across a range of skill levels and

ages. Participants must be individuals who actively engage in golf, regardless of their handicap or experience level, as flexibility may play a significant role in performance for all golfers. The focus is on golfers with limited flexibility or range of motion (ROM) in key areas such as the hips, trunk, and shoulders, which are crucial for an effective golf swing. This population may include both those experiencing flexibility limitations due to age, injury, or lack of training, and those who wish to improve their flexibility to enhance their game. The studies will aim to assess the effects of flexibility interventions on various performance outcomes, such as swing mechanics, driving distance, club head speed, and injury prevention.

Intervention The intervention being studied involves various flexibility training techniques designed to enhance range of motion (ROM) and muscle flexibility, particularly in the hips, trunk, and shoulders, which are essential for optimal golf performance. These interventions include static stretching, where a stretch is held for a period to increase flexibility; dynamic stretching, which involves controlled, active movements to improve ROM through motions similar to the golf swing; PNF (Proprioceptive Neuromuscular Facilitation) stretching, combining stretching with muscle contraction to enhance flexibility; yoga, which improves flexibility, balance, and mobility through specific poses targeting key muscle groups; and self-myofascial release (SMR), such as foam rolling, to release muscle tightness and improve ROM. These flexibility interventions aim to enhance swing mechanics, increase driving distance, improve club head speed, and reduce the risk of injury, ultimately improving overall golf performance.

Comparator The comparator in this review will include no intervention or alternative training methods. The "no intervention" group refers to participants who do not receive any flexibility training or specific intervention, allowing the assessment of golf performance based solely on their baseline flexibility and natural training methods. The alternative training methods may include other forms of physical conditioning, such as strength training, endurance training, or functional training, which may not specifically target flexibility but are often used to improve golf performance. This comparison will help determine the specific effects of flexibility training on golf performance relative to other commonly used training approaches or no intervention at all.

Study designs to be included The review will include randomized controlled trials (RCTs), cohort studies, cross-sectional studies, and pre-post intervention studies. These designs will provide robust evidence on the effects of flexibility training on golf performance by comparing interventions with baseline measurements or alternative training methods. RCTs will offer the highest level of evidence by minimizing bias, while cohort and pre-post studies will offer additional insights into flexibility's impact over time.

Eligibility criteria Studies eligible for inclusion in this review will meet the following criteria: Participants must be adult golfers, both professional and amateur, who are actively involved in golf and either have limited flexibility or seek to improve flexibility for performance enhancement. The intervention must involve flexibility training, such as static stretching, dynamic stretching, PNF stretching, yoga, or self-myofascial release (SMR), focusing on key areas like the hips, trunk, and shoulders. The comparator must include no intervention or alternative training methods like strength or endurance training. Eligible studies should report outcomes related to golf performance, such as club head speed, driving distance, swing accuracy, and injury prevention. The review will include randomized controlled trials (RCTs), cohort studies, cross-sectional studies, and pre-post intervention studies. Studies published in English will be considered, and those not focusing on flexibility interventions, not assessing golf performance outcomes, or not involving adult golfers will be excluded.

Information sources The information sources for this review will include several electronic databases, clinical trial registries, and grey literature to ensure a comprehensive search of relevant studies. The primary databases to be searched are PubMed, Scopus, Web of Science, and SPORTDiscus, which cover a wide range of disciplines including sports science, flexibility training, and golf performance. In addition, clinical trial registries such as ClinicalTrials.gov and ISRCTN will be searched to identify ongoing or unpublished trials. Grey literature, including reports from sports organizations, theses, dissertations, and conference proceedings, will also be considered. Furthermore, the authors of relevant studies will be contacted to obtain additional data or clarification if needed.

