INPLASY PROTOCOL

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The Effect of Tai chi on Positive Activated Affect: A Systematic Review and Multilevel Meta-analysis of Randomized Controlled Trials

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Review question / Objective: To evaluate the effect of Tai chi on positive activated affect and examine whether effect varied according to participant characteristics, Tai chi exposure, or features of research design.

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 any style of Tai chi exercise. Studies comparing any style of Tai chi with a control condition or non-Tai chi comparator are included. Our outcome of interest is self-reported positive-activated affect. Relevant randomized controlled trials (RCTs) are included. Inclusion criteria included: (1) English language articles, (2) any styles of Tai chi (3) assignment to either Tai chi or to non-Tai chi comparison condition, (4) continuous self reported positive-activated affect outcome measured using validated self-report questionnaires at baseline and post Tai chi intervention. Articles that are excluded: (1) Studies that evaluated an acute session of Tai chi are excluded; (2) single arm pre-post designs without controlled conditions are excluded; (3) Controlled trials but without randomized assignment are excluded; (4) compared different styles of Tai chi or other mindful exercises (such as yoga, qigong), but without a control comparison (4) compared Tai chi with drugs (5) Studies that positive activated affect measured as dichotomous outcomes or non-positive-activated affect or biomarkers are not included.

INTRODUCTION

Review question / Objective: To evaluate the effect of Tai chi on positive activated affect and examine whether effect varied according to participant characteristics, Tai chi exposure, or features of research design.

Condition being studied: Positive affect (PA), a pleasant feeling state, reflects a level of positive engagement with the environment (eg. happiness, joy, excitement, enthusiasm, and contentment, etc.). There is now impressive evidence from qualitative and quantitative reviews that have consistently emphasized the importance of PA on health benefits such as an increase in longevity, cardiovascular health, and immune function. Hence, interventions that can cultivate or boost positive affect may be especially important for people to maintain or improve general well-being. Tai chi, a form of Chinese mindful exercise, has gained popularity in Western countries as an alternative and complementary approach for improving not only the physical but also psychological well-being of individuals. In Chinese traditions, Tai chi is based on principles that are inherent to Chinese traditional medicine and usually are conceptualized to cultivate functional integrity and the enhancement of the health-related energy and power that the Chinese call Qi, which can be either enriched or exhausted. Cumulative systematic review and meta-analysis have shown that Tai chi has positive effects on improving the affective well-being of individuals, which commonly investigated negative affect. However, no previous systematic review or meta-analysis has been found to attempt to explore the effects of Tai chi on positive affect, to our knowledge. The primary aim of the study is to address the effect of Tai chi on positive affect. For this study, positive affect is conceptualized according to a circumplex structure, in which core affect describes the quality of subjective experience along with the valence (positive-negative) and activation (activated–deactivated) dimensions of the affect circumplex. Our focus will be Tai chi-induced changes in affective states of the upper right quadrant of the circumplex. We refer to this quadrant as positive-activated affect (PAA) consistent with the previous studies We located 2 published meta-analytic reviews of the effects of exercise on PPA that reported effect size (ES) of nearly a half standard deviation(SD) supporting statistically significant improvement on PPA following acute (SD = 0.37) and regular exercise (SD = 0.48). Despite their seminal contributions to the knowledge base, those reviews did not include Tai chi as an intervention strategy and did not provide a comprehensive review of the cumulative evidence using the same methodology. The multiple components of Tai chi exercise might yield an effect of PAA different from that of the traditional aerobic exercises. Additionally, the meta-analytical procedures employed in the aforementioned meta-analysis assume independence among the effect sizes to be pooled, when, in fact, this is difficult to occur. Very often exercise intervention studies yield more than one interested outcome effect nested within studies. These multiple effects share the same subjects, the sampling errors will be dependent. As such, a traditional meta-analysis may violate independence and confound aggregated mean effect sizes. Most often meta-analysts adopt strategies such as: ignoring dependence; averaging effect sizes within studies, and/or analyzing multiple outcomes within studies separately. These strategies remain sub-optimal in the light of meta-analytical tools that are currently available and that allow proper modeling of dependencies within studies without the unnecessary loss of information/data-reduction aforementioned and thus yield a more robust pooled effect size – i.e. multi-level meta-analysis techniques. In view of these considerations, the size of the effect of Tai chi on PAA and whether they vary according to participant characteristics, features of Tai chi exposure, and features of research design have not been established. Therefore, we extend Reed and Buck's (2006) study to conduct a comprehensive, systematic review and multilevel meta-analysis of randomized controlled trials aimed to clarify these questions.

METHODS

Participant or population: Healthy or unhealthy participants.

Intervention: Any style of Tai Chi intervention.

Comparator: The comparators are control or non-Tai chi comparison condition. But the following comparators are excluded: (1) drugs (2) different styles of Tai chi or other types of mindful exercises.

Study designs to be included: Randomized controlled trials (RCTs).

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Information sources: Articles published before Dec. 31, 2020, are located using searches of EBSCO, PubMed, Web of Science, Scopus. The reference lists of articles and reviews are also manually searched. The randomized controlled trails are included. Language is limited with English.

Main outcome(s): Continuous positive-activated affect outcomes are measured using validated self-report questionnaires at baseline and post Tai chi. positive affect is conceptualized according to a circumplex structure, in which core affect describes the quality of subjective experience along the valence (positive-negative) and activation (activated–deactivated) dimensions of the affect circumplex. Our focus will be Tai chi exercise-induced changes in affective states of the upper right quadrant of the circumplex. We refer to this quadrant as positive-activated affect.

Quality assessment / Risk of bias analysis: The quality of studies included in the meta-analysis are assessed using the amended Dusky quality assessment scale. There are 15 criteria in the amended Dusky quality assessment scale (Criterion 1: Random assignment; Criterion 2: Detailed assignment; Criterion 3: Bias in grouping absent; Criterion 4: Described outcomes; Criterion 5: Objective outcomes; Criterion 6: Assessed blindly; Criterion 7: Defined inclusion /exclusion; Criterion 8: Report number excluded; Criterion 9, Tai chi clearly described; Criteria 10: Control clearly described; Criteria 11: Statistical analysis provided; Criteria 12: P value provided; Criteria 13: Analysis appropriate; Criteria 14: Sample size justified; Criteria 15: Adherence reported).Scores on the scale range between 0 and 15, with higher scores indicating higher quality of methodology.

Strategy of data synthesis: Effect sizes are calculated by subtracting the mean change in the comparison condition from the mean change in Tai chi condition and dividing the difference by the pooled standard deviation of baseline scores.Effect sizes are adjusted for small sample bias. 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 restricted 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 Tai chi. We divide the moderators into three categories on the basis of participant variables (i.e., baseline positive-activated affect levels, intervention age), Tai chi exposure (i.e., duration or intensity of sessions), or characteristics of research design (i.e., timing of assessments, type of comparison group). First, multilevel meta-regression analysis with restricted 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 positive-activated affect, 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.

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