

Meta-analysis of the efficacy of best possible self : a positive psychology intervention

Fong, Kuan Wei

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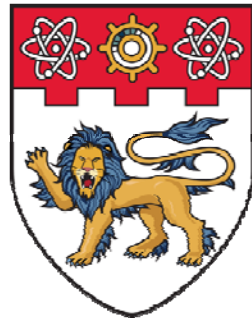
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**META-ANALYSIS OF THE EFFICACY
OF *BEST POSSIBLE SELF*: A POSITIVE
PSYCHOLOGY INTERVENTION**

**FONG KUAN WEI
SCHOOL OF SOCIAL SCIENCES**

2020

META-ANALYSIS OF THE EFFICACY OF *BEST POSSIBLE SELF*: A POSITIVE
PSYCHOLOGY INTERVENTION

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OF *BEST POSSIBLE SELF*: A POSITIVE
PSYCHOLOGY INTERVENTION**

FONG KUAN WEI

School of Social Sciences

A thesis submitted to the Nanyang Technological University
in partial fulfilment of the requirement for the degree of
Master of Arts

2020

Statement of Originality

I certify that all work submitted for this thesis is my original work. I declare that no other person's work has been used without due acknowledgement. Except where it is clearly stated that I have used some of this material elsewhere, this work has not been presented by me for assessment in any other institution or University. I certify that the data collected for this project are authentic and the investigations were conducted in accordance with the ethics policies and integrity standards of Nanyang Technological University and that the research data are presented honestly and without prejudice.

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This thesis **does not** contain any materials from papers published in peer-reviewed journals or from papers accepted at conferences in which I am listed as an author.

12 January 2020

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Fong Kuan Wei

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Abstract

Positive psychology interventions have shown promise in recent years in improving well-being. A commonly used intervention is the Best Possible Self (BPS) intervention. Does the intervention improve positive affect and reduce negative affect? The aim of this thesis and meta-analysis is to consolidate effect sizes found in randomized experimental studies of the BPS intervention and to identify moderator variables that influence the effect of the intervention. Twenty-two studies, with a total of 1719 participants, met criteria for inclusion in the analysis. Results show that the BPS intervention significantly improve positive affect and reduce negative affect. In addition, several factors moderated the effectiveness, including the specificity of the instructions, time instructions given to participants, whether the studies were administered in-person or online, and the type of control group compared to. The findings in this meta-analysis indicated that the BPS intervention is an effective intervention which can be used to improve affect.

Chapter 1

Literature Review

This thesis reviews the Best Possible Selves (BPS) Intervention, one of the commonly used Positive Psychology interventions, and examines its effectiveness through meta-analysis on randomized controlled studies involving BPS.

Positive psychology is a field that was conceived by Martin Seligman and Christopher Peterson (Seligman, Steen, Park & Peterson, 2005). In 1998, Martin Seligman, then President of the American Psychological Association, delivered an inauguration speech in which is widely considered as the birth of the positive psychology movement. ‘Stopping the madness’, was the essential message of the speech, as psychology took a paradigm shift to consider enhancing the happiness and well-being of people.

Since then, research on positive psychology has flourished. The publication of the Oxford Handbook of Positive Psychology (Snyder & Lopez, 2009; 2nd ed) has resulted in the spark of positive psychology research. The publication of the Oxford Handbook of Methods in Positive Psychology (Ong & Dulmen, 2007) then followed to support quantitative research in Positive Psychology, illuminating in book chapters on what questions could be asked in this field and the kinds of work that need to be done. The effects of positive psychology interventions could potentially be far-reaching and extend beyond to populations of individuals that do not meet the criteria of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV). In other words, one does not have to be ‘ill’ to receive treatment. In the World Health Organization’s definition of mental health (as cited in Boiler, Haverman, Westerhof, Riper, Smit & Bohlmeijer 2013):

Mental health is a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively, and is able to make a contribution to his or her community.

This definition underscores that although individuals may not be diagnosed with mental illnesses, unhappiness may exist which undermines optimum functioning in daily life (Boiler et al., 2013).

A key tenet of the positive psychology movement is that character strengths can be cultivated. A list of character strengths can be found on the Values in Action (VIA) website. These include *Hope*, *Optimism*, *Gratitude* and *Kindness*. There have been numerous studies (e.g. Feldman & Dreher, 2012; Peters, Flink, Boersma, & Linton, 2010; Froh, Kashdan, Ozimkowski, & Miller, 2009; Otake, Shimai, Tanaka-Matsumi, Otsui, & Fredrickson, 2006) documenting the effects of interventions that aimed to cultivate these strengths both in children and adult populations. Along with the aim of enhancing the character strengths, other outcome variables such as affect, measures of psychological well-being and life satisfaction were measured to show the efficacy of these interventions. The International Positive Psychology Association is an important research body and many clinicians and researchers accept that positive psychology findings could prove beneficial (Boiler et al., 2013).

Despite positive psychology gaining popularity as a field both in terms of accumulating research findings and organizations that are founded to promote positive psychology, there remain criticisms of it, as in any other specific disciplines of psychology. Gable & Haidt (2005) argued that if the emerging discipline of positive psychology is needed, this may suggest past psychology disciplines focused on the negatives, and the so-called 'negative psychology' has taught us little. A better description would be that previously, psychology, which was mostly neutral, but with more emphasis on negative than positive research issues, had been successful, just that the lack of progress, or the imbalance of positive topics, has become evident (Gable & Haidt, 2005).

Another prevailing criticism of positive psychology is that people who study positive psychology see the world with a ‘Pollyanna’ view, or in other words, failing to recognize the real negative aspects of life (Gable & Haidt, 2005). However, this also is not a valid criticism. The aims of positive psychology are to complement the existing knowledge base by building up new knowledge of human strength, resilience, and growth, and not to erase previous work done on distress, dysfunction, and pathology. Gable and Haidt (2005) provided a website in which a list of researchers involved in positive psychology publications and conferences can be found (<http://www.positivepsychology.org/>). The researchers that started on positive psychology research topics were nearly all housed in traditional psychology departments and their publications can be found in mainstream journals (Gable & Haidt, 2005).

The third criticism that has often been mentioned (Gable & Haidt, 2005; Held, 2004; Alex Linley, Joseph, Harrington & Wood, 2006) is that in trying to define what is positive, there is ambiguity in the descriptive ‘good’ vs the prescriptive ‘good’. This is not as straightforward as in medicine, where what is good usually means patients having longer lifespans and without suffering illnesses (Held, 2004; as cited in Gable & Haidt, 2005). Diener and Suh (1997) suggested that value systems or cultural norms can be used as a reference to judge what is positive or good. Another suggestion was that if something is chosen regularly, there is belief in the goodness or value by the individuals who make that choice (as cited in Gable & Haidt, 2005). Individuals can judge if something (object, event, process, or outcome) is pleasant or satisfying. Ultimately, positive psychology aims to develop these processes or interventions to increase and sustain the factors that are involved in building strengths, positive experiences, and positive relationships of oneself with others (Gable & Haidt, 2005).

Over the past two decades, as the number of research studies on these positive psychology interventions have increased tremendously, *specific* interventions have been replicated in various studies to study their efficacy. These specific interventions are well-known in the literature as ‘counting your blessings’ – a task in which participants list five things for which they were grateful for (e.g. Emmons & McCullough, 2003, Watkins, Woodward, Stone & Kolts study 3, 2003, Dunn & Schweitzer, 2005), ‘gratitude expression’ – an interpersonal task in which participants express in a letter the gratitude they feel for another person (e.g. Ozimkowski, 2007, Froh et al., 2009, Toepfer, Cichy & Peters 2012), ‘practicing kindness’ (e.g. Kerr, O’Donovan & Pepping, 2015), ‘usage of personal strengths (to enhance well-being)’ (e.g. Seligman et al. 2005), ‘setting personal goals’ and an intervention which this thesis is focused on – ‘the Best Possible Self’ intervention. The Best Possible Selves (BPS) Intervention is known as one of the ‘flagship’ intervention exercises conducted whose efficacy has been shown in many studies, across different populations (Heckerens, Eid & Heinitz, 2019).

The BPS intervention is an intervention which asked participants to focus on visualizing and writing about their imagined future best possible selves. The origins of this intervention can be traced back to the work of Michael W. Fordyce, one of the first few researchers who taught ‘volitional strategies’ (intentional, of one’s will activities) in order to increase happiness (or what current positive psychologists refer to as positive affect). In 1977, he carried out three studies in which he used the program that he developed – the 14 Fundamentals for Happiness (Fordyce, 1977). In developing this program, he believed that these 14 Fundamentals are achievable by average people to attain happiness, in contrast to longer term characteristics of happy people such as heightened job status, higher income and social status. Examples of the fundamentals include “socializing, practicing optimism, reducing negativity, and not worrying”. The full 14 Fundamentals can also be found in

Fordyce (1981) and Fordyce (1983). It is relevant to note that the fourth and seventh fundamentals in exact words are “(to) get better organized and plan things out” and “(to) develop positive, optimistic thinking”. These two fundamentals are reflected in the instructions given to participants for the Best Possible Self Intervention. To summarize the efforts of Fordyce’s pioneering work, the students in his studies (7 studies in total) who were taught the happiness-increasing strategies showed increases in happiness compared to those in groups who did not receive the training (Lopez, Snyder, Boehm & Lyubomirsky, 2009).

As the Best Possible Self Intervention is primarily a written intervention, it is of relevance to trace the roots of this writing activity. The researcher who is well-known for disclosive writing research is James W. Pennebaker. His 1989 experiment wanted to investigate the effect of putting emotional ‘upheavals’ into the written form. The hypothesis of the experiment is that disinhibiting or disclosing emotions would improve health. It is a true experiment design with an experimental group and a control group, with participants randomly assigned. In the experimental condition, the participants were encouraged to delve into their emotions. In the control condition, they were asked to describe objects and events dispassionately. The common instructions to both groups were to write about an assigned topic for 15 minutes daily, over 4 consecutive days. Participants were also assured that their writing would remain anonymous and encouraged to write continuously without regard to spelling, grammar, or sentence structure.

Specifically, the experimental group participants were asked to spend each daily session writing about one or more traumatic experience in their lives. The instructions are:

For the next 4 days, I would like for you to write about your very deepest thoughts and feelings about the most traumatic experience of your life. In your writing, I'd like you to really let go and explore your very deepest emotions and thoughts. You might tie your topic to your relationships with others, including parents, lovers, friends, or relatives. You may also want to

link your experience to your past, your present, or your future, or to who you have been, who you would like to be, or who you are now. You may write about the same general issues or experiences on all days of writing, or on different traumas each day. All of your writing will be completely confidential. (Pennebaker, 1989, p. 215)

The control group was asked to write about non-emotional topics, such as to describe the laboratory room in which they were seated or their own living room. There are some notable effects of this experiment conducted by James Pennebaker, with regards to positive affect. Participants in the experimental condition enjoyed the writing process and found it to be extremely “valuable and meaningful”. 98% of participants would participate in future similar activities (Pennebaker, 1997; as cited in Lopez, Snyder, Niederhoffer, & Pennebaker, 2009).

