



Systematic review

Mantra meditation for mental health in the general population: A systematic review

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ABSTRACT

Introduction: Meditation has attracted increased attention in the literature as a non-pharmacological strategy to foster positive mental health amongst the general population. This systematic review aims to summarise studies of mantra meditation (which includes Transcendental Meditation, TM[®]) to understand its potential value in fostering positive mental health and alleviating negative affectivity in non-clinical populations.

Methods: Electronic databases were searched for English language, peer-reviewed empirical studies (published between 1970 and 2018) that related to mantra meditation, reported at least one outcome of mental health and utilised healthy, non-clinical populations. Studies were assessed for quality and risk of bias using the Quality Appraisal Tool for Quantitative Studies (QATQS). Data abstraction was facilitated by a tailored data extraction form.

Results: A total of 2171 records were identified, of which 37 were included in this review. Studies report on outcomes of anxiety, stress, depression, burnout, anger and psychological distress. 78% of studies utilised the TM programme. Findings indicate that mantra meditation interventions may have minimal to moderate beneficial effects on mental health in general populations. Over 90% of studies were considered to be of weak quality.

Conclusions: There is some evidence that mantra meditation can improve mental health and negative affectivity in non-clinical populations, however poor study quality may hinder the extent to which one can be certain about the accuracy of these findings. Mantra meditation may be considered a useful adjunct to workplace wellbeing initiatives or educational programmes. Further studies of higher quality that incorporate cost-effectiveness analyses are warranted.

1. Introduction

Mental health promotion focuses on enhancing protective factors and decreasing risk factors for developing mental health problems, and represents a core component of national and international action plans on mental health policy [1,2]. Mind-body interventions offer non-pharmacological techniques to foster positive mental health in both clinical and non-clinical populations. Stakeholders and policy makers rely on reviews of the current evidence to inform judgments and decisions. Mindfulness meditation – which typically advocates for non-judgmental awareness of the body and mind, with attention and

acceptance of the present moment – has been reviewed extensively [3–7]. Mantra meditation has yet to be evaluated with such rigour.

Mantra meditation typically involves continually repeating a chosen word, phrase or set of syllables (silently or aloud) while passively disregarding any internal or external distractions. The sound or mantra in meditation is proposed to act as an effective vehicle for overriding mental speech (which is the predominant form of conscious thinking for most people), thus continually redirecting negative or intrusive automatic thoughts which perpetuate psychological distress. Various subtypes of mantra meditation exist, including Transcendental Meditation[®] (TM), OM chanting, Benson's Relaxation Response (RR) [8] and Japa

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yoga. While TM® advocates have argued that subtle differences exist (in that the TM® technique appreciates the mantra at “finer” levels in which the mantra becomes secondary in experience and ultimately disappears [9,10]), all are based upon the same fundamental principle of repeating a word or phrase to elicit a relaxation response, thus will be addressed in this review under the collective term of ‘mantra meditation’.

The number of studies exploring the impact of mantra meditation on indicators of mental health has grown over recent decades, with reductions in burnout, stress, depression, anxiety and trauma symptoms widely observed [11–17]. Indeed, systematic reviews and meta-analyses have been conducted to attempt to synthesise the literature in this field [5,18,19]. However, two primary concerns have been raised with the reviews that exist to date. Firstly, stringent eligibility criteria with regard to study design (i.e. inclusion of randomised controlled trials only) has restricted the breadth of studies included in such reviews, excluding important findings of cohort studies and non-randomised controlled trials. As research in the field of mantra meditation is still (in comparative terms) in its infancy, a broad approach is considered appropriate to provide a more comprehensive overview of evidence of its efficacy to date [20,21]. Secondly, existing reviews have focused specifically on participants with a clinical condition (i.e. clinical anxiety or PTSD). While this is useful, we maintain that such findings are potentially limited to patient groups and cannot be readily generalised to the wider population (i.e. individuals who have not been diagnosed with a clinical condition, who are the ultimate target population of mental health promotion strategies).

We endeavour to overcome the above criticisms by systematically reviewing all empirical studies (including randomised controlled trials, non-randomised trials, cohort studies and qualitative research) that evaluate the impact of mantra meditation on mental health related outcomes within a healthy, non-clinical group of adult participants. In doing so, we hope to provide a comprehensive evidence base on the potential utility of mantra meditation programmes to reduce psychological distress and promote mental well-being in the general population. Our objective is guided by the PICOS framework, as outlined in Table 1.