Main outcome(s) The main outcomes of this review will focus on the impact of flexibility training on golf performance. Key outcomes include club head speed (CHS), which is a crucial indicator of swing efficiency and power; driving distance,

reflecting the distance the ball travels from the tee; swing accuracy, which measures the precision and consistency of the golfer's swing; and injury prevention, specifically the reduction of common golf-related injuries such as those in the back, shoulders, and hips. These outcomes will be assessed using pre- and post-intervention comparisons, with effect measures including mean differences or standardized mean differences. The timing of these outcomes will consider both immediate effects (short-term) immediately after the intervention, as well as long-term effects, if available, based on follow-up measurements taken weeks or months after the training.

Quality assessment / Risk of bias analysis To assess the quality of included studies, the PEDro scale (Physiotherapy Evidence Database scale) will be used. The PEDro scale is a widely recognized tool for evaluating the methodological quality of randomized controlled trials (RCTs) and experimental studies. It consists of 11 items that assess various aspects of study quality, including randomization, blinding, sample size, and outcome measures. Studies will be rated on a scale from 0 to 10, with higher scores indicating better methodological quality.

The risk of bias will be assessed based on the individual items of the PEDro scale, focusing on areas such as the adequacy of randomization, allocation concealment, blinding of participants and assessors, and the completeness of outcome data. Studies scoring 6 or higher will be considered to have good quality, while studies scoring below 6 will be regarded as having lower quality. This quality assessment will help determine the reliability of the evidence and the potential risk of bias in the included studies.

Strategy of data synthesis The data synthesis for this review will involve a qualitative and quantitative approach. First, a narrative synthesis will be conducted to summarize the findings of the included studies. This will involve categorizing the studies based on the type of flexibility intervention, the outcomes measured, and the timing of the intervention (short-term vs. long-term).

For studies that report sufficient quantitative data, meta-analysis will be performed to calculate the pooled effect size using standardized mean differences (SMD) or mean differences (MD), depending on the data reported. Random-effects models will be used for meta-analysis to account for variability between studies. Subgroup analyses may be conducted based on factors such as the type of flexibility intervention (e.g., static vs. dynamic stretching), the duration of the intervention, or the specific outcome measure (e.g., club head speed vs. driving distance).

If data are insufficient for a meta-analysis, the review will rely on a qualitative synthesis of the findings, highlighting trends, patterns, and differences across studies. The GRADE (Grading of Recommendations Assessment, Development, and Evaluation) approach will also be used to assess the overall quality of the evidence for each outcome.

Subgroup analysis Subgroup analyses will be conducted to explore variations in the effects of flexibility training on golf performance based on specific factors. These include the type of flexibility intervention, such as static stretching, dynamic stretching, PNF stretching, yoga, and self-myofascial release (SMR); the duration of the intervention, comparing short-term (e.g., one-time or weekly) and long-term (e.g., several weeks or months) training programs; and the golfer's experience level, distinguishing between professional and amateur golfers. Additionally, the analysis will differentiate the effects of flexibility training on various outcome measures, such as club head speed, driving distance, swing accuracy, and injury prevention. These subgroup analyses will help identify which factors may influence the effectiveness of flexibility training in improving golf performance.

Sensitivity analysis Sensitivity analysis will be conducted to assess the robustness of the review's findings and evaluate the influence of study quality and other potential biases on the overall results. This analysis will involve testing the stability of the results by excluding studies with high risk of bias, such as those with low PEDro scale scores, or studies with small sample sizes. Additionally, sensitivity analyses will examine whether the results are influenced by the type of flexibility intervention, the duration of the intervention, or the specific outcome measures (e.g., club head speed vs. driving distance). If substantial heterogeneity exists, we will conduct separate analyses for studies with low, moderate, or high risk of bias to determine if this affects the pooled estimates. These analyses will help ensure that the conclusions drawn from the review are not unduly influenced by a single study or a specific subgroup of studies.

Language restriction English.

Country(ies) involved Malaysia - Universiti Putra Malaysia.

Keywords Golf performance; flexibility training; warm-up; dynamic stretching; static stretching; foam rolling; PNF stretching; yoga; club head speed; driving distance; swing.

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