The long-term effect was that there were significantly reduced numbers of physician visits in the next year for participants in the experimental condition (in comparison to those in the control condition). The immediate effects of those in the experimental condition were affective and emotional. Many students cried and were upset, having disclosed traumatic events. They felt distressed as this experience elicited their negative emotions about the events they faced. This effect of disclosive writing is best described by Lopez, Snyder, Niederhoffer, & Pennebaker (2009) in this sentence: “(the) mere act of emotional disclosure through writing is a powerful therapeutic agent”.

Other further studies (Pennebaker, Kiecolt-Glaser, & Glaser, 1988; Petrie, Booth, & Pennebaker, 1998; as cited in Lopez et al. 2009) since then have documented salubrious effects of participants in writing about traumatic events. For review articles, interested readers can refer to Smyth (1998), and Pennebaker & Chung (2007), as cited in Lopez, Snyder, Niederhoffer, & Pennebaker (2009).

The other aspect of the Best Possible Selves Intervention involves visualizing those selves, and this can be traced back to *Possible Selves* (Markus & Nurius, 1986). In the seminal 1986 article, Markus & Nurius discussed about possible selves “providing a conceptual link between cognition and motivation”. The definition of possible selves can be stated as a type of ‘self-knowledge’ pertaining to how individuals think about their potential and about their future. The difference between the possible selves and the dreaded possible selves are that the former are the selves that we want to become, the latter, the selves that we are afraid of becoming.

Possible selves provide the ‘self-relevant form’, specific to the individual. The article provides a theory of how the role of possible selves belongs to the self-concept. According to Markus & Nurius (1986), possible selves “reveal the inventive and constructive nature of the self” and also reflect the extent to “which the self is socially determined and constrained”. The self-concept, in the cognitive approach, can be viewed as schemas that lends ‘structure’ and ‘coherence’ to an individual’s self-relevant experiences (Markus & Nurius, 1986). The authors suggested that there are two distinct functions of possible selves:

- 1) Function as incentives for future behavior
- 2) Provide an evaluative and interpretive context for the current view of self.

The first function has direct relevance to optimism research, in which the Best Possible Selves Intervention is used in medical articles to induce optimism. They further described the first function “Possible selves give specific cognitive form to our desires for mastery, power, or affiliation, and to our diffuse fears of failure & incompetence.” The practicality of such function can be seen in the elaboration by Markus & Nurius (1986) “The fact that the high recovery subjects endorsed many positive possible selves, and evaluated them to be quite

likely, suggests that these selves were available in the working self-concepts of these respondents and were functioning as incentives.”

The second function “evaluative and interpretive context for the now self” is not immediately clear in how this mechanism functions in Best Possible Self Interventions. It could be that by engaging in a visualization activity of one’s future self, it gives a form of reality-check to the individual, reminding oneself the difference between current and ideal.

Markus & Nurius (1986), in their paper, suggested that future empirical work can study exactly how these possible selves operate within the self-system. Although this thesis is primarily concerned with outcome variables of Best Possible Self Interventions, future work may examine how the mechanisms of this intervention lead to increases in positive affect and positive future expectancies. Currently, only one article on the mechanism of the BPS intervention is published (Heckerens, Eid & Heinitz, 2019). It may take awhile more for further studies that investigate mechanisms of the intervention before a meta-analysis can be conducted. A meta-analysis article on the mechanisms of how gratitude function to improve prosociality has already been published (Does Gratitude enhance Prosociality?: A meta-analytic review; Ma, Tunney & Ferguson, 2017).

The Positive Psychology movement started a shift towards greater focus on positive topics and its benefits to individuals. It was in 2001, when King conducted a study for participants to write about their life goals on a variation of Pennebaker’s writing paradigm, which contained the essence of what positive psychology is about in the form of disclosive writing. King’s study of asking participants to disclose their thoughts on life goals were based largely on Pennebaker’s decades of research on trauma disclosive writing. Her paper in 2001 presented several findings of Pennebaker’s research, which was conducted in the 80s and 90s

(Pennebaker 1988, 1989 & 1992), when psychology was well known for psychotherapy and interventions that focused on the negative aspects such as trauma.

Disclosive writing has several benefits such as superior immune function, better adjustment to college and quickly finding employment after being laid off (King, 2001). The traditional notion that disclosive writing leads to better self-regulation has a few supporting theories. In Pennebaker's writing experiments, it was thought that *emotional expression* had a role, in that confiding in others about a trauma lead to individuals better off physically than others. The writing studies also encouraged participants to "really let go... and write as much as you can about the experience", demonstrating the role that releasing pent-up emotions may be beneficial for self-regulation. Other theories proposed are a theory of *active inhibition* to account for the healing power of writing (Pennebaker 1988, 1989, 1992; as cited in King, 2001) and emotional catharsis (Pennebaker 1997; as cited in King, 2001). However, the health benefits of writing may be linked to constructing a sensible story rather than releasing pent up emotions (King, 2001). It was this shift in thought, which became the aim in King's study, to test if writing that promoted self-regulatory processes might produce health benefits, without having participants go through the experiencing of intensive negative emotions in trauma disclosure. She asked randomly assigned participants to write narrative descriptions of their best possible future selves. Such exercise was expected to allow them to examine a previously unexamined part of their motivational lives. This was aligned with the theory in *Possible Selves*, that writing about life goals involves processes related to cognitive-behavioural treatment, by bringing awareness and clarity to one's life goals and helping one to reorganize priorities and decide on values. Another possibility is with regards to goal ambivalence – goal conflict will be reduced when one writes about life goals, allowing one to recognize and resolve such conflicts.

The Best Possible Self intervention was thus ‘created’ – a session that reflects positive psychology ideals and retains the benefits of narrative writing construction. This intervention contains an aspect of mental simulation as well. Individuals who conducted a mental simulation of doing well on a test performed better, showing the relationship between thought and action (Pham & Taylor, 1999; as cited in King, 2001). Individuals who simulated a stressful life event also had psychological benefits over others (Rivkin & Taylor, 1999; as cited in King, 2001). The effects of King’s experiment were measured longitudinally, those in the BPS condition had significant immediate increases in positive mood. Three weeks later, they had increases in subjective well-being and five months later, fewer visits to a health center (physical benefits).

In King’s 2001 study, the comparison involved a traumatic writing condition (there were four conditions – a control condition, a traumatic writing condition, a BPS writing condition and a BPS + traumatic writing condition). It was in 2006, with Sheldon and Lyubomirsky’s study that showed that a *single session* of BPS writing significantly increase positive affect relative to a control group (Peters, Flink, Boersma & Linton, 2010). Sheldon and Lyubomirsky (2006) also proposed the ‘self-concordant motivation (SCM)’. If participants are initially motivated to sustain effortful practising of the assigned exercises, it will lead to greater benefits for them. The SCM can be described in three different ways: 1) as a characteristic of the exercise, reflecting the relative degree to which participants are initially engaged in them. 2) as an individual difference predictor of exercise frequency on success and 3) as a measure of person-exercise fit, expected to moderate the relationship between exercise frequency and changes in affect. Sheldon and Lyubomirsky were also among the first authors to use the Positive and Negative Affect Scale (PANAS) to measure positive and negative mood, in which many subsequent studies use this to measure affect as outcome variable.

Further development on the Best Possible Selves intervention came in the study conducted by Peters et al. 2010. There were two developments made by this study: 1) Paving the way for BPS to be used as an optimism manipulation in subsequent studies 2) Adding specific instructions to the intervention for participants in which many subsequent studies adopted. In their study, it was mentioned that the BPS intervention fitted the requirement of a manipulation to increase optimism. Optimism induction is useful because of scientific and clinical significance. The manipulation would also demonstrate causal link between optimism and positive consequences for health and behaviour. The aim of their study was to explore if it is possible to use the BPS intervention experimentally, to increase positive expectancies in for the future. To do this, they compared the effects of a single session of the BPS exercise with that of a control exercise (writing and imagining a typical day) on the Subjective Probability Test (SPT; MacLeod, 1996; as cited in Peters et al. 2010). Their paper also noted King's 2001 study on the original BPS intervention and that because her study consisted of a trauma writing condition and a mixed condition (trauma writing + BPS), the effects on optimism could not be experimentally isolated. Subsequent studies that used BPS as an optimism induction more often used the positive and negative future expectancies scale.

Another point to note about Peters et al's 2010 study is that this was the first study involving the BPS to include a *specific* instruction of a 5-minute mental imagery component to the original writing exercise. The rationale was that mental imagery will lead to stronger effects on emotions and cognition than verbal processing of the same material. Participants were instructed to think for 1 minute about what they wish to write, write continuously for 15 minutes, followed by the 5-minute mental imagery component. Actual instructions of this experiment for both BPS intervention and control (Typical Day) condition can be found in the Appendix of this thesis. Subsequent studies that employed these specific instructions include Boselie et al. (2014), Renner et al. (2014,) Peters et al. (2016) and others.

The sustainable happiness model is a model proposed by Lyubomirsky, Sheldon & Schkade (2005) (as cited in Lopez et al. 2009a). In their model, the primary determinants of happiness are one's set point, one's life circumstances, and related to this thesis (the Best Possible Self is an *intentional* intervention), the *intentional activities* in which one engages. Accordingly, the set point accounts for approximately 50% of the variance in individual differences, the circumstances in one's life account for 10%, and the most promising factor for affecting change in happiness is the engagement of intentional activities, which account for approximately 40%. Intentional activities have potential for improving positive affect because of two characteristics, they are naturally viable and episodic (have beginning and ending points). These two characteristics work against adaptation, which means that individuals find it difficult to adapt to something that is changing continuously, in contrast to one's circumstances, which stays relatively constant (Lopez et al., 2009a).

Primary studies sometimes study the long-term effects of intentional activities, for example, the Best Possible Self intervention. A meta-analysis is a way to measure the cumulative effects of longitudinal primary studies. For studies whose outcome variable (e.g. positive affect) are measured at multiple time-points, we can ask the following questions with comparison to a control group. 1) Overall effect – is the overall effect size (by comparing synthetic effect sizes created for each study) significant? 2) Difference in effect size between the two groups at equivalent time points.

Other reasons for doing a meta-analysis

The issue of narrative review versus meta-analytic review can be found in numerous textbooks on meta-analysis. Although researchers routinely conduct narrative reviews (i.e. traditional literature review) in empirical research articles, I wish to point out some possible advantages of a meta-analytic review over a narrative review.

Published articles often contain results that are significant. A narrative review typically consists of articles that have significant findings. In a meta-analytic review, the list of articles often includes “unpublished studies”, e.g. student’s dissertations, which may offer a more complete picture of the topic instead of only focusing on studies that have significant findings. The meta-analysis on the samples of studies conducted in this thesis contained a student’s dissertation (i.e. Summerfield, 2015).

