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Abstract

Many types of intervention are used to boost adults' self-esteem but their relative efficacy and the characteristics that moderate this efficacy remain unclear. We addressed these questions via a meta-analysis of 119 studies. Results obtained using a random-effects model showed a significant effect of interventions on adults' global self-esteem, *d* = 0.38, 95% CI [0.33, 0.43]. This efficacy is moderated by some types of intervention, session format, experimenter contact, population type, and type of control group. We discuss these findings by addressing the limitations of our analyses and some issues related to this field of research (e.g., lack of power, heterogeneity of the studies included, publication bias, confounding effects) and by providing recommendations for future research and clinical practice.

Keywords: self-esteem, intervention, adult, meta-analysis, moderators

Self-esteem Interventions in Adults – A Systematic Review and Meta-analysis

Self-esteem is central to human well-being (Baumeister et al., 2003) and low self-esteem is associated with many common mental health problems (Sowislo & Orth, 2013). Research on ways of increasing people's self-esteem has produced innumerable interventions. These different types of intervention target different determinants of a person's self-perception and self-esteem. For example, some interventions target the cognitive aspects of self-perceptions by modifying dysfunctional self-schemata (e.g., cognitive-behavioral therapies; CBTs) or altering the processing of self-perceptions in memory (e.g., reminiscence-based interventions). Others try to encourage self-disclosure (e.g., support groups) or increase positive thoughts and emotions (e.g., positive psychology interventions). Meta-analyses of the efficacy of CBTs and reminiscence-based interventions have shown they are effective in increasing self-esteem in adults (Kolubinski et al., 2018; Pinquart & Forstmeier, 2012), but alternative techniques have been less widely studied and their efficacy is yet to be proven. We addressed this issue by using a comprehensive meta-analysis of self-esteem interventions to compare the relative efficacy of different types of intervention and to examine characteristics that may impact their efficacy (e.g., intervention length, format, contact with the experimenter…).

Self-esteem: Definition and Approaches

Self-esteem has been conceptualized in so many ways that it is difficult to give a clear and consensual definition. According to Rosenberg (1965), self-esteem is an indicator of self-acceptance, self-respect, and satisfaction with oneself, but does not encompass feelings of superiority and perfection. Several conceptualizations of self-esteem agree that self-esteem arises from the way one feels about one's self-concept (Greenwald et al., 2002; Shavelson et al., 1976), that is, the set of cognitive representations one holds about oneself. For example, in Greenwald et al. (2002) associative knowledge structure, self-concept arises from cognitive associations between the Self and one or more attributes, whereas self-esteem arises from associating the Self with an affective

evaluation of these associations. In Shavelson et al.'s (1976) multidimensional hierarchical model, self-esteem derives from people's evaluations of their self-conceptions in specific domains, which are shaped by their experiences in different environments. The judgments of specific self-concepts combine to build one's global self-esteem (or general self-concept), which is at the top of the hierarchy. Shavelson et al.'s model led to the recognition that self-esteem is multidimensional and that it is possible to evaluate self-esteem both in specific domains, via multidimensional scales (e.g., Coopersmith Self-Esteem Inventory; Coopersmith, 1967), and globally, using global measures (e.g., Rosenberg Self-Esteem Scale; RSES; Rosenberg, 1965). According to the specificity matching principle (Swann et al., 2007), specific self-esteem should be a better predictor of specific behavioral outcomes and global self-esteem should be a better predictor of global outcomes. For example, academic self-concept is a good predictor of academic performance measured via school marks (Marsh, 1993), whereas global self-esteem is a good predictor of global health-related outcomes such as psychological well-being (Rosenberg et al., 1995), antidepressant medication (von Soest et al., 2016), and depressive symptoms (Orth et al., 2014).

The Consequences of Self-esteem

Having low or high self-esteem has many consequences on people's everyday lives. For example, having a positive self-concept promotes increased adapted effort and perseverance in the face of difficulties (Di Paula & Campbell, 2002), as well as self-acceptance and interpersonal skills and behaviors (Cameron & Granger, 2019, for a meta-analysis). A meta-analysis of longitudinal studies also found significant cross-lagged effects, indicating that low self-esteem significantly predicts both later depression and anxiety (Sowislo & Orth, 2013). However, empirical evidence for links between self-esteem and psychological outcomes must be interpreted with caution due to the methodological limitations of some studies, most notably the use of subjective measurement methods and the absence of tests to ensure the effects of self-esteem are not confounded with those of other, strongly correlated variables. For example, Baumeister et al.'s (2003) review of studies they considered to have "used highly rigorous methods" found that trait self-esteem was strongly linked

to happiness and enhanced initiative, but only weakly or modestly linked to academic and professional performance, social and anti-social behaviors, addictions, and interpersonal relationships.

Given the association between self-esteem and quality of life/well-being and the links between low self-esteem and many psychological disorders, it is important to prevent and/or reverse declines in self-esteem. Consequently, a large amount of research has been dedicated to developing methods for helping individuals increase their self-esteem.

Main Interventions to Increase Self-esteem

The literature describes innumerable interventions for increasing self-esteem or promoting more positive self-perceptions. CBTs have become the most common type of self-esteem intervention. Fennell (1998) suggested that low self-esteem is a result of a complex cognitive process: Negative self-beliefs, which are formed by negative life events, lead to the development of dysfunctional hypotheses that can engender maladaptive behaviors, resulting in a vicious circle in which these behaviors reinforce the negative self-beliefs and induce further maladaptive behaviors. In CBTs, the therapist explains these cognitive processes to patients (psychoeducation) and helps them modify the perceptual and interpretative biases underlying the vicious circle (cognitive therapy). By breaking the vicious circle, CBTs enable patients to become more self-accepting, revise negative self-beliefs, and establish more positive beliefs about the Self. According to a recent meta-analysis, Fennell's CBT has a medium to large effect on enhancing self-esteem in adults, whether they are healthy, depressed, or anxious, and benefits last at least three months after the end of the intervention (Kolubinski et al., 2018).

Reminiscence-based interventions focus on recovering autobiographic memory and reflecting on its contents. Whereas simple reminiscence activities aim to enhance positive affectivity and promote positive and adaptive views of the Self by encouraging patients to recall and communicate positive past events, life-review interventions are a more complex form of reminiscence-based interventions in which patients are encouraged to reevaluate negative past

events, as well as to recall positive memories. According to Pinquart and Forstmeier's (2012) meta-analysis, reminiscence-based interventions compared to a control condition have a small to moderate effect on depressive symptoms and positive well-being (including self-esteem), whatever participants' age or participants' health status at baseline, including the presence of depression, dementia, or physical illness.

Support groups are another frequently used way of improving patients' mental health and well-being. They involve a series of meetings between a group of people, during which participants can discuss their problems with peers. Sessions may or may not be supervised by a psychotherapist and discussions, which are designed to facilitate self-disclosure, may be free or guided. A cross-sectional study by Bracke et al. (2008) suggested that support groups can have a positive impact on self-esteem in patients with chronic psychiatric conditions: Supporting peers had a positive impact on self-esteem, whereas receiving support from peers had a positive effect on self-efficacy.

Art therapy uses the creative process (painting, sculpture, theatre, music, dance, etc.) as a conduit to help people get in touch with, express, and transform their inner thoughts and feelings (Franklin, 1992). Although there is currently little scientific evidence for art therapy's ability to increase self-esteem, a recent randomized controlled study reported a significant effect of artistic activities on self-esteem in institutionalized elderly people (Ching-Teng et al., 2019).

Another recent trend has been to integrate positive psychology principles into interventions to promote well-being and self-esteem. Examples include compassion-based interventions, which aim to identify, understand, and prevent suffering for oneself or others, and gratitude interventions, which teach people exercises that help them cultivate a sense of gratefulness. These interventions should increase perceived social acceptance and relational value. If so, as self-esteem could be viewed as an indicator of social approval and disapproval (Leary & Baumeister, 2000), these interventions may have a positive effect on self-esteem. Of the few studies to have tested the effect of positive psychology interventions on self-esteem, some have reported findings that support this

hypothesis (Lincoln et al., 2013; Mongrain et al., 2011, for compassion-based interventions; Rash et al., 2011, for gratitude interventions).

Evaluative conditioning is also used in social psychology experiments to modify the valence of the Self and thereby increase self-esteem. In these interventions, a representation of the Self (e.g., the word "I" or the person's name) is repeatedly associated with positively valenced stimuli (e.g., positive words or images) to increase the positivity of the Self and thus temporarily boost self-esteem. However, studies of evaluative conditioning's impact on self-esteem, most of which have focused on implicit self-esteem, have produced mixed results (Baccus et al., 2004; Versluis et al., 2017), and Hofmann et al.'s (2010) meta-analysis of these findings showed that evaluative conditioning does not have a significant effect on self-esteem.

Previous Reviews and Meta-analyses

The only two meta-analyses of the efficacy of self-esteem interventions conducted to date have focused on children. Haney and Durlak (1998) examined 116 studies of self-esteem interventions in children. Their meta-analysis showed that interventions directly targeting self-esteem are significantly more effective than those that try to boost self-esteem by modifying associated variables (e.g., social skills, behaviors) and that therapeutic programs are more effective than preventive interventions. However, they suggested that this latter finding may be due to a ceiling effect arising from the fact that preventive interventions are used with healthy participants, who are likely to have higher baseline self-esteem scores than participants in therapeutic studies. They also reported a mean duration of 16 weeks for an intervention's beneficial effects, but this finding must be viewed with caution because their analysis was underpowered. O'Mara et al. (2006) conducted a meta-analysis of 145 studies of self-esteem interventions in children. Their results replicated most of Haney and Durlak's (1998) findings and had greater statistical power. According to O'Mara et al., therapeutic interventions are more effective than preventive actions. The largest effect sizes were associated with interventions that use praise and/or feedback, and the benefits of interventions were stable over time (from 3 weeks to 14 months after the end of the intervention).

Unfortunately, differences between children and adults' determinants of self-esteem mean that information about the efficacy of self-esteem interventions in children cannot be simply extrapolated to adults (Harter, 2006, 2012). Consequently, interventions for adults must be examined separately from those for children.

Need for a Meta-analysis

Researchers have measured the efficacy of innumerable preventive or therapeutic interventions for boosting self-esteem in adults, but no one has yet produced a survey showing which types of intervention, if any, are superior to others. The diversity of self-esteem models and measurements, and the heterogeneity of study methodologies make it difficult for researchers and clinicians to compare interventions, identify ways of improving existing tools, or suggest avenues for developing new techniques. The only way to overcome these issues is to conduct a comprehensive meta-analysis of self-esteem evaluations. To help fill this gap in the literature, we carried out a meta-analysis of the efficacy of interventions for boosting self-esteem in adults. Our objectives were to determine the overall efficacy of self-esteem interventions and to indicate the efficacy of individual interventions. Also, we aimed at determining which characteristics of interventions and studies contribute most to their efficacy.

Potential Moderators of Intervention Efficacy

The moderators we considered were of two types: those relating to intervention design and those relating to study methodology. The following section describes these moderators and some a priori hypotheses we tested.

Moderators Related to Intervention Design

Type of intervention. As described above, many interventions have been proposed to increase self-esteem. However, these various types of interventions target very different processes that can have more or less important effects on self-esteem. Several theories posit that cognitive generalizations about the Self have a significant impact on how individuals process the information

they associate with. These self-schemata are multiple, domain-specific, and are built on familiar and recurrent experiences. Because self-schemata act as a kind of filter that helps individuals process self-related information in a specific domain, anticipate future behavior in that domain and resist counter-schematic information (Markus, 1977), they can have a great impact on self-esteem. For example, dysfunctional (negative) self-schemata can lower self-esteem by creating a vicious circle in which positive information about the Self is filtered out, thereby reinforcing a negative affective evaluation of the Self. Self-esteem CBTs try to overcome the perceptual and interpretative biases underlying this vicious circle by identifying dysfunctional self-schemata and using cognitive techniques to modify them (e.g., Beck et al. 1979; Fennell, 1998). Reminiscence-based interventions also aim to change individuals' cognitive self-representations by encouraging them to recall positive memories and re-evaluate negative events in their past. According to the Self-Memory System model (Conway, 2005), the "Conceptual Self" results from combining semantic (i.e., general knowledge about oneself) and episodic (i.e., specific personal events) self-representations with personal attitudes, beliefs, and values drawn from socio-cultural experiences (Conway et al., 2004). These self-representations affect self-esteem because they shape the affective evaluation of the Self an individual draws from their past experiences. In this line, it has been shown that the capacity to associate positive interpretations of negative events has a positive impact on self-esteem (McAdams et al., 2001).

In summary, CBTs and reminiscence-based interventions focus on cognitive processes that contribute greatly to forming the self-knowledge from which self-esteem is derived, by helping individuals either deeply modify their self-schemata or recall memories and re-evaluate negative past events. None of the other types of self-esteem intervention focus on the cognitive processes involved in self-representation; instead, they try to boost self-esteem by modifying affects (e.g., positive psychology therapies) or social perceptions (e.g., support groups), or by increasing the positivity of the Self (e.g., evaluative conditioning). Consequently, we hypothesized that CBTs and life-review interventions will have a greater positive impact on self-esteem than other interventions.

Furthermore, because CBTs involve a combination of cognitive techniques and behavioral exercises, whereas reminiscence-based interventions rely on cognitive exercises alone, we expected CBTs to be more effective than reminiscence-based interventions in boosting self-esteem.

