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Effect of trunk-focused exercise programs on psychosocial and physical capacities in older adults: a systematic review with meta-analyses.

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ADMINISTRATIVE INFORMATION

Support - Ministerio de Ciencia, Innovación y Universidades (Plan Nacional I+D+i; Ref.: RTI2018-098893-B-I00), Spain.

Review Stage at time of this submission - Preliminary searches.

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 28 June 2023 and was last updated on 28 June 2023.

INTRODUCTION

Review question / Objective The aim of this systematic review is to compare trunk-focused exercise programs vs no exercise program or other type of exercise programs in psychosocial and physical outcomes of older adults. Additionally, to explore if moderator factors regarding the participants or the training program characteristics modulate the effects observed. To this end, the proposed systematic will address the following question: Which improves in a greater extent psychosocial and physical outcomes in older adults, trunk-focused exercise programs, other type of exercises or no intervention?

Rationale On the one hand, most of the systematic reviews available regarding trunk-focused exercise programs in older adults are focused on Pilates exercises (1-5). To the authors knowledge, only Granacher et al., (2013) gathered different types of programs focusing on the trunk structures to analyze the impact on balance,

functional performance and fall prevention; but other outcomes of interest such as quality of life, cognitive function were not considered. Furthermore, because 10 years have already passed, the number of studies available have increased, which could help to strengthen evidence-based results and if possible, the performance of meta-analysis providing pooled effect sizes of the studies included.

On the other hand, there is a major gap regarding exercises focusing on trunk structures common to all types of populations (e.g., older adults, athletes, people with health disorders such as low back pain, stroke...), which is the faint description of the training programs. Altogether results in a lack of knowledge about which are the training program characteristics that evoke the best results in this population. On this wise, it is important to understand how training characteristics such as the type of trunk exercise, training volume, intensity modulate the impact of the effects observed. This will help to optimize the design of trunk-focused exercise programs to enhance their

impact. Likewise, it would be interesting to consider participant characteristics such as the body mass index, as it has recently shown that for example in people with chronic low back pain that could be related to the changes observed in pain perception (6).

Condition being studied The present systematic review will address psychosocial and physical dimensions through different outcomes that will cover both aspects. Regarding psychosocial component, quality of life, mental health and cognitive function will be primarily addressed, but if related parameters are commonly addressed in the study they will be also included. Regarding physical fitness, we will consider trunk physical fitness (i.e., endurance, strength, stability, flexibility of trunk structures), whole-body balance (i.e., test assessing body balance in different conditions such as static or dynamic tasks), and functional mobility (i.e., referring to test that involve physical functions and skills required for mobility through gait testing, the timed up and go test, the sit to stand test...). We will also consider training program and participant characteristics to analyze how they modulate the impact produced in the different parameters analyzed.

METHODS

Search strategy PubMed: (("trunk strength*" OR "trunk stab*" OR "trunk endurance" OR "trunk flex*" OR "trunk stretch*" OR "trunk control" OR "core strength*" OR "core stab*" OR "core endurance" OR "core flex*" OR "core control" OR "lumbar strength*" OR "lumbar stab*" OR "lumbar endurance" OR "lumbar flex*" OR "lumbar control" OR "lumbopelvic stab*" OR "lumbopelvic endurance" OR "lumbopelvic flex*" OR "lumbopelvic control" OR "spine strength*" OR "spine stab*" OR "spine flex*" OR "spine control" OR "spinal strength*" OR "spinal stab*" OR "spinal flex*" OR "spinal stretch*" OR "spinal control" OR "pilates") AND ("training" OR "exercise" OR "program" OR "intervention") AND ("older adults" OR "elderly" OR "geriatrics" OR "seniors") AND ("randomized" OR "randomized") NOT ("cell"))
Embase: ('trunk strength*' OR 'trunk stab*' OR 'trunk endurance' OR 'trunk flex*' OR 'trunk stretch*' OR 'trunk control'/exp OR 'trunk control' OR 'core strength*' OR 'core stab*' OR 'core endurance' OR 'core flex*' OR 'core control' OR 'lumbar strength*' OR 'lumbar stab*' OR 'lumbar endurance' OR 'lumbar flex*' OR 'lumbar control' OR 'lumbopelvic stab*' OR 'lumbopelvic endurance' OR 'lumbopelvic flex*' OR 'lumbopelvic control' OR 'spine strength*' OR 'spine stab*' OR 'spine flex*' OR 'spine control' OR 'spinal strength*' OR 'spinal stab*' OR 'spinal flex*' OR 'spinal stretch*' OR 'spinal control' OR 'pilates') AND ('training' OR 'exercise' OR 'program' OR 'intervention') AND ('older adults' OR 'elderly' OR 'geriatrics' OR 'seniors') AND ('randomized' OR 'randomized') NOT ('cell'))