2. Method

2.1. Protocol and registration

The protocol for this systematic review has been published and is available online [22]. The original protocol specified the review would report on the impact of mantra meditation on physical, psychological, cognitive, social and occupational health. This review is refined to mental health related outcomes only. Deviations from the protocol with accompanying rationale can be found in Supplementary File 1. The systematic review was registered with the International Prospective Register of Systematic Reviews (PROSPERO) on 27th November 2017 (registration number CRD42017079294).

2.2. Study design

This systematic review has been developed and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [23] guidelines.

Table 1
PICOS Framework.

Participants	Healthy, non-clinical adult (18+) population (individuals with no discernible diagnosis of mental or physical illness)
Interventions	Any form of mantra meditation
Comparisons	Any active or passive control group (not applicable to qualitative studies)
Outcomes	Direct indicators of mental health (i.e. depression, anxiety, stress, burnout)
Study Design	Any empirical study design

Table 2
Search strategy of terms.

[mantra* AND meditation] OR [mantram*] OR [transcendental AND meditation] OR [mantra* AND yoga] OR [Japa AND yoga] OR [OM AND chanting]

2.3. Search strategy

The search strategy was designed to be as broad as possible to identify all potentially relevant literature (see Table 2 for search terms). The information retrieval process included an electronic search of the MEDLINE, Scopus, Embase, PsycINFO and PubMed databases (specific to Title, Abstract and Keywords only). Limiters of English language, publication date (1970–2017) and peer-reviewed publications were applied to each electronic search. To ensure literature saturation, hand searches of reference lists were conducted on all included studies. The reference lists of several reviews of similar topics were also hand searched for relevant studies. An additional study published in 2018 was subsequently identified and included in the review.

2.4. Eligibility criteria

The key inclusion criteria for this review were as follows:

- Studies that recruited healthy, non-clinical adult (18+) participants (i.e. participants who were not recruited into the study because of a specific illness)
- Studies that reported outcomes directly pertaining to mental or psychological health (i.e. depression, anxiety, stress, burnout)
- Studies of any empirical design featuring primary data collection
- Studies that reported on a mantra meditation intervention of some capacity (i.e. ‘OM’ chanting, transcendental meditation)

Pursuant to the above, exclusion criteria included studies that recruited clinical samples (i.e. hypertensive patients) or children (younger than 18), studies that utilised secondary data (i.e. reviews), theoretical articles or commentaries without statistical analyses, and studies that reported on outcomes not directly pertaining to psychological health (i.e. recidivism rates).

2.5. Study selection

Studies identified from the electronic database searches were exported into EndNoteX7, which facilitated deduplication of records. A subsequent hand search of studies identified a number of further duplicates to be removed. The study selection process involved two stages, as depicted in Fig. 1. All titles, abstracts and full-texts were assessed by two independent reviewers against aforementioned eligibility criteria. Disagreements between reviewers were resolved by a third independent reviewer.

2.6. Data extraction

A tailored data extraction form was developed to standardise the extraction and synthesis process. This was piloted by the first author (JL), with feedback integrated into its further development. The first author (JL) extracted all relevant data from the final list of included studies. To assess the consistency of the data extraction process, a random selection of 10% of the articles were reviewed independently by a second author (LP), who was blind to the first author’s decision. Due to notable heterogeneity in study design, treatment modality and assessment of outcome measures, it was not plausible to calculate the impact of mantra meditation using Cohen’s *d* and quantify intervention outcomes.

2.7. Quality appraisal

The Quality Assessment Tool for Quantitative Studies [24] (QATQS)