Group or individual format. Social interaction and integration have numerous positive effects on health-related behaviors and psychological well-being (S. Cohen, 2004). A recent meta-analysis showed a strong and robust association between social relationships and self-esteem that held across different sample characteristics such as age and sex (M. A. Harris & Orth, 2019), confirming the hypothesis of interpersonal theories of self-esteem (e.g., the sociometer theory, according to which self-esteem is predicted by perceived social approval; Leary & Baumeister, 2000). Therefore, we hypothesized that, due to their effect on promoting social relationships, group interventions will have a greater positive impact on self-esteem than individual interventions.

Intervention length. Intervention length may moderate the positive effect of interventions on self-esteem in two ways. First, an intervention's length may affect the depth of its effects on the self-perception underlying a person's positive or negative self-esteem: Longer interventions may create deeper and more durable effects, whereas shorter interventions may be too brief to produce far-reaching changes (Hansen et al., 2002). Second, intervention length may influence patients' treatment expectations (Greenberg et al., 2006) and their motivation to engage in the therapeutic process, which can impact an intervention's efficacy (Noble et al., 2001; Schneider & Klauer, 2001). Whereas short therapies may be suitable for patients who are aware of their problems' origins and patterns of influence, longer interventions may be necessary for patients who need to establish therapeutic alliances (Steenbarger, 1994). Given the complexity of the relationship between intervention length and efficacy, we did not formulate any hypotheses about the impact of an intervention's length on its efficacy.

Moderators related to study design

Population type. Interventions to increase self-esteem can be beneficial for most people given the transdiagnostic nature of low self-esteem and the positive psychological impact of having

positive self-esteem in everyday life. Thus, these interventions are offered to a wide range of people. Patients with clinical psychiatric conditions often find it difficult to modify their thinking and behaviors, probably due to the influence of pathological self-schemata on their cognitions. This difficulty may impact the efficacy of self-esteem interventions. For example, depressed people suffer from distorted cognitions that lead to negative perceptions about the world, the future, and themselves. Consequently, depressed people tend to have chronically low self-esteem that may be difficult to improve through clinical interventions (Beck et al., 1979). Although this reasoning is particularly pertinent to mood disorders, it also applies to personality disorders because the adaptive inflexibility and vicious circles that characterize some of these pathologies (American Psychiatric Association, 2013) can hinder therapeutic processes. Therefore, we hypothesized that reported efficacy will be lower for interventions tested on subjects with psychiatric conditions than for interventions tested on healthy subjects.

Experimenter contact. Interventions aimed at increasing self-esteem have sometimes been tested via online studies in which participants self-administer the intervention and complete the baseline and post-test measures online. Online participants, especially those recruited using crowdsourcing platforms or similar web resources, can have specific characteristics: they may be "professional" participants, who complete numerous studies every day; they may be non-naïve participants, who use web forums to discover a study's hypotheses; or they may have an attentional style (mistrust of and hypervigilance against seriousness trackers) that can bias some experimental effects (Chandler et al., 2014). Besides, online studies also lack face-to-face contact between experimenter and participant. Such contact can affect the efficacy of treatments and interventions by introducing a placebo effect, making the therapy appear more credible, or triggering the observer-expectancy effect (Constantino et al., 2012). We hypothesized that reported efficacy will be lower for interventions tested via online studies than for interventions tested via studies involving face-to-face contact between participants and the experimenter or therapist.

Type of control group. When the efficacy of an intervention is assessed in comparison to a control group, studies of self-esteem interventions have used two kinds of control group: active and inactive (Higgins & Thomas, 2020; Karlsson & Bergmark, 2015). Participants in active control groups receive an intervention that does not contain the therapeutic ingredient, whereas participants in inactive control groups do not receive any intervention (e.g., waiting list or treatment-as-usual). Although participants in active control groups do not benefit from the intervention's therapeutic ingredient, they may benefit from therapeutic context and study inclusion effects (e.g., experimenter contact, occupational effects, helping advance research; Di Blasi et al., 2001), which are known to have a positive effect on certain outcome indicators. Participants in inactive control groups do not benefit either from the therapeutic ingredient or from study inclusion effects). Based on this distinction, we predicted that reported efficacy will be greater for interventions that were compared with inactive control groups (absolute effect) than for interventions that were compared with active control groups (relative effect). Also, active control groups can be divided into two types depending on whether or not participants were given a placebo, i.e. a control intervention whose features may lead the participants to think they received the therapeutic ingredient and therefore benefit from a placebo effect (Wampold et al., 2005). We expected reported efficacy to be lower for interventions that were compared with a placebo active control group than for interventions that were compared with a non-placebo active control group.

Post-test delay. The durability of the effects of interventions can be determined by comparing pre-test scores with scores obtained at different times following the intervention, from immediate post-tests to long-term follow-up tests. The reported durability of benefits to patients varies greatly between studies, with the benefits of some interventions being apparent only in immediate post-test scores, whereas the benefits of other interventions lasted for up to 12 months after the intervention. The effects of self-esteem interventions in children can last for up to 14 months (Haney & Durlak, 1998; O'Mara et al., 2006). However, the decline in post-test scores over

time noted in educational research has led researchers to call for further studies of the durability of the effects of self-esteem interventions.

Methods

Literature Search Procedure

We conducted a computerized search of the PsycINFO and PubMed databases in February 2021, using the following combination of search terms in titles and keywords: (self-esteem OR self-concept) AND (enhanc* OR incre* OR chang* OR improve* OR intervention OR therap* OR manipulat* OR conditioning). This initial search identified 2,768 papers and dissertations published in English between 1989 and 2021. We included unpublished studies and dissertations in our search to minimize publication bias (Ferguson & Brannick, 2012). A subsequent manual search of the bibliographies of published meta-analyses, systematic reviews, and papers on the impact of interventions or therapies on well-being and psychosocial outcomes allowed us to add 67 more references to our corpus. After reading titles and abstracts, we excluded a large number of our initial 2,835 papers and dissertations because they did not report a non-medical intervention on adults (i.e., developmental studies, fundamental studies, medication treatment, cosmetic or medical surgery). After excluding a further 29 references whose full texts we were unable to obtain, despite contacting the authors and searching open-access databases, we were left with a sample of 322 papers and dissertations. As a final step, we used mailing lists and listservs (APA DIV29 and Psy16) to request published and unpublished studies. In the end, the only paper we retrieved in this way lacked empirical findings and was, therefore, excluded.

The first author read all 322 references (342 studies) in our corpus to determine whether they were eligible for inclusion in the meta-analysis. Any doubt as to whether a study met our inclusion criteria was resolved through discussion with the last author.

Inclusion criteria

To be included in our meta-analysis, a study had to meet the following criteria:

(1) It had to report a non-medical intervention, technique, or therapy designed to increase self-esteem. This led us to exclude all medical studies (substance use or aesthetic surgery) and studies testing the efficacy of an intervention targeting another primary physical or psychological outcome. If no distinction between the outcome was given (e.g., no primary or secondary specification), the paper had to describe the intervention as directly targeting the construct of self-esteem or to clarify the mechanisms through which the intervention is supposed to affect self-esteem in the population of interest. The application of this criterion led us to exclude 93 studies.

(2) Participants in the study had to be adults. We excluded one study where the mean age of the participants was inferior to 18 years. Apart from age, no exclusion criteria on the type of population were applied as self-esteem interventions can be offered to a wide spectrum of populations.

(3) The study had to take the form of a randomized controlled trial (RCT) or a no-controlled study using a pre-post design. Unrandomized controlled studies were excluded (this involves studies that used an accidental group control). RCTs using a control group assumed to have a negative effect on self-esteem were excluded. Eleven studies comparing the relative efficacy of different interventions that can theoretically have an effect on self-esteem (apart from placebo and expectancy effects) were considered as non-controlled studies and were included only if a pre-post design was used to report the effects of each intervention. Finally, 12 studies that did not directly test the efficacy of an intervention on self-esteem (e.g., moderation analysis by the baseline level of self-esteem) were excluded. We excluded 68 studies on the basis of this criterion.

(4) The study had to include a quantitative measure of global self-esteem. Our meta-analysis focused on global self-esteem, which is a better predictor of general well-being and mental health than specific self-esteem (Rosenberg et al., 1995). Global self-esteem can be assessed via global measures of the self-concept (e.g., Robson Self-concept Questionnaire; Robson, 1989), global measures of self-esteem (e.g., RSES; Rosenberg, 1965), or total scores on multidimensional self-esteem/self-concept scales (e.g., Tennessee Self-Concept Scale; Fitts & Warren, 1996). We excluded

10 studies that did not use a measure of self-esteem at all or used only specific self-esteem assessments (e.g., social self-esteem subscale of the State Self-Esteem Scale; Heatherton & Polivy, 1991). However, we included many global self-esteem measures, notably state and trait self-esteem assessments, explicit self-report questionnaires, and implicit measures. Finally, we excluded 4 qualitative studies.

(5) The study had to provide enough statistical information to compute or reconstruct an effect size. The studies we included had to report descriptive data (sample size, mean self-esteem scores, and standard deviations) for each measurement time (pre- and post-assessment depending on the study design) and for each condition (experimental and control groups if applicable). Despite contacting authors to obtain this information when it was not included in the paper, we excluded 47 studies that did not meet this criterion. However, to minimize the number of studies excluded, we included papers that provided incomplete but usable data.[1]

Applying these criteria led us to exclude 223 studies. The main reasons for excluding studies were lack of focus on self-esteem in the intervention description and/or design (37.22%), incomplete or unreliable data (21.07%), and absence of randomization in controlled studies (17.78%). Our final sample contained 119 studies.

Coding of Studies

The first and last authors independently coded all 119 studies included in the meta-analysis. Disagreements were solved through discussion. Inter-rater agreement was high, as is shown by the Kappa coefficient (> 0.81) for the coding of categorical moderators (Landis & Koch, 1977), and the small percentage (4.05%) of disagreements in coding the quantitative data (descriptive data, sample sizes, estimated attrition rate). Studies that included several subsamples and several measurement times, and/or used a variety of self-esteem measurement tools to assess an intervention's efficacy,

[1] When sample sizes for each group were not reported, we estimated the number of participants in the experimental and control groups by dividing the total number of participants by two. For studies that directly reported pre-intervention/post-intervention differences, we adapted our effect size calculations to the data provided (in such cases, we included only studies that provided the standard deviation of the pre-intervention score).

provided more than one effect size. We coded each effect size, along with several parameters describing the study design, the study sample, the intervention, and the self-esteem measures used (see Appendix).

Study Design and quality

The studies included in this meta-analysis were randomized controlled trials and single-group studies with a pre-post measurement design or randomized controlled trials with a post-test-only measurement design. For randomized controlled trials, we considered three types of control group. Participants in placebo control groups received an active intervention that was assumed to have no effect on self-esteem. These participants were blind to the group they were allocated to and had no way of knowing the intervention they received was a placebo. Active control groups are similar to placebo control groups except for the fact that participants might have been aware that they had been allocated to the control group, rather than the experimental group. Participants in inactive control groups did not receive any intervention, were on a waiting list or continued their treatment as usual. If the type of control group used was not stated, it was categorized as inactive. We coded (in days) the time between the end of the intervention and each post-intervention measurement of self-esteem. Immediate post-tests were coded as 0 days. We also rated the quality of the studies based on the recommendations of the NHLBI and the Cochrane Collaboration (Higgins & Thomas, 2020). The studies were assessed as being of good quality, fair quality, or poor quality according to different criteria[2]. For controlled studies, we assessed the risk of bias by considering the randomization procedure, the use of a blind or double-blind procedure, the equivalence and comparability of the groups, the reliability of the measures, the type of analyses performed, and their statistical power. For uncontrolled studies (single-group studies), the risk of bias was estimated on the accuracy and adequacy of the inclusion criteria, the representativeness of the sample, the reliability of the measures, the use of a blinded procedure, and the accuracy and power of the

[2] An independent double rating of the quality of the studies was carried out on 68% of the studies included in the meta-analysis by the first and the last author. Inter-rater agreement was high with a Kappa coefficient greater than 0.81.

statistical analyses performed. The attrition rate for each study was calculated according to the different measurement times (immediate post-test or delayed follow-up) and the interventions used when possible. This rate was calculated by dividing the number of participants who dropped out by the number of participants who started the intervention (or randomized in the case of RCT) and multiplying the result by 100. When we were unable to calculate this rate directly and when this information was reported, we relied on the attrition rates reported by the authors.

Population

Population characteristics included sample size, participants' ages (mean), and population type (healthy or clinical). Given the diversity of the methodologies used in clinical research (Hankin et al., 2005), we decided to classify as clinical samples all samples comprising people with any type of psychiatric condition or disorder (whether using continuous measures or categorical classification of psychiatric disorders). Healthy samples were samples of participants who did not have any psychiatric conditions. Samples we could not categorize as either healthy or clinical, because they comprised people with subclinical psychiatric symptoms or people "at-risk" of developing a psychiatric disorder, were coded as "Other" (e.g., increased age, Schaakxs et al., 2017; physical disabilities or diseases such as cancers, Schroevers et al., 2003; people with low self-esteem, Sowislo & Orth, 2013).

Intervention

We began by categorizing self-esteem interventions by type of therapeutic approach, differentiating between CBTs, reminiscence-based interventions, evaluative conditioning, psychoeducation/counseling, self-statements, support groups, mindfulness/relaxation, positive psychology interventions, physical activities, art therapies (including crafts, music therapy, and dance therapy), and other interventions (specific interventions for which we had very few independent effect sizes). Several studies also tested the efficacy of therapeutic programs combining other different approaches, which we coded as mixed interventions (e.g., psychoeducation plus support groups, CBT plus positive psychology, CBT plus support groups, CBT plus psychodynamic therapy,

etc.). We also coded the format of intervention sessions (individual or group), and the total length of the intervention in hours, calculated by summing the durations of each session. Finally, we differentiated between studies that were carried out entirely online, with all contacts between experimenters and participants taking place via the internet, and "face-to-face" studies in which interventions and measures were administered during physical meetings.