In a meta-analysis study, by combining primary studies together, one statistical benefit is that the size of the error estimate gets smaller and smaller, because a large number of subjects are combined. If more future studies are conducted on the same intervention, a more precise estimate of the effect size can be obtained.

In a typical medical intervention study, meta-analysis helps to compare several primary studies and the summarized effect size with its error estimate is used to convince users that the benefit of the drug will only benefit the symptom in question. Meta-analysis studies in social science (e.g. positive psychology interventions) can be used in this manner, to show that effects are one-directional (with effect size and confidence interval, we can say that an intervention is helpful), or to uncover the different moderating variables that result in the difference or direction of effect sizes across studies.

The coding of moderating variables across studies allow a meta-analytic reviewer to compare studies. By coding of variables and subgroup analyses, we can identify the moderating variables that have a greater effect on the outcome variables. Tests of hypotheses of moderators on how they affect the magnitude of effect size are observational and do not actually involved participants in an experimental design. This puts the meta-analytic reviewer is in the position to answer research questions that could lead to implications of future research.

Previous meta-analyses on Positive Psychology interventions

There have been some meta-analyses and review articles conducted that are of interest to this thesis. They are Sin & Lyubomirsky (2009), Boiler et al. (2013), Loveday, Lovell & Jones (2016), Malouff & Schutte (2017).

Sin & Lyubomirsky (2009) conducted a ‘practice-friendly’ meta-analysis of positive psychology interventions and found that overall, positive psychology interventions significantly enhance well-being (mean $r = .29$, standardized mean difference Cohen’s $d = 0.61$) and decrease depressive symptoms (mean $r = .31$, Cohen’s $d = 0.65$). The findings were intended for clinicians to incorporate into the positive psychology interventions that they conduct.

Their study was met with criticism by Boiler et al. (2013), who conducted a meta-analysis of their own specifically on randomized controlled trials. The meta-analysis conducted by Sin & Lyubomirsky included both randomized controlled trials and quasi-experimental studies. Quasi-experimental studies are not considered true experiments because the random assignment of participants is not ensured, unless efforts are made to ensure that groups do not differ in baseline variables. Another criticism was that the treatment effects in Sin & Lyubomirsky’s (2009) meta-analysis could be overestimated because of their inclusion of lower quality studies. Study quality is a moderator variable analysed by Boiler et al. (2013). Finally, their last critique was that studies of not ‘pure positive psychology interventions’ were included. What they meant was that there were studies (e.g. mindfulness, life-review) that were not strictly developed within the positive psychology framework.

How did Boiler et al. (2013) included ‘study quality’ as a variable to be analysed? They assessed each study using six criteria, these six criteria were established by the Cochrane collaboration. Each study was judged on 1) Was randomization concealed

adequately? 2) Were subjects blind to their condition 3) Was there assessment of baseline comparability between groups? 4) Were there at least 50 participants in the analysis for adequate power? 5) Was the data completed with follow-up data? 6) Did each study handle missing data using intention-to treat analysis (as compared to completers-only analysis)? Each study received a 1 or 0 for each criteria, giving a maximum of 6 points.

Another positive attribute of Boiler et al. (2013) meta-analysis was that they included subgroup analyses which tested differences in Cohen's d between subgroups. The six moderators are 1) Self-selected sample vs not self-selected sample 2) Duration of intervention 3) Type of intervention 4) Recruitment method 5) Psychosocial problems 6) Quality rating

The authors mentioned as a suggestion that although their study had strict inclusion criteria, a variety of positive psychology interventions were still lumped together (e.g. gratitude list, best possible interventions). It would be 'wise and meaningful' to conduct meta-analyses that were limited to *specific* types of interventions. Therefore, this thesis tries an attempt to answer this suggestion, by conducting a meta-analysis of specifically Best Possible Selves intervention. Till date, there has not been any specific meta-analysis of BPS interventions, there is one by Carrillo et al. 2019 in PLoS, which used a different effect size measure for the summary effect.

There exist, though, a *narrative approach* review article on the Best Possible Selves Intervention by Loveday et al. (2016). The purpose of their review article was to review findings from primary studies that used the BPS instructions, and to suggest directions for future research. The review consisted of 31 studies (4616 participants). The studies were grouped according to the following categories: (a) correlation studies (b) outcome variables (c) trauma comparison (d) delivery method (e) portfolio studies, and (f) moderating variables. The authors commented that other outcome induction can be studied other than positive

affect and optimism. They suggested hope and appreciation but there may not have enough studies that include these as outcome variables. They also noted that studies tend to overemphasize the measurement of subjective well-being (affect and life satisfaction) as compared to ‘broader’ measures of well-being such as psychological well-being (Ryff 2014; as cited in Loveday et al. 2016) and social well-being (Keyes 2002; as cited in Loveday et al., 2016).

Person-features that moderate the efficacy of BPS interventions can also be studied, as suggested by Loveday et al. (2016). As BPS intervention may not work the same for all individuals, the authors mentioned that personality traits (as studied by Ng 2016) and emotional processing levels (as studied by Maddalena et al. 2014) of the intervention could help us to understand the application of the BPS intervention. The authors (Loveday et al. 2016) also recommended that dosage regimes can also be studied. For example, does the effectiveness of the BPS intervention vary if it is performed weekly or daily? Hence, my thesis would like to examine this moderator variable.

Modified instructions can also be studied. In King (2001) original study, the instructions are modified in subsequent studies by other researchers (e.g. Peters et al., 2010 etc.) Till date, there are no studies that have compared the original BPS with these modified versions. My thesis would like to investigate this moderator variable.

Another meta-analysis that was conducted recently is the one by Malouff & Schutte (2017) on the use of psychological interventions to increase optimism. This meta-analysis included studies whose aim is to train or induce optimism, as such, is not specific on the Best Possible Self intervention itself. Table 1 contains a summary of the previous meta-analyses conducted:

Table 1: Relevant previous meta-analyses conducted on positive psychology interventions

Study name	Overall finding	Moderator variables	Notable finding
Sin & Lyubomirsky 2009	A meta-analysis of 51 positive psychology interventions with 4266 individuals was conducted to determine if PPIs enhance well-being and ameliorate depressive symptoms. PPIs do enhance well-being (mean $r = .29$) and decrease depressive symptoms (mean $r = .31$).	Depression status of participants, self-selection, age, format and duration of the interventions.	First well-known meta-analysis conducted on positive psychology interventions in general. Interventions were not specific interventions. Did not solely include randomized control trials.
Boiler et al. 2013	A meta-analysis of 39 positive psychology interventions with 6139 individuals was conducted to determine if PPIs enhance subjective well-being and psychological well-being, and to reduce depressive symptoms. PPIs do enhance subjective well-being (mean Cohen's $d = .34$), psychological well-being	Duration of intervention, selection of participants via referral or hospital, psychosocial status, study design.	Meta-analysis was conducted on PPIs that used randomized control design. Study design was analysed as moderator variable. Not a meta-analysis on a specific positive psychology intervention.

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(mean Cohen's $d = .20$) and decrease depressive symptoms (mean Cohen's $d = .23$).

Malouff & Schutte 2017	A meta-analysis of 29 optimism training interventions with 3319 individuals was conducted to determine if optimism training increase optimism. Interventions do increase optimism (Hedges' $g = .41$).	Type of optimism intervention, delivery of intervention (in-person), control group, optimism measure, date when optimism was assessed, completer vs intention-to-treat analyses.	Meta-analysis was conducted on optimism positive psychology interventions that used randomized control design. Not a specific meta-analysis on BPS but on optimism interventions in general.
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Aims of Current Study

The aim of my thesis is to conduct a meta-analysis of the effects of the Best Possible Selves Intervention. To ensure that effects were due to the manipulation of the BPS intervention, only randomized controlled experiments were included. In line with King's 2001 and Sheldon and Lyubomirsky's 2006 studies, in which affect was measured immediately post-intervention, this meta-analysis includes studies with outcome variables measured immediately after the BPS intervention. Studies from 2001 to 2019 were included.

The primary aim is to obtain an effect size of positive and negative affect of the Best Possible Self Intervention. A secondary aim is to answer the call of Loveday et al. 2016, which is to study the interventional characteristics that moderate the efficacy of the BPS. Because most of the studies were conducted on university student samples, age would not be analysed as the variation in age is limited. The Best Possible Self instructions that originated from King's 2001 study was general (see Appendix) as it did not instruct participants to think of their best self in specific areas of their lives. Modification has since been done to those instructions to include specific domains, such as their professional work domain and family domain. As such, the *specificity of the domain* will be studied as a moderating variable.

Another moderating variable that will be studied is the *time instructions given to participants* specifically to visualize their best possible selves. The original instructions found in King's 2001 study were general in that they were just told to "write narrative descriptions of their best possible future selves for 20 minutes" (Sheldon & Lyubomirsky, 2006). In an earlier section of this thesis (pp. 16 - 17), it was mentioned that Peters et al. 2010 added modified instructions in the form of "think for 1 minute, write for 15 minutes, and to imagine as vividly as possible their best self for 5 minutes". These instructions per study will be grouped according to 'general' or 'specific' dosage instructions.

The third categorical moderating variable that will be analysed is whether the intervention was carried out in-person or over the internet (*method of administration*). In primary studies, interventions that are carried out in-person have direct human contact and pre-arranged timeslots. Self-administered interventions over the internet are convenient and anonymous (Layous et al. 2013).

Finally, the fourth categorical moderating variable to be coded is the type of control group. Because the BPS intervention is an optimism induction, it will be interesting to see the comparison of effect size between treatment vs control (typical day) and treatment vs control (schedule for the following day).

According to Rothstein, Sutton and Borenstein (2005), meta-regression is “an extension of either the fixed- or random- effects meta-analysis models in which (study-level) covariates are added to the meta-analysis model in an attempt to explain differences (heterogeneity) in estimated effects from the included studies.” Continuous moderator variables such as the *number of sessions* of the BPS intervention will be analysed using meta-regression for this study.

The tertiary aim of my thesis is to examine the longitudinal effects of the BPS intervention on positive affect. This is done by performing an analysis on studies that measure positive affect at multiple time-points. Specifically, the question “Are the effects of the BPS sustainable?” will be addressed.

Chapter 2

Literature search

There were two main strategies of conducting the search. The first strategy was to use the NTU Library database. A comprehensive search was done by entering the following keywords into the following major databases: PsycARTICLES, Education Source, ERIC, OpenDissertations, PsycINFO, with: best possible self (-ves), intervention, positive psychology with the publishing limiting date from 1st Jan 2000 to 31st December 2019. The second strategy was to cross-check the references from the other articles (both meta-analyses review articles and primary studies that were not included in the meta-analysis articles). The articles that were checked for were:

- Loveday et al. 2016 (Review article)
- Malouff & Schutte 2017 (Meta-analysis)
- Sin & Lyubomirsky 2009 (Meta-analysis)
- Boiler et al. 2013 (Meta-analysis)
- Heekerens & Heinitz 2019 (Primary study)

Description of studies

The selection process is illustrated in Figure 1.