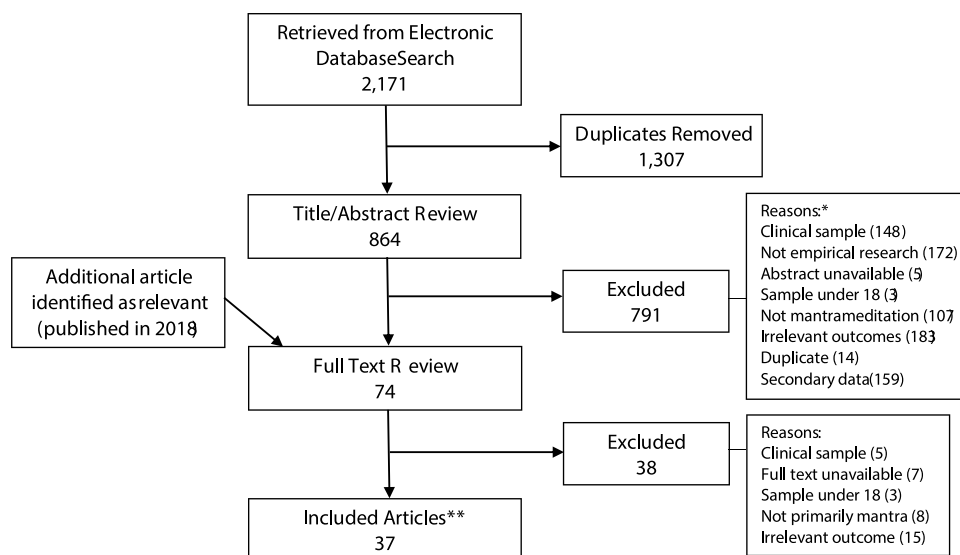


Fig. 1. Flowchart of study selection process.

* Primary reason for exclusion.

**One article reports on two different experiments [38]. This has been documented as two separate articles for the purpose of data analysis and extraction.

developed by the Effective Public Health Practice Project (EPHPP) was used to assess methodological quality of the full-texts in six areas; selection bias, study design, confounders, blinding status, data collection methods and withdrawals/dropouts. A quality score of one (strong), two (moderate) or three (weak) is assigned to each area, and a global score for each study is established. No weak ratings across any of the areas represents a study as ‘strong’, one weak area depicts the study as ‘moderate’ and two or more weak areas depict a ‘weak’ study. A companion document (Dictionary for the EPHPP QATQS) was used to assist with scoring the tool. Quality appraisal of studies ran concurrently to the data extraction process. The quality appraisal process was conducted by the first author (JL), with a random sub-selection of articles reviewed by a second author (LP). A third reviewer was available if disagreements occurred regarding a study’s assigned quality rating, however this was not necessary.

3. Results

3.1. Search results

The total electronic database search (Embase, Medline, PsycINFO, Pubmed and Scopus) retrieved 2171 articles with limiters of English language, published after 1970 and peer-reviewed articles. Following de-duplication, 864 titles/abstracts were screened for eligibility. Of these, 73 were selected for a full-text review. One additional article that was published after the initial database search was identified and included in the full text review. A further 38 studies were excluded at this point, primarily due to outcomes and interventions not meeting the inclusion criteria and unavailability of the full text. Of the 36 final articles, one paper [38] reported on two different experiments, thus was documented as two separate articles for the purpose of analysis and extraction. Data extraction and quality appraisal is therefore based upon 37 articles that met all required criteria (Fig. 1). A brief overview of rejected studies along with the rationale for their rejection is available from the authors upon request.

3.2. Study characteristics

A total of 37 articles were included in the analysis. Thirty papers were intervention studies and seven were non-intervention studies. Four of the papers pertained to two trials [25–28], thus the analysis

represents results from 35 independent participant samples. Study design varied, with five cross-sectional studies, ten randomised controlled trials (RCTs), twelve quasi-experimental studies (i.e. studies with a control group but lacking random assignment), eight single cohort pre-post studies (i.e. uncontrolled trials), and two qualitative studies. The vast majority of studies utilised the standardised TM[®] programme (n = 29). Five studies adapted the Mantram Repetition Program (MRP; based on Easwaran’s approach to meditation [29]), with the final three studies utilising OM chanting, Japa meditation and an adaptation of TM, respectively. Table 3 below provides a more detailed overview of the included studies. Most studies were conducted in the USA (n = 25) where the Maharishi University of Management in Iowa developed the TM[®] programme. Three studies were conducted in Uganda, two in the Netherlands, with the remaining studies conducted in the UK, New Zealand, Israel, Iran, India, Croatia, Australia (one each, respectively). Overall, the studies were conducted in a wide range of settings, including occupational settings (n = 8), prison settings (n = 6), university settings (n = 11), community settings (n = 8), refugee camps (n = 2), veteran settings (n = 1) and nursing home settings (n = 1). Every study incorporated a measure of self-report, one study included a measure of behavioural observation [30], and two studies included direct measures (i.e. stress reactivity, autonomic arousal) [31,32]. Only one study incorporated measures that were not standardised [33].

