

INPLASY PROTOCOL

To cite: Donti et al. Is there a window of opportunity for flexibility development in youth? A systematic review with meta-analysis. Inplasy protocol 202190032. doi: 10.37766/inplasy2021.9.0032

Received: 11 September 2021

Published: 11 September 2021

Corresponding author:
Gregory C. Bogdanis

gbogdanis@phed.uoa.gr

Author Affiliation:
School of Physical Education & Sport Science, National & Kapodistrian University of Athens; Institute of Human Movement Science, Sport and Health, University of Graz, Austria.

Support: Austrian Science Fund FWF.

Review Stage at time of this submission: Risk of bias assessment.

Conflicts of interest:
None declared.

Is there a window of opportunity for flexibility development in youth? A systematic review with meta-analysis

Donti, O¹; Konrad, A²; Panidi, I³; Dinas, PC⁴; Bogdanis, GC⁵.

Review question / Objective: To examine if there is a difference in the effect of stretching training on flexibility during childhood (6-11 years of age) and adolescence (12-18 years of age).

Condition being studied: We are going to examine whether there is a greater response to stretching training (i.e. 'window of opportunity') during childhood, compared with adolescence.

Information sources: Two review team members will independently screen the titles and abstracts of the retrieved publications to select the eligible publications. One review team member will act as a referee in case of disagreement between the review team members. We will also ensure that any retracted publications are identified and excluded from the selection outcome. Furthermore, we will locate the full texts that will not be immediately accessible, via emails to the lead authors and/journals of publication. A full list of the excluded publications will be provided in the final version of the systematic review.

INPLASY registration number: This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 11 September 2021 and was last updated on 11 September 2021 (registration number INPLASY202190032).

INTRODUCTION

Review question / Objective: To examine if there is a difference in the effect of stretching training on flexibility during childhood (6-11 years of age) and adolescence (12-18 years of age).

Rationale: Flexibility is an important component of physical fitness for competitive and recreational athletes and especially in sports requiring the ability to move comfortable through a large range of motion (ROM). It is suggested that during

early and late childhood (6-11 years of age) there is a 'window of opportunity' for flexibility development with the underlying assumption that flexibility may be enhanced more if it is trained early. However, this notion is supported by selected research evidence and there is no conclusive data on whether this window of opportunity exists. Therefore, a systematic review with meta-analysis is warranted.

Condition being studied: We are going to examine whether there is a greater response to stretching training (i.e. 'window of opportunity') during childhood, compared with adolescence.

METHODS

Search strategy: Two independent investigators performed an algorithmic searching on Pubmed central, Web of Science and Scopus databases. These search algorithms were 'translated' from one database to another, so that they were recognizable by the corresponding website search engine. Two more investigators acted as referees in disagreement between the three searches. The reference lists of the eligible publications will also be screened for identifying any eligible to the research question publications, which did not appear in the initial searching.

Participant or population: Healthy trained or untrained children from 6 to 18 years of age, of both sexes will be the eligible population for inclusion in the systematic review process. No restriction on physical activity habits will be applied. Obese or normal weight will also be included while patients and/or clinical populations will be excluded from the study.

Intervention: Any type/kind of stretching training (> 2 weeks) not including other stimulus than stretching in the intervention (e.g. vibration or strength training). We will only include studies that incorporated pre- and post-intervention testing, short (> 2 weeks) and long-term.

Comparator: Pre and post measurements of a single or multiple experimental groups

that were submitted to flexibility training/to different stretching training protocols and a group or multiple groups that did not perform stretching training and acted as controls. Pre and post measurements of a single or multiple experimental groups that were submitted to flexibility training and a group or multiple groups that did not perform stretching training and acted as controls.

Study designs to be included: Studies that include an appropriate intervention will be considered as eligible (i.e. randomized and non-randomized trials).

Eligibility criteria: Inclusion criteria for eligibility studies include: 1. Peer-reviewed studies that include an appropriate intervention, either short (>2 weeks) or long-term stretching intervention on ROM enhancement, will be considered as eligible (i.e. randomized and non-randomized trials). 2. Output in any language. 3. No date limits will be applied in the selection of the eligible publications. Exclusion criteria for eligible studies include: 1. Publication that did not examine the effect of stretching training in humans. 2. Studies conducted on animals or in vitro. 3. Studies that focused on small joints or muscles such as fingers or toes. 4. Studies that included training components such as blood restriction, vibration or electrical stimulation, studies without a clearly defined stretching protocol and studies that examined only a detraining period (studies including a training and a detraining period will be included). 5. Review papers, letters to the Editor, opinion papers and conference abstracts. 6. Theses and dissertations 7. 'Grey' literature (i.e. non peer-reviewed publications). Inclusion criteria for eligibility studies include: 1. Peer-reviewed studies that include an appropriate intervention, either short (>2 weeks) or long-term stretching intervention on ROM enhancement, will be considered as eligible (i.e. randomized and non-randomized trials). 2. Output in any language. 3. No date limits will be applied in the selection of the eligible publications. Exclusion criteria for eligible studies include: 1. Publication that

