

Can Online Positive Psychology Interventions based on the PERMA model increase Happiness? A systematic review and meta-analysis

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Abstract

Introduction

Online Positive Psychology Interventions (OPPIs) have gained attention for their potential as scalable tools for enhancing well-being. This systematic review and meta-analysis evaluates the effectiveness of OPPIs that are based on the PERMA model (Seligman et al., 2011) in increasing happiness among adults. The primary research question was: *Are OPPIs based on the PERMA model effective in increasing happiness among adults?* Consistent with prior research it was hypothesized that these interventions would show small to moderate positive effects on happiness.

Methods

A comprehensive search was conducted across PsycINFO, PubMed, and Scopus to identify randomized controlled trials (RCTs) that examined the effects of OPPIs on happiness. Studies were included if they focused on adult populations, delivered interventions online, tested an intervention that targets at least one of the components of the PERMA model, and measured happiness as an outcome. A random-effects meta-analysis was conducted to pool the results, assess heterogeneity, and perform follow-up analyses at various time points, including 1-month, 3-month, and 6-month follow-ups.

Results

A total of 15 studies involving 7,020 participants were included. The meta-analysis revealed a small but statistically significant effect of OPPIs on happiness ($g = 0.149$, 95% CI [0.098, 0.199], $p < .0001$), with low heterogeneity ($I^2 = 17.0\%$). Effects remained significant at the 1-month ($g = 0.154$, 95% CI [0.080, 0.228], $p = .0002$) and 3-month ($g = 0.258$, 95% CI [0.034, 0.483], $p = .026$) follow-ups, but the effect at 6 months was not significant ($g =$

0.249, 95% CI [-0.026, 0.524], $p = .073$). Sensitivity analysis confirmed the robustness of the findings, and no significant publication bias was detected.

Discussion

The meta-analytic findings suggest that OPPIs based on the PERMA model can have small positive effects on happiness. However, several limitations must be considered. Most included studies were conducted in Western, well-educated populations, limiting generalizability. Moreover, the absence of a second independent reviewer during screening and data extraction may have introduced bias, reducing reliability. Additionally, the non-significant effect size at the 6-month follow-up and increased heterogeneity in long-term outcomes highlight inconsistencies, suggesting variable long-term effects. Despite these limitations, OPPIs seem to be a scalable and accessible tool for improving happiness. The significant short-term effects suggest that even brief, self-administered interventions can enhance happiness, but more research is needed to understand the long-term sustainability of these effects and their broader applicability to diverse populations.

Introduction

In the ever-evolving landscape of psychology, the pursuit of understanding and enhancing human well-being has led to the emergence of a dynamic and influential field: positive psychology. This field, focusing on the scientific study of human flourishing and optimal functioning, represents a significant shift from the traditional focus on psychopathology to one that emphasizes potential, resilience, and the positive aspects of the human experience. Seligman and Csikszentmihalyi (2000), pioneers in this field, argued that psychology should not only concern itself with the alleviation of suffering but also with the proactive cultivation of positive aspects that make life worth living. This focus underscores an inherent belief in the field: individuals aspire for more than merely the absence of suffering, they strive for a life filled with positivity and fulfillment (Duckworth et al., 2004). The core concepts and areas of study of positive psychology are positive emotions, overall well-being, positive traits, strengths, fostering positive relationships, and interventions specifically designed to enhance well-being (Keyes et al., 2012).

Positive Psychology Interventions

As the field of positive psychology expanded, considerable attention turned to how its insights could be applied in practical ways to improve well-being. This focus on practical application led to the development and research of Positive Psychology Interventions (PPIs), which aim to enhance well-being through intentional activities that foster positive emotions, cognitions, and behaviors (Sin & Lyubomirsky, 2009), including exercises such as expressing gratitude, using personal strengths, counting blessings, or practicing kindness.

The evidence base supporting the effectiveness of PPIs is considerable. A comprehensive mega analysis of meta-analysis by Carr et al. (2023), which examined 98 meta-analyses involving 4065 primary studies with a total of 501335 participants, found that

PPIs have a small to a medium significant effect on well-being, quality of life, strengths, depression, anxiety, and stress, with these effects being partially maintained at a 7.5-month follow-up.

Furthermore, PPIs have also demonstrated effectiveness in clinical contexts. For instance, a meta-analysis by Pan et al. (2022) on the use of PPIs in treating depression revealed that these interventions significantly reduce depressive symptoms, showing a moderate effect in decreasing depression scores. Additionally, a meta-analysis by Chakhssi et al. (2018) focusing on the impact of PPIs on well-being and distress in clinical samples found that PPIs significantly enhance well-being, reduce depression, and lead to substantial improvements in anxiety. These findings are particularly noteworthy, as they highlight the potential of PPIs not only in non-clinical settings but also as valuable tools in clinical contexts. Such evidence points to the growing adaptation and research of PPIs in clinical settings, suggesting a broadening scope of positive psychology beyond its traditional boundaries. Furthermore, scholars argue for a shift towards the integration of positive psychology into clinical psychology (Maddux, 2008; Rashid, 2009; Wood & Tarrier, 2010), stressing the importance of not just focusing on mental illness but also on developing well-being and utilizing a clients strengths, virtues, and positive experiences.