3.3. Anxiety

Anxiety was the most frequently reported outcome across all studies, with 23 papers reporting on either state anxiety, trait anxiety, or both. Spielberger’s State-Trait Anxiety Inventory (STAI) [34] was the most commonly utilised metric. Other measures included the Brief Symptom Inventory, GHQ-28, Endler Multidimensional Anxiety Scales, Profile of Mood States, Epstein-Fenz’s Manifest Anxiety Scale, Trauma Symptom Checklist, S-R Inventory of Anxiousness, Zuckerman’s Adjective Checklist and Bendig’s modified version of the Taylor Manifest Anxiety Scale.

Seventeen of the 23 studies reporting on the outcome of anxiety describe significant improvements in either state or trait anxiety. Eleven of these 17 were quasi-experimental in design, or did not have a control group. Of the seven RCTs (i.e. the gold standard of scientific research) that reported on anxiety outcomes, only two concluded that mantra meditation has a significant impact on anxiety, in comparison to a control group [35,36]. Four RCTs definitively concluded that TM had

Table 3
Study Characteristics.

Author (year)	Population (N)	Study Design	Type of Mantra	Primary Comparison	Relevant Outcome	Impact	Study Quality
Alexander et al. (1993) [50]	Occupational setting (86)	Quasi-experimental	TM	Regular meditator vs Passive control	Trait Anxiety	+	Weak
Yunesian et al. (2008) [51]	General public (80)	Single cohort pre-post	TM	Before vs After	State Anxiety	~	Weak
					Anxiety	+	
					Somatisation	+	
					Depression	/	
					Total GHQ	+	
Alexander et al. (2003) [27]	Prison setting (160)	Cross-sectional	TM	TM group vs Other prison groups	Trait Anxiety	+	Weak
Rees et al. (2013) [25]	Refugee population (42)	Quasi-experimental	TM	TM vs Wait-list control	State Anxiety	+	Weak
Mishra et al. (2017) [14]	School Teachers (8)	Single cohort pre-post	OM Chanting	Before vs After	Post-traumatic stress	+	Weak
Nidich et al. (2017) [13]	Prison setting (22)	RCT	TM	TM vs Wait-list control	Stress	+	Weak
Rees et al. (2014) [26]	Refugee population (11)	Single cohort pre-post	TM	Before vs After	Post-traumatic stress	+	Weak
Alexander et al. (1989) [37]	Nursing home residents (73)	RCT	TM	TM vs Mindfulness vs Relaxation vs No treatment control	Trait Anxiety	/	Weak
					Depression	/	
Alexander and Orme-Johnson (2003) [28]	Prison setting (271)	Quasi-experimental	TM	Active TM vs Controls	Trait Anxiety	~	Weak
Berkovich-Ohana and Glicksohn (2017) [52]	General public (141)	Cross-sectional	TM	TM vs Mindfulness vs Control	Positive Affect	/	Weak
					Negative Affect	/	
Bormann et al. (2006) [45]	Occupational setting (62)	Single cohort pre-post	Mantram Repetition	Before vs After	Stress	+	Weak
					Trait Anxiety	+	
					State Anxiety	/	
					Trait Anger	+	
					State Anger	/	
Bormann et al. (2006) [48]	Occupational setting/veterans (66)	Qualitative	Mantram Repetition	–	Themes of managing stress and managing emotions other than stress	+	N/A
Bormann et al. (2009) [46]	Occupational setting (21)	Single cohort pre-post	Mantram Repetition	Before vs After	Stress	+	Weak
					Depression	+	
					Trait Anger	/	
Burns et al. (2011) [53]	University setting (43)	Single cohort pre-post	TM	Before vs After	Trait Anxiety	+	Weak
					Stress	+	
					Depression	~	
Buttner et al. (2016) [16]	Veteran setting (273)	Single cohort pre-post	Mantram Repetition	Before vs After	Depression	+	Weak
					Anxiety	+	
					Somatisation	+	
					Total Psychological Distress	+	
Dillbeck (1977) [54]	University setting (33)	Quasi-experimental RCT	TM	TM vs Relaxation Group	Trait Anxiety	+	Weak
Elder et al. (2014) [11]	Occupational setting (40)	RCT	TM	TM vs Wait-list control	Stress	+	Moderate
					Depression	+	
					Burnout	+	
Gaylord et al. (1989) [31]	University setting (83)	Quasi-experimental	TM	TM vs Active control	State Anxiety	+	Weak
Leach et al. (2015) [39]	Community setting (17)	RCT	TM	TM vs Wait-list control	Stress Reactivity	+	Weak
					Stress	+	
					Depression	/	
					Anxiety	/	
Hawkins et al. (2003) [47]	Prison setting (300)	Quasi-experimental	TM	TM vs Control	Psychological distress	/	Weak
					Psychological wellbeing	~	
Leary et al. (2018) [12]	Occupational setting (39)	Single cohort pre-post	Mantram Repetition	Experienced meditators vs Novice meditators	EE	+	Weak
					DP	+	(for novice)
					PA	+	(for novice)
Nidich et al. (2009) [35]	University setting (298)	RCT	TM	TM vs Wait-list control	Depression	+	Weak
					Anger	+	
					Anxiety	+	
					Total Psychological Distress	+	
Nidich et al. (2016) [36]	Prison setting (181)	RCT	TM	TM vs No-treatment control	Stress	+	Moderate
					Depression	+	
					Anxiety	+	
Sheppard et al. (1997) [49]	Occupational setting (44)	Quasi-experimental	TM	TM vs Active control	State Anxiety	/	Moderate
					Trait Anxiety	+	
					Depression	+	
Smith et al. (1976a) [38]	University setting (139)	RCT	TM	TM vs No treatment	Trait Anxiety	+	Weak
					Muscle Tension	+	
					Autonomic Arousal	+	
Smith et al. (1976b) [38]	University setting (54)	Quasi-experimental	TM	TM vs Active control	Trait Anxiety	/	Weak
					Muscle Tension	/	
					Autonomic Arousal	/	