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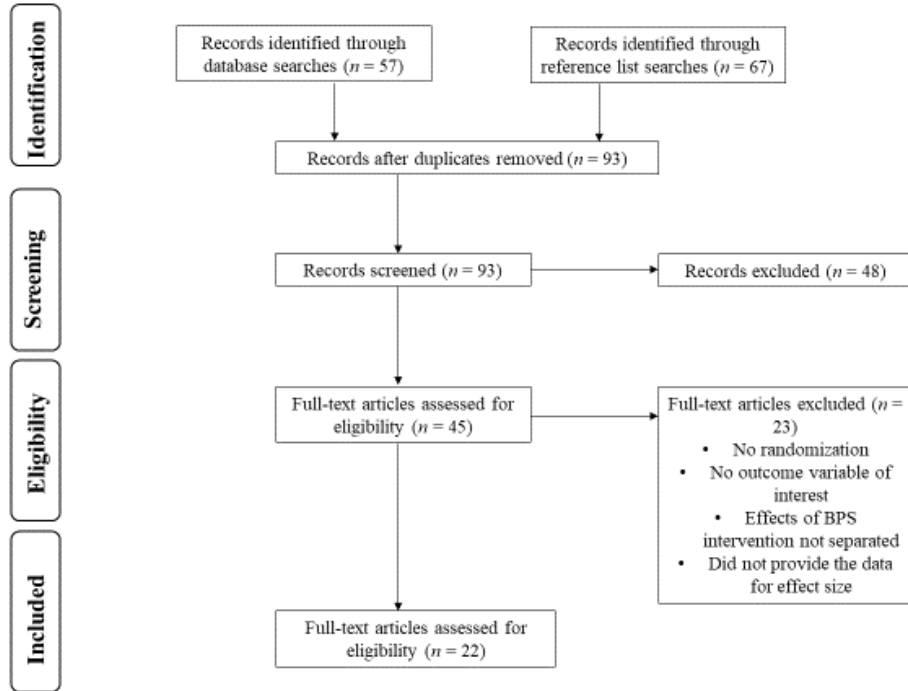


Figure 1 Flow diagram.

Table 2 shows the 22 studies that are analysed for the outcome on positive affect.

Table 2: Studies names and scales used

Study ID	Study Names	Study Titles	Positive Affect Scale
1	Boselie et al. 2014	Increasing optimism abolishes pain-induced impairments in executive task performance	PANAS
2	Boselie, Vancleef & Peters 2016 Study 1	The effects of experimental pain and induced optimism on working memory task performance	PANAS
3	Boselie, Vancleef & Peters 2016 Study 2	The effects of experimental pain and induced optimism on working memory task performance	PANAS
4	Boselie, Vancleef & Peters 2017	Increasing Optimism Protects Against Pain-Induced Impairment in Task-Shifting Performance	PANAS
5	Hanssen, Peters, Vlaeyen, Meevissen & Vancleef 2013	Optimism lowers pain: Evidence of the causal status and underlying mechanisms	VAS
6	Harrist, Carlozzi, McGovern &	Benefits of expressive writing and expressive talking about life goals	Mood Rating Scale (Diener &

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	Harrist (talking) 2007		Emmons, 1984) (King, 2001)
7	Harrist, Carlozzi, McGovern & Harrist (writing) 2007	Benefits of expressive writing and expressive talking about life goals	Mood Rating Scale (Diener & Emmons, 1984) (King, 2001)
8	Heekerens, Eid & Heinitz 2019	Dealing with conflict: Reducing goal ambivalence	PANAS (German)
9	King 2001	using the best-possible-self intervention The health benefits of writing about life goals	Positive and Negative mood (Diener & Emmons, 1984)
10	Layous, Nelson & Lyubomirsky 2013	What is the optimal way to deliver a positive activity intervention? The case of writing about one's best possible selves	
11	Liau, Neihart, Teo & Lo 2016	Effects of the Best Possible Self Activity on Subjective and Depressive Symptoms Well-Being	PANAS
12	Manthey et al. 2015	Effectiveness of two cognitive interventions promoting happiness with video-based online instructions	SPANE (German)
13	Meevissen et al. 2011	Become more optimistic by imagining a best possible self: Effects of a two week intervention	PANAS (Dutch-shortened)
14	Molinari et al. 2018	The power of visualization: back to the future for pain management in Fibromyalgia Syndrome	PANAS
15	Odou & Vella-Brodrick 2013	The Efficacy of Positive Psychology Interventions to Increase Well-Being and the Role of Mental Imagery Ability	PANAS
16	Owens & Patterson 2013	Positive Psychological Interventions for Children: A Comparison of Gratitude and Best Possible Selves Approaches	PANAS-C
17	Peters et al. 2010	Manipulating optimism: Can imagining a best possible self be used to increase positive future expectancies?	PANAS
18	Peters et al. 2015	Dispositional and induced optimism lead to attentional preference for faces displaying positive emotions: An eye-tracker study	PANAS
19	Renner et al. 2014	Effects of a best-possible-self mental imagery exercise on mood and dysfunctional attitudes	PANAS (Dutch)

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20	Seear & Vella-Brodrick 2012	Efficacy of Positive Psychology Interventions to Increase Well-Being: Examining the Role of Dispositional Mindfulness	PANAS
21	Sheldon and Lyubomirsky 2006	How to increase and sustain positive emotion: The effects of expressing gratitude and visualizing best possible selves	PANAS
22	Summerfield 2015	Positive Interventions: A comparison of the effects of three good things, best possible selves and a control task of early memories on dispositional gratefulness, life satisfaction, positive affect and negative affect	PANAS

Effect size used in this study

There are three effect sizes related to post-intervention data for two groups (i.e. intervention vs control). They are ‘Difference in means’, ‘Standardized difference in means’ and ‘Hedges’ g ’. The ‘Difference in means’ is the raw mean difference and provides an intuitive measure of the effect. However, it can only be used if all studies report the same metric, e.g. all studies use the PANAS. In the 22 studies used for analysis, not all used the PANAS. The ‘Standardized difference in means’ is known as Cohen’s d and is the raw difference in means divided by the standard deviation (compute within groups and pooled). Cohen’s d is used commonly in social science literature. According to Borenstein, Hedges, Higgins and Rothstein (2009), they recommended using the Hedges’ g , which is an adjusted standardized difference in means according to the sample size of each study. The correction is quite small for large samples. This is because to obtain Hedges’ g from Cohen’s d , a correction factor is multiplied to Cohen’s d , and this correction factor is dependent on the degrees of freedom (subtracting the number of groups (2) from the total sample size). For this thesis, both Cohen’s d and Hedges’ g will be used to compute the effect size, for the purpose

of illustrating by example and comparison. Cohen's d will be reported in the main text, with Hedges' g in brackets.

Fixed-effect model vs Random-effects model

In a meta-analysis study, a decision must be made regarding fixed-effect model vs random-effects model. In this thesis, the choice is the random-effects model, because this model assumes that the studies have been selected from a universe of studies that meet the inclusion/exclusion criteria. This model also assumes that the effect sizes in these studies are a random selection of the effect sizes in the universe (Borenstein et al., 2009), and the true effect size may vary from study to study. In the random-effects model, the aim is to estimate the mean of the dispersion of 'true' effects. This is possible because in computing for the summary effect size, the 'inverse-variance weights' that are used for the random-effects model contains an additional term – the between-study variance (Borenstein, Hedges, Higgins & Rothstein, 2010).

Chapter 3

Results

The analyses reported in this paper were conducted by Comprehensive Meta-Analysis Version 3.0. (Borenstein, Hedges, Higgins, & Rothstein, 2014).

BPS intervention vs. Control

The studies have been coded so that a positive difference means that the intervention increased positive affect. The analysis is based on twenty-two studies that evaluated the impact of the Best Possible Selves Intervention on increasing positive affect. Each study compared positive affect for persons who had been randomized to either the BPS intervention group or to a control group. The effect sizes to be reported are Cohen's *d* and Hedges' *g*. The studies in the analysis were sampled from a universe of possible studies as detailed in the inclusion/exclusion criteria in the earlier section.

Does the BPS Intervention increase positive affect?

The overall average of the effect size (Cohen's *d*) across twenty-two studies is 0.528 (95% confidence interval [CI = 0.350, 0.706]; $Q[21] = 63.041$, $p = <0.001$) across 22 samples (Hedges' *g*: 0.521 (95% confidence interval [CI = 0.345, 0.696]; $Q[21] = 62.888$, $p = <0.001$)). This effect size is moderate and statistically significant. This means that on average, participants who received the BPS intervention had 0.528 (0.521) standard deviations higher on positive affect than those in the control condition. The confidence interval for the difference in means is 0.350 to 0.706 (0.345 to 0.696), the true mean difference in the universe of studies could fall anywhere in the range. The range does not include a difference of zero, showing that the true efficacy of Best Possible Self intervention versus a control group is probably not zero.

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Table 3: Studies and their group means

ID	Study Names	Treatment	SD	n	Control	SD	n
		mean			mean		
1	Boselie et al. 2014	32.79	8.41	38	29.14	7.47	36
2	Boselie et al. 2016	33.53	6.7	41	27.73	7.05	40
	Study 1						
3	Boselie et al. 2016	29.42	5.61	32	27.06	5.9	29
	Study 2						
4	Boselie et al. 2017	31.24	5.34	31	27.62	5.43	30
5	Hanssen et al. 2013	9.7	9.24	40	2.36	11.6	39
6	Harrist et al. 2007 Talking Grp	3.79	0.75	18	3.6	0.75	18
7	Harrist et al. 2007 Writing Grp	4.02	0.94	19	3.49	0.66	20
8	Heekerens et al. 2019	3.39	0.71	87	3.07	0.73	84
9	King 2001	1.26	1.48	19	1.37	0.95	16
10	Layous et al. 2013	0.26	1.3	80	-0.23	1.4	37
11	Liau et al. 2016	30.39	8.85	81	27.07	9.75	81
12	Manthey et al. 2015	21.3	4.1	135	21.1	4.2	150
13	Meevissen et al. 2011	3.35	0.66	28	2.55	0.75	26
14	Molinari et al. 2018	2.5	0.78	38	2.18	0.79	33
15	Odou & Vella-	35.5	1.76	21	30.96	2.3	30

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Brodrick 2013							
16	Owens &	56.28	10.82	23	55.65	10.22	17
Patterson 2013							
17	Peters et al. 2010	3.46	0.74	44	2.52	0.93	38
18	Peters et al. 2015	35.5	6	28	30	7.7	28
19	Renner et al. 2014	64.39	12.29	20	62	20.78	20
20	Seear & Vella-	35.07	6.57	19	33.02	6.51	29
Brodrick 2012							
21	Sheldon and	4.04	0.59	23	3.6	0.78	23
Lyubomirsky 2006							
22	Summerfield 2015	29.93	8.59	15	30.13	8.19	15