strength*' OR 'spinal stab*' OR 'spinal flex*' OR 'spinal stretch*' OR 'spinal control' OR 'pilates') AND ('training'/exp OR 'training' OR 'exercise'/exp OR 'exercise' OR 'program'/exp OR 'program' OR 'intervention'/exp OR 'intervention') AND ('older adults'/exp OR 'older adults' OR 'elderly'/exp OR 'elderly' OR 'geriatrics'/exp OR 'geriatrics' OR 'seniors'/exp OR 'seniors') AND ('randomised'/exp OR 'randomised' OR 'randomized'/exp OR 'randomized')

SPORTDiscus: (("trunk strength*" OR "trunk stab*" OR "trunk endurance" OR "trunk flex*" OR "trunk stretch*" OR "trunk control" OR "core strength*" OR "core stab*" OR "core endurance" OR "core flex*" OR "core stretch*" OR "core control" OR "lumbar strength*" OR "lumbar stab*" OR "lumbar endurance" OR "lumbar flex*" OR "lumbar stretch*" OR "lumbar control" OR "lumbopelvic strength*" OR "lumbopelvic stab*" OR "lumbopelvic endurance" OR "lumbopelvic flex*" OR "lumbopelvic stretch*" OR "lumbopelvic control" OR "spine strength*" OR "spine stab*" OR "spine endurance" OR "spine flex*" OR "spine stretch*" OR "spine control" OR "spinal strength*" OR "spinal stab*" OR "spinal endurance" OR "spinal flex*" OR "spinal stretch*" OR "spinal control" OR "pilates") AND ("training" OR "exercise" OR "program" OR "intervention") AND ("older adults" OR "elderly" OR "geriatrics" OR "seniors") AND ("randomized" OR "randomized") NOT ("cell"))

Cochrane (CENTRAL): (("trunk strength" OR "trunk strengthening" OR "trunk stability" OR "trunk stabilization" OR "trunk endurance" OR "trunk flexibility" OR "trunk stretching" OR "trunk control" OR "core strength" OR "core strengthening" OR "core stability" OR "core stabilization" OR "core endurance" OR "core flexibility" OR "core stretching" OR "core control" OR "lumbar strength" OR "lumbar strengthening" OR "lumbar stability" OR "lumbar stabilization" OR "lumbar endurance" OR "lumbar flexibility" OR "lumbar stretching" OR "lumbar control" OR "lumbopelvic strength" OR "lumbopelvic strengthening" OR "lumbopelvic stability" OR "lumbopelvic stabilization" OR "lumbopelvic endurance" OR "lumbopelvic flexibility" OR "lumbopelvic stretching" OR "lumbopelvic control" OR "spine strength" OR "spine strengthening" OR "spine stability" OR "spine stabilization" OR "spine endurance" OR "spine flexibility" OR "spine stretching" OR "spine control" OR "spinal strength" OR "spinal strengthening" OR "spinal stability" OR "spinal stabilization" OR "spinal endurance" OR "spinal flexibility" OR "spinal stretching" OR "spinal control" OR "pilates") AND ("training" OR "exercise" OR "program" OR "intervention") AND ("older adults" OR "elderly" OR

“geriatrics” OR “seniors”) AND (“randomized” OR “randomised”) NOT (“cell”).

Participant or population The present systematic will include participants from 65 years of age onwards.

Intervention The studies will have to include an experimental group performing a trunk-focused exercise program (i.e., a program primarily composed of exercises that specifically aim to target the core/trunk structures, as indicated by their execution descriptions, names, and/or the authors' guidance).

Comparator This systematic review will compare trunk-focused exercise programs to a) no exercise interventions, and b) other type of exercise programs not focusing on the trunk/core structures (e.g., aerobic, general strengthening, balance, walking exercises...).

Study designs to be included The design of the articles included will be randomized controlled trials.

