

INPLASY PROTOCOL

The Effects of a Single Session of Mindful Exercise on Anxiety: A Systematic Review and Meta-Analysis

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Review question / Objective: To evaluate the effects of a single session of mindful exercise on anxiety and examine whether effects varied according to participant characteristics, mindful exercise exposure, or features of research design.

Information sources: Articles published before Dec. 31, 2020, are located using searches of Google Scholar, PubMed, PsycINFO, and Web of Science. The randomized or non-randomized controlled trials (RCTs) are included. Language is limited with English.

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INTRODUCTION

Review question / Objective: To evaluate the effects of a single session of mindful exercise on anxiety and examine whether effects varied according to participant characteristics, mindful exercise exposure, or features of research design.

Condition being studied: Anxiety disorders are the most common mental illnesses in the United States, affecting about 23 million people (4% of women and 2% of men) each year. In response, psychological approaches and medication are the mainstays of treatment for anxiety disorders. However, many people experiencing anxiety do not seek

medical treatment or therapy. Moreover, existing evidence suggests that medical treatment and psychological therapy can be costly and inaccessible to many. Thus, seeking alternative and complementary approaches for managing anxiety are preferred by people with anxiety symptoms. In recent years, mindful exercise has gained the attention of practitioners and researchers in Western countries as an alternative and complementary approach for health promotion. As a special type of physical exercise, mindful exercise was defined here as involving an active mindful element executed with a profound inwardly mental focus over and above the habitual bodily movements involved in traditional forms of exercise. Several meta-analytic reviews of randomized controlled trials (RCTs) have suggested that mindful exercise (yoga, Tai chi and Qigong) had positive effects on reducing anxiety among clinical and non-clinical individuals. However, almost all of the meta-analyses included articles that used long-term regular mindful exercise training. Little is known about the effects of a single session of mindful exercise on anxiety, which might contribute cumulatively to favorable long-term effects. Prior meta-analyses have shown acute exercise was accompanied by significant anxiety reductions. The scientific advisory committee report for the 2018 Physical Activity Guidelines for Americans concluded that acute exercise had been associated with reduction of anxiety, but the effect size was small. However, the available evidence from experimental studies of acute exercise showed the exercise modes had been primarily limited to conventional types of exercise including walking, running on a treadmill, or leg cycling. In contrast to mindful exercise, these exercise modalities were generally characterized by expenditure of high amount of metabolic energy to build up muscles and strength or increase bone density. The multiple components of mindful exercise might yield anxiolytic effects different from that of the traditional exercises. Nevertheless, previous systematic reviews and meta-analyses investigating the effects of

exercise on anxiety found significant moderating effects from moderators selected a priori based on empirical or logical rationale for participant characteristics, exercise stimulus features, and research design features. As such, the size of anxiolytic effects of a single session of mindful exercise and whether they vary according to participant characteristics, features of exercise exposure, and features of research design have not been established. We are to report on a comprehensive, systematic review and meta-regression analysis aimed to provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).

METHODS

Search strategy: Articles published before Dec. 31, 2020, are located using searches of Google Scholar, PubMed, PsycINFO, and Web of Science. The reference lists of articles and reviews are also manually searched. The search terms used are "yoga" " Tai chi", "Tai chi Chuan", "Tai chi Chih", "ta'i chi", "tai ji", "Tai Ji Quan", "taijiquan", "qigong", "qi gong", "qi", "chi gong", "anxiety", "mood", "acute", "single bout", "one bout", "single session", and "one session". For each of these databases, the general search strategy used the following form: ("acute"[Title/Abstract] OR "single bout" [Title/Abstract] OR "one bout" [Title/Abstract] OR "single session"[Title/Abstract] OR "one session"[Title/Abstract]) AND ("yoga"[MeSH Terms] OR "tai ji"[MeSH Terms] OR "qigong"[MeSH Terms] OR "yoga" [Title/Abstract] OR "tai chi" [Title/Abstract] OR "tai chi chuan" [Title/Abstract] OR "tai chi chih"[Title/Abstract] OR ("ta'i"[All Fields] AND "chi"[Title/Abstract]) OR "tai ji"[Title/Abstract] OR "tai ji quan"[Title/Abstract] OR "taijiquan"[Title/Abstract] OR "qigong" [Title/Abstract] OR "qi gong"[Title/Abstract] OR "qi"[Title/Abstract] OR "chi gong" [Title/Abstract]) AND ("anxiety"[MeSH Terms] OR "anxiety" [Title/Abstract] OR "mood" [Title/Abstract]).

Participant or population: Healthy or unhealthy participants.

Intervention: A single session of yoga, Tai chi, or Qigong practice.

Comparator: The comparators are control or non-mindful exercise comparison condition. But the following comparators are excluded: (1) drugs (2) different styles of Tai chi Qigong and yoga.