Measures of Self-esteem

We coded the measures used to assess self-esteem as explicit or implicit. Explicit measures included self-esteem scales or questionnaires that require respondents to indicate the extent to which they agree with statements describing either low or high self-esteem (e.g., RSES; Rosenberg, 1965) and positive or negative self-perceptions (e.g., Tennessee Self-Concept Scale; Fitts & Warren, 1996). Implicit self-esteem is the positivity with which a person automatically or unconsciously assesses the Self. It is usually assessed via behavioral or indirect measures, including implicit association tasks, such as the IAT (Greenwald & Farnham, 2000), and preference tasks, such as the Name Letter Task (Koole et al., 2001). Also, we coded explicit measures according to whether they assessed trait self-esteem – how good the respondents generally feel about who they are (e.g., Self-Discrepancy Scale, Hardin & Lakin, 2009; RSES, Rosenberg, 1965) – or state self-esteem – how good the respondents feel about themselves at that moment (e.g., State Self-Esteem Scale; Heatherton & Polivy, 1991).

Meta-analytic Procedure

Effect Size Calculations

We calculated separate effect sizes for each sample as standardized mean differences using a raw score metric (Morris & DeShon, 2002). We used Hedges' coefficient to adjust the effect sizes to reduce the likelihood of bias due to overestimating the population effect size in samples with few participants (Hedges, 1981). *d* denotes the adjusted effect size and can be interpreted using Cohen's criteria (1992) of small (0.2), medium (0.5), and large (0.8) effects sizes. Individual effect size

computations were performed using the "*metafo*r" R-package (Viechtbauer, 2010). As recommended by Rosenthal (1991), we set a conservative estimate of 0.7 as the pre-post correlation (ρ) for the distribution of effect sizes of studies using a pre-post measurement design. This is the lower bound of expected test-retest reliability in psychometric measurements (Dunlap et al., 1996).

For randomized controlled trials with a pre-post design ($RCT_{pre\text{-}post}$), we computed effect sizes following the method of Morris (2008). A pre-post difference was computed within each group (intervention group and control group) by subtracting the baseline self-esteem score from the self-esteem score obtained at the end of the intervention and dividing the result by the pre-test standard deviation. We computed effect sizes for each study by subtracting the pre-post difference for the control group from the pre-post difference for the experimental group (Morris, 2008, eq. 8). We used the formula given by Becker (1988) and adapted by Morris (2008, eq. 16) to calculate the distribution of each effect size.

For randomized controlled trials with a post-test-only measurement design (RCT_{post}), the standardized mean difference was calculated by subtracting the control group self-esteem score from the experimental group self-esteem score obtained at the end of the intervention and dividing the result by the pooled standard deviation. We used the formula given by Hedges (1983, eq. 9) to compute the unbiased distribution of each effect size.

Finally, for single-group studies with a pre-post design ($SGS_{pre\text{-}post}$), the standardized mean difference was computed by subtracting the baseline self-esteem score from the self-esteem score obtained at the end of the intervention and dividing the result by the pre-test standard deviation. We used the formula given by Becker (1988) to calculate the distribution of each effect size.

Multiple Effect Sizes and Independence

Many studies reported more than one effect size because they tested the efficacy of various types of intervention, included more than one dependent variable (e.g., used two distinct measurement scales to assess self-esteem), examined the efficacy of an intervention in different subsamples (e.g., healthy and clinical participants), or included both immediate and follow-up post-

intervention assessments of the same variable. These types of designs met the criteria for inclusion in our meta-analysis but raised the issue of the independence of the different effect sizes obtained for the same sample. We checked that the effect sizes included in our analyses were independent by applying the shifting unit method (Cooper, 1989), which involves shifting the unit of analysis (sample or moderator modalities) according to the hypothesis being tested (mean effect size analysis or moderating effect respectively). Multiple effect sizes obtained for the same sample within each study were systematically averaged within each unit of analysis (Hedges & Olkin, 1985).

Data Analyses

All analyses were carried out with the "*metafor*" R-package (Viechtbauer, 2010) and Wilson's SPSS for Windows meta-analysis macros (Wilson, 2005). We assumed there would be some variability between individual effect sizes due to sampling error within studies and to differences between studies as a result both of identifiable factors (i.e., moderators) and unmeasured random factors (Valentine et al., 2010). Therefore, we used a random-effects model to perform the mean effect size analysis and a mixed-effects model to perform moderation analyses. Because sample sizes differed greatly between studies, we weighted each effect size by multiplying its value by the inverse of its variance, which is strongly correlated with sample size. This ensured that effect-size estimates from larger samples had greater weight than effect-size estimates from smaller samples. To analyze the effects of moderators, we performed meta-regression analyses with method-of-moments estimation (DerSimonian-Laird estimator) and dummy coding (to test a priori contrast in moderation analyses that involved comparing more than two modalities). For categorical moderators, we reported here Q_B statistic, which is analogous to an *F*-test (ANOVA) and indicated whether the individual effect sizes associated with each modality differed significantly in their means.

Outliers were identified with the use of (absolute) studentized deleted residuals of individual effect sizes (Viechtbauer & Cheung, 2010). Effect sizes with studentized deleted residuals larger than ± 1.96 were excluded from the corresponding analyses. This procedure increases the accuracy of extreme value detection when running random and mixed-effects model analyses.

Results

Description of the Studies Included

Our literature searches identified 119 studies that met our inclusion criteria (from 103 journal articles and 4 dissertations). The 119 studies reported 224 individual effect sizes from 134 independent samples, which ranged in size from 4 participants to 664 participants (total number of participants = 8 394, *M* = 62.64, *SD* = 77.66). Participants' mean age ranged from 18.56 years to 86.80 years (*M* = 38.08 years, *SD* = 17.96 years). Twenty percent of these studies involved clinical samples and 31 % involved healthy samples. The remaining 49% involved "other" samples, which we decided not to include in our analyses due to their heterogeneous nature. Only 11% of the studies used implicit measures of self-esteem (Implicit Association Test and Name-Letter Task); the remaining 89% used self-reported explicit measures. Of the studies that used explicit measures, 89% used trait measures (60% used the RSES), and 11% used state measures.

Mean Effect Size Analysis

We computed a mean effect size for each of the 134 independent samples included in the meta-analysis. Seventeen independent effect sizes were identified as outliers and excluded from the analysis. Using a random-effects model, the mean effect size analysis indicated a significant mean effect size of 0.38 with a 95% CI [0.33, 0.43], $p < .001$, associated with strong analytical power (> .80). A homogeneity analysis using Q and I^2 statistics showed significant substantial heterogeneity among effect sizes $Q(116) = 290.48$, $p < .001$, $I^2 = 60.07\%$. Therefore, the data indicate that the interventions included in our meta-analysis have a significant effect on self-esteem, with some heterogeneity among effect sizes.

Risk of bias across studies

In line with Sterne and Egger's (2001) recommendations, we constructed a funnel plot with standardized mean differences as the *x* axis and standard errors as the *y* axis. An Egger regression test for funnel plot asymmetry for a mixed-effects meta-regression model showed that the

distribution of effect sizes was asymmetrical (Z = 3.78, p <.001) and indicated a possible publication bias in our meta-analysis. Because studies reporting positive findings are more likely to be published, our literature search is more likely to have uncovered studies in which intervention had a significant effect than those in which the effect was not significant (despite our efforts to locate unpublished reports). The asymmetry in the funnel plot may also be due to poorly designed studies overestimating effect sizes. In the case of clinical research, practical difficulties (restricted access to patients, barriers to using placebo or active control groups) often result in studies being based on small sample sizes and no control groups, which can lead to effect sizes being overestimated. Using a Trim-and-fill procedure, we identified that 20 studies on the left side would be needed to make the funnel plot symmetric (Figure 1) and imputed a new mean effect size of 0.29 (95% CI [0.23, 0.35], p < .001).

While we used comparable metrics, the effect size calculations from various study designs could lead to different interpretations. We decided to conduct a moderation analysis and to specify this mean effect size according to the study's design to facilitate the interpretation of the results. We did not find any significant difference between the mean effect sizes of alternate study designs, Q_B(2, 114) = 2.43, p = .297. The mean effect size of $RCT_{pre\text{-}post}$ was 0.37 (95% CI [0.29, 0.45], p < .001). This positive significant effect size could suggest either a greater increase in self-esteem or a smaller decrease in self-esteem in the experimental group than in the control group between the two measurement times (pre-post). For RCT_{post}, the mean estimate effect size was 0.27 (95% CI [0.12, 0.43], p < .001), and represented a significantly higher post-test self-esteem score in the experimental group than in the control group. In this design, adequate randomization procedures were expected to eliminate between-group differences in the initial level of self-esteem. Thus, the interpretation of this mean effect size may be similar to that of RCTs with a pre-post design. However, as only post-test standard deviations are given in this type of design, it is important to consider that the effect size may be slightly biased by a subject-by-intervention interaction (Morris & DeShon, 2002). Finally, the mean effect size associated with $SGS_{pre\text{-}post}$ design was 0.41 (95% CI [0.34,

0.49], $p < .001$) and showed a significant increase in self-esteem following the intervention. Given the absence of a significant moderating effect and to increase the statistical power of our analyses, we decided to analyze other moderating effects by combining the estimated effect sizes of the different design types.

[INSERT FIGURE 1 ABOUT THERE]

Risk of bias within studies

The quality of each study was assessed to account for the risk of bias within studies. In total, of the 119 studies included in this meta-analysis, 19% were assessed as good quality, 53% as fair, and 28% as poor. An exploratory analog ANOVA analysis revealed a non-significant effect of the study quality on effect size, $Q_B(2, 107) = 4.39$, $p = .111$. The mean effect size was 0.53 (95% CI [0.40, 0.66]) for good quality studies, 0.42 (95% CI [0.34, 0.50]) for fair quality studies, and 0.34 (95% CI [0.22, 0.46]) for poor quality studies. The use of a control group is an asset for controlling various biases and assessing the relative efficacy of an intervention, but clinical research does not always allow its use for ethical and/or practical reasons. So, we differentiated the criteria for assessing the quality of studies according to whether a control group was used or not. Of the 74 included controlled studies using a control group ($RCT_{pre\text{-}post}$ and RCT_{post}), 21.33% were assessed as good quality, 49.33% as fair, and 29.33% as poor. For uncontrolled studies ($SGS_{pre\text{-}post}$), of the 45 included studies using this type of design, 15 % were assessed as good quality, 58% as fair, and 27% as poor.

The risk of bias within studies was also investigated with the estimation of the studies' attrition rate. This attrition rate was a criterion for quality rating. Methodologically, high attrition rates could bias the conclusion of a study by having a negative impact on the randomization process in RCTs, especially if the differential attrition rate between groups is high. Participants who drop out of the study could present specific characteristics that could impact main outcomes. However, one solution to avoid this type of bias is to perform intention-to-treat analyses (McCoy, 2017). Clinically, the attrition rate can also be an indicator of participants' adherence to the intervention. For example, if many participants drop out of the intervention, this may be a sign that the intervention is

not well accepted or appropriate for patients. Of all the studies included in this meta-analysis, the average estimated attrition rate was 15.31% (13.36% for $RCT_{pre\text{-}post}$, 3.95% for RCT_{post}, and 21.63 % for $SGS_{pre\text{-}post}$ [3]). However, for many studies, the attrition rate was estimated to be 0 because the number of participants who started the intervention was the same as those whose data were analyzed (although intention-to-treat analyses were not specified). This is surprising, given the high attrition rate often encountered in interventional research, and may be related to a lack of methodological precisions in some studies (Flick, 1988). If we consider only studies for which an attrition rate greater than 0 could be calculated, the average attrition rate of the studies included in this meta-analysis was 22.29%.

Moderation Analyses

We detected and deleted outliers from each moderation analysis. Table 1 presents the results of these analyses for the categorical moderators.

Moderators Related to Intervention Design

Type of intervention. We hypothesized that CBTs should be more effective in boosting self-esteem than other types of intervention, and that reminiscence-based interventions should be more effective than other types of intervention except for CBTs. All types of intervention appear to be effective in increasing self-esteem (95% confidence interval not including 0), except for self-statements whose mean effect size appears to be non-significant. Descriptively, we found that the effects sizes of mindfulness/relaxation techniques, art therapies, and CBTs were the largest, followed by the medium effects of mixed interventions, support groups, psychoeducation, and psychoeducation plus support groups[4]. Physical activity, reminiscence-based interventions, and evaluative conditioning were also effective on self-esteem, although their mean effect sizes appeared to be smaller. The descriptive results did not support our hypothesis. However, because

[3] It is important to consider that the very low attrition rate observed for RCT_{post} is due to the fact that this type of design tests the efficacy of very short interventions such as evaluative conditioning, which is usually carried out in a single session.
[4] In this analysis, interventions combining psychoeducation and support groups were finally considered as a separate category with regard to the number of independent effect sizes for this specific type of intervention (k = 6).

most intervention types were associated with a very small number of independent effect sizes (k < 10), the calculated estimates were imprecise (causing mean effect size by intervention type to be either underestimated or overestimated). These mean effect sizes by type of intervention need to be clarified, as some are found to be associated with wide 95% confidence intervals (e.g., mindfulness/relaxation, support groups, physical activities, self-statements). We ran an exploratory analysis to clarify our results and to compare the mean effect sizes associated with each intervention. Because publication practices vary between specialized kinds of literature, we examined publication bias for each type of intervention separately. Significant Egger tests showed that the distributions of effect sizes were asymmetric for mindfulness/relaxation (Z = 2.05, p = .040), psychoeducation (Z = 2.32, p = .020) and the heterogeneous category of "other" interventions (Z = 2.51, p = .012). While the effect size imputed by a Trim and fill procedure remains the same for psychoeducation, the adjusted effect sizes were substantially reduced by correcting for publication bias for mindfulness/relaxation (d = 0.39, 95% CI [0.01, 0.76], p = .046) and "other" interventions (d = 0.21, 95% CI [0.09, 0.34], p < .001). Finally, to increase the power of the moderation analysis, we included only the intervention types for which we had more than 10 independent effect sizes (CBTs, reminiscence-based interventions, evaluative conditioning, mixed interventions, and others) in an analog ANOVA analysis. The results showed a significant effect of type of intervention on effect size, $Q_B(4, 79) = 11.13$, p = .025, suggesting that these five types of intervention significantly differ in their efficacy (CBT being the most effective intervention).