Table 4: Studies and their effect sizes

ID	Study Names	Cohen's <i>d</i>	Standard error	Variance	Hedges' <i>g</i>	Standard error	Variance
1	Boselie et al. 2014	0.46	0.24	0.06	0.45	0.23	0.05
2	Boselie et al. 2016 Study 1	0.84	0.23	0.05	0.84	0.23	0.05
3	Boselie et al. 2016 Study 2	0.41	0.26	0.07	0.41	0.26	0.07
4	Boselie et al. 2017	0.67	0.26	0.07	0.66	0.26	0.07
5	Hanssen et al. 2013	0.70	0.23	0.05	0.69	0.23	0.05

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6	Harrist et al. 2007 Talking						
	Grp	0.25	0.33	0.11	0.25	0.33	0.11
7	Harrist et al. 2007 Writing						
	Grp	0.66	0.33	0.11	0.64	0.32	0.10
8	Heekerens et al. 2019	0.44	0.15	0.02	0.44	0.15	0.02
9	King 2001	-0.09	0.34	0.12	-0.08	0.33	0.11
10	Layous et al. 2013	0.37	0.20	0.04	0.37	0.20	0.04
11	Liau et al. 2016	0.36	0.16	0.03	0.35	0.16	0.02
12	Manthey et al. 2015	0.05	0.12	0.01	0.05	0.12	0.01
13	Meevissen et al. 2011	1.14	0.29	0.09	1.12	0.29	0.08
14	Molinari et al. 2018	0.41	0.24	0.06	0.40	0.24	0.06
15	Odou & Vella-Brodrick 2013	2.17	0.36	0.13	2.13	0.35	0.12
16	Owens & Patterson 2013	0.06	0.32	0.10	0.06	0.31	0.10
17	Peters et al.	1.13	0.24	0.06	1.12	0.24	0.06

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	2010						
18	Peters et al.						
	2015	0.80	0.28	0.08	0.79	0.27	0.07
19	Renner et al.						
	2014	0.14	0.32	0.10	0.14	0.31	0.10
20	Seear & Vella- Brodrick						
	2012	0.31	0.30	0.09	0.31	0.29	0.09
21	Sheldon and Lyubomirsky						
	2006	0.64	0.30	0.09	0.63	0.30	0.09
22	Summerfield						
	2015	-0.02	0.37	0.13	-0.02	0.36	0.13

The Z -value for testing the null hypothesis (that the mean difference is 0.0) is 5.818, with a corresponding p -value is <0.001 . The null hypothesis that the intervention does not improve positive affect is rejected.

Heterogeneity tests

The observed effect size varies across study, but a certain amount of variation is expected due to sampling error. Heterogeneity tests in this section are to check if the observed variation is purely due to such error or there is systematic variation that is beyond what the sampling error can account for before moderator analyses can proceed.

The Q -statistic provides a test of the null hypothesis that all studies in the analysis share a common effect size. If all studies shared the same effect size, the expected value of Q

would be equal to the degrees of freedom (the number of studies minus 1) (Borenstein et al. 2009). The Q -value is 63.041 with 21 degrees of freedom and a p-value of <0.001 (Hedges' g : The Q -value is 62.888 with 21 degrees of freedom and a p-value of <0.001). This means that the effect size varies across the studies systematically (not due to random sampling error). Potential moderators can be explored to account for such systematic variation. The I^2 statistic is 66.688% (62.888%). Heterogeneity is considered moderate to high. The T^2 statistic is the variance of true effect sizes and is 0.112 (0.109) for this sample of 22 studies. T is the standard deviation of true effects and is 0.334 (0.330).

Confidence interval VS Prediction interval

In a meta-analysis study, the confidence interval reflects only error of estimation of the mean, whereas the prediction interval incorporates both dispersion of true effect sizes and error (Borenstein et al. 2009). The adjusted 95% prediction interval is -0.198 to 1.254 (-0.195 to 1.237). In the universe of populations represented by these studies, the true effect size in 95% of cases will fall somewhere in this range. There will be some populations where the BPS intervention reduces positive affect slightly (0.198 (0.195) standard deviation), and in some populations, the BPS intervention increases positive affect by more than 1 standard deviation (1.254 (1.237) standard deviation).

Subgroup Analyses

Subgroup analyses are presented in Table 5. The specificity of domain, time instructions given to participants, method of administration and the type of control group that may account for the variation in the effect sizes are examined across the included studies.

Table 5: Subgroup Analyses

ID	Names	Domain int.	Time int.	Administer	Control	Dosage
1	Boselie et al. 2014	General	Specific	In-person	TD	1 session
2	Boselie et al. 2016 Study 1	General	Specific	In-person	TD	1 session
3	Boselie et al. 2016 Study 2	General	Specific	In-person	TD	1 session
4	Boselie et al. 2017	General	Specific	In-person	TD	1 session
5	Hanssen et al. 2013	General	Specific	In-person	TD	1 session
6	Harrist et al. 2007 Talking Grp	General	General	In-person	SD (King, 2001)	4 sessions (4 consecutive days)
7	Harrist et al. 2007 Writing Grp	General	General	In-person	SD (King, 2001)	4 sessions (4 consecutive days)
8	Heekerens et al. 2019	General	Specific	In-person	TD	1 session
9	King 2001	General	General	In-person	SD	4 sessions (4 consecutive days) 20 mins each day
10	Layous et al.	Specific	General	Mixed	TD	

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	2013					
11	Liau et al.	Specific	General	In-person	TD	1 session
	2016					
12	Manthey et al. 2015	Specific	General	Online	SD	8 sessions (1 per week)
13	Meevissen et al. 2011	Specific	Specific	In-person	TD	1 session
14	Molinari et al. 2018	Specific (Meevissen et al. 2011)	Specific	In-person	TD	1 session
15	Odou & Vella-Brodrick 2013	Specific	General	Online	No-activity	7 sessions (7 consecutive days)
16	Owens & Patterson 2013	General	General	In-person	TD	4.6 sessions (1 per week)
17	Peters et al. 2010	General	Specific	In-person	TD	1 session
18	Peters et al. 2015	General	Specific	In-person	TD	1 session
19	Renner et al. 2014	General (Peters et al 2010)	Specific	In-person	TD	1 session
20	Seear &	Specific	General	Online	No-	7 sessions (7

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	Vella-				activity	consecutive days)
	Brodrick					
	2012					
21	Sheldon and Lyubomirsky	General	General	In-person	Life Details (TD)	1 session
	2006					
22	Summerfield	Specific	General	Online	Early Memories	5 sessions (1 per day)
	2015					

Note: TD = Typical day; SD = Schedule for the following day

For positive affect, three out of the three subgroups of studies for BPS interventional characteristics resulted in different effect sizes. Higher effect sizes were found for: 1) Studies that gave general domain instructions 2) Studies that instruct participants to think and visualize specifically and 3) Studies that were administered in-person (One study was removed as it contained a mixture of online/in-person modes of administration and results were not reported separately – Layous et al. 2013). Although there were no significant differences, this recognizable trend showed that specificity of instructions and domain, and in-person administration may lead to greater gains in positive affect. For control group subgroup analysis, higher effect size was found for studies in which control group was coded for Typical Day (TD) and this comparison was significant $Q[1] = 6.403, p = <0.05$. Studies in which the control group used TD resulted in a higher effect size vs studies in which the control group used SD (0.561 vs 0.154). For Hedges' g , the comparison was also significant $Q[1] = 6.453, p = <0.05$. Three studies (Odou & Vella-Brodrick 2013; Seear & Vella-Brodrick 2012; Summerfield 2015) were removed from the comparison to control group subgroup analysis because the control group conditions were inert (psychologically inactive). According to Davis et al. (2016), psychologically active conditions are activities which has

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theoretical or empirical evidence that it might enhance psychological well-being. An inert condition is measurement-only control. Table 5 (Cohen's *d*) and Table 6 (Hedges' *g*) shows the subgroup analyses for positive affect:

Table 6: Moderator effects: subgroup analysis (post-test) on Cohen's *d*

Outcome	Criteria	Subgroup (study)	n	Cohen's <i>d</i> (95% CI)	Test for subgroup differences
Positive Affect	Domain instructions	General	14	0.531 (0.304 to 0.757)***	$Q=0.001, df=1$ ($p=0.972$)
		Specific	8	0.524 (0.234 to 0.814)**	
	Time instructions	General	11	0.393 (0.150 to 0.635)**	$Q=2.213, df=1$ ($p=0.137$)
		Specific	11	0.647 (0.416 to 0.878)***	
	Method of administration	In-person	17	0.541 (0.333 to 0.750)***	$Q=0.006, df=1$ ($p=0.938$)
		Online	4	0.522 (0.083 to 0.961)*	
	Control	TD	15	0.561 (0.418 to 0.705)***	$Q=6.403, df=1$ ($p=0.011$)
		SD	4	0.154 (-0.127 to 0.435) ns	

Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; ns non-significant for Z-test.

Table 7: Moderator effects: subgroup analysis (post-test) on Hedges' *g*

Outcome	Criteria	Subgroup (study)	n	Hedges' <i>g</i> (95% CI)	Test for subgroup differences
Positive Affect	Domain instructions	General	14	0.523 (0.299 to 0.747)***	$Q=0.001, df=1$ ($p=0.976$)
		Specific	8	0.517 (0.231 to 0.804)***	
	Time instructions	General	11	0.387 (0.148 to 0.625)**	$Q=2.249, df=1$ ($p=0.134$)
		Specific	11	0.639 (0.411 to 0.868)***	
	Method of administration	In-person	17	0.534 (0.328 to 0.740)***	$Q=0.007, df=1$ ($p=0.934$)
		Online	4	0.514 (0.081 to 0.947)*	
	Control	TD	15	0.555 (0.413 to 0.697)***	$Q=6.453, df=1$ ($p=0.011$)
		SD	4	0.152 (-0.124 to 0.429) ns	

Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; ns non-significant for Z-test.

Meta-regression of dosage

The number of intervention sessions for each study is coded as a continuous variable for meta-regression. The coefficient for number of BPS sessions is -0.028 (-0.028). This means that as the number of intervention sessions increases by 1 unit, positive affect

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decreases by 0.028 unit. This association is not statistically significant. The 95% confidence interval for the coefficient includes 0, the Z-value is -0.76 (-0.77), and the p-value is 0.4468 (0.4392). Equivalently (since there is only one covariate in the model) Q for the model is 0.58 (0.60) with 1 degree of freedom and $p = 0.4468$ (0.4392).

Is the number of sessions (dose) related to increases in positive affect?

The Q value is 0.58 (0.60), $df=1$, $p=0.4468$ (0.4392). We cannot reject the null hypothesis. There is **no** evidence that the higher the number of BPS intervention sessions, the greater the increase in positive affect for participants.

Does the BPS Intervention reduce negative affect?

