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Review

Mindfulness-based stress reduction for healthy individuals: A meta-analysis

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ABSTRACT

Background: An increasing number of mindfulness-based stress reduction (MBSR) studies are being conducted with nonclinical populations, but very little is known about their effectiveness.
Objective: To evaluate the efficacy, mechanisms of actions, and moderators of MBSR for nonclinical populations.
Data sources: A systematic review of studies published in English journals in Medline, CINAHL or Alt HealthWatch from the first available date until September 19, 2014.
Study selection: Any quantitative study that used MBSR as an intervention, that was conducted with healthy adults, and that investigated stress or anxiety.
Results: A total of 29 studies ($n = 2668$) were included. Effect-size estimates suggested that MBSR is moderately effective in pre–post analyses ($n = 26$; Hedge's $g = .55$; 95% CI [.44, .66], $p < .00001$) and in between group analyses ($n = 18$; Hedge's $g = .53$; 95% CI [.41, .64], $p < .00001$). The obtained results were maintained at an average of 19 weeks of follow-up. Results suggested large effects on stress, moderate effects on anxiety, depression, distress, and quality of life, and small effects on burnout. When combined, changes in mindfulness and compassion measures correlated with changes in clinical measures at post-treatment and at follow-up. However, heterogeneity was high, probably due to differences in the study design, the implemented protocol, and the assessed outcomes.
Conclusions: MBSR is moderately effective in reducing stress, depression, anxiety and distress and in ameliorating the quality of life of healthy individuals; however, more research is warranted to identify the most effective elements of MBSR.

Introduction

Stress is prevalent in modern society and has become a significant global health problem [1,2]. Research suggests that high levels of stress can negatively affect both physical and mental health and are found to be associated with autoimmune diseases [3], migraines [4], obesity [5], muscle tension and backache [6], high cholesterol [7], coronary heart disease [8], hypertension [9], and stroke [10].

In the last decade, interest in research investigating mindfulness-based interventions has increased substantially [11]. Even though a consensus about an unequivocal operational definition of mindfulness is lacking so far [12,13], one of most commonly employed definitions of mindfulness was provided by Jon Kabat-Zinn who suggests that mindfulness could be described as a moment to moment awareness that is cultivated by purposefully paying attention to the present experience, with a non-judgmental attitude [14]. Interventions utilizing mindfulness techniques have shown efficacy for treating a variety of mental disorders and in coping with physical or medical conditions, including, among others, chronic pain [15], fatigue [16], stress [17,18], cancer [19], heart disease [20], type 2 diabetes [21], psoriasis [22], and insomnia [23].

Mindfulness-based stress reduction (MBSR) [24] is a well-established mindfulness training that has shown to reduce stress, depression, and anxiety [25,26]. MBSR teaches individuals to observe situations and thoughts in a nonjudgmental, nonreactive, and accepting manner. MBSR provides training in formal mindfulness practices, including body scan, sitting meditation, and yoga. MBSR seeks to change the individual's relationship with stressful thoughts and events by decreasing emotional reactivity and enhancing cognitive appraisal [27]. The standard MBSR

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curriculum is conducted in an 8-week structured group format, which includes weekly 2.5-hour group sessions in addition to a 6-hour daylong retreat.

Although initially developed for chronic pain, MBSR has reported positive results among an array of clinical and nonclinical populations, including cancer, health care professionals, continuing education students, and college undergraduates [28–30]. Chiesa et al. [28] were the first to systematically investigate the usefulness of MBSR in healthy individuals. They concluded that MBSR provided a significant nonspecific moderate to large effect on the reduction of stress in comparison with no-treatment controls. However, there were significant methodological limitations and only 10 studies were included in the analysis. Eberth and Sedlmeier [30] conducted a meta-analysis of 38 controlled studies on the effects of mindfulness meditation on psychological well-being among a nonclinical population. Among the 38 studies, 17 used MBSR, the results suggested moderate effects in reducing stress and negative emotions and in increasing well-being. However, the meta-analysis included only studies that were published before March 2010, had some methodological limitations (e.g., it did not implement PRISMA criteria and it did not include a quality measure), failed to determine moderators of the observed effects, did not investigate the role of mindfulness in the effectiveness of the interventions, and did not investigate long-term effects of MBSR.