[INSERT TABLE 1 ABOUT THERE]

Group or individual format. In line with our hypothesis, we found that interventions using group sessions were more effective than intervention using individual sessions, $Q_B(1, 102) = 6.70$, p = .009.

Intervention length. We conducted exploratory analyses to examine the possible impact of intervention length on efficacy. The length of the intervention does not appear to have a significant

effect on efficacy, as shown by a meta-regression analysis on 88 independent effect sizes for which we were able to estimate the total duration of the intervention in hours, β = - 0.03, p = .757.

Moderators Related to Study Design

Population type. We expected interventions to be less effective in increasing self-esteem in clinical samples than in healthy samples. Contrary to our hypothesis, effect sizes for interventions conducted on clinical samples were significantly larger than those for interventions conducted on healthy samples, $Q_B(1, 66) = 6.00$, p = .014. The effect size for the "Other" population category was not analyzed given the high heterogeneity of the types of samples it covers. In previous meta-analyses in children, the authors suggested a ceiling effect of self-esteem interventions in healthy samples (Hanney & Durlack, 1998). To investigate this hypothesis, we examined mean initial self-esteem scores at the Rosenberg Self-Esteem Scale from studies using a pre-test measure ($RCT_{pre\text{-}post}$ and $SGS_{pre\text{-}post}$). A Student t-test for independent samples (Welch correction) showed that this mean initial self-esteem score at the Rosenberg Self-Esteem Scale did not significantly differ between clinical and healthy samples, $t(23.28) = -0.96$, 95% CI [- 6.05, 0.2.22], p = .348.

Experimenter contact. In line with our hypothesis, an analog ANOVA showed that face-to-face studies reported significantly higher effects than online studies, $Q_B(1, 114) = 4.32$, p = .038. However, this result should be treated with caution due to the uneven number of effect sizes in the two subgroups (k = 12 versus k = 104 for online and face-to-face studies, respectively) leading to a reduced statistical power (Higgins & Thomas, 2020).

Type of control group. Planned contrasts were used to test the moderating effect of the type of control group in controlled studies ($RCT_{pre\text{-}post}$, RCT_{post}). The first contrast compared inactive control groups to active and placebo control groups considered together (C1: 2 -1 -1). The second contrast compared, within C1, active and placebo control groups (C2: 0 1 -1). As predicted, the mean effect size associated with inactive control groups was significantly larger than the mean effect size associated with active and placebo control groups considered together, β = 0.42, p < .001. However,

the mean effect sizes associated with active and placebo control groups were not significantly different, β = 0.07, *p* = .525.

Post-test delay. An exploratory meta-regression analysis did not reveal a significant effect of post-test delay on reported intervention efficacy, β = 0.01, *p* = .890, even when only follow-ups (instead of immediate post-tests) were considered, β = - 0.12, *p* = .429. These results suggest that the effects of the interventions do not decrease significantly over time once the intervention has ended.

Associations Between Moderators

Because we tested moderating effects individually, associations between moderators may have caused their effects to be confounded or suppressed. To examine this possibility, we assessed the strength of the associations between moderators (Table 2). If moderators are significantly linked, their effects may be confounded or suppressed and lead to the actual effect of each moderator being misinterpreted. Possible confounding or suppressor effects can be detected by performing additional meta-regression analyses on significant moderating effects and controlling for associated moderators.

For the format of the intervention, the mean effect size associated with group sessions was no longer significantly larger than the mean effect size associated with individual sessions after controlling for population type ($Q_B(1, 57) = 3.54$, $p = .059$) and control group type ($Q_B(1, 59) = 0.03$, $p = .869$). For population type, the difference between the mean effect size associated with clinical samples and the mean effect size associated with healthy samples became non-significant after controlling for the format of the intervention ($Q_B(1, 57) = 1.33$, $p = .248$) and after controlling for type of control group ($Q_B(1, 38) = 0.52$, $p = .472$). For the type of control group, the mean effect size associated with inactive control groups remained significantly larger than the mean effect size associated with active and placebo control groups considered together (C1) after controlling for intervention format (β = 0.43, *p* = .004), but this contrast was no longer significant after controlling for the population type (β = 0.35, *p* = .065). No suppressive effect was found on non-significant moderators (i.e., active vs placebo control group, post-test delay, intervention length). We

investigated the effect of contact with the experimenter by including in an exploratory analysis only those types of intervention that were tested both online and face-to-face (CBTs, evaluative conditioning, positive psychology interventions, psychoeducation, reminiscence-based intervention, psychoeducation plus support groups, and others). The effect of the experimenter' contact remained significant ($Q_B(1, 85) = 5.12$, $p = .024$). However, we were unable to test for other confounding effects of other moderators on experimenter contact and intervention type due to a lack of crossover between moderators' modalities.

[INSERT TABLE 2 ABOUT THERE]

Discussion

Although the literature describes innumerable interventions aimed at boosting adults' self-esteem, it lacks a comprehensive summary indicating the relative efficacy of each type of intervention, identifying which characteristics of existing interventions are most important in increasing self-esteem, and ascertaining the features of study design that impact the reported efficacy of these interventions. The present meta-analysis helps fill this gap.

The Efficacy of Self-esteem Interventions

Overall, the 119 studies included in our meta-analysis suggest that self-esteem interventions are effective regardless of their format (individual or group), the target population (clinical or healthy), the type of contact with the experimenter/therapist (face-to-face or online), the comparison with a control group (inactive, active or placebo control group) and the length of the intervention. The positive effects last up to one year. However, these results should be interpreted with caution as our conclusions are highly dependent on the reliability of the database and as strong associations between some moderators have been identified (Table 2).

First, with strong analytical power, we found a significant effect of interventions on adults' global self-esteem (overall $d = 0.38$) associated with substantial heterogeneity in the effect sizes. The Trim-and-fill procedure allowed us to correct for the publication bias observed on this overall effect

size and to impute a significant corrected effect size of 0.29. According to Cohen's criteria (1992), this overall effect size can be defined as small. The literature on self-esteem interventions is sensitive to a publication bias which contributes to overestimate the overall effect size of interventions. However, this effect size remains significant after correction for this bias, which suggests that the tendency of the literature to publish studies with significant results does not fully explain the apparent efficacy of the interventions included in this meta-analysis. This publication bias may have been increased because we only included interventions that targeted self-esteem as a primary outcome or interventions designed to specifically increase self-esteem. The inclusion of studies that did not primarily target self-esteem could have helped to reduce this publication bias. However, we decided to restrict the analysis to interventions targeting self-esteem to limit the heterogeneity of the included studies and to increase the consistency of this meta-analysis. Nevertheless, we do not rule out the fact that some interventions targeting other health variables may also have a significant effect on self-esteem, given the strong association between self-esteem and other psychological constructs as happiness (Baumeister et al., 2003), psychological well-being (Rosenberg et al., 1995), depression, anxiety (Sowislo & Orth, 2013), etc.

The overall efficacy of self-esteem interventions is a quite robust finding because the type of design and the quality of the studies do not moderate the efficacy of the interventions. According to the design type, the exact interpretation of the sign of the mean effect size is not strictly the same, given the way effect sizes were computed. However, talking efficacy in the broad sense (increase in self-esteem in the experimental group or smaller decrease compared to a control group), it is possible to conclude that the three types of design included in our meta-analysis demonstrate the efficacy of interventions on self-esteem, with no significant difference in effect sizes between studies that use a control group or not, and those that control for baseline’s self-esteem or not. Interestingly, in our database, studies considered to be of low quality did not significantly contribute to overestimating the positive effect of interventions on self-esteem. Because good quality studies also show an increase in self-esteem while controlling for more risk of bias, it seems that the overall

efficacy of the interventions is not entirely due to major methodological biases. This is also supported by the fact that studies comparing the efficacy of the intervention to a placebo control group were found to be effective in improving self-esteem while controlling expectancy and placebo effects. The proportion of studies rated as poor quality (between 27% and 29%) can be explained by many limitations faced by clinical and interventional research. Some quality criteria simply could not be met due to ethical or practical obstacles. For example, the lack of power of certain studies or an unrepresentative sampling method may be linked to the difficulty of including some types of patients. The use of blind and double-blind procedures is generally impossible when using inactive control groups (patients are aware that they are not performing any intervention). Attrition rate may be related to the length of the intervention or specific patient characteristics, with certain populations known to have low adherence to interventions (e.g., Zust, 2000) or high mortality rates (e.g., elderly, severely physically ill). Finally, the validity of the self-esteem measure may depend on the adequacy of pre-existing validated scales for the target population (validation in the patients' language, adequacy of items for specific populations...). Nevertheless, it is important to consider that the overall effect is significant even though most included studies used the well-validated Rosenberg Self-esteem Scale, which is supposed to measure a relatively stable construct and is known to be not very sensitive to change (Borras et al., 2009; Lecomte et al., 1999). However, the majority of the studies were judged to be of fair quality (between 49% and 58%), reflecting the fact that the methodological criteria on which we based our assessment were generally not made explicit in the studies. Future studies must provide more methodological details about their procedures and more justification for why one type of methodology was chosen over another so that the reader can easily appreciate the level of evidence provided by each study. This would help to make this vast field of literature on self-esteem much more understandable for researchers and clinicians.

What Types of Interventions Are Effective?

Despite the apparent overall efficacy of the interventions to increase self-esteem, the substantial heterogeneity in effect sizes found as well as the great variability in the types of

interventions included does not allow us to conclude with a high level of certainty that all interventions are effective. We were able to locate a large number of independent effect sizes only for CBTs, reminiscence-based interventions, and evaluative conditioning techniques. Thus, the significant effect sizes found were associated with relatively narrow confidence intervals, which allows us to conclude more precisely about the magnitude of the effect sizes of these three types of interventions.

The larger number of effect sizes identified for CBTs and reminiscence-based interventions reflects the over-representation of these interventions for increasing self-esteem in the literature. Importantly, we found no significant publication bias for these intervention studies. Furthermore, our results for these two types of intervention are consistent with previous meta-analyses that found medium to large effect sizes for CBTs (Kolubinski et al., 2018) and small effect sizes for reminiscence-based interventions (Pinquart & Forstmeier, 2012). Our results also suggest that reminiscence-based interventions are less effective than CBTs in increasing global self-esteem. This might be because the exercises used to recall and re-evaluate memories may help some patients integrate negative memory traces into their life stories, and thereby reduce their psychological impact. However, they may not be able to substantially modify the negative traces in some patients, so they remain present in the memory system and continue to have a negative impact on self-perceptions and self-esteem. On the other hand, CBTs could have a greater impact on self-esteem by combining cognitive and behavioral techniques to identify and profoundly modify the negative beliefs and self-schemas that cause low self-esteem, as well as to help patients develop self-confidence, assertiveness and adopt strategies for coping with threats to the Self.

Our finding that evaluative conditioning has a significant small effect on self-esteem is in contradiction with Hofmann's results (2010). While we identified a reasonable number of independent effect sizes for this type of intervention, some fluctuations in the estimated effect sizes may have led to this difference with Hofmann's results, which were based on an extremely powerful meta-analysis. Moreover, most of the evaluative conditioning studies included in our meta-analysis

used an experimental design without a baseline measure of self-esteem (RCT_{post}), justified by the use of implicit measures of self-esteem. Thus, it was impossible to calculate an effect size for these techniques that controlled for the initial level of self-esteem of the participants. So, the computations of our effect sizes may have been slightly biased despite the randomization procedure systematically used in these studies. Finally, it is difficult to compare the effect of evaluative conditioning to the effect of the other interventions included in this meta-analysis because the studies using this technique mainly use implicit measures of self-esteem whereas 89% of the studies included in the meta-analysis use explicit measures of self-esteem. Implicit measures avoid the problem of self-report biases (e.g., social desirability bias), but few studies have used such measures to test the efficacy of self-esteem interventions due to a lack of consensus on whether explicit and implicit self-esteem are independent constructs or components of a single construct (Tafarodi & Ho, 2006) and because major psychometric flaws have been found in existing implicit self-esteem measures (Bosson et al., 2000). Thus, if the evaluative conditioning appears effective to modify implicit self-esteem, our results do not allow us to establish its efficacy on explicit self-esteem.

Finally, our result does not support our hypothesis that CBTs and reminiscence-based interventions, both focusing on cognitive processes from which self-esteem is derived, would be more effective than other interventions based on more social or affective processes. Indeed, descriptive results suggest that some alternative interventions may be more effective in increasing self-esteem (e.g., mindfulness/relaxation). However, being based on few independent effect sizes, the accurate efficacy of other types of interventions needs to be clarified.

What Remains to Be Clarified?