Studies have shown that the BPS intervention improve positive affect and positive expectancies. However, the findings on negative affect are still mixed. The subsequent analyses will help to answer if there is an overall effect of the intervention on negative affect. The studies have been coded so that a negative difference means that the intervention reduced negative affect as compared to control. Two studies (King, 2001; Layous et al. 2013) were removed because they did not measure specifically negative mood as an outcome variable. Table 6 shows the studies that are involved in the analysis:

Table 8: Studies and their group means

ID	Study Names	Treatment	SD	n	Control	SD	n
		mean			mean		
1	Boselie et al. 2014	11.82	2.78	38	12.36	2.65	36
2	Boselie et al. 2016						
	Study 1	13.09	3.54	41	12.58	3.58	40
3	Boselie et al. 2016						
	Study 2	13.8	2.51	32	13.71	2.64	29

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4	Boselie et al. 2017	12.48	3.45	31	12.77	3.5	30
5	Hanssen et al. 2013	-5.35	10.03	40	-0.62	16.21	39
6	Harrist et al. 2007						
	Talking Grp	1.24	0.66	18	1.58	1	18
7	Harrist et al. 2007						
	Writing Grp	1.35	0.71	19	1.71	0.86	20
8	Heekerens et al.						
	2019	1.4	0.4	87	1.57	0.56	84
11	Liau et al. 2016	17.27	6.87	81	16.88	6.49	81
12	Manthey et al.						
	2015	15.3	4.6	135	15.6	4.6	150
13	Meevissen et al.						
	2011	1.14	0.5	28	1.23	0.48	26
14	Molinari et al.						
	2018	2.01	1.06	38	2.23	1	33
15	Odou & Vella-						
	Brodrick 2013	18.07	1.72	21	23.69	1.96	30
16	Owens & Patterson						
	2013	37.11	14.91	23	31.06	10.82	17
17	Peters et al. 2010	1.25	0.33	44	1.29	0.36	38
18	Peters et al. 2015	12.2	3.1	28	12.4	3.5	28
19	Renner et al. 2014	13.53	12.45	20	11.9	11.29	20
20	Seear & Vella-						
	Brodrick 2012	18.11	7.21	19	22.21	7.25	29
21	Sheldon and						
	Lyubomirsky 2006	1.43	0.42	23	1.74	0.63	23
22	Summerfield 2015	16.13	10.61	15	14.67	7.68	15

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Table 9: Studies and their effect sizes

ID	Study Names	Cohen's d	Standard Error	Variance	Hedges' g	Standard Error	Variance
1	Boselie et al. 2014	-0.20	0.23	0.05	-0.20	0.23	0.05
2	Boselie et al. 2016 Study 1	0.14	0.22	0.05	0.14	0.22	0.05
3	Boselie et al. 2016 Study 2	0.03	0.26	0.07	0.03	0.25	0.06
4	Boselie et al. 2017	-0.08	0.26	0.07	-0.08	0.25	0.06
5	Hanssen et al. 2013	-0.35	0.23	0.05	-0.35	0.22	0.05
6	Harrist et al. 2007 Talking Grp	-0.40	0.34	0.11	-0.39	0.33	0.11
7	Harrist et al. 2007 Writing Grp	-0.46	0.32	0.11	-0.45	0.32	0.10
8	Heekerens et al. 2019	-0.35	0.15	0.02	-0.35	0.15	0.02
11	Liau et al. 2016	0.06	0.16	0.02	0.06	0.16	0.02
12	Manthey et al. 2015	-0.07	0.12	0.01	-0.07	0.12	0.01
13	Meevissen et al. 2011	-0.18	0.27	0.07	-0.18	0.27	0.07

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14	Molinari et al.						
	2018	-0.21	0.24	0.06	-0.21	0.24	0.06
15	Odou & Vella- Brodrick						
	2013	-3.01	0.41	0.17	-2.97	0.41	0.16
16	Owens & Patterson						
	2013	0.45	0.32	0.10	0.44	0.32	0.10
17	Peters et al.						
	2010	-0.12	0.22	0.05	-0.12	0.22	0.05
18	Peters et al.						
	2015	-0.06	0.27	0.07	-0.06	0.26	0.07
19	Renner et al.						
	2014	0.14	0.32	0.10	0.13	0.31	0.10
20	Seear & Vella- Brodrick						
	2012	-0.57	0.30	0.09	-0.56	0.30	0.09
21	Sheldon and Lyubomirsky						
	2006	-0.58	0.30	0.09	-0.57	0.30	0.09
22	Summerfield						
	2015	0.16	0.37	0.13	0.15	0.36	0.13

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The overall average of the effect size (Cohen's d) across 20 studies is -0.234 (95% confidence interval [CI = -0.432, -0.037]; $Q[19] = 65.736$, $p = <0.001$) across 20 samples (Hedges' g : -0.231 (95% confidence interval [CI = -0.426, -0.036]; $Q[19] = 65.694$, $p = <0.001$)). This effect size is small and statistically significant. This means that on average, participants who received the BPS intervention had 0.234 (0.231) standard deviations lower on negative affect than those in the control condition. The confidence interval for the difference in means is -0.432 to -0.037 (-0.426 to -0.036), the true mean difference in the universe of studies could fall anywhere in the range. The range does not include a difference of zero, showing that the true efficacy of Best Possible Self intervention versus a control group is probably not zero.

The Z -value for testing the null hypothesis (that the mean difference is 0.0) is -2.329 (-2.327), with a corresponding p -value of 0.02. Since the p -value is below 0.05, we can reject the null hypothesis. The null hypothesis that the intervention does not reduce negative affect is rejected.

Heterogeneity tests

The Q -value is 65.736 with 19 degrees of freedom and a p -value of <0.001 (Hedges' g : The Q -value is 65.694 with 19 degrees of freedom and a p -value of <0.001). There is heterogeneity in effect size across studies and that the variation in effect size is not attributable to sampling error alone. I^2 is 71.096% (71.078%) and this reflects that heterogeneity is high. The T^2 statistic is 0.134 (0.131). T is the standard deviation of true effects and is 0.366 (0.362).

Confidence interval VS Prediction interval

In a meta-analysis study, the confidence interval reflects only error of estimation of the mean, whereas the prediction interval incorporates both dispersion of true effect sizes and

error (Borenstein et al. 2009). The adjusted 95% prediction interval is -1.0315 to 0.5635 (-1.0196 to 0.5576). In the universe of populations represented by these studies, the true effect size in 95% of cases will fall somewhere in this range. The prediction interval means that there will be some populations where the BPS intervention increases negative affect by more than a half standard deviation (0.56 (0.56) standard deviation), and in some populations, the BPS intervention reduces negative affect by more than 1 standard deviation (1.03 (1.02) standard deviation).

Subgroup Analyses

Subgroup analyses are presented in Table 10 (Cohen's *d*) and Table 11 (Hedges' *g*). Specificity of domain, time instructions given to participants, method of administration, and the type of control group compared to were analysed.

For negative affect, only one subgroup analysis resulted in significant difference, the method of administration (in-person vs online), $Q[1]= 4.184, p <0.05$ (Hedges' *g*: $Q[1]= 4.614, p <0.05$). Online administered BPS intervention resulted in a higher effect size vs in-person administration. Two other subgroups of studies resulted in different effect sizes, although the results were not significant. Higher effect sizes were found for 1) Studies that gave specific domain instructions 2) Studies that instruct participants to think and visualize given a general time-frame.

For control group subgroup analysis, higher effect size was found for studies in which control group was coded for SD, but this comparison was not significant. Studies in which the control group used SD resulted in a higher effect size vs studies in which the control group used TD (-0.140 vs -0.116) (0.140 vs -0.114). Three studies (Odou & Vella-Brodrick 2013; Seear & Vella-Brodrick 2012; Summerfield 2015) were removed from the comparison

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to control group subgroup analysis for the same reason as mentioned in the subgroup analysis for positive affect. See Table 10 and 11:

Table 10: Moderator effects: subgroup analysis (post-test)

Outcome	Criteria	Subgroup (study)	n	Cohen's <i>d</i> (95% CI)	Test for subgroup differences
Negative Affect	Domain instructions	General	13	-0.143 (-0.399 to 0.112) ns	$Q=1.489, df=1$ ($p=0.222$)
		Specific	7	-0.412 (-0.760 to -0.064)*	
	Time instructions	General	9	-0.396 (-0.712 to -0.080)*	$Q=1.677, df=1$ ($p=0.195$)
		Specific	11	-0.121 (-0.391 to 0.149) ns	
	Method of administration	In-person	16	-0.135 (-0.363 to 0.094)ns	$Q=4.184, df=1$ ($p=0.041$)
		Online	4	-0.689 (-1.168 to -0.210)**	
	Control	TD	14	-0.116 (-0.236 to 0.004) ns	$Q=0.040, df=1$ ($p=0.842$)
		SD	3	-0.140 (-0.347 to 0.067)	

Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; ns non-significant for Z-test.

Table 11: Moderator effects: subgroup analysis (post-test)

Outcome	Criteria	Subgroup (study)	n	Hedges' g (95% CI)	Test for subgroup differences
Negative Affect	Domain instructions	General	13	-0.141 (-0.393 to 0.111) ns	Q=1.485, df=1 (p=0.223)
		Specific	7	-0.406 (-0.750 to -0.063)*	
	Time instructions	General	9	-0.390 (-0.701 to -0.078)*	Q=1.656, df=1 (p=0.198)
		Specific	11	-0.120 (-0.387 to 0.146) ns	
	Method of administration	In-person	16	-0.133 (-0.359 to 0.093) ns	Q=4.614, df=1 (p=0.041)
		Online	4	-0.678 (-1.150 to -0.206) **	
	Control	TD	14	-0.114 (-0.233 to 0.005) ns	Q=0.046, df=1 (p=0.831)
		SD	3	-0.140 (-0.346 to 0.066) ns	

Note. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; ns non-significant for Z-test.

Meta-regression of dosage

The coefficient for number of BPS sessions is -0.08 (-0.08). This means that as the number of intervention sessions increases by 1 unit, negative affect decreases by 0.08 (0.08) unit. This association is not statistically significant. The 95% confidence interval for the coefficient includes 0, the Z-value is -1.82 (-1.81), and the p -value is 0.069 (0.069).

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Equivalently (since there is only one covariate in the model) Q for the model is 3.31 (3.29) with 1 degree of freedom and $p = 0.069$ (0.069).

Is the number of sessions (dose) related to decrease in negative affect?

The Q value is 3.31 (3.29), $df=1$, $p=0.069$ (0.069). We cannot reject the null hypothesis. There is no evidence that the higher the number of BPS intervention sessions, the greater the decrease in negative affect for participants.

Publication bias for Positive Affect

The funnel plot for positive affect was asymmetrically distributed in a way that the smaller studies appeared more on the right side of the mean. This reflects the fact that smaller studies (which appear toward the bottom) are more likely to be published if they have larger than average effects, which makes them more likely to meet the criterion for statistical significance.