Potential Benefits of Online Interventions

With the success of PPIs in various settings, the next logical step is to consider how these interventions can be made more accessible to a broader audience. One promising approach to achieving this broader reach is through the use of online interventions. Although still an emerging area of study, online interventions hold significant potential in expanding the reach of psychological support. As the integration of technology becomes an increasing part of our daily lives, online interventions are gaining attention for their potential to reshape

how individuals seek and receive psychological care (Morris & Aguilera, 2012). These interventions, while not yet fully established, show promise in addressing several key issues in traditional therapeutic approaches.

First and foremost, online interventions may help overcome barriers to accessibility. Face-to-face interventions, while effective, are often limited by geographical, logistical, and financial constraints. Online platforms have the potential to overcome these limitations by providing psychological support to individuals in remote or underserved areas (Ritterband & Tate, 2009). This expanded accessibility is particularly relevant for positive psychology, where the goal extends beyond alleviating distress to enhancing well-being across diverse populations.

Another potential advantage of online interventions is the promise of enhanced privacy and anonymity. For individuals who may feel stigmatized or uncomfortable seeking traditional face-to-face therapy, online platforms could offer a safer, more private space to explore their well-being without fear of judgment (Ryan et al., 2010).

Furthermore, online interventions appear to offer scalability, addressing the growing demand for mental health services. While face-to-face therapies are limited by time and resource constraints, digital interventions can be delivered to many individuals simultaneously. This scalability could provide a cost-effective way to meet increasing psychological support needs (Barak & Grohol, 2011).

The potential for flexibility and adaptability of online platforms are also notable. Unlike traditional interventions, which are often bound by time and place, online platforms offer users the ability to engage with interventions at their own pace and convenience. This flexibility has the potential to make it easier for individuals to integrate positive psychology

practices into their daily lives, increasing the likelihood of sustained engagement and long-term effectiveness (Barak & Grohol, 2011).

Challenges and Pitfalls of Online Interventions

While online interventions offer numerous potential benefits, they also present several challenges and pitfalls that must be carefully considered. One of the primary concerns is the digital divide, which refers to the unequal access to technology across different populations. Individuals in low-income or rural areas may lack reliable internet access, digital literacy, or the necessary devices to engage with online interventions effectively (van Dijk, 2019). This gap in access could exacerbate existing inequalities in mental health care, leaving the most vulnerable populations underserved.

Another significant challenge is the lack of human interaction in online interventions. Traditional face-to-face therapy allows for a therapeutic relationship to develop between the clinician and the client, which is considered an essential component of effective psychological support (Norcross & Wampold, 2011). The absence of real-time, personal interaction in online platforms can limit the development of trust and rapport, potentially reducing the effectiveness of the intervention. Furthermore, online interventions often rely on self-guided modules, which may lead to reduced adherence and engagement over time. Without the accountability and support provided by a therapist, users may struggle to maintain motivation, leading to lower completion rates and less impactful outcomes (Kelders et al., 2012).

Furthermore, Privacy and security concerns are also central when it comes to online interventions. While online platforms may offer enhanced privacy and anonymity, they also raise questions about data protection and confidentiality. The storage and transmission of sensitive personal information online expose users to the risk of data breaches and

unauthorized access (Bennett et al., 2010). Ensuring robust security measures and clear privacy policies is essential to building user trust and safeguarding their well-being.

Lastly, one-size-fits-all approaches in online interventions can be problematic. Unlike traditional therapy, which can be tailored to the individual's unique needs and circumstances, online interventions often follow a standardized format. This lack of personalization may result in interventions that are less effective for certain individuals or conditions, failing to address the complexities of their mental health needs (Ebert et al., 2017).

In conclusion, while the research on online interventions is still developing, these platforms offer promising potential to enhance mental well-being and improve access to care. The possible benefits of greater accessibility, increased privacy, scalability, and flexibility present exciting opportunities for the future of mental health support. The COVID-19 pandemic further underscored this, as digital health technologies, such as apps, ensured continuity of care and demonstrated the potential to broaden access to psychological support in times of crisis (Torous et al., 2020). However, it is equally important to address the challenges and pitfalls associated with online interventions, such as the digital divide, lack of human interaction, privacy concerns, and standardized approaches. Ongoing research and development are essential to fully understand and optimize the effectiveness of these interventions, ensuring they are inclusive, secure, and adaptable to meet the diverse needs of all individuals. By carefully balancing the benefits and challenges, online interventions can pave the way for innovative, effective, and accessible approaches to psychological care in the digital age.