Despite the few robust results presented above, it should be emphasized that many more studies are needed to conclude with certainty. First, the mean effect sizes of some type of intervention need to be considered with caution (e.g., mindfulness/relaxation, art therapies, support groups, psychoeducation, positive psychology interventions, physical activity, self-statements) as they included few independent effect sizes, leading to wide confidence intervals and imprecise mean

effect size estimates. This could lead to overestimating significant effect sizes, but also to compute non-significant effect sizes. Thus, the non-significant effect of self-statements on self-esteem could stem from a lack of statistical power (only four independent effect sizes for this type of intervention). Another explanation could be that the technique's efficacy may be sensitive to a participant's initial level of self-esteem, as self-statements can have a negative effect on some people, particularly those with low self-esteem, by creating a cognitive dissonance between self-perceptions and the self-statements used (Wood et al., 2009). However, recently this negative effect on people with low self-esteem has not been replicated (Flynn & Bordieri, 2020). This suggests the need for further studies on the effects of self-statements on self-esteem.

Some types of interventions are susceptible to publication bias, such as mindfulness/relaxation and psychoeducation interventions, and correcting for this bias leads to a considerable decrease in the estimated effect size (e.g., from 0.62 to 0.39 for mindfulness/relaxation interventions). The fact that not all types of intervention are sensitive to publication bias illustrates the different publication practices in the literature, which once again accentuates the difficulty of a comprehensive interpretation of self-esteem interventions efficacy.

The large variation in effect sizes reported by the studies included in our meta-analysis suggests that the characteristics of the intervention and/or of the methodology used to assess its efficacy may impact an intervention's perceived efficacy. In line with the findings of meta-analyses of self-esteem interventions in children (Haney & Durlak, 1998; O'Mara et al., 2006), our results showed that post-test delay had no effect on the size of the increase in self-esteem in adults. We also found that that the length of the intervention has a non- significant effect on the effect size of the intervention, which is a surprising result because global self-esteem is often considered resistant to change (Shavelson et al., 1976), which would imply that relatively long interventions are needed to produce far-reaching changes. However, these two non-significant moderation analyses may be underpowered because the duration of the intervention was not systematically indicated in the studies and many studies do not use follow-up measures to investigate the durability of the effects of

the interventions. We found that the effects reported by studies with active control groups were not greater than those reported by studies with placebo control groups. This may be due to confusion between these two categories, as few studies actually provided information on how participants were blinded. For example, participants in some control groups described as placebo groups may have realized which group they were in, thereby turning these groups into active (non-placebo) control group. So, we recommend including a measure of participants' awareness of which condition they were in and, whenever possible, using a double-blind procedure, so the experimenter does not have any impact on participants' awareness of the conditions.

Regarding significant moderator analyses, we found that interventions conducted in a group setting and those with face-to-face contact with the experimenter/therapist were significantly more effective than those conducted in individual sessions and those conducted online. We also found that comparing the effect of an intervention to an inactive control group demonstrates significantly larger effect sizes than comparing it to an active control or placebo group and that the interventions delivered to a clinical population are more effective than those provided to healthy participants. Finally, exploratory analyses suggest the lower efficacy of self-esteem interventions in healthy people is not due to a ceiling effect with healthy people as proposed by Haney and Durlak (1998) because we found that the initial self-esteem scores at the Rosenberg Self-Esteem Scale of the healthy samples were not significantly higher than those of clinical samples. Self-esteem interventions may benefit clinical populations more than healthy populations because clinical populations see greater therapeutic value in these interventions than healthy populations. The resulting increase in patient motivation and expectancies would then increase the efficacy of the intervention (Greenberg et al., 2006). However, the significant associations between moderators seriously complicate the interpretations and do not allow us to conclude on strong moderating effects. We found significant confounding effects between format, population type, and type of control group. For example, individual interventions are frequently performed in healthy subjects and using active or placebo control groups. Thus, the lower effect of individual interventions compared to group interventions

could be due to: (a) the fact that these individual interventions are performed with healthy subjects for whom the interventions are less effective than those performed in clinical populations, or (b) to the fact that they are compared to control groups for whom the effect sizes of the interventions are smaller. This effect of the format, the type of population, the type of control group could also be due to the type of intervention moderator which is strongly associated with them. Indeed, we can see that the most effective interventions such as CBTs, art therapies, or support groups are frequently carried out in group settings, with clinical population, and using inactive control groups. Unfortunately, we were unable to test for all confounding effects related to the type of intervention and experimenter contact moderators due to a lack of cross-over between moderator modalities. Thus, the processes involved in the efficacy of self-esteem interventions seem difficult to determine, as efficacy may be due to the processes targeted by the different types of interventions, as well as to specific factors related to the design of the study or participants' characteristics. However, we sought to understand what processes were targeted by the interventions included in our meta-analysis.

Potential Processes Involved in Interventions' Efficacy

Despite the many interpretative cautions that must be taken with our results, this meta-analysis allowed us to identify the interventions mainly invested in the literature to increase self-esteem. The mechanisms of action of these interventions focus on various processes involved in self-esteem. Taken together, our results suggest that interventions to increase self-esteem are effective, but it seems difficult to identify a common therapeutic ingredient for all types of interventions to increase self-esteem. Indeed, not all interventions use the same processes to increase self-esteem. CBTs, reminiscence-based interventions, or self-statements target cognitive processes from which self-esteem is derived and aim at modifying negative self-beliefs and schemata, re-evaluating memory traces of negative events, or training positive thoughts about oneself. However, the nature of the action of these interventions on the content or the activation patterns of the memory traces involved in self-perception remains to be clarified (Brewin, 2006). Some interventions target more affective processes by promoting emotional self-expression such as art therapy (Franklin, 1992),

reducing the emotional impact of negative thoughts on the Self such as mindfulness interventions (Fennell, 2004), or modifying the affective valence of the Self using evaluative conditioning. It would be interesting to further investigate the durability of the effects of these interventions on self-esteem to know if their positive effects are due to a significant change in self-perceptions or to a momentary activation of a subset of positive working self-knowledge relating to a particular affective state (Rholes et al., 1987). According to interpersonal theories of self-esteem (Cooley, 1902; Leary & Baumeister, 2000), it would also be relevant to aim at the social interactions from which self-esteem can be built. In this line, some positive psychology interventions (e.g., gratitude and compassion), as well as support groups, aim to foster a sense of inclusion and social acceptance. These social processes may also explain why group interventions appear to be more effective than those conducted in individual sessions. Finally, coping, perceived sense of control, self-efficacy, and self-confidence can also be therapeutic targets in some interventions such as psychoeducation and physical activity interventions. However, the involvement of these different variables in the building of self-esteem needs to be further investigated.

To conclude, there seem to be many processes that can lead to an increase in self-esteem and just as many types of interventions that use them. This may explain why a part of the studies included in our meta-analysis used mixed interventions that combine different processes (e.g., psychoeducation plus support groups). It seems essential in further studies to investigate the processes involved in the efficacy of interventions by trying to control for the different variables that may be involved in the effects of studies and avoiding observed confounding effects.

Limitations

This meta-analysis included all types of self-esteem interventions so we could provide an overview as wide as possible of their efficacy. Because any corpus comprising studies conducted from a variety of theoretical perspectives and using various methodologies will be highly heterogeneous, we used a random-effects model to compute mean effect sizes. This enabled us to

extrapolate our findings to a wide range of study populations, but it meant that our analyses had less statistical power compared with fixed-effects analyses. Moreover, as mentioned above, we were able to include only small numbers of studies in some modalities of our moderators (i.e., type of intervention, experimenter contact). So, we were not able to carry out the full moderation analysis of the type of intervention. We were also unable to control for confounding effects between some associated moderators because there was no crossover between the modalities of several moderators (i.e., intervention type, experimenter contact).

Conclusion and Recommendations for Future Research

This meta-analysis is the first to examine both the efficacy of a variety of self-esteem interventions in adults and the impact of different moderators relating to intervention design and study methodology. The results show that interventions included in this meta-analysis are effective in increasing self-esteem. However, the average effect sizes of some of the interventions need to be clarified with more effect sizes (e.g., self-statements, mindfulness/relaxation, support groups) and the strong associations between the various moderators of intervention efficacy complicate the interpretations of our results. Nevertheless, we can conclude that CBTs, reminiscence-based interventions, and evaluative conditioning are effective in increasing self-esteem in adults (CBTs being the most effective). Consequently, clinical psychologists wishing to increase their patients' self-esteem should use one or more of these interventions.

This meta-analysis has highlighted several issues in this field of research. Self-statements interventions do not appear to be effective, but this may be due to methodological weaknesses in the relatively small numbers of studies included. Hence, additional studies are needed to further investigate the possible benefits of these interventions. Overall, more rigorous studies of self-esteem interventions are needed. Future studies evaluating the efficacy of self-esteem interventions should further detail their methods and use rigorous procedures such as RCT with placebo control groups to exclude the effects of other variables (e.g., participant expectancies, placebo effects) and, ideally,

follow a double-blind procedure. Finally, it would be necessary to publish more non-significant results to reduce the publication bias observed in the literature.

Although the quantity, quality, and heterogeneity of the studies included in our meta-analysis limit the conclusions we can draw, our findings show that most types of interventions are effective in boosting self-esteem. Further research is needed to determine the nature of the psychological processes mobilized by each type of intervention.

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Papers marked with an asterisk indicate studies included in the meta-analysis.

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Appendix

Descriptive Overview and Individual Effect Sizes for the Studies Included in the Meta-analysis

Study	Design	Intervention	Format	Lenght (in hours)	Population type	Contact	Sample's mean age	Control group type	Measure	Type of measure	Post-test Delay (in days)	Attrition rate	Quality assessment	Sample size	Effect size (*d*)
Adam Rita (2010) - Dissertation	SGSpre-post	CBT	Group	12	Other	Real	41.57	No	Culture-Free Self-Esteem Inventory	Explicit (Trait)	0	0	Fair	7	0.19
	SGSpre-post	Other	Group	13	Other	Real	44.5	No	Culture-Free Self-Esteem Inventory	Explicit (Trait)	0	42.86	Fair	4	0.41
Allen (2004) - Dissertation	RCTpre-post	Psychoeducation	Individual	0.33	Healthy	Real	24.4	Active	Self-Liking Scale revised	Explicit (Trait)	0	0	Fair	56	0.13
	RCTpre-post	Psychoeducation	Individual	0.33	Healthy	Real	24.4	Active	Self-Liking Scale revised	Explicit (Trait)	0	0	Fair	62	-0.10
Anzules et al. (2007)	SGSpre-post	Art therapy	Group	12	Other	Real	Unspecified	No	Coopersmith Self-Esteem Inventory	Explicit (Trait)	0	0	Poor	14	1.05
	SGSpre-post	Art therapy	Group	12	Other	Real	Unspecified	No	Coopersmith Self-Esteem Inventory	Explicit (Trait)	60	0	Poor	14	1.78
Bahadir-Yilmaz & Oz (2017)	RCTpre-post	Psychoeducation	Individual	15	Other	Real	37.65	Inactive	Coopersmith Self-Esteem Inventory	Explicit (Trait)	0	0	Good	60	1.16
Bahaeloo-Horeh & Assari (2008)	SGSpre-post	Physical activity	Group	72	Healthy	Real	23.3	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	0	Poor	54	0.33
Baker et al. (2015)	SGSpre-post	Art therapy	Unspecified	12	Other	Real	38.9	No	Head Injury Semantic Differential Scale	Explicit (Trait)	0	23.08	Fair	10	0.52
Barr et al. (2001)	SGSpre-post	Support group + psycheducation	Group	Unspecified	Clinical	Real	46.2	No	Self-Esteem Rating Scale (Nugent & Thomas, 1993)	Explicit (Trait)	0	0	Poor	10	-0.20

	SGSpre-post	Support group + psycheducation	Group	Unspecified	Clinical	Real	46.2	No	Self-Esteem Rating Scale (Nugent & Thomas, 1993)	Explicit (Trait)	0	0	Poor	10	0.02
	SGSpre-post	Mixed intervention	Group	Unspecified	Clinical	Real	41.5	No	Self-Esteem Rating Scale (Nugent & Thomas, 1993)	Explicit (Trait)	0	0	Poor	10	0.28
	SGSpre-post	Mixed intervention	Group	Unspecified	Clinical	Real	41.5	No	Self-Esteem Rating Scale (Nugent & Thomas, 1993)	Explicit (Trait)	0	0	Poor	10	0.21
Borras et al. (2009)	RCTpre-post	CBT	Group	24	Clinical	Real	41	Inactive	Self-Esteem Rating Scale (negative self-esteem)	Explicit (Trait)	0	20.37	Fair	48	1.27
	RCTpre-post	CBT	Group	24	Clinical	Real	41	Inactive	Self-Esteem Rating Scale (positive self-esteem)	Explicit (Trait)	0	20.37	Fair	48	1.06
	RCTpre-post	CBT	Group	24	Clinical	Real	41	Inactive	Visual Analogical Scale	Explicit (Trait)	0	20.37	Fair	48	0.92
Bouvet & Coulet (2015)	RCTpre-post	Mindfulness/ Relaxation	Group	10	Other	Real	40.37	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	7	0	Good	30	0.87
Brown et al. (2004)	RCTpre-post	CBT	Group	Unspecified	Healthy	Real	Unspecified	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	90	34.1	Fair	120	0.31
Buckroyd et al. (2006) - Study 1	SGSpre-post	CBT	Group	10	Clinical	Real	Unspecified	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	28.57	Poor	5	0.29
	SGSpre-post	CBT	Group	10	Clinical	Real	Unspecified	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	180	28.57	Poor	5	0.42
	SGSpre-post	Mixed intervention	Group	20	Clinical	Real	Unspecified	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	50	Poor	4	0.89
	SGSpre-post	Mixed intervention	Group	20	Clinical	Real	Unspecified	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	180	50	Poor	4	1.17