did not examine the effect of stretching training in humans. 2. Studies conducted on animals or in vitro. 3 Studies that focused on small joints or muscles such as fingers or toes. 4. Studies that included training components such as blood restriction, vibration or electrical stimulation, studies without a clearly defined stretching protocol and studies that examined only a detraining period (studies including a training and a detraining period will be included). 5. Review papers, letters to the Editor, opinion papers and conference abstracts. 6. Theses and dissertations 5. 'Grey' literature (i.e. non peer-reviewed publications).

Information sources: Two review team members will independently screen the titles and abstracts of the retrieved publications to select the eligible publications. One review team member will act as a referee in case of disagreement between the review team members. We will also ensure that any retracted publications are identified and excluded from the selection outcome. Furthermore, we will locate the full texts that will not be immediately accessible, via emails to the lead authors and/journals of publication. A full list of the excluded publications will be provided in the final version of the systematic review.

Main outcome(s): The main outcome variable will include changes in ROM in lower and upper limbs, assessed after a stretching training (> 2 weeks).

Data management: Two review team members will independently extract data from the eligible studies in an appropriate table. In case of disagreement one team member will make an ultimate decision regarding the data that should be extracted. A priori pilot data extraction will be used, to ensure a comprehensive data extraction process. In case that data are missing from the paper we will contact via email the corresponding authors in order to retrieve them. The data that will be included in the final data extraction table are: 1. First author name and year of

publication 2. Methodological design 3. Population characteristics 4. Intervention characteristics 5. Measurements 5. Main outcome.

Quality assessment / Risk of bias analysis:

The risk of bias will be performed by two independent assessors, while one investigator will act as a referee, in case of a disagreement between the risk of bias assessors. For the eligible randomized controlled trials, we will use the revised Version 2 of the Cochrane tool that consists of five dimensions (a) the randomization process; (b) deviations from intended interventions; (c) missing outcome data; (d) measurement of the outcome; and (e) selection of the reported result. For the eligible non-randomized controlled trials, the ROBINS-I tool will be used. The following components included in the ROBINS-I tool: a) bias arising from the randomization process, b) bias due to deviations from intended interventions, c) bias due to missing outcome data, d) bias in measurement of the outcome, and e) bias in selection of the reported result. The results of the risk of bias assessment will be extracted in relevant tables and figures.

Strategy of data synthesis: For the eligible studies that will not deliver suitable data for a meta-analysis, a summarized narrative description of their results will be provided. For the eligible studies that will provide available and/or suitable data for a meta-analysis, a random effect meta-analysis model will be used to account for heterogeneity due to differences in study populations, study duration, protocol of intervention, joint examined, and other factors. We are going to use a continuous meta-analysis method to calculate mean differences between an experimental (i.e. stretching) and an appropriate control situation. We will consider heterogeneity as significant if p10 studies/entries. All meta-analyses will be conducted using the RevMan 5.3 software.

Subgroup analysis: Subgroup analysis will include analyses of different categories for age (early and middle childhood vs. late

childhood and adolescence) and total volume of stretching protocols.

Sensitivity analysis: In case that the data of the eligible publications are suitable, we will assess the applicability and quality of the findings of the systematic review via the Grading of Recommendations Assessment, Development and Evaluation (GRADE) analysis.

Language: No restriction.

Country(ies) involved: Greece, Athens; Austria, Graz.

Keywords: flexibility; stretching; children; adolescents.

Contributions of each author:

Author 1 - Olyvia Donti - The author led the conception of the study, the data collection, quality assessment, data extraction and manuscript writing.

Email: odonti@phed.uoa.gr

Author 2 - Andreas Konrad - The author led the conception of the study, the data collection, quality assessment, data extraction and manuscript writing.

Email: andreas.konrad@uni-graz.at

Author 3 - Ioli Panidi - The author led the conception of the study, the data collection, quality assessment and data extraction and contributed to writing the manuscript.

Email: ipanidi@phed.uoa.gr

Author 4 - Petros C. Dinas - The author led the design of the study, the quality assessment and data extraction and analysis and also contributed to writing the manuscript.

Email: petros.cd@gmail.com

Author 5 - Gregory C. Bogdanis - The author led the conception of the study, the design of the study, data collection, data extraction and analysis and manuscript writing.

Email: gbogdanis@phed.uoa.gr