(continued on next page)

Table 3 (continued)

Author (year)	Population (N)	Study Design	Type of Mantra	Primary Comparison	Relevant Outcome	Impact	Study Quality
Tomljenovic et al. (2016) [17]	University setting (12)	Single cohort pre-post	TM	Before vs After	State Anxiety Trait Anxiety	+ /	Weak
Throll (1981) [55]	General public (48)	Quasi-experimental	TM	TM vs Progressive Relaxation	State Anxiety Trait Anxiety	+ +	Weak
Walton et al. (1995) [42]	University setting (55)	Cross-sectional	TM	TM practitioners vs Non-TM practitioners	State Anxiety Trait Anxiety Anger Depression Total Mood Disturbance	/ + (females only) + + +	Weak
Zuroff and Schwarz (1978) [30]	University setting (60)	RCT	TM	TM vs Muscle Relaxation	Psychological Maladjustment Trait Anxiety (SR) Trait Anxiety (B)	/ + /	Weak
Wolf and Abell (2003) [43]	General public (93)	RCT	Japa meditation	TM vs Active control vs Passive control	Depression Stress	+ +	Weak
Schoormans and Nyklicek (2011) [44]	General public (55)	Cross-sectional	TM	TM vs Mindfulness	Stress Positive Affect Negative Affect	/ / /	Weak
Goldstein et al. (2018) [56]	General public (81)	Quasi-experimental	TM	TM vs Wait-list control	Stress	+	Weak
Boswell and Murray (1979) [32]	University setting (80)	RCT	Programme Modelled after TM	TM vs Active control vs Progressive relaxation vs No treatment	State Anxiety Trait Anxiety Autonomic Arousal	/ / /	Weak
Abrams and Siegel (1978) [57]	Prison setting (115)	Quasi-experimental	TM	TM vs Wait-list control	State Anxiety Trait Anxiety	+ +	Weak
Hjelle (1974) [41]	University setting (36)	Cross-sectional	TM	Experienced meditators vs Novice meditators	Anxiety	+ (experienced)	Weak
West (1980) [33]	General public (83)	Qualitative	TM	-	Open-ended questions related to experience and impact of meditation	+ /	N/A

TM = Transcendental Meditation®.

+ = Significant Difference.

~ = Trend towards Improvement.

/ = No Significant Difference.