Online Positive Psychology Interventions

As most PPIs are brief and often designed for self-administration (Baños et al., 2017), their concise and autonomous nature makes them ideally suited for online delivery. This has

been acknowledged in the academic field and two prominent terminologies have emerged to capture the intersection between online interventions and positive psychology: “Online Positive Psychology Intervention” and “Positive Technologies”. Mitchell et al. (2010) proposed the term “online positive psychological interventions” (OPPIs) and advocated for the effectiveness and sustainability of these interventions as tools for health and well-being promotion, contributing to a more holistic approach to mental healthcare. Secondly, the term “positive technology” was introduced by Botella et al. (2011) and defined as “the scientific and applied approach for improving the quality of our personal experiences with the goal of increasing wellness, and generating strengths and resilience in individuals, organizations, and society” (p.1). Leveraging the principles of positive psychology and the possibilities of technologies, positive technologies aim to create tools that foster personal growth, enhance well-being, and improve overall quality of life.

The field of OPPIs is rapidly evolving, with a wide range of studies exploring different types of interventions aimed at promoting well-being. These interventions often take the form of structured programs delivered through digital platforms, including websites, mobile apps, and virtual environments. Web-based platforms and mobile apps are among the most common, offering users the flexibility to engage in positive psychology exercises at their convenience. Additionally, emerging technologies like virtual reality (VR) and augmented reality (AR) are being explored for the development of OPPIs. VR and AR offer an immersive environment, which can be adapted to the individual needs of a user. This allows clinicians to create life-like experiences for users while being in a safe environment (Montana et al., 2020). These interventions can range from a narrative relaxation experience based on mindfulness exercises (Villani & Riva, 2008) to interventions focusing on fostering empathy by allowing users to experience the perspective of another in a specific context, aiming to facilitate insight and prosocial behavior (Gaggioli et al., 2019).

While the potential of OPPIs is increasingly recognized, and a growing number of interventions are being tested in randomized controlled trials (RCTs), there remains a need for more extensive research to establish their efficacy. The next step in advancing this field is to rigorously evaluate these online approaches, ensuring they are both effective and adaptable to meet the needs of different target populations.

Research Gap and Rationale

During the initial literature search only two reviews, by Baños et al. (2017) and Francis et al. (2021) were found that reviewed literature on OPPIs. Baños et al. (2017) conducted a narrative review on whether OPPIs can promote well-being and resilience in the adolescent population. They identified 9 studies that tested OPPIs in the adolescent population which found positive results but highlighted the need for more controlled studies and longitudinal studies. Francis et al. (2021) did a systematic review of the effectiveness of online, school-based PPIs to improve mental health and well-being. They focused on school-based interventions for school-aged children and reviewed 9 relevant studies. For efficacy measures, the included studies typically found small positive but nonsignificant results. Furthermore, it was concluded that OPPIs seem to be able to overcome barriers related to restricted human and environmental resources, but the capacity and expertise of online interventions, and the aspect of human connection, remain unknown.

No review was found that investigated OPPIs in the adult population, yet focusing on this demographic seems particularly important given the unique stressors and challenges this demographic faces. Adults encounter a variety of stressors, ranging from work-related stress to the balancing of personal and familial responsibilities. Additionally, adults demonstrate a significant engagement with digital technology in their daily lives, making them well-suited for online interventions. Moreover, young adults are reported to have the highest rate of

mental illnesses (Adams et al., 2013), making this population particularly relevant for the research and application of OPPIs. Additionally, older adults often face challenges such as social isolation, health-related concerns, and transitions into retirement, which can impact their mental health and overall well-being (Coyle & Dugan, 2012). Therefore, investigating the potential of OPPIs to increase well-being in the adult population, including both young and older adults, is highly relevant and necessary.

Considering the potential benefits of online interventions and the growing body of research supporting their efficacy, it seems relevant to investigate the effectiveness of these online approaches. To achieve this, a systematic review and meta-analyses focusing on randomized controlled trials (RCTs) were conducted. The focus on RCTs ensures a high level of evidence, minimizing bias and establishing causality.

Furthermore, previous meta-analyses often employed a broad definition of what constitutes a PPI, leading to the inclusion of a wide range of different interventions (Bolier et al., 2013; Carr et al., 2023). This variation in interventions could be one of the potential reasons for the high heterogeneity observed in these meta-analyses. To address this issue, the current review will narrow its focus to interventions that explicitly target one or more components of the PERMA model.

The PERMA model, developed by Seligman (2011), is one of the most influential frameworks in positive psychology for understanding well-being. It identifies five core elements that contribute to well-being: Positive Emotion, Engagement, Relationships, Meaning, and Achievement. Each element represents an important aspect of the human experience, playing a vital role in shaping an individual's overall sense of well-being, and targeting these elements provides a structured approach to enhancing well-being.

Basic empirical research has been essential in validating the theoretical constructs of the PERMA model and its relationship with well-being. The association between positive emotions and well-being, for instance, has been observed in research by Bastian et al. (2014) who found that cultures valuing positive emotions report higher life satisfaction. Moreover, Siltan et al. (2020) highlighted the importance of positive emotion regulation in managing depression, leading to enhanced well-being. Similarly, Salovey et al. (2000) discussed the health benefits of positive emotions, such as their positive impact on immune function and promoting healthy behaviours. Strategies for amplifying positive emotions, such as socializing and savouring life's moments, have been associated with increased well-being (Livingstone & Srivastava, 2012).