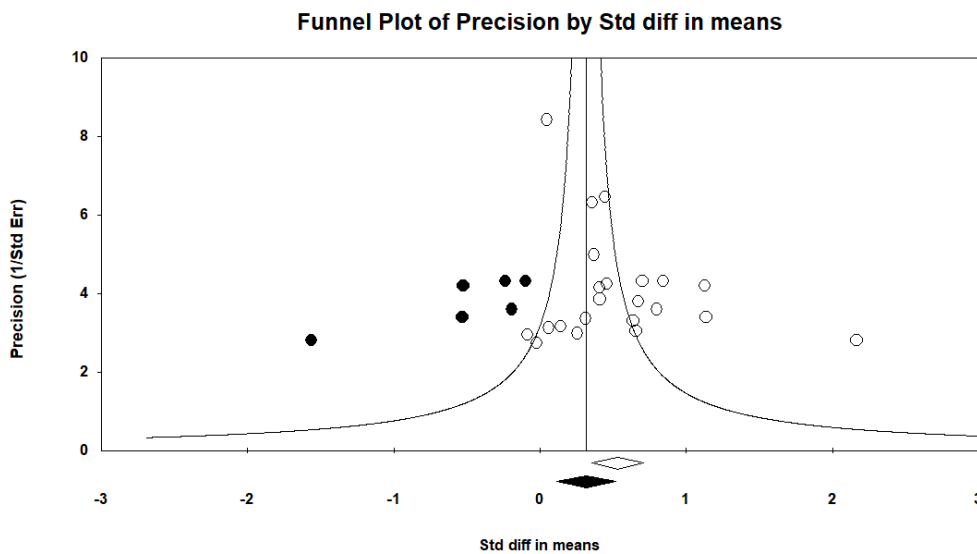


Fig 3. Funnel plot for positive affect. Imputed studies are in black.

Classic fail-safe n: This meta-analysis incorporates data from 22 studies, which yield a z-value of 9.72 and corresponding 2-tailed p-value of <0.001 . The fail-safe N is 519, meaning that 519 'null' studies would need to be included for the combined 2-tailed p-value to exceed 0.05 (i.e. become insignificant). In other words, to nullify the effect, there would need to be 23.6 missing studies for every observed study included in this meta-analysis.

A significant correlation in the Begg and Mazumdar Rank Correlation Test suggests that bias exists. A non-significant correlation may be due to low statistical power, and cannot be taken as evidence that bias is absent. For this meta-analysis, Kendall's tau b (corrected for ties, if any) is -0.061, with a 1-tailed p-value (recommended) of 0.347 or a 2-tailed p-value of 0.693 (based on continuity-corrected normal approximation). This is non-significant, and this could be due to low statistical power.

Egger's regression intercept suggests that publication bias exists for positive affect (intercept (B0) is 2.073, 95% confidence interval (-0.209, 4.355), with $t=1.895$, $df=20$). The 1-tailed p-value (recommended) is 0.036, and the 2-tailed p-value is 0.072. Therefore, the 1-tailed test is significant and suggests that publication bias exists for positive affect.

The mean effect size of positive affect was therefore recalculated by imputing missing studies using the Trim and Fill method. Under the random effects model the point estimate and 95% confidence interval for the combined studies is 0.528 (0.350, 0.706). Using Trim and Fill the imputed point estimate is 0.316 (0.114, 0.517).

Publication bias for Negative Affect

The funnel plot for negative affect was symmetrically distributed in a way that the smaller studies appeared equally on both sides of the mean. This indicates no publication bias.

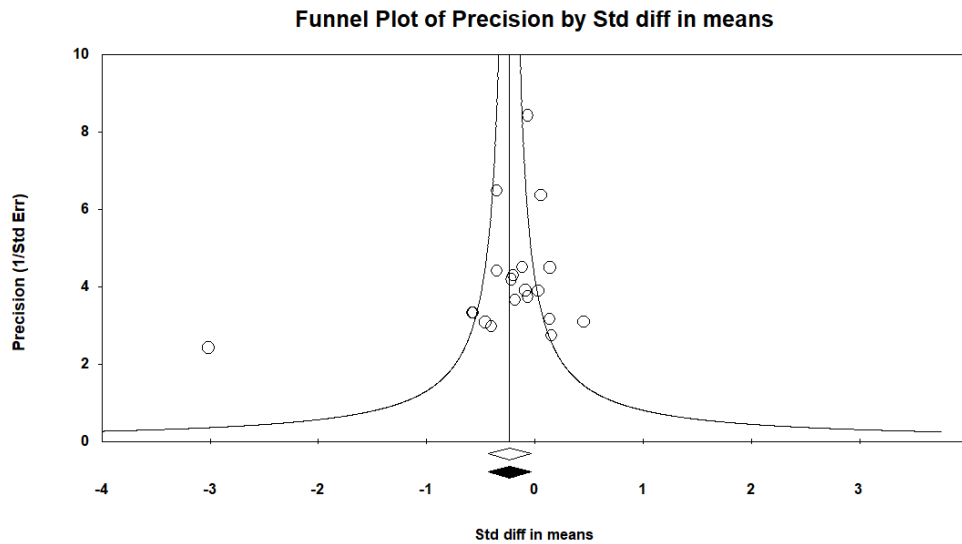


Fig 4. Funnel plot for negative affect. There are no imputed studies.

Classic fail-safe n: This meta-analysis incorporates data from 20 studies, which yield a z-value of -4.06 and corresponding 2-tailed p-value of <0.001. The fail-safe N is 66, meaning that 66 'null' studies would need to be included for the combined 2-tailed p-value to exceed 0.05 (i.e. become insignificant). In other words, to nullify the effect, there would need to be 3.3 missing studies for every observed study included in this meta-analysis.

Begg and Mazumdar Rank Correlation Test: Kendall's tau b (corrected for ties, if any) is -0.163, with a 1-tailed p-value (recommended) of 0.157 or a 2-tailed p-value of 0.314 (based on continuity-corrected normal approximation), which is not significant.

Egger's regression intercept suggests that publication bias does not exist for negative affect (intercept (B0) is -1.80, 95% confidence interval (-4.404,0.805), with $t=1.451$, $df=18$). The 1-tailed p-value (recommended) is 0.082, and the 2-tailed p-value is 0.164.

As the funnel plot is symmetric, there is no need for the Trim and Fill method to impute missing studies.

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Test of follow-up effects

Seven studies examined follow-up effects on positive and negative affect after at least 3 weeks and up to 16 weeks (see Table 8). These seven studies were used in the analysis of multiple time-points. The random-effects model demonstrated moderate and significant overall effect in comparison with the control groups for positive affect (Cohen's *d* 0.50, 95% CI [0.124, 0.876], $p < .01$) (Hedges' *g* 0.494, 95% CI [0.122, 0.865], $p < .01$).

Table 12: Treatment mean and control mean for each study

ID	Names	Time (in weeks)	Treatment mean	SD	n	Control mean	SD	n
21	Sheldon & Lyubomirsky 2006	*0	4.04	0.59	23	3.6	0.78	23
		3	3.45	0.9	23	3.4	0.79	23
20	Seear & Vella- Brodrick 2012	1	35.07	6.57	19	33.02	6.51	29
		3	37.16	8.35	14	30.25	8.47	12
15	Odou & Vella- Brodrick 2013	1	35.5	1.76	21	30.96	2.3	30
		3	37.16	2.23	14	29.77	2.3	13
12	Manthey, Vehreschild & Renner 2015	8	21.3	4.1	135	21.1	4.2	150
		12	21.1	4.5	102	21.3	5	116
11	Liau, Neihart, Teo & Lo 2016	*0	30.39	8.85	81	27.07	9.75	81
		4	30.44	8.94	81	27.84	10.45	81
8	Heekerens, Eid &	*0	3.39	0.71	87	3.07	0.73	84

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		Heinitz 2019						
		1	3.38	0.69	87	3.32	0.66	84
14	Molinari et al 2018	4	2.5	0.78	23	2.18	0.79	28
		8	2.56	0.84	18	2.22	0.76	17
		16	2.48	0.92	15	2.23	0.81	13

Table 13: Effect size for each study

ID	Names	Time	Cohen's <i>d</i>	Standard error	Variance	Hedges' <i>g</i>	Standard error	Variance
21	Sheldon & Lyubomirsky 2006	*0	0.64	0.30	0.09	0.63	0.30	0.09
		3	0.06	0.29	0.09	0.06	0.29	0.08
20	Seear & Vella- Brodrick 2012	1	0.31	0.30	0.09	0.31	0.29	0.09
		3	0.82	0.41	0.17	0.80	0.40	0.16
15	Odou & Vella- Brodrick 2013	1	2.17	0.36	0.13	2.13	0.35	0.12
		3	3.26	0.59	0.35	3.17	0.57	0.33
12	Manthey, Vehreschild & Renner 2015	8	0.05	0.12	0.01	0.05	0.12	0.01
		12	-0.04	0.14	0.02	-0.04	0.14	0.02

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11	Liau, Neihart, Teo & Lo 2016	*0	0.36	0.16	0.03	0.35	0.16	0.02
		4	0.27	0.16	0.02	0.27	0.16	0.02
8	Heekerens, Eid & Heinitz 2019	*0	0.44	0.15	0.02	0.44	0.15	0.02
		1	0.09	0.15	0.02	0.09	0.15	0.02
14	Molinari et al 2018	4	0.41	0.28	0.08	0.40	0.28	0.08
		8	0.42	0.34	0.12	0.41	0.33	0.11
		16	0.29	0.38	0.15	0.28	0.37	0.14

Heterogeneity tests results are as follow:

For the fixed-effects model: the Q -value is 30.602 with 6 degrees of freedom and a p-value of <0.001. (Hedges' g : the Q -value is 30.531 with 6 degrees of freedom and a p-value of <0.001). There is heterogeneity in effect size across studies and that the variation in effect size is not attributable to sampling error alone. I^2 is 80.394% (80.348%) Heterogeneity is considered high. The T^2 statistic is 0.184 (0.181). T is the standard deviation of true effects and it is 0.43 (0.425).

Chapter 4

Summary

Does the Best Possible Self intervention improve positive affect and reduce negative affect? Based on this meta-analysis study conducted, the answer is yes. The combined results of 22 and 20 studies reveal that the BPS intervention significantly improve positive affect and reduce negative affect, respectively. The magnitude of these overall effects are medium-sized for positive affect (Cohen's $d = 0.528$ and Hedges' $g = 0.521$) and small-sized for negative affect (Cohen's $d = -0.234$ and Hedges' $g = -0.231$), indicating that the BPS intervention works well. This mirrors the findings of previous meta-analyses conducted such as Sin & Lyubomirsky (2009) in their review of positive psychology interventions on well-being. Therefore, it is highly encouraged to use the BPS intervention, on populations that have been included in this meta-analytic study (e.g. university students, patients suffering from pain).

The moderator analyses conducted also point to specific aspects of the intervention which enhances the efficacy of the intervention. First, the specificity of the domain given in the instructions moderated the effectiveness of the BPS for both positive affect and negative affect. Participants who were asked to focus on visualizing their best selves in specific domains, such as professional, and family, had lower outcome in positive affect compared to control condition. However, for negative affect, by asking participants to focus on specific domains led to lower negative affect as compared to control condition.