- = Significant Disimprovement.

SR = Self-report.

B = Behavioural.

no impact on the measure of anxiety [32,37–39]. Three cross-sectional studies included anxiety measures in their outcomes, and generally reported positive findings, with regular mantra meditators scoring significantly lower on state and trait anxiety scales than either controls or novice meditators [40–42]. One cross-sectional study reported no difference between groups for men, however women who meditated using the mantra demonstrated significantly lower trait anxiety than those who did not [42].

3.4. Depression

Eleven studies reported on outcomes of depression. Eight of these papers reported significant improvements in depression. The measures used varied considerably across studies, with a number of studies reporting depression as a subscale of a more general mental health questionnaire. Such measures included the Self-Rating Depression Scale, Clinical Epidemiology Study for Depression (CESD), the Brief Symptom Inventory, Mental Health Inventory, Profile of Mood States, WebNeuro test, Trauma Symptom Checklist, IPAT Depression Scale, Generalised Contentment Scale and the GHQ-28.

Six studies were RCTs, with four of these reporting significant reductions in depression scores for the mantra meditation group, in comparison to the control group [11,35,36,43]. One RCT compared TM versus mindfulness versus relaxation versus no treatment, and reported no impact of mantra meditation on depression in comparison to any of the other groups [37]. Similarly, the remaining RCT reported no statistically significant difference between TM group and control group for depression, despite a trend towards improvement being evident in the TM group [39]. The remaining five articles varied in design (one with a

control group, four without) with four reporting significant decreases in self-reported depression, and one reporting no significant change for depression.

3.5. Stress

Fourteen studies reported on stress outcome (five RCTs, one cross-sectional, three quasi-experimental and five uncontrolled studies). Overall, the vast majority of studies reported significant reductions in stress following a mantra meditation programme ($n = 12$). The cross-sectional study reported no significant difference between the mantra meditation group and the mindfulness group on self-reported stress [44]. One RCT reported that no significant difference was observed between a TM group and a wait-list control group on stress scores, although there was a trend towards greater improvement in those who received TM [39]. All studies utilised self-report measures, and one included an additional direct measure of stress, the Skin Potential Response Habituation technique (for stress reactivity). The Perceived Stress Scale (PSS) was the most frequently used metric ($n = 8$), with other measures including the Post-traumatic Stress Disorder Checklist – Civilian Version (PCL-C), WebNeuro test and the Index of Clinical Stress (ICS).

3.6. Burnout

Two studies report on burnout; one RCT and one uncontrolled study. Both studies are relatively recent (2014 and 2017, which may reflect the emergence of burnout as an occupational health issue in the literature) and both report on participants in occupational settings. The RCT reports a significant reduction in overall burnout for those who practiced TM,

compared to controls [11]. The uncontrolled trial compares the results of those who had meditation experience at baseline (regular meditators) and those who had no meditation experience (novice meditators). The authors report that for novice meditators, a significant decrease in emotional exhaustion and increase in professional efficacy was observed [12]. The study concludes that the beneficial effect of mantram repetition practice may be only specific to individuals who had not practiced meditation previously. Both studies utilised Maslach's Burnout Inventory (MBI) in their measurement of burnout.

3.7. Anger

Four studies reported outcomes on anger, two of which utilised Spielberger's State-Trait Anger Inventory, and two which utilised a subscale of the Profile of Mood States. The studies generally report positive findings with regards to self-reported anger. One RCT demonstrated a significant improvement in anger scores for the TM group, in comparison to the control group [35]. One cross-sectional study reported that anger scores in non-TM practitioners were twice as high as those of TM practitioners [42]. The remaining two studies were uncontrolled trials; one reported significant reductions in trait anger but with no significant change to state anger [45], and the other reported no change in anger score from pre- to post-intervention [46].

3.8. Other

The remaining studies reported on a variety of outcomes that are related to emotional wellbeing, but that do not fall under the direct heading of depression, anxiety, stress, burnout or anger. Such outcomes include positive affect, negative affect and psychological maladjustment. One cross-sectional study reports no significant difference between TM practitioners and mindfulness practitioners on the Global Mood Scale (GMS) which reflects subscales relating to both positive and negative affect [44]. A RCT assessing psychological maladjustment using Rotter's Incomplete Sentences Test reported that psychological maladjustment decreased over time, but did not differ significantly between the treatment and control groups, making it inappropriate to infer any specific impact of mantra meditation [30]. A quasi-experimental trial comparing a group of prisoners who learned TM versus a group who didn't learn TM reported no significant difference between groups for 'psychological distress' (subscale of Mental Health Inventory). Only a trend towards significance was evident for 'psychological wellbeing' when comparing differences between the TM group and control group [47].