In the context of engagement, the concept of “flow”, or deep psychological engagement, has been extensively studied (Csikszentmihalyi, 1990). This state of absorption and focus has been linked to enhanced well-being, with studies by Sanford et al. (2018) and Tse et al. (2021) finding a positive relationship between flow experiences and outcomes like job performance and life satisfaction. Moreover, Engagement in productive activities, including volunteering and paid work, is positively associated with well-being (Bryce & Haworth, 2002; Fekete et al., 2020).

Similarly, the aspect of positive relationships in fostering well-being has been established by research. Studies by Ramsey and Gentzler (2015), Lee and Szinovacz (2016), and Sun et al. (2019) all underscore the association between positive relationships and improved well-being.

Likewise, the concept of meaning in life and its link to well-being has been substantiated through research, with significant findings by Zika and Chamberlain (1992) and

García-Alandete (2015), showing associations between life's meaning and various dimensions of psychological well-being.

Lastly, accomplishment, another key element of PERMA, has been consistently supported by research. Studies by Gander et al. (2016) and Job et al. (2009) identified accomplishment, as a significant factor for increased well-being. Furthermore, Tuominen et al. (2008) found a link between achievement goals related to self-improvement and growth, and higher levels of well-being.

In summary, The PERMA model provides a comprehensive and empirically validated framework for understanding the multifaceted nature of well-being. Each of the five elements plays an important role in shaping an individual's overall well-being, as supported by research across various domains. By narrowing the selection criteria to interventions targeting these specific elements, this review aims to reduce the heterogeneity observed in previous research, providing a more accurate assessment of how these interventions impact well-being.

In addition, earlier meta-analyses (Bolier et al., 2013; Carr et al., 2023) have included a range of different outcome measures for measuring well-being, including subjective well-being, psychological well-being, and happiness measurements. This review aims to further narrow down the scope by focusing specifically on happiness, to further reduce the high heterogeneity observed in previous research.

Happiness, often defined by the term subjective well-being, is a central component of positive emotions and overall well-being, making it a crucial outcome in the study of PPIs. It is typically conceptualized as including both cognitive and emotional elements. The cognitive aspect involves life satisfaction, which refers to an individual evaluation of their overall quality of life, while the emotional component focuses on the frequency with which a person

experiences positive emotions (Suldo, 2016). Research has consistently shown that happiness besides contributing to the experience of subjective well-being, also promotes physical health (Diener & Chan, 2011; Frey 2011). Additionally, happiness is closely linked to improved interpersonal relationships, greater work productivity, and higher levels of creativity and resilience (Lyubomirsky et al., 2005).

In the context of OPPIs, happiness seems a highly relevant outcome for several reasons. First, the nature of these interventions, often brief, self-administered, and designed to be integrated into daily life, makes them particularly well-suited to enhancing happiness. Activities such as gratitude exercises, savoring positive experiences, and practicing kindness are specifically designed to increase positive emotions and life satisfaction (Seligman et al., 2005). Given their focus on cultivating positive emotions and improving quality of life, these interventions are likely to have a significant impact on happiness.

To conclude, focusing on happiness as the primary outcome measure in this review provides several advantages. It aligns both with the theoretical foundations in positive psychology and empirical evidence supporting its role in developing well-being and other positive outcomes. Furthermore, by narrowing the scope, this review aims to reduce heterogeneity observed in previous meta-analyses, offering clearer and more targeted insights into the effectiveness of OPPIs.

The objective of this study

The primary objective of this systematic review and meta-analysis is to evaluate the efficacy of OPPIs that aim to increase well-being through one or more components of the PERMA model, with a specific focus on their impact on enhancing happiness in the adult population. This review aims to provide insights into whether these interventions can effectively promote well-being according to a well-established theoretical framework.

This review aims to advance the field of positive psychology by addressing several gaps in the existing literature on OPPIs. Firstly, it extends the focus beyond previously examined populations, such as adolescents and school-based settings, to the adult population, a demographic that encounters unique stressors and has been underrepresented in OPPIs research. By doing so, the review provides valuable insights into how OPPIs can enhance well-being and happiness among adults. Secondly, the review narrows the scope to specifically examine happiness as the primary outcome measure. This targeted approach potentially reduces the high heterogeneity observed in earlier reviews, which included a broad range of well-being outcomes, thereby aiming to offer a more precise conclusion on the effectiveness of OPPIs on specifically fostering happiness. Additionally, by grounding the analysis in the PERMA model, the review ensures a theoretically robust framework that aligns interventions with well-established components of well-being. Furthermore, by exclusively focusing on RCTs, the review ensures a high level of methodological rigor and reliability in its findings. Collectively, these contributions fill significant gaps in the literature and provide a comprehensive insight into the efficacy of OPPIs in promoting happiness among adults. This enhanced understanding can inform future research directions, guide practice, and support the development of more effective, online interventions aimed at improving mental health and well-being in diverse adult populations.