A more recent qualitative systematic review examined the effects of MBSR on stress management in nonclinical populations in 17 trials dating between January 2009 and 2014 [29]. The outcomes suggested positive effects on both psychological and physiological measures without quantifying these effects. Overall, the current state of the literature suggests the need for a more systematic quantifiable summarization of the effects, mechanisms of actions, and moderators of MBSR for nonclinical populations. Therefore, we conducted a comprehensive effect-size analysis with the following objectives: (1) to quantify the effect size of MBSR for psychological variables (i.e., anxiety, depression, stress, distress, and burnout) in healthy individuals; (2) to investigate and quantify the role of mindfulness in MBSR; and (3) to explore moderator variables.

Methods

Power analysis

Assuming an average sample size of 25 individuals per group (on the basis of previous meta-analyses, e.g., 31), a small to moderate effect size of 0.3 (on the basis of previous meta-analyses comparing mindfulness to other active treatments, e.g., psycho-education; 31), and a large heterogeneity among the studies (as MBSR studies differ from each other in their design, implementation, and included outcomes), for a power of 80%, 15 studies comparing MBSR to an active treatment will be needed. For a power of 90%, 18 or 19 studies will be needed [32]. For within-group (e.g., pre–post) and between-group comparisons (e.g., comparing mindfulness to a waitlist), effect sizes were found to be moderate to large (e.g., 31), reducing as a result the number of required studies to 11 for a power of 80% and to 14 for a power of 90% [32].

Eligibility criteria

Any study examining MBSR interventions among healthy adults (i.e., over 18) was eligible for inclusion in the meta-analysis. Studies were excluded if they (1) did not evaluate the intervention or implemented a qualitative design; (2) did not sample healthy participants; (3) did not include stress and/or anxiety measures; (4) utilized other stress reduction strategies; or (5) did not include sufficient data to compute the effect size.

Information sources

Studies were identified by searching Medline, CINAHL and Alt HealthWatch for papers from the first available date until September 19, 2014. All papers were thoroughly verified and only English language papers corresponding to the selection criteria listed above were included in the analyses.

Search

We used the search terms mindfulness-based stress reduction, and MBSR combined with intervention or program.

Study selection

Eligibility assessment was performed in a non-blinded, standardized manner by the first author and was reviewed by the second author. Disagreements between reviewers were resolved through discussions, and in a few instances the authors of the original studies were contacted for clarifications or for asking for missed data in order to compute effect sizes. In one case, the authors were unable to provide the required data and the corresponding paper was excluded.

Data collection process

We developed an electronic data extraction sheet, pilot-tested it on five randomly-selected studies, and refined it accordingly. Data collection was conducted in September, 2014. When duplicate reports were identified for the same data, only the latest ones were included.

Data items

Information was extracted from each trial based on: (1) the characteristics of the trial (including the year of publication, design, randomization, blinding, therapist qualifications, number of participants, type of outcome measures, and follow-up time in weeks); (2) the characteristics of the intervention (including target population, length of treatment in hours, length of assigned home practice in hours, and treatment setting); (3) the characteristics of the comparison group, in controlled studies (including the number of participants, type of control, type of treatment, and length of treatment); and (4) the characteristics of participants (including mean age, percentage of males, and attrition rate).

Risk of bias in individual studies

To minimize the influence of data selection, we included data pertaining to all available psychological outcomes (i.e., anxiety, depression, stress, distress, and burnout), and quality of life. We also included data pertaining to potential mechanisms of action (i.e., mindfulness, compassion, spirituality/empathy measures). We included data from the last follow-up, when such data were available.

We also included a study quality score, which was comprised of items based on Jadad's criteria [33] and others pertaining to mindfulness. The included items are adherence of the treatment to the standard MBSR protocol (i.e., not using a modified, light, or over the phone/web version); administration of measures at follow-up; use of validated mindfulness/compassion measures; training of therapists/facilitators (i.e., psychologists, trainees in psychology, or social workers); and the mindfulness training/experience of therapists/facilitators (i.e., formal training in MBSR). For controlled studies, the items included whether participants were randomized between the treatment and control groups, whether participants in both groups spent an equal amount of time in treatment, and whether evaluators or experimenters were blind regarding the treatment/control conditions and/or participants were blind regarding the study's hypotheses. For all binary items