3.9. Qualitative findings

Two studies utilised qualitative methodology for their approach. One paper used the critical incident interviewing technique [48] and reported on themes concerning the use of the mantram to manage stress, the use of the mantram to manage emotions other than stress and the use of the mantram to manage unwanted thoughts. The remaining paper used open-ended questions and conducted frequency analyses on responses [33]. Participants were asked about their perception of the impact of meditation, where 26.4% of the sample cited psychological benefits and 17.3% cited decreased susceptibility to stress. Participants were also asked about their experience while meditating, and 22.52% cited mental relaxation and a state of peace as their primary experience.

3.10. Compliance

Reporting on compliance or regularity of practice was extremely poor and inconsistent across the intervention studies. Thirteen of the intervention papers did not make any reference to compliance to practice in their group of participants. A number of papers reported in their methodology that frequency of meditation practice was in fact collected,

however this was not reported in the findings. Of those that reported actual figures, measures of compliance widely varied, ranging from self-report, to wrist-worn counters, to logbooks and meditation diaries, and monitoring by course instructors. Furthermore, different approaches to measuring compliance were evident, with some papers reporting compliance as average attendance at group meditations, and other papers reporting compliance as meditation at least once a day. Such approaches to measuring the regularity of practice are largely subject to bias and thus unreliable. Compliance is not comparable across studies, thus making it difficult to draw any conclusions regarding the potential impact of compliance to meditation on outcome measures.

3.11. Study quality

As determined by QATQS, of the 35 quantitative studies included, 32 were deemed to be of 'weak' quality, with only three studies scoring a study quality rating of 'Moderate' [11,36,49]. No study received a 'Strong' quality rating. The most predominant form of bias contributing to weak study quality across the review was selection bias.

4. Discussion

This is the first known review to document the impact of mantra meditation on healthy individuals. We identified 37 articles representing 35 different studies on the effects of mantra meditation on psychological health published before March 2018. The reviewed studies report on outcomes that are directly related to mental health, and include anxiety, depression, stress, burnout, anger and mood state.

4.1. General findings

Overall, mantra meditation may be cautiously considered a useful intervention to reduce psychological distress in healthy, non-clinical populations. Variation in intervention length and style, as well as poor reporting on adherence to meditation practice, make it difficult to draw robust conclusions regarding the efficacy of its practice. Poor methodological quality of intervention studies on mantra meditation is consistent with earlier reviews in this area [19]. Despite this, it can be observed that the vast majority of studies report positive outcomes in some manner. In studies that reported null results, it is important to consider that every sample represented a non-clinical population, thus making it plausible that a floor effect may have had an influence (i.e. there may not have been room to measure an effect if symptom levels of the outcomes were low to begin with). Furthermore, it is notable that most studies that reported null findings were reporting on analyses of group comparisons between mantra meditation and an active control group, such as mindfulness [30,32,37,44,52]. This might suggest that while mantra meditation is a feasible intervention in itself to reduce psychological stress, it may not necessarily be any *more* effective than other forms of relaxation training and/or stress reduction. Theoretically speaking, this would make sense, as progressive muscle relaxation, mindfulness and mantram repetition all arguably fall under the general heading of meditation, which has been defined as "a family of techniques which have in common a conscious attempt to focus attention in a non-analytical way and an attempt not to dwell on discursive, ruminating thoughts" (p. 268) [58]. The more appropriate question, therefore, might not be 'What works?' but rather, 'What works for whom?' More sophisticated studies (for example equivalence trials) would be useful to further differentiate outcomes of various mind-body interventions, and explore whether certain forms of meditation are more useful for certain populations over others.