Eligibility criteria Based on the PICOS strategy, it will be as follows: - Population: people aged from 65 years onwards.- Intervention: exercise programs focused on the trunk structures (i.e., a program primarily composed of exercises that specifically aim to target the core/trunk structures, as indicated by their execution descriptions, names, and/or the authors' guidance).- Comparator: a) no exercise intervention, or b) other exercise programs not focusing on the trunk structures (e.g., aerobic, general strengthening, balance, walking exercises...).- Outcomes: psychosocial (i.e., quality of life and cognitive function) and physical parameters (i.e., trunk physical fitness [i.e., endurance, strength, stability, flexibility of trunk structures], whole-body balance [i.e., test assessing body balance in different conditions such as static or dynamic tasks], and functional mobility [i.e., referring to test that involve physical functions and skills required for mobility through gait testing, the timed up and go test, the sit to stand test...]).- Study design: randomized controlled trials. Other inclusion criteria: - There were preintervention and immediate postintervention assessment of the outcomes targeted. Exclusion criteria: - Articles were written in other language than English, Spanish, French, or Italian.- They carried out yoga interventions, making it challenging to classify them solely as trunk-focused exercise programs or general exercise programs. This is because yoga primarily emphasizes whole-body balance rather than solely

targeting the trunk/core structures.- Articles were excluded if general exercise programs included more than 25% of trunk exercises.

Information sources The databases that will be used in the present systematic review will be PubMed, Embase, SPORTDiscus and Cochrane (CENTRAL). Additionally, a complementary manual search will be performed on the references list from the systematic review on the topic to avoid missing potential eligible articles.

Main outcome(s) The main outcomes of the review will be quality of life, mental health, and cognitive function for the psychosocial dimension; and trunk physical fitness (i.e., endurance, strength, stability, flexibility of trunk structures), whole-body balance (i.e., test assessing body balance in different conditions such as static or dynamic tasks), and functional mobility (i.e., referring to test that involve physical functions and skills required for mobility through gait testing, the timed up and go test, the sit to stand test...) for physical functioning. We will register these outcomes through the different test or scales employed by the articles. Nonetheless, if an article provides two methods for the same outcome, the one most used by the studies will be selected.

Additional outcome(s) Participants and training program characteristics will be registered to analyze their impact as moderator factors on the main outcomes of the review. The moderator factors considered for participants characteristics will be sex, years, health disorder (if available), body mass index, and baseline psychosocial and physical parameters. Regarding the training characteristics, the subsequent will be considered: type of trunk exercise, weeks of training, training frequency, session duration, total training volume, and intensity (if available). If other moderator factors of interest are identified during the review process this will be updated in the manuscript.

Data management A specific codebook will be created for the systematic review, registering a) characteristics of the studies (e.g., country, year...), b) characteristics of the sample (e.g., sex, years...), c) characteristics of the training program (e.g., type of exercise, weeks of training, training frequency, session duration...), d) mean and standard deviation of the outcomes registered, e) quality and risk of bias of the studies. Two reviewers will independently screen, complete the data extraction and assess the quality and risk of bias of the potential articles. In case of disagreement a third reviewer will be consulted.

Quality assessment / Risk of bias analysis The Cochrane Risk of Bias II tool will be employed to assess the risk of bias of the studies included (7). On the other hand, the GRADE approach will be used to assess the certainty of evidence of the outcomes analyzed (8).

Strategy of data synthesis The mean change and standard deviation of the changes will be calculated to report the standardized mean difference or the mean difference depending on whether the outcomes are reported through different or the same scale/tests, respectively. When a trial consisted of two experimental groups that met the inclusion criteria, the control group sample will be divided into two halves, each of which will be used with one of the experimental groups. We will employ a random-effects model to calculate the pooled effect sizes because of the variability that will be present in both sample and training programs.

Subgroup analysis Subgroup analyses will be performed through meta-regression analysis if the number of studies available for each outcome is higher than 10, as recommended by Borenstein et al., (2011) (9). If not, subgroup analysis based on the median score, where the moderator factors will be averaged from both experimental and control groups. Afterwards, and based on the median scores, two subgroups will be created (i.e., below and over the median). Subgroup analysis will be performed on the moderator factors previously mentioned.

Sensitivity analysis To assess the robustness of the results obtained using the imputed correlation value of 0.5 in case of the studies not providing the standard deviation of the changes, a sensitivity analysis will be conducted by examining correlation values of 0.6, 0.7, 0.8, and 0.9.

Language restriction Randomized controlled trials published in English, Spanish, Italian and French will be considered for inclusion in the systematic review.

Country(ies) involved All the authors involved in the review are from Spain.

Other relevant information Contributorship: all authors will contribute equally to this work

Keywords Trunk-focused exercise programs; older adults; moderator factors; psychosocial and physical factors.

Dissemination plans The present systematic review is intended to be published in a journal included in the journal citation of reports.

Contributions of each author

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