Second, the specificity of the time instructions also moderated the effectiveness of the BPS intervention, but in opposite directions for positive affect and negative affect. Participants who were given time specifically to think before writing and to visualize after writing had stronger positive affect than if they were told in general to write and visualize for 20 minutes. This moderator variable worked in the other direction for negative affect, with

participants who were told in general to write and visualize having lower scores in negative affect compared to the control condition.

The third moderator variable investigated in this meta-analysis also interestingly showed that online studies conducted led to lower negative affect scores compared to the control condition and this was statistically significant at 0.05 level. However, more studies can be conducted for online interventions as most studies were conducted in-person.

Finally, the fourth variable which moderated the effectiveness of the BPS is the type of control group coded for. For positive affect, participants in which they were compared to control group (typical day) had higher average effect size than participants compared to control group (schedule for the following day). This comparison was statistically significant.

In sum, the moderator findings suggest that a well-designed Best Possible Self intervention to improve positive affect would ask participants to visualize their best selves in general manner, given specific time instructions, be administered in-person, and be compared to a control group which ask participants to think about their typical day of events. To reduce negative affect, a well-designed Best Possible Self intervention would ask participants to visualize their best selves in specific domains, given general time instructions, be administered online, and be compared to a control group which ask participants to think about their schedule for the following day.

In the prediction model for the variability of effect sizes in the studies that are used in this meta-analysis, the number of sessions (dosage) does not really add much in the variability of the true effect size. Therefore, it seems like one intervention session may be enough to be functioning in the 'evaluative' concept in possible selves.

Publication bias analysis involve a logical sequence of analyses. Each of the different types of publication bias test serve a different purpose. For example, funnel plots provide a

visual sense of the data. The Failsafe N test if the overall effect size is attributable to bias.

The rank correlation test for evidence of bias via a statistical significance test. The Trim and Fill procedure considers what would be a ‘corrected’ effect size should publication bias be removed (Rothstein, Sutton & Borenstein, 2005). Triangulation using multiple techniques is essential due to each technique’s different purpose, and these methods should be regarded as tools for sensitivity analysis (Vevea, Coburn & Sutton, 2019). The publication bias analyses for positive affect suggest that publication bias *exists*. Using Trim and Fill the ‘corrected’ Cohen’s d effect size estimate is 0.316 (0.114, 0.517), which is considerably lower than the original estimate of 0.528. The publication bias analyses for negative affect suggest that publication bias *does not exist*.

Limitations

These findings can be interpreted cautiously, as this meta-analysis only included studies that fulfil the inclusion/exclusion criteria. Causal conclusions cannot be drawn regarding the moderators because the studies were not randomly assigned to moderator levels (Rosenthal, 1991; as cited in Sin & Lyubomirsky, 2009). With only 22 studies and 20 studies respectively for the two outcome variables, the analyses also had relatively low power to detect significant moderators (Malouff & Schutte, 2017). Findings with moderators that have one category including only a few studies may be especially likely to not be replicated in future studies. Therefore, subgroup analyses are best viewed as providing hypotheses about possible moderating variables (Malouff & Schutte, 2017).

This meta-analysis used the standardized mean difference as an effect size measure to compare the experimental and control groups at post-intervention. Other effect-size measures can be used, such as correlation and the standardized mean change in pre-post interventions, in future meta-analyses. The standardized mean change can be viewed as a statistical way of

controlling for baseline differences if baseline analyses were not conducted. The efficacy of the intervention on other outcome variables such as life satisfaction can also be investigated to further support the usefulness of the Best Possible Self.

Participants that were randomly assigned to the Best Possible Self intervention include participants who were experimentally pain-induced, university students, patients, and children. More studies can be conducted to investigate the efficacy of the Best Possible Self intervention on populations that were not included, such as the elderly, or employees in organizations, to determine and ascertain the efficacy of the intervention on other subgroups, similar to different levels conducted by clinical trials.

Implication and future directions

Depression is one of the more commonly diagnosed mental illnesses. Considering the population of individuals *not* suffering from diagnosed depressive disorders such as major depressive disorder, the degree of positive affect and negative affect will too vary among individuals. To the extent that volitional activities can improve transient positive affect to improve daily functioning of people will benefit not just the measurable aspects such as positive affect but also in other areas such as work productivity. This is what positive psychology tries to do, to focus on processes that improve human strength and growth (Gable & Haidt, 2005). As recommended by Sin & Lyubomirsky (2009), the Best Possible Self Intervention can be used as a positive psychology intervention to be incorporated into clinical practice to improve positive affect for suitable populations.

Positive psychology intervention studies have shown their wide application across different subgroups of people, for example, some studies that have used the BPS intervention were carried out online. This means that the implementation was relatively easy and can be carried out without the presence of a researcher conducting the manipulation in a typical lab

experiment. The BPS intervention can be used in a manner like gratitude interventions that have been conducted extensively. One example is a study conducted by Seligman, Steen, Park & Peterson (2005), in which one of the intervention was the ‘gratitude visit’, a writing of a letter to express their gratitude towards someone who has helped them before. Subsequent investigation found that people had chosen to continue with this exercise long after the study ended (Wood, Joseph & Linley, 2007). Other gratitude interventions have found similar success in this ‘self-reinforcing’ characteristic of positive psychology activities (Emmons & McCullough, 2003; Lyubomirsky et al., 2005, as cited in Wood et al., 2007). These include the now-considered ‘mainstream’ self-help activities such as ‘counting blessings’ or ‘three good things’, in which anyone can keep an account of things they were grateful for in their daily journal.

The research of Seligman et al. (2005) has showed that gratitude interventions are particularly suitable in increasing levels of happiness and well-being for people in the general population, and this is an important implication for positive psychologists who aim to balance research and practice that leads to fostering the positive aspects of life (Linley, Joseph, Harrington & Wood, 2006; as cited in Wood et al., 2007).

Similarly, the BPS can be easily practiced by participants long after primary studies of intervention are conducted. The instructions are simple (as proven to be easily followed by online studies) and visualization can be done at appropriate junctures of the lives of individuals, because goals of a person may change over time. This meta-analysis conducted has showed the cumulative effects of BPS on affect and is an important first step towards proving that the intervention works on psychological well-being. The aim of improving the negative and fostering the positive aspects of life by earlier researchers such as Fordyce (mentioned earlier in my thesis) is now being realized by the positive psychology movement with clear and accumulating evidence in scientific studies.

Sustainable model of happiness

In this meta-analytic study, it has shown that BPS intervention increases positive affect. It also mirrored the findings in Boiler et al. (2013) as cited in (Heekerens et al. 2019) that the effects decrease over time, with this being a meta-analysis of a specific positive psychology intervention.

Test of follow-up effects in this study showed that for positive affect in the long-term, the effect size decrease over time. This is an observational comparison, because more studies can be conducted to investigate the long-term effect of disclosive writing on positive affect. The current meta-analysis is the first to empirical cumulate the effects of the BPS intervention on positive affect. Future meta-analyses can also be conducted on other specific positive psychology interventions to find out if the sustainable model of happiness of intentional activities hold. To allow for the overall effect of all studies to be properly investigated, more primary studies can be conducted longitudinally.

In line with other meta-analyses conducted (e.g. Frattaroli, 2006), the moderator variables investigated in this study showed the same recognizable trend in direction. Sin and Lyubomirsky (2009) said that cognitive strategies are useful in boosting happiness levels and to alleviate depression. Giving participants allocated time to visualize possible selves is one such cognitive strategy. Whether or not participants are self-selected also has relevance to motivation levels and how much they can benefit from positive psychology interventions than their non self-selected peers (Sin & Lyubomirsky, 2009). Perhaps more studies using online format can be carried out. The issue of pre-arranged timeslots vs convenience of accessing the interventions can be tested in further studies.

An interesting question to be asked will be, how does the BPS intervention really work? To investigate the mechanisms of optimism induction, we can ask questions such as

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does goal ambivalence help in efficacy of the intervention? Do mediating variables of participants, such as base line disposition affect the efficacy of positive psychology interventions?

A more rigorous meta-analysis can include the study design of primary studies to find out if this affects the effect size of intervention, conducted in a similar vein by Boiler et al. 2013. To help future meta-analyses answer the question of effect size difference of experimental vs control group at specific time-points, future study designs of primary studies can be conducted at similar time points. Finally, future studies may compare whether repeated use of the optimism induction affects self-esteem and the interaction of intervention characteristics on individual differences.

Appendix

Coding instructions for control group subgroup analysis

Control conditions

Typical Day (TD): ‘Think about your typical day’ means that you take notice of ordinary details of your day that you usually don’t think about. These might include particular classes or meetings you attend to, people you meet, things you do, typical thoughts you have during the day. Think of this as moving through your typical day, hour after hour.

Procedure: 1 minute to think about what to write followed by uninterrupted writing for 15 minutes and ending with 5 minutes of imagining the story that was just written. Instructions were given both verbally and in writing.

Life details (Sheldon & Lyubomirsky, 2006): Coded as TD

“Let me get more specific. You have been randomly assigned to pay more attention to the daily details of your life. “Pay more attention to your life” means that you take notice of the ordinary details of your life that you wouldn’t typically think about. These might include particular classes or meetings you attend, typical interactions with acquaintances, typical thoughts that you have during the day, or your typical schedule as you move through the day. In all of these cases, you may be helped to better identify problem areas in your life, and to take action to change them. You may not have thought about yourself in this way before, but research suggests that doing so can have a strong positive effect on your mood and life satisfaction. So, we’d like to ask you to continue thinking in this way over the next few weeks, following up on the initial writing that you’re about to do.”

Schedule for the following day (King, 2001):

For the control condition, participants were asked each day to write about their plans for the day in as much detail as possible (after Pennebaker et al., 1996)

Because this has a future-oriented thought, it is coded differently from TD. I code this as SD.

This is also commented by Heckerens, Eid and Heinitz, 2019 (We chose this control condition – Previous day, because the format is comparable to the BPS condition, but the content was past instead of future-oriented and was thus expected to be emotionally neutral on average.)

Previous day condition was coded as typical day, because typical day has the statement “that you usually don’t think about”

Previous day (Heckerens, Eid and Heinitz, 2019): Participants in the control condition were instructed to write about their previous day for 20 minutes, after which they were asked to briefly imagine their previous day (e.g., as used by Lyubomirsky & Layous, 2013; Odou & Vella-Brodrick, 2013).

Layous, Nelson & Lyubomirsky (2013):

“Please take a moment to think about what you did during the last 24 h. That is, create a mental outline of what you did during that time. Now, for the next 10 min, please write out these activities in a list format. Be as detail oriented as possible, but try to leave out emotions, feelings, or opinions pertaining to your plans. In other words, focus on exactly what you did.”

Task exercise (Manthey et al. 2014): “During the next weeks put your focus on the important tasks in your life. [...] Now think of the upcoming week precisely. Which tasks lie ahead of you? [...] Please compile a list and write down five of these things. [...] Please extend your list for five further things each week, ...”

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This has a future-oriented focus, so I coded this as SD.

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