Study designs to be included: Randomized or non-randomized controlled trials (RCTs)

Eligibility criteria: The eligibility criteria are established based on a PICOS model (Participants, Intervention, Comparison, Outcome, and Study design). The participants of interest are healthy or unhealthy adults. The intervention of interest is a single session of mindful exercise. Studies comparing any style of mindful exercise (yoga, Tai chi, or Qigong) with a control condition or non-mindful exercise comparator are included. Our outcome of interest is self-reported anxiety. Relevant randomized or non-randomized controlled trials (RCTs) are included. Inclusion criteria included: (1) English language articles, (2) a single session of any styles of yoga, Tai chi, or Qigong, (3) assignment to either mindful exercise (yoga, Tai chi, or Qigong) or to non-mindful exercise comparison condition, (4) between subjects design or within subjects design, (5) continuous anxiety outcome measured using validated self-report questionnaires at pre and post mindful exercise. Articles that are excluded: (1) single arm pre-post designs without controlled conditions, (2) Because yoga, Tai chi, or Qigong is typically comprised of various movements for each session, studies decomposed yoga, Tai chi, or Qigong as different movement segments and compared different effects on anxiety among those segments but not against a control comparison, (3) compared different styles of yoga, Tai chi or Qigong, but without a control comparison (4) compared yoga, Tai chi or Qigong with drugs, (5) anxiety measured as dichotomous outcomes or

other surrogate outcomes (such as sleep quality) or biomarkers.

Information sources: Articles published before Dec. 31, 2020, are located using searches of Google Scholar, PubMed, PsycINFO, and Web of Science. The randomized or non-randomized controlled trials (RCTs) are included. Language is limited with English.

Main outcome(s): Continuous anxiety outcomes are measured using validated self-report questionnaires at pre and post mindful exercise.

Quality assessment / Risk of bias analysis: The quality of studies included in the meta-analysis are assessed using the PEDro scale. There are 11 criteria in the PEDro scale (Criterion 1: Subjects eligibility; Criterion 2: Random allocation; Criterion 3: Concealed allocation; Criterion 4: Baseline homogeneity; Criterion 5: Subjects blind; Criterion 6: Therapist blind; Criterion 7: Assessor blind; Criterion 8: Adherence rate is over 85%, Criterion 9, Intent-to -treat analysis; Criteria 10: Between-group statistical comparison; Criteria 11: Point measures and/or measures of variability). Scores on the PEDro scale range between 0 and 10, with higher scores indicating higher quality of methodology. The score from "Criterion 1" is not included in the calculation of the overall score.

Strategy of data synthesis: Effect sizes are calculated by subtracting the mean change in the comparison condition from the mean change in the mindful exercise condition and dividing the difference by the pooled standard deviation of pre-condition scores. Effect sizes are adjusted for small sample bias. A decrease in anxiety among mindful exercise participants is indicated by a positive effect. Because we anticipate heterogeneity in treatment effects derived from different settings and methods, a random effects model is used to aggregate mean effect size (ES) with the Metafor package in R.14.0. We also anticipate that some included studies may yield more than one outcome score. Because these multiple effects share the same subjects,

the sampling errors will be dependent. As such, traditional meta-analysis may violate independency and confound aggregated mean effect sizes. Therefore, we will apply a multilevel meta-analysis model with maximum likelihood estimation to adjust for between-studies variance and correlated effects within studies using R Metafor package according to standard procedures in R.14.0. Heterogeneity of mean effects is described by the Q and I² (95% CI) statistics. The number of unpublished or unretrieved studies of null effects that would diminish the significance of observed effects to $p > 0.05$ is estimated as fail-safe N+. Funnel plots is graphed and Egger's test is performed to estimate possible publication bias.

Subgroup analysis: Potential effect size moderators are selected a priori if adequate data existed and there is an empirical or logical rationale why the variable could moderate anxiety responses to mindful exercise. We divide the moderators into three categories on the basis of participant variables (i.e., pre-exercise anxiety levels, intervention age), exercise features (i.e., duration or intensity of sessions), or characteristics of research design (i.e., timing of assessments, type of comparison group, whether randomization was performed). First, multilevel meta-regression analysis with maximum likelihood estimation using Metafor package in R.14.0 is applied to adjust nested effects within studies to test univariate moderators hypothesized to influence effect size for ratings of anxiety, if any significant moderators for the univariate analysis are observed, then all the significant moderators are included in a multilevel mixed model multiple regression model.

Sensitivity analysis: Sensitivity analyses are used by eliminating potential outlying studies and evaluating the overall pooled effect when the studies are omitted.

Country(ies) involved: China and America.

Keywords: acute exercise; meta-regression; multilevel meta-analysis; state anxiety; Tai chi, Qigong, yoga.

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