The following research question (RQ) and hypothesis (HQ) have been formulated:

RQ : Are OPPIs based on the PERMA model effective in increasing happiness among adults?

H: Based on previous research significant low to moderate positive effects on happiness are expected

Methods

For reporting the methods, results, and discussion of this meta-analysis, the Preferred Reporting Items for Systematic Reviews (PRISMA) guidelines were applied (Page et al., 2021).

Databases Searched

The literature search was conducted across three major databases: PsycINFO, PubMed, and Scopus. These databases were selected for their extensive coverage of psychological literature, ensuring a broad retrieval of studies related to health, well-being, and psychological interventions. It was decided to exclude grey literature and focus exclusively on peer-reviewed articles. This was done to ensure the inclusion of studies that have undergone rigorous quality control processes. Peer-reviewed articles typically offer higher methodological rigor and reliability, which is essential for the validity and reproducibility of a systematic review and meta-analysis. By excluding grey literature, we aimed to avoid the potential biases and variability in quality that can be associated with non-peer-reviewed sources, thereby maintaining a high standard of evidence in our analysis.

Search Strategy

To systematically search for all research on OPPIs based on the PERMA model, a comprehensive search strategy was developed and implemented. The search strategy was intentionally broad to capture all relevant interventions, including interventions that do not specifically mention positive psychology or the PERMA model but are aimed at increasing well-being through one or more components of the PERMA model (see Table 1). To construct the search strategy, a wide range of keywords was used, covering the following primary themes: Positive Psychology, Intervention, Online Intervention, PERMA model, and Randomized Controlled Trials. These themes were combined using the AND operator in the

search string, ensuring that studies relevant to all criteria were included. Additionally, non-adult populations were excluded using the AND NOT operator.

Table 1

Keywords constituting the syntax entered in the databases

Included (All Text)	Included (Title/Abstract)	Included (Title/Abstract)	Included (All Text)	Included	Excluded (Title/Abstract)
Positive Psychology	Intervention	Online intervention	PERMA model	RCT	Non adults
"Positive Psychology" OR "Positive Technology" OR "Positive Mental Health" OR "Positive Technologies"	"intervention" OR "program" OR "therapy" OR "treatment" OR "blended care" OR "blended-care" OR "blended therapy"	"online" OR "web" OR "web-based" OR "mobile" OR "smartphone" OR "digital" OR "computer" OR "internet" OR "app" OR "application" OR "e-Health" OR "m-Health" OR "social media" OR "virtual reality" OR "VR" OR "augmented reality" OR "AR" OR "multimedia" OR "sensing technolog*" OR "monitoring technolog*" OR "smart technolog*"	"well-being" OR "flourishing" OR "PERMA" OR "positive emotion" OR "engagement" OR "relationship*" OR "meaning" OR "accomplishment" OR "joy" OR "gratitude" OR "serenity" OR "hope" OR "pride" OR "love" OR "positive affect" OR "happiness" OR "contentment" OR "awe" OR "flow" OR "involvement" OR "immersion" OR "positive relationship*" OR "social connection*" OR "interpersonal relationship*"	"Randomized control trial*" OR "Randomised control trial*" OR "Randomized controlled trial*" OR "Randomised controlled trial*" OR "RCT" OR "clinical trial*" OR "clinical study" OR "Random allocation" OR "Randomly allocated" OR "randomization" OR "controlled trial*" OR "Double-blind" OR "Single-blind" OR "Triple-blind" OR	"children" OR "child" OR "kids" OR "high school students" OR "school students" OR "youth" OR "teenager" OR "infant" OR "pediatric*"

OR "wearable technolog*"	OR "social support" OR "social well- being" OR "community support" OR "friendship*" OR "family relationship*" OR "social network*" OR "interpersonal bond*" OR "emotional support" OR "peer support" OR "purpose" OR "personal significance" OR "contribution" OR "life goals" OR "life mission" OR "meaningful" OR "personal mission" OR "achievement*" " OR "mastery" OR "success" OR "personal growth" OR "goal*" OR "self- improvement" OR "competence" OR "self- efficacy" OR "fulfilment" OR "professional development" OR "personal development" OR "performance" OR "self- development"	"Placebo controlled" OR "placebo"
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Selection of studies

The results of the literature search were uploaded and screened using Covidence a platform for the data management of systematic reviews. The selection of studies was conducted by one reviewer (Author of this Review). The selection process was done in two distinct phases. In the initial phase, studies were selected based on the title and abstract. The primary aim was to efficiently narrow down the literature found to a manageable subset of studies that are relevant to the objective of this review. Following the initial screening, the second phase involved a detailed review of the full-text articles. In this phase, studies were rigorously evaluated to determine their direct relevance and adherence to the inclusion criteria of this review.