Buckroyd et al. (2006) - Study 2	SGSpre-post	Mixed intervention	Group	72	Clinical	Real	Unspecified	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	33.33	Poor	12	0.21
	SGSpre-post	Mixed intervention	Group	72	Clinical	Real	Unspecified	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	180	33.33	Poor	12	-0.13
	SGSpre-post	Mixed intervention	Group	72	Clinical	Real	Unspecified	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	365	33.33	Poor	12	0.09
Byers et al. (1990)	RCTpre-post	Other	Group	16	Other	Real	45.14	Active	Tennessee Self-Concept Scale (total positive self score)	Explicit (Trait)	0	0	Fair	50	0.31
Cerezo et al. (2014)	RCTpre-post	Mixed intervention	Group	28	Other	Real	50.03	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	15.46	Good	175	0.60
Chadwick et al. (2014)	SGSpre-post	Mixed intervention	Group	6	Other	Real	34.5	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	10	Good	27	0.59
	SGSpre-post	Mixed intervention	Group	6	Other	Real	34.5	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	90	26.67	Fair	22	1.19
Chen et al. (2015)	RCTpre-post	Art therapy	Group	30	Other	Real	35.5	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	8	Good	200	0.55
Cheung et al. (2013) - Study 3	RCTpost	Other	Individual	Unspecified	Healthy	Online	36.58	Placebo	2 items (unvalidated)	Explicit (Unspecified)	0	0	Fair	664	0.19
Cheung et al. (2013) - Study 4	RCTpost	Other	Individual	Unspecified	Healthy	Online	19.38	Placebo	4 items (unvalidated)	Explicit (Unspecified)	0	0	Fair	127	0.73
Ching-Teng et al. (2019)	RCTpre-post	Art therapy	Group	20	Clinical	Real	78.4	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	9	Fair	55	1.15
Ciliska (1998)	RCTpre-post	CBT	Group	24	Other	Real	Unspecified	Inactive	Janis and Field Feeling of Inadequacy	Explicit (Trait)	0	45.1	Poor	52	0.46

	RCTpre-post	CBT	Group	24	Other	Real	Unspecified	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	45.1	Poor	52	0.57
	RCTpre-post	Psychoeducation	Group	12	Other	Real	Unspecified	Inactive	Janis and Field Feeling of Inadequacy	Explicit (Trait)	0	45.1	Poor	49	0.30
	RCTpre-post	Psychoeducation	Group	12	Other	Real	Unspecified	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	45.1	Poor	49	0.41
Clore & Gaynor (2006)	SGSpre-post	CBT	Individual	4	Other	Real	21.33	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	33	Fair	10	1.57
	SGSpre-post	Self-statements	Individual	4	Other	Real	21.33	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	33	Fair	10	1.76
Collin et al. (2016)	SGSpre-post	Mixed intervention	Individual/ Group	Unspecified	Clinical	Real	25.63	No	Multi-dimensional self-esteem inventory (global subscale)	Explicit (Trait)	0	25	Fair	60	0.47
Cusumano & Robinson (1993)	SGSpre-post	Physical activity	Group	4	Healthy	Real	Unspecified	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	5.56	Fair	45	0.15
	SGSpre-post	Mindfulness/ Relaxation	Group	4	Healthy	Real	Unspecified	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	5.56	Fair	45	0.39
Darvishi et al. (2020)	RCTpre-post	Other	Group	12	Other	Real	Unspecified	Inactive	Coopersmith Self-Esteem Inventory	Explicit (Trait)	14	0	Poor	24	2.40
Delinsky & Wilson (2006)	SGSpre-post	CBT	Individual	3	Other	Real	20.5	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	6.6	Fair	21	0.91
	SGSpre-post	CBT	Individual	3	Other	Real	20.5	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	42	8.8	Fair	21	0.96
	SGSpre-post	CBT	Individual	3	Other	Real	20.5	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	6.6	Fair	20	0.18

	SGSpre-post	CBT	Individual	3	Other	Real	20.5	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	42	8.8	Fair	20	0.22
Dijksterhuis (2004) – Study 1	RCTpost	Evaluative Conditioning	Individual	Unspecified	Healthy	Real	Unspecified	Placebo	Name Letter Task (full name)	Implicit	0	0	Fair	78	0.46
	RCTpost	Evaluative Conditioning	Individual	Unspecified	Healthy	Real	Unspecified	Placebo	Name Letter Task (initials)	Implicit	0	0	Fair	78	0.49
Dijksterhuis (2004) – Study 2	RCTpre-post	Evaluative Conditioning	Individual	Unspecified	Healthy	Real	Unspecified	Placebo	Name Letter Task (initials)	Implicit	0	0	Fair	35	0.53
Dijksterhuis (2004) – Study 4	RCTpost	Evaluative Conditioning	Individual	Unspecified	Healthy	Real	Unspecified	Placebo	Name Letter Task (initials)	Implicit	0	0	Fair	42	0.63
	RCTpost	Evaluative Conditioning	Individual	Unspecified	Healthy	Real	Unspecified	Placebo	Name Letter Task (initials)	Implicit	0	0	Fair	41	0.55
Erlen et al. (2001)	RCTpre-post	Reminiscence-based	Unspecified	6	Other	Real	42.1	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	7	0	Fair	20	-0.03
	RCTpre-post	Reminiscence-based	Unspecified	6	Other	Real	42.1	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	90	0	Fair	20	-0.38
	RCTpre-post	Reminiscence-based	Unspecified	6	Other	Real	42.1	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	365	0	Fair	20	-0.70
Espinosa et al. (2018)	RCTpre-post	Evaluative Conditioning	Individual	Unspecified	Other	Online	22.9	Placebo	Rosenberg Self-Esteem Scale (1 item)	Explicit (Trait)	1.5	0	Poor	28	0.00
	RCTpre-post	Evaluative Conditioning	Individual	Unspecified	Other	Online	22.9	Placebo	Rosenberg Self-Esteem Scale (1 item)	Explicit (Trait)	1.5	0	Poor	28	-0.06
	RCTpre-post	Evaluative Conditioning	Individual	Unspecified	Other	Online	22.9	Placebo	Name Letter Task (initials)	Implicit	1.5	0	Poor	28	0.30
Fai Tam (2000)	RCTpre-post	Other	Individual/ Group	Unspecified	Other	Real	Unspecified	Active	Self-Concept Questionnaire for Physically Disabled Hong Kong Chinese	Explicit (Trait)	0	0	Fair	41	0.48

	RCTpre-post	Other	Individual/ Group	Unspecified	Other	Real	Unspecified	Inactive	Self-Concept Questionnaire for Physically Disabled Hong Kong Chinese	Explicit (Trait)	0	0	Fair	31	0.87
Fleming & Burns (2017)	RCTpost	Evaluative Conditioning	Individual	0.5	Healthy	Online	37.9	Placebo	State Self-Esteem Scale	Explicit (State)	0	33.09	Fair	91	-0.03
	RCTpost	Evaluative Conditioning	Individual	0.5	Healthy	Online	37.9	Placebo	Implicit Association Test	Implicit	0	33.09	Fair	91	-0.27
	RCTpost	Evaluative Conditioning	Individual	0.5	Healthy	Online	37.9	Placebo	State Self-Esteem Scale	Explicit (State)	0	30.02	Fair	91	0.07
	RCTpost	Evaluative Conditioning	Individual	0.5	Healthy	Online	37.9	Placebo	Implicit Association Test	Implicit	0	30.02	Fair	91	0.00
Flynn & Bordieri (2020) - Study 1	RCTpost	Self-statements	Individual	Unspecified	Healthy	Real	22.2	Active	McGuire & McGuire State Self-esteem	Explicit (State)	0	0	Fair	75	0.20
	RCTpost	Self-statements	Individual	Unspecified	Other	Real	22.2	Active	McGuire & McGuire State Self-esteem	Explicit (State)	0	0	Fair	75	-1.50
Flynn & Bordieri (2020) – Study 2	SGSpre-post	Self-statements	Individual	0.16	Healthy	Real	21.64	No	Beck Self-Esteem Scale	Explicit (State)	0	4.34	Fair	127	0.41
	SGSpre-post	Mixed intervention	Individual	Unspecified	Healthy	Real	21.64	No	Beck Self-Esteem Scale	Explicit (State)	0	4.34	Fair	110	0.33
	SGSpre-post	Other	Individual	0.16	Healthy	Real	21.64	No	Beck Self-Esteem Scale	Explicit (State)	0	2.3	Fair	110	0.20
	SGSpre-post	Mixed intervention	Individual	Unspecified	Healthy	Real	21.64	No	Beck Self-Esteem Scale	Explicit (State)	0	2.3	Fair	127	0.16
Frey et al. (1992)	RCTpre-post	CBT	Group	Unspecified	Other	Real	72.48	Active	Culture-Free Self-Esteem	Explicit (Trait)	0	13.8	Poor	21	0.04

									Inventory						
	RCTpre-post	CBT	Group	Unspecified	Other	Real	72.48	Active	Hunter Self-Esteem Scale	Explicit (Trait)	0	13.8	Poor	21	0.14
Froufe & Schwartz (2001)	RCTpre-post	Self-statements	Individual	24	Healthy	Real	Unspecified	Inactive	Tennessee Self-Concept Scale (total score)	Explicit (Trait)	0	33.6	Poor	39	0.25
	RCTpre-post	Self-statements	Individual	24	Healthy	Real	Unspecified	Placebo	Tennessee Self-Concept Scale (total score)	Explicit (Trait)	0	33.6	Poor	41	-0.09
	RCTpre-post	Self-statements	Individual	24	Healthy	Real	Unspecified	Inactive	Tennessee Self-Concept Scale (total score)	Explicit (Trait)	0	33.6	Poor	42	0.43
	RCTpre-post	Self-statements	Individual	24	Healthy	Real	Unspecified	Placebo	Tennessee Self-Concept Scale (total score)	Explicit (Trait)	0	33.6	Poor	44	0.09
Garzon et al. (2001)	SGSpre-post	Other	Group	48	Healthy	Real	32	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	0	Fair	32	0.77
	SGSpre-post	Other	Group	48	Healthy	Real	32	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	21	25	Poor	24	0.70
Goldin & Gross (2010)	SGSpre-post	Mindfulness/ Relaxation	Group	24	Clinical	Real	35.2	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	12.5	Good	14	0.92
Gothe et al. (2011)	SGSpre-post	Physical activity	Group	120	Other	Real	66.43	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	18.9	Fair	72	-0.04
	SGSpre-post	Physical activity	Group	120	Other	Real	66.43	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	19.1	Fair	72	0.28
Grumm et al. (2009) – Study 1	RCTpost	Evaluative Conditioning	Individual	Unspecified	Healthy	Real	23.3	Placebo	State Self-Esteem Scale	Explicit (State)	0	0	Fair	80	-0.35
	RCTpost	Evaluative Conditioning	Individual	Unspecified	Healthy	Real	23.3	Placebo	Semantic differential	Explicit (Trait)	0	0	Fair	80	-0.22

	RCTpost	Evaluative Conditioning	Individual	Unspecified	Healthy	Real	23.3	Placebo	Implicit Association Test	Implicit	0	0	Fair	80	0.69
Grumm et al. (2009) – Study 3	RCTpost	Evaluative Conditioning	Individual	Unspecified	Healthy	Real	24.2	Placebo	State Self-Esteem Scale	Explicit (State)	0	0	Fair	32	0.94
	RCTpost	Evaluative Conditioning	Individual	Unspecified	Healthy	Real	24.2	Placebo	Semantic differential	Explicit (Trait)	0	0	Fair	32	0.31
	RCTpost	Evaluative Conditioning	Individual	Unspecified	Healthy	Real	24.2	Placebo	Implicit Association Test	Implicit	0	0	Fair	32	0.49
	RCTpost	Evaluative Conditioning	Individual	Unspecified	Healthy	Real	24.2	Placebo	State Self-Esteem Scale	Explicit (State)	0	0	Fair	32	-0.14
	RCTpost	Evaluative Conditioning	Individual	Unspecified	Healthy	Real	24.2	Placebo	Semantic differential	Explicit (Trait)	0	0	Fair	32	-0.07
	RCTpost	Evaluative Conditioning	Individual	Unspecified	Healthy	Real	24.2	Placebo	Implicit Association Test	Implicit	0	0	Fair	32	0.69
Guanipa et al. (1997)	RCTpre-post	Mixed intervention	Group	27	Healthy	Real	Unspecified	Active	Tennessee Self-Concept Scale (total score)	Explicit (Trait)	0	43.2	Poor	41	0.38
Gumley et al. (2006)	RCTpre-post	CBT	Individual	5	Clinical	Real	36.25	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	NA	Fair	144	0.25
	RCTpre-post	CBT	Individual	5	Clinical	Real	36.25	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	90	NA	Fair	144	0.16
	RCTpre-post	CBT	Individual	5	Clinical	Real	36.25	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	270	NA	Fair	144	0.41