Generally speaking, it remains a substantial challenge for researchers to attempt to translate a phenomenon of Eastern tradition that emphasises life-long growth into an effective intervention utilised in Western culture that may alleviate distress. All interventions reported in this review are relatively short term and do not truly afford

participants the time to cultivate the practice and achieve a level of expertise that can translate to improved emotional health. This may contribute to some inconsistency across findings. All studies make reference to the fact that meditation is a skill that requires expert instruction and time dedicated to practice – this is something that should be taken into consideration, both for future trials and for programmes implemented in occupational settings. Longitudinal studies with more comprehensive and objective reporting of compliance to meditation practice are warranted, to capture the true impact of mantra meditation on psychological health.

4.2. Strengths and limitations

The strengths of this review should be considered alongside its drawbacks. This review incorporated a process of duplicate study selection, cross-checking of data abstraction, and comprehensive quality of evidence assessment to formulate conclusions from the data. The review focuses on samples of general, healthy individuals which allows for the extrapolation of findings to non-clinical groups that may be the focus of mental health promotion strategies (for example workers in an occupational setting, teachers or students in an educational setting, prisoners, minority support groups, and more). Homogeneity of studies is important to draw comparative effectiveness conclusions, with inconsistencies in bodies of evidence typically due to variances in the clinical conditions that are examined within a review. The authors believe this justifies the exclusion of studies that refer to clinical populations.

The most substantial drawback of this review may be the exclusive focus on published, peer-reviewed articles. On the one hand, it ensures that included studies are of a certain methodological rigour, particularly considering that meditation as a research focus is still in its infancy. On the other hand however, it may leave the review susceptible to publication bias. As noted above, the reviewed studies reported insufficient information on compliance to meditation practice, making it difficult to isolate the extent to which mantra meditation impacts mental health. With the exception of the official TM[®] programme, most mantra interventions are not standardised and report insufficient detail on intervention content, structure and delivery. This makes it difficult for future research to attempt to replicate findings. The quality of the vast majority of included studies was deemed to be weak, as determined by the QATQS. As noted in the results, the primary source of bias contributing to weak study quality was selection bias. To expand on this briefly, this means that in most studies, participants were selecting themselves to learn mantra meditation (i.e. they were neither randomly selected from a target population, nor referred from a source such as a clinic). This may reflect a greater degree of help-seeking behaviour that would predispose them to have better outcomes than a random sample of participants. It is noteworthy that due to under-reporting of methodology or lack of clarity in the studies, authors had to make judgements about the extent to which bias was present. This in itself is subjective and may contribute to biased interpretation. Finally, it is acknowledged that a greater percentage of articles selected for second independent review would have been optimal to ensure consistency and accuracy across the data extraction and quality appraisal process.

4.3. Future recommendations

A number of recommendations for future research emerge from the findings presented in this systematic review. Firstly, detailed reporting of methodology is required, with much greater information provided on mantra interventions, attendance to programmes and compliance to home practice. Secondly, well-matched active control groups (for example, mindfulness-based interventions or guided imagery interventions) are fundamental to isolating the effects of mantra meditation from the expectation of relief or group contact. It would be interesting to examine differences in outcome between interventions that

encourage repeating the mantra aloud, and those that encourage repeating the mantra silently. Similarly, studies may examine mantras that hold spiritual meaning for the individual, versus mantras that are essentially meaningless. It is recommended that a standardised assessment of cost-effectiveness is carried out, as this will be particularly relevant to stakeholders and policy makers who may wish to integrate such programmes into mental health promotion strategies. Typically, the TM[®] programme is associated with substantial cost (approx. €600 for standard course [59]). Considering the burden of proof in the literature is concerned with TM, a rigorous analysis of cost-effectiveness should be a priority. A final recommendation calls for higher quality studies to be carried out on this topic, with rigorous methodologies and detailed interventions to reaffirm the positive trends that are evident from this review.

4.4. Conclusion

There is some evidence that mantra meditation can improve mental health related outcomes in the general, non-clinical population, however this evidence is based on individual studies of poor quality. As such, the efficacy of mantra meditation as a mechanism that provides relief from stress and a basis for more dynamic and effective activity should not be overstated at this time. Despite the poor quality of studies reviewed, positive trends are evident which suggests that such programmes may have exciting educational, occupational and psychotherapeutic potential, offering the general population an individual approach that avoids the side effects of medications, the stigma of treatment as well as barriers related to issues of cost and accessibility. Larger trials of superior quality are required to draw more definite conclusions.

Authors contribution

All research done by the authors.

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Conflict of interest

None

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.eujim.2018.09.010>.

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