The inclusion criteria were as follows:

- **Study Focus:** Studies must investigate or evaluate OPPIs. Moreover, interventions must be based on or relate to the PERMA model or at least one of its components (Positive Emotions, Engagement, Relationships, Meaning, Accomplishment)
- **Delivery Mode:** The interventions under review must be delivered entirely online or through digital platforms, encompassing a range of technologies such as web-based programs, mobile applications, and other internet-mediated platforms.
- **Outcomes Measured:** Eligible studies are those that measure happiness as their outcome.
- **Adult population:** Studies focusing on adult population
- **Study Design:** The study must be a randomized controlled trial (RCT)

- **Language:** Studies published in English or German

Conversely, the following exclusion criteria were applied to streamline the selection process and maintain the review focus:

- **Intervention including components that are not related to the PERMA model:**
Studies that investigate interventions that include components that are not related to the PERMA model were excluded.
- **In-Person or Hybrid Interventions:** Studies focusing on face-to-face interventions or those incorporating significant offline components, which cannot be distinctly evaluated separately from online elements, were excluded.
- **Non-Empirical Work:** Opinion pieces, editorials, and non-peer-reviewed literature were excluded to focus on empirical evidence and maintain a high standard of scientific rigor.

These inclusion and exclusion criteria were designed to guide a systematic identification and selection of studies relevant to the objectives of this review. By clearly outlining the scope of eligible studies, these criteria ensure a focused, comprehensive, and methodologically sound review process.

Data Extraction

The data extraction was done by the author of this article. For the data extraction, a priori Data extraction form was created and used (see Table 1). For collecting the data excel was used. Information from each study was organized into tables using Excel.

Table 2

A priori data extraction form

	Data Items	Description
1	Authors	Name of study authors
2	Study title	Title of the study
3	Study design	What kind of control group was used?
4	Country	The country where the intervention was implemented
5	Age	Participants age by years: mean, sd, and range
6	Participant Characteristics	Percentage of female participants and specific characteristics of participants if mentioned (like e.g. university students or community sample)
7	Inclusion and Exclusion Criteria Participants	What are the inclusion and exclusion criteria for the included participants of each study included in this review
8	Sample size	The number of participants who participated in the study, each of the intervention groups and control group
9	Intervention Name	Name of the intervention
10	Intervention Activities	Information on specific activities that were carried out during the interventions by the participants
11	Intervention timing	Length, duration, and frequency of intervention
12	Delivery Mode of Intervention	Information on which digital or online medium was used to deliver the intervention

13	Measurement tool for measuring Happiness	What outcomes were measured? And which measurement tools were used to measure these outcomes?
14	Measurement timing	At what time points were the outcomes measured in the study
15	Main findings	Summary of main findings
16	Effect Sizes and Statistical Significance	Sample size, mean, and standard deviation for both the intervention and control group at post-test or effect sizes at post-test
17	Long-term outcomes	Sample size, mean, and standard deviation for both the intervention and control group at follow-up or effect sizes at follow-up
18	Attrition rates	Attrition rates at post-test

Methodological Quality

The methodological quality of the included studies was assessed by the author of this article using the following eight criteria scale: 1) Adequate description of randomization process, 2) Drop-out was described or dropout analysis was performed, 3) Intention to treat analysis was performed or there were no dropouts, 4) At least one of the professionals was experienced, trained or schooled in psychologist, psychiatrist or health professional, 5) Adequate power analysis or a total of minimal 64 participants per group, 6) Treatment integrity was checked and reported, 7) Comparability of the outcome measure at baseline was assessed, 8) Inclusion or exclusion criteria were adequately described. The quality of a study

was assessed as low quality if 0 to 3 criteria were met, medium quality if 4 to 6 criteria were met, and high quality if 7 to 8 criteria were met.

Data Analysis

For each study included and its intervention group fitting the inclusion criteria, standardized mean differences (Hedge's g) between the intervention and control group at post-intervention were calculated. For two of the included studies, the authors did not report the distribution of participants between the intervention and control groups. In these cases, even distribution between the groups was assumed to calculate the standardized mean difference. Following the guidelines set by Cohen (1988), effect sizes were categorized as follows: 0–0.32 was considered small, 0.33–0.55 as moderate, and 0.56–1.2 as large. Positive effect sizes indicate that the intervention had a favorable effect compared to the control, while negative effect sizes suggest that the control or comparator group outperformed the intervention.

Some heterogeneity was expected due to the anticipated variety of different types of interventions and target groups. Thus, a random-effects model was chosen for the meta-analysis. Pooled mean differences were calculated using the meta package in R. The between-study variance τ^2 was estimated using the restricted maximum likelihood (REML) estimator. The τ^2 estimate captures the variability between the study results. To account for uncertainty in the estimate of τ^2 , the Hartung-Knapp-Sidik-Jonkman (HKSJ) adjustment was applied, which provides more accurate confidence intervals for the overall effect size, especially in the presence of heterogeneity. The Q-profile method was used to calculate the confidence intervals around the τ^2 , and a prediction interval was computed to estimate the range within which the true effect of a new study is expected to fall. Heterogeneity between studies was assessed using the Q-statistic and I^2 statistics. The Q-statistic quantifies total heterogeneity by

measuring the total variability in effect sizes across studies. A significant Q-value rejects the null hypothesis of homogeneity, indicating that the true effect sizes likely differ between studies. Additionally, the I^2 statistic provides a percentage reflecting the variability between studies that is attributed to true differences beyond what would be expected from random sampling error. According to Higgins et al. (2003), 0% indicates no observed heterogeneity, 25% suggests low heterogeneity, 50% moderate heterogeneity, and 75% or higher reflects high heterogeneity.