Hall & Tarrier (2003)	RCTpre-post	CBT	Individual	Unspecified	Clinical	Real	38	Inactive	Robson Self-concept Questionnaire	Explicit (Trait)	4.5	8	Poor	23	1.78
	RCTpre-post	CBT	Individual	Unspecified	Clinical	Real	38	Inactive	Robson Self-concept Questionnaire	Explicit (Trait)	90	28	Poor	18	1.77
Hallford & Mellor (2015)	RCTpre-post	Reminiscence-based	Individual	0.33	Healthy	Online	25.5	Active	Rosenberg Self-Esteem Scale (1 item)	Explicit (Trait)	0	23.4	Good	153	0.28
	RCTpre-post	Reminiscence-based	Individual	0.33	Healthy	Online	25.5	Active	Rosenberg Self-Esteem Scale (1 item)	Explicit (Trait)	0	23.4	Good	173	0.26
Hames & Joiner (2012)	RCTpre-post	Self-statements	Individual	Unspecified	Healthy	Real	Unspecified	Placebo	State Self Esteem Scale	Explicit (State)	0	0	Fair	139	-0.08
	RCTpre-post	Self-statements	Individual	Unspecified	Healthy	Real	Unspecified	Placebo	State Self Esteem Scale	Explicit (State)	0	0	Fair	140	-0.02
Hammermeister et al. (2009)	SGSpre-post	Psychoeducation	Group	12	Healthy	Real	38.3	No	Self-Esteem Rating Scale (Nugent & Thomas, 1993)	Explicit (Trait)	0	NA	Poor	27	0.34
Hanser & Thompson (1994)	RCTpre-post	Mixed intervention	Individual	8	Clinical	Real	67.9	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	NA	Poor	20	0.39
	RCTpre-post	Mixed intervention	Individual	8	Clinical	Real	67.9	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	NA	Poor	20	0.44
Harris et al. (1998)	RCTpre-post	Support group + psychoeducation	Group	24	Other	Real	36.1	Inactive	Rosenberg Self-Esteem Scale (dicotomous scoring)	Explicit (Trait)	0	10.7	Poor	130	0.16
	RCTpre-post	Support group + psychoeducation	Group	24	Other	Real	36.1	Inactive	Rosenberg Self-Esteem Scale (dicotomous scoring)	Explicit (Trait)	90	36.3	Poor	130	0.10

Helgeson et al. (1999)	RCTpre-post	Psychoeducation	Group	6	Other	Real	48.25	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	7	NA	Fair	126	0.33
	RCTpre-post	Psychoeducation	Group	6	Other	Real	48.25	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	180	NA	Fair	132	0.15
	RCTpre-post	Support Group	Group	8	Other	Real	48.25	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	7	NA	Fair	122	0.24
	RCTpre-post	Support Group	Group	8	Other	Real	48.25	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	180	NA	Fair	129	0.24
	RCTpre-post	Support group + psycheducation	Group	14	Other	Real	48.25	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	7	NA	Fair	124	0.34
	RCTpre-post	Support group + psycheducation	Group	14	Other	Real	48.25	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	180	NA	Fair	130	0.33
Hill et al. (2006)	RCTpre-post	Support group + psycheducation	Group	Unspecified	Other	Online	Unspecified	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	Unspecified	16.66	Poor	100	0.34
Jalali et al. (2017)	RCTpre-post	CBT	Group	16.5	Other	Real	32.12	Inactive	Coopersmith Self-Esteem Inventory - general self-esteem subscale	Explicit (Trait)	0	46.2	Poor	28	1.47
Jong-Un (2008)	RCTpre-post	Psychoeducation	Group	15	Other	Real	24.2	Inactive	Coopersmith Self-Esteem Inventory	Explicit (Trait)	0	0	Poor	25	2.00
Kim et al. (2015)	RCTpre-post	Other	Unspecified	3	Other	Real	Unspecified	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	20.3	Fair	62	0.30
Korrelboom et al. (2009)	RCTpre-post	CBT	Group	8	Clinical	Real	25.4	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	9.4	Good	51	0.55

Korrelboom et al. (2012)	RCTpre-post	CBT	Individual	16	Clinical	Real	40.9	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	3.3	Good	61	1.23
	RCTpre-post	CBT	Individual	16	Clinical	Real	40.9	Inactive	Self-Esteem Rating Scale (negative self-esteem)	Explicit (Trait)	0	3.3	Good	61	0.92
	RCTpre-post	CBT	Individual	16	Clinical	Real	40.9	Inactive	Self-Esteem Rating Scale (positive self-esteem)	Explicit (Trait)	0	3.3	Good	61	0.48
Koutra et al. (2010)	SGSpre-post	CBT	Group	16	Healthy	Real	20.43	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	NA	Fair	53	0.64
Kunikata et al. (2016)	SGSpre-post	CBT	Group	24	Clinical	Real	42.8	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	7.3	Fair	41	0.45
	SGSpre-post	CBT	Group	24	Clinical	Real	42.8	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	90	7.3	Fair	41	0.53
Lan et al. (2019)	RCTpre-post	Reminiscence-based	Unspecified	Unspecified	Other	Real	82.98	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	11.29	Fair	62	0.34
Lecomte et al. (1999)	RCTpre-post	CBT	Group	24	Clinical	Real	40.6	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	15.79	Poor	95	0.13
	RCTpre-post	CBT	Group	24	Clinical	Real	40.6	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	180	15.79	Poor	95	0.18
Lee et al. (2006)	RCTpre-post	Other	Individual	8	Other	Real	56.6	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	9.8	Fair	74	0.45
Li et al. (2002)	RCTpre-post	Physical activity	Group	48	Other	Real	73.2	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	23.41	Poor	94	0.37
Lim et al. (2010)	RCTpre-post	CBT	Group	8	Healthy	Real	22.1	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	0	Fair	40	0.57
Lincoln et al. (2013)	RCTpre-post	Positive psychology	Individual	0.5	Other	Real	23.23	Active	Rosenberg Self-Esteem	Explicit (Trait)	0	0	Fair	70	0.33

									Scale						
Maricutoiu et al. (2019) – Study 1	RCTpost	Evaluative Conditioning	Individual	Unspecified	Healthy	Unspecified	23.3	Placebo	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	0	Fair	105	0.40
	RCTpost	Evaluative Conditioning	Individual	Unspecified	Healthy	Unspecified	23.3	Placebo	Name Letter Task (initials)	Implicit	0	0	Fair	105	0.11
Maricutoiu et al. (2019) – Study 2	RCTpost	Evaluative Conditioning	Individual	Unspecified	Healthy	Online	22.59	Placebo	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	20.83	Fair	76	0.52
	RCTpost	Evaluative Conditioning	Individual	Unspecified	Healthy	Online	22.59	Placebo	Name Letter Task (initials)	Implicit	0	20.83	Fair	76	0.16
Maricutoiu et al. (2019) – Study 3	RCTpost	Evaluative Conditioning	Individual	Unspecified	Healthy	Online	Unspecified	Placebo	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	0	Fair	178	0.49
	RCTpost	Evaluative Conditioning	Individual	Unspecified	Healthy	Online	Unspecified	Placebo	Name Letter Task (initials)	Implicit	0	0	Fair	178	0.01
Martinez-Hidalgo et al. (2018)	SGSpre-post	Mixed intervention	Group	40	Healthy	Real	21	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	NA	Good	25	0.20
	SGSpre-post	Mixed intervention	Group	40	Clinical	Real	21	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	NA	Good	22	0.14
Matsuguma et al. (2019) – Study 2	RCTpre-post	Positive psychology	Individual	1	Other	Real	41.37	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	7	0	Fair	22	0.67
	RCTpre-post	Positive psychology	Individual	1	Other	Real	41.37	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	30	0	Fair	22	0.74
McGovern et al. (2002)	SGSpre-post	Support group + psycheducation	Individual/ Group	Unspecified	Other	Real	41.4	No	Tennessee Self-Concept Scale (total score)	Explicit (Trait)	0	48.1	Fair	41	0.38
	SGSpre-post	Support group + psycheducation	Individual/ Group	Unspecified	Other	Real	41.4	No	Tennessee Self-Concept Scale (total score)	Explicit (Trait)	270	48.1	Fair	41	0.86
McNamee et al. (1995)	SGSpre-post	Support Group	Group	15	Healthy	Real	Unspecified	No	Rosenberg Self-Esteem	Explicit (Trait)	0	0	Good	13	1.19

									Scale						
	SGSpre-post	Support Group	Group	15	Healthy	Real	Unspecified	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	120	0	Good	13	1.40
Mongrain et al. (2011)	RCTpre-post	Positive psychology	Individual	1.75	Healthy	Online	33.63	Placebo	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	36.3	Good	472	0.02
Morgan (2000) - Dissertation	RCTpre-post	Reminiscence-based	Individual	12	Other	Real	82.59	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	0	Poor	17	-0.22
	RCTpre-post	Reminiscence-based	Individual	12	Other	Real	82.59	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	42	0	Poor	17	0.24
Morton et al. (2012)	SGSpre-post	CBT	Group	16	Other	Real	38	No	Robson Self-concept Questionnaire	Explicit (Trait)	0	24.49	Fair	37	1.29
Muller-Pinget et al. (2019)	SGSpre-post	Art therapy	Group	27	Other	Real	43.4	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	45	Fair	11	0.70
Murphy et al. (2005)	SGSpre-post	CBT	Unspecified	32	Other	Real	33.6	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	NA	Fair	61	0.22
	SGSpre-post	Positive psychology	Group	24	Other	Real	40.1	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	NA	Fair	107	0.33
Nosek et al. (2016)	SGSpre-post	CBT	Individual	Unspecified	Other	Online	43.21	No	Hudson Index of Self-Esteem	Explicit (Trait)	0	42.42	Fair	19	0.19
	SGSpre-post	CBT	Individual	Unspecified	Other	Online	43.21	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	42.42	Fair	19	0.39
O'Connor et al. (2011)	RCTpre-post	Other	Individual	0.75	Healthy	Real	19.49	Placebo	Rosenberg Self-Esteem Scale	Explicit (Trait)	30	2.5	Good	105	-0.11
	RCTpre-post	Other	Individual	0.75	Healthy	Real	19.49	Placebo	Implicit Association Test	Implicit	30	2.5	Good	107	0.40
	RCTpre-post	Other	Individual	0.75	Healthy	Real	19.49	Placebo	Rosenberg Self-Esteem	Explicit (Trait)	30	2.5	Good	105	-0.08

									Scale						
	RCTpre-post	Other	Individual	0.75	Healthy	Real	19.49	Placebo	Implicit Association Test	Implicit	30	2.5	Good	107	0.60
Osterndorf et al. (2011)	SGSpre-post	Positive psychology	Group	18	Other	Real	38.55	No	Coopersmith Self-Esteem Inventory	Explicit (Trait)	7	36.84	Fair	6	0.61
	SGSpre-post	Positive psychology	Group	18	Other	Real	38.55	No	Coopersmith Self-Esteem Inventory	Explicit (Trait)	91	52.63	Fair	6	0.49
	SGSpre-post	Other	Group	18	Other	Real	38.55	No	Coopersmith Self-Esteem Inventory	Explicit (Trait)	7	36.84	Fair	6	1.10
	SGSpre-post	Other	Group	18	Other	Real	38.55	No	Coopersmith Self-Esteem Inventory	Explicit (Trait)	91	52.63	Fair	6	3.07
Pack & Condren (2014)	SGSpre-post	CBT	Group	15	Other	Real	39.5	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	43.8	Fair	50	1.11
	SGSpre-post	CBT	Group	15	Other	Real	39.5	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	90	82.02	Fair	16	0.77
Pearson et al. (2012)	SGSpre-post	CBT	Individual	9	Other	Real	21.4	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	48.72	Fair	20	0.57
	SGSpre-post	CBT	Individual	9	Other	Real	21.4	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	90	48.72	Fair	20	0.39
	SGSpre-post	CBT	Individual	9	Other	Real	21.4	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	180	48.72	Fair	20	0.47
	SGSpre-post	Other	Individual	9	Other	Real	20.5	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	35.9	Fair	25	0.70

	SGSpre-post	Other	Individual	9	Other	Real	20.5	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	90	35.9	Fair	25	0.66
	SGSpre-post	Other	Individual	9	Other	Real	20.5	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	180	35.9	Fair	25	0.49
Philpot & Bamburg (1996)	RCTpre-post	Self-statements	Individual	Unspecified	Other	Real	21.4	Inactive	Coopersmith Self-Esteem Inventory	Explicit (Trait)	0	0	Fair	60	1.82
Poorgholami et al. (2016)	RCTpre-post	Psychoeducation	Unspecified	5	Other	Real	Unspecified	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	21	0	Poor	50	1.22
Poorneselvan & Steefel (2014)	SGSpre-post	Reminiscence-based	Individual	5.25	Other	Real	Unspecified	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	7	NA	Good	20	1.09
Rash et al. (2011)	RCTpre-post	Positive psychology	Individual	Unspecified	Healthy	Real	22.5	Placebo	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	16.1	Good	47	0.34
Ribeiro et al. (2020)	SGSpre-post	Psychoeducation	Individual	Unspecified	Healthy	Online	Unspecified	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	7	71.97	Fair	74	0.31
Richard et al. (2017)	SGSpre-post	Art therapy	Group	20	Healthy	Real	19	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	0	Fair	9	0.37
Rigby & Waite (2006)	SGSpre-post	CBT	Group	20	Other	Real	Unspecified	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	11.6	Poor	72	1.11
	SGSpre-post	CBT	Group	22	Other	Real	Unspecified	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	11.6	Poor	72	1.72
Ritter et al. (2013)	RCTpre-post	CBT	Individual	20.8	Clinical	Real	32.23	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	40	Good	39	1.19
	RCTpre-post	CBT	Individual	20.8	Clinical	Real	32.23	Inactive	Implicit Association Test	Implicit	0	40	Good	39	0.79