Sensitivity Analysis

Outliers were identified based on their confidence intervals relative to the pooled effect size. Specifically, studies were considered outliers if the upper bound of their 95% confidence interval was lower than the lower bound of the pooled effect size's confidence interval, indicating an extremely small effect. Conversely, studies were also flagged as outliers if the lower bound of their 95% confidence interval was higher than the upper bound of the pooled effect size's confidence interval, suggesting an extremely large effect. This approach ensures that only those studies with effect sizes that are significantly different from the overall pooled effect are identified as outliers. A sensitive analysis was done by excluding identified outliers, helping to maintain and check the robustness of the meta-analytic results.

To identify influential cases, Baujat plots were created to check for studies that significantly contribute to the heterogeneity compared to other included studies. Furthermore, a Leave-One-Out Meta-Analysis was conducted to assess the influence of the influential cases on the pooled effect sizes and heterogeneity. Lastly, a sensitivity analysis was done by excluding the identified influential studies to evaluate the robustness of the meta-analytic results and to determine how much the overall conclusions depend on these specific studies.

Moreover, a subgroup analysis was conducted comparing studies assessed to be of high quality to studies assessed of low or medium quality. The purpose of this analysis was to check whether the methodological quality of included studies affects the observed effect.

Publication Bias

To address potential publication bias, several methods were employed. First, funnel plots were visually inspected to assess the symmetry of the studies' effect sizes around the pooled estimate, which can indicate the presence of publication bias. To statistically test for asymmetry, Egger's Regression Test was conducted, providing a formal assessment of the likelihood of publication bias.

Additionally, the Duval & Tweedie Trim-and-Fill method was used to adjust for publication bias in case asymmetry was found. This method estimates the number of potentially missing studies that might exist due to publication bias and recalculates the pooled effect size after adjusting for these missing studies. The Trim-and-Fill method is widely used in practice and offers results that are easily interpretable by other researchers, making it a valuable tool for ensuring the robustness of the meta-analytic findings.

Results

Study selection

The selection process is illustrated in Figure 1. In the initial search across three databases Scopus, PubMed, and PsycINFO a total of 277 studies were found. Specifically, 219 studies were identified through Scopus, 33 through PubMed, and 25 through PsycINFO. An additional six relevant references were found through citation searching. Following the removal of 32 duplicate studies, identified using Covidence, 251 studies were retained for abstract screening. Of these, 189 studies were excluded based on the abstracts, as they did not meet the inclusion criteria. The remaining 62 studies were subjected to full-text screening to

assess their eligibility. During this phase, 47 studies were excluded for several reasons. Most of these were removed as they did not use happiness as an outcome measure (n= 36). Moreover, six studies were removed as they tested interventions that did not focus on the components of the PERMA model or included components that were decided to not be related to the PERMA model. These studies and reasoning for exclusion are provided in Table 3. Furthermore, three studies were removed as they were not RCT and one study was removed as it included participants under the age of 18. Lastly, the study by Seligman et al. (2005) was removed as effect sizes were only reported on significant results and not for non-significant results. This was done to not introduce selection bias into the data extraction process. Ultimately, 15 studies met all inclusion criteria and were included in the final review.