	RCTpre-post	Other	Individual	20.8	Clinical	Real	34.11	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	40	Fair	39	1.19
	RCTpre-post	Other	Individual	20.8	Clinical	Real	34.11	Inactive	Implicit Association Test	Implicit	0	40	Fair	39	0.47
Robinson & Bacon (1996)	SGSpre-post	Mixed intervention	Individual/ Group	22	Other	Real	39	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	9.62	Good	46	1.08
Rodriguez-Diaz et al. (2016)	RCTpre-post	Mixed intervention	Group	22.5	Other	Real	86.8	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	10	15.71	Fair	56	0.68
Russel & Jory (1997)	SGSpre-post	CBT	Group	Unspecified	Other	Real	Unspecified	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	38.36	Poor	45	-0.34
Safavi et al. (2011)	RCTpre-post	Psychoeducation	Group	4.5	Other	Real	Unspecified	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	30	31.7	Poor	123	2.44
Scheck et al. (1998)	RCTpre-post	Other	Individual	Unspecified	Clinical	Real	20.93	Active	Tennessee Self-Concept Scale (total positive self score)	Explicit (Trait)	Unspecified	29.41	Fair	59	0.48
Selensky & Carels (2021)	RCTpre-post	Other	Individual	Unspecified	Healthy	Online	18.49	Active	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	32.52	Fair	189	0.19
	RCTpre-post	Psychoeducation	Individual	Unspecified	Healthy	Online	18.45	Active	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	32.52	Fair	189	0.22
	RCTpre-post	Psychoeducation	Individual	Unspecified	Healthy	Online	18.73	Active	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	32.52	Fair	180	0.13
Setian (1990) - Dissertation	SGSpre-post	Other	Individual/ Group	Unspecified	Healthy	Real	Unspecified	No	Self-Perception Inventory	Explicit (Trait)	0	38.46	Poor	16	-0.10
Shiina et al. (2005)	SGSpre-post	CBT	Group	10	Clinical	Real	23.8	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	36	Fair	16	1.12
Shimotsu et al. (2014)	SGSpre-post	CBT	Individual/ Group	10	Clinical	Real	38.57	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	13.04	Fair	46	0.44

Steiner et al. (2019) – Study 1	RCTpre-post	Reminiscence-based	Individual	1	Healthy	Real	18.91	Active	Rosenberg Self-Esteem Scale (4 items)	Explicit (State)	0	3.2	Poor	179	0.19
Steiner et al. (2019) – Study 2	RCTpre-post	Reminiscence-based	Individual	2	Healthy	Real	19.24	Active	Rosenberg Self-Esteem Scale (4 items)	Explicit (State)	0	4.2	Poor	141	0.23
Steiner et al. (2019) – Study 3	RCTpre-post	Reminiscence-based	Individual	1	Healthy	Real	61.56	Active	Rosenberg Self-Esteem Scale	Explicit (State)	0	0	Poor	101	0.33
Stevenson et al. (2002)	RCTpre-post	Mixed intervention	Group	16	Clinical	Real	35.86	Inactive	Davidson and Lang Self-Esteem Measure	Explicit (Trait)	0	2.22	Fair	43	0.82
Stevens-Ratchford (1993)	RCTpre-post	Reminiscence-based	Group	12	Other	Real	79.75	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	0	Poor	24	0.13
Teague et al. (2006)	SGSpre-post	Art therapy	Group	9	Other	Real	37	No	Visual analogue scale	Explicit (Trait)	0	0	Poor	7	0.31
	SGSpre-post	Art therapy	Group	9	Other	Real	37	No	Visual analogue scale	Explicit (Trait)	21	0	Poor	7	0.04
Vaughan & Kinnier (1996)	RCTpre-post	Reminiscence-based	Group	12	Other	Real	39.5	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	34.1	Fair	19	0.15
	RCTpre-post	Support Group	Group	12	Other	Real	39.5	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	34.1	Fair	17	-0.01
Versluis et al. (2017) – Study 1	RCTpost	Evaluative Conditioning	Individual	Unspecified	Healthy	Real	19.83	Placebo	State Self-Esteem Scale	Explicit (State)	0	1.19	Good	84	0.41
	RCTpost	Evaluative Conditioning	Individual	Unspecified	Healthy	Real	19.83	Placebo	Implicit Association Test	Implicit	0	0	Good	84	0.35
	RCTpost	Evaluative Conditioning	Individual	Unspecified	Healthy	Real	19.83	Placebo	Implicit Association Test	Implicit	0.083	0	Good	84	-0.09
Versluis et al. (2017) – Study 2	RCTpost	Evaluative Conditioning	Individual	Unspecified	Clinical	Real	20.29	Placebo	State Self-Esteem Scale	Explicit (State)	0	1.3	Good	77	0.26
	RCTpost	Evaluative Conditioning	Individual	Unspecified	Clinical	Real	20.29	Placebo	Implicit Association	Implicit	0	1.3	Good	77	0.25

									Test						
Versluis et al. (2017) – Study 3	RCTpost	Evaluative Conditioning	Individual	Unspecified	Clinical	Real	20.4	Placebo	State Self-Esteem Scale	Explicit (State)	0	1.23	Good	80	0.05
	RCTpost	Evaluative Conditioning	Individual	Unspecified	Clinical	Real	20.4	Placebo	Implicit Association Test	Implicit	0	1.23	Good	80	0.00
Vickery et al. (2006)	SGSpre-post	Support group + psycheducation	Group	6	Other	Real	31.8	No	Head Injury Semantic Differential Scale	Explicit (Trait)	0	0	Fair	18	0.77
Waite et al. (2012)	RCTpre-post	CBT	Individual	10	Other	Real	33.6	Inactive	Robson Self-concept Questionnaire	Explicit (Trait)	0	9.1	Good	22	2.80
Wang (2004)	SGSpre-post	Reminiscence-based	Individual	12	Other	Real	75.69	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	7.69	Fair	23	0.12
	SGSpre-post	Reminiscence-based	Individual	12	Other	Real	75.69	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	7.69	Fair	25	0.23
Wang et al. (2005)	RCTpre-post	Reminiscence-based	Individual	16	Other	Real	75.6	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	13	Good	94	0.07
Wegener et al. (2015)	SGSpre-post	Mixed intervention	Individual/ Group	Unspecified	Clinical	Real	35.24	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	11.76	Fair	44	0.75
	SGSpre-post	Mixed intervention	Individual/ Group	Unspecified	Clinical	Real	35.24	No	Name Letter Task (full name)	Implicit	0	11.76	Fair	45	-0.89
	SGSpre-post	Mixed intervention	Individual/ Group	Unspecified	Clinical	Real	35.24	No	Implicit Association Test	Implicit	0	11.76	Fair	45	-0.23
Werrij et al. (2008)	SGSpre-post	Other	Individual	3.25	Other	Real	45	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	8.47	Poor	23	0.26

	SGSpre-post	Other	Group	12.5	Other	Real	45	No	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	8.47	Poor	31	0.17
Whelan et al. (2007)	SGSpre-post	CBT	Group	Unspecified	Other	Real	43.6	No	Rosenberg Self-Esteem Scale (modified version)	Explicit (Trait)	0	20	Poor	4	0.34
Wu (2002)	RCTpre-post	Art therapy	Group	20	Clinical	Real	Unspecified	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	14.3	Poor	74	0.71
	RCTpre-post	Art therapy	Group	20	Clinical	Real	Unspecified	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	60	14.3	Poor	24	0.81
Wu (2011)	RCTpre-post	Reminiscence-based	Group	12	Other	Real	81.34	Inactive	Rosenberg Self-Esteem Scale	Explicit (Trait)	7	3.9	Fair	24	1.53
Zhou et al. (2012)	RCTpre-post	Reminiscence-based	Group	9	Clinical	Real	69.43	Active	Rosenberg Self-Esteem Scale	Explicit (Trait)	0	3.1	Fair	125	-0.27
Zust (2000)	SGSpre-post	CBT	Group	40	Other	Real	Unspecified	No	Coopersmith Self-Esteem Inventory	Explicit (Trait)	0	50	Fair	7	0.74
	SGSpre-post	CBT	Group	40	Clinical	Real	Unspecified	No	Coopersmith Self-Esteem Inventory	Explicit (Trait)	0	11.11	Good	7	1.16

Figure 1

Ajusted Funnel Plot of Effect Size versus Standard Error (Trim-and-Fill)

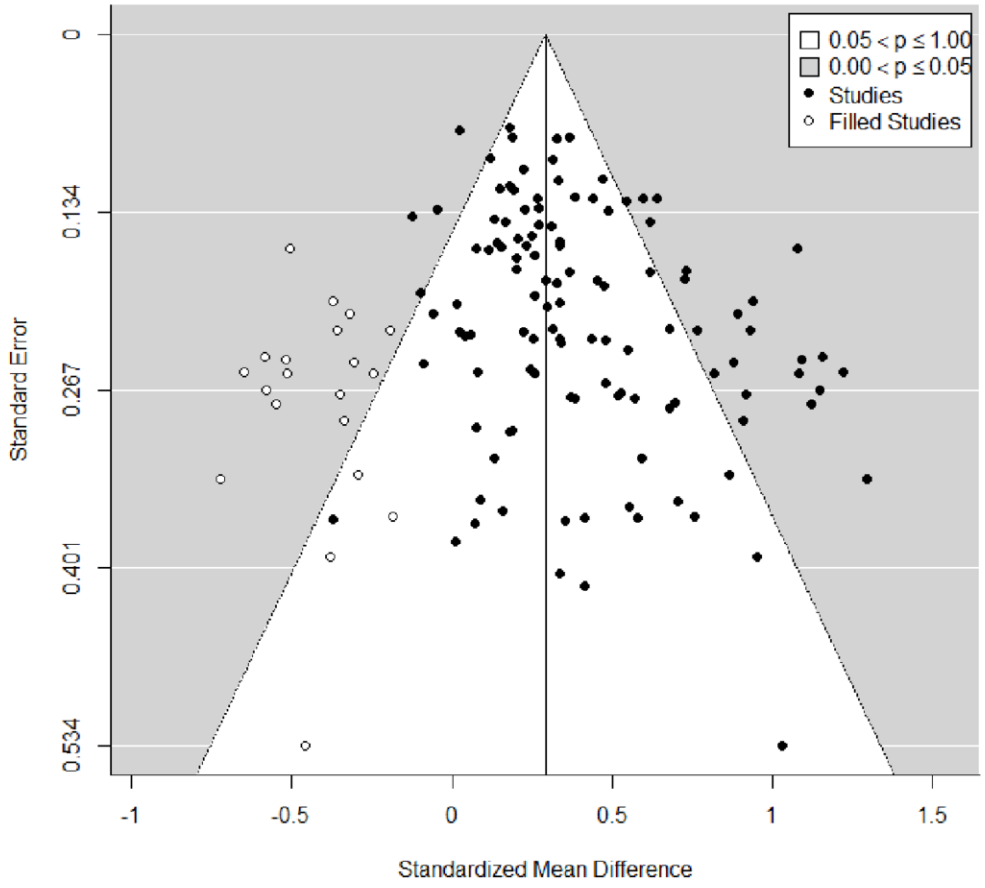

Table 1

Number of Effect Sizes (k), Weighted Mean Effect Size (d), Confidence Interval, and Analog ANOVA Test (Q_B) of Effect Size for each Categorical Moderator

	k	*d*	95% Confidence Interval		Q_B
			Lower	Upper	
Intervention	125				11.13**[f]
Mindfulness/Relaxation	3	0.62***	0.29	0.95	
Art-therapy	7	0.60***	0.36	0.83	
CBT	24	0.51***$_a$	0.39	0.62	
Support group	3	0.43*	0.07	0.79	
Mixed intervention	16	0.41***$_b$	0.28	0.54	
Psychoeducation	8	0.40***	0.22	0.58	
Psychoeducation + Support Group	6	0.36***	0.15	0.56	
Other	17	0.35***$_c$	0.22	0.48	
Positive Psychology	6	0.29**	0.07	0.50	
Evaluative Conditioning	14	0.25**$_d$	0.09	0.41	
Reminiscence-based	13	0.24**$_e$	0.09	0.39	
Physical activity	4	0.23*	0.01	0.46	
Self-statements	4	0.19	-0.06	0.45	
Format	104				6.70**
Group	53	0.44***$_a$	0.37	0.51	
Individual	51	0.31***$_b$	0.24	0.38	
Population	68				6.00*
Clinical	26	0.45***$_a$	0.34	0.56	
Healthy	42	0.28***$_b$	0.21	0.36	
Experimenter contact	116				4.32*
Face-to-face	104	0.40***$_a$	0.35	0.46	
Online	12	0.24***$_b$	0.10	0.38	
Control group	69				16.62***
Inactive	35	0.47***$_a$	0.39	0.56	
Active	12	0.26***$_b$	0.13	0.39	
Placebo	22	0.20***$_b$	0.10	0.31	

Note. Effect sizes with different subscripts ($_{a, b,, c, d, e}$) are significantly different ($p < .05$).

[f] The Q_B analysis performed on the type of intervention only concerns types of intervention with $k < 10$.

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 2

Associations Between Moderator Variables

	Intervention	Format	Control group	Population	Experimenter contact	Post-test delay	Length
Intervention	1						
Format	V = .42***	1					
Control group	V = .50***	V = .34***	1				
Population	V = .43***	V = .30***	V = .41***	1			
Experimenter contact	V = .30	V = .23*	V = .30**	V = .24**	1		
Post-test delay	F(12, 161) = 1.04	F(1, 146) = 1.30	F(2, 86)= 3.34*	F(1, 80) = 8.29**	F(1, 161) = 1.84	1	
Length	F(12, 90) = 5.24***	F(1, 92) = 17.42***	F(2, 51) = 3.38*	F(1, 41) = 1.80	F(1, 99) =2.58	r = .09	1

Note. We used chi-squared tests on Cramer's V coefficient for associations between categorical moderators, Pearson correlation coefficients for associations between continuous moderators, and one-way ANOVAs for associations between categorical and continuous moderators.

* $p < .05$, ** $p < .01$, *** $p < .001$