Figure 1

Flow diagram

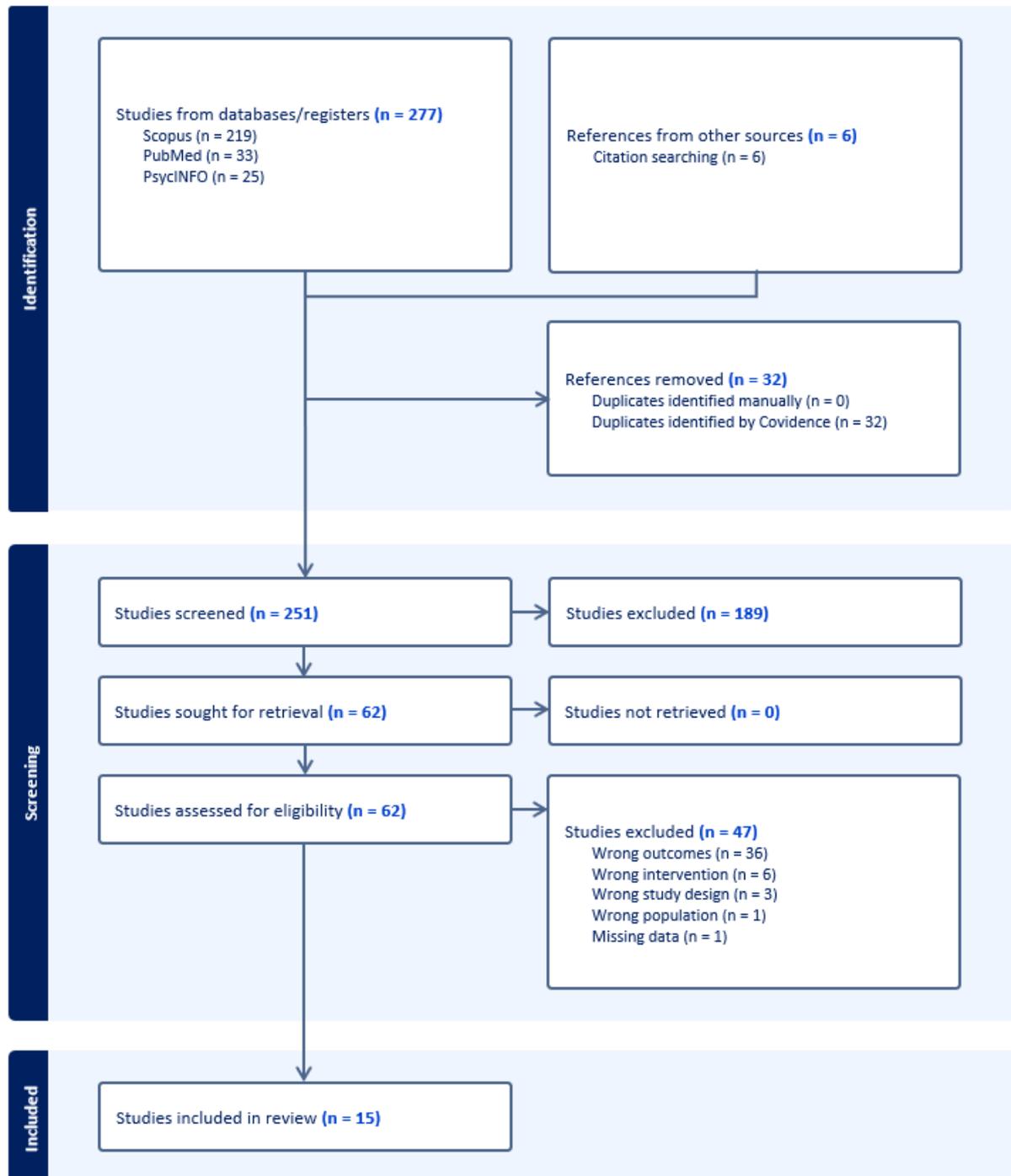


Table 3

Studies excluded due to not fitting the intervention criteria and reasoning for their exclusion

Study	Intervention	Reasoning for Exclusion
Amonoo et al. (2020)	Multicomponent 8-week Positive Psychology Intervention including the following components: Gratitude for positive events, using personal strengths, gratitude letter, performing acts of kindness, recalling past success, enjoyable and meaningful activities, and future planning.	This study was removed as it includes a strengths-based module in its intervention. It was decided to remove intervention focused on strength as strength is not a component of the PERMA model and cannot directly be linked to one of its components.
Bolier et al. (2014)	The study tested five different interventions that were based on positive psychology and cognitive behavioral therapy principles : Psyfit, Colour Your Life, Strong at work, Don't Panic Online and Drinking Less.	The five interventions tested in this study were all based on or include components that are based on cognitive behavioral therapy principles. It was decided to remove interventions based on cognitive behavioral therapy, as this review aims to specifically investigate positive psychology interventions.
Joutsenniemi et al. (2014)	Happiness intervention includes four different exercises: Good deeds,	It was decided to remove this study as reducing rumination cannot be

	gratitude, optimism, and reducing rumination.	linked to one of the components of the PERMA model.
Peters et al. (2017)	Online Positive Psychology interventions specifically target self-compassion, positive emotions, and optimism.	This study was removed as it included a self-compassion component in its intervention. It was decided that self-compassion cannot be linked to one of the components of the PERMA model.
Proyer et al. (2015)	Signature strengths-intervention and bottom-strengths-intervention.	It was decided to remove intervention focused on strength as strength is not a component of the PERMA model and cannot directly be linked to one of its components. Therefore, this study was removed.
Roig et al. (2020)	The study tested a 7-module program called Space for Resilience, which includes cognitive behavioral elements (cognitive flexibility, optimism, challenging negative self-talk, behavioral activation and active coping) and information about social support, lifestyle factors, and values.	It was decided to remove interventions based on cognitive behavioral therapy, as this review aims to specifically investigate positive psychology interventions. Therefore, it was decided to remove this study

Study characteristics

The characteristics of the studies included in this systematic review and meta-analysis are summarized in Table 1. A total of 7,020 participants were involved across all studies, with 5,202 participants allocated to intervention groups and 1,818 participants allocated to control groups. Most studies employed a placebo control group ($n = 13$), with 12 using an early memories exercise and one study using mental health promotion information as the placebo. Additionally, one study employed a waitlist control group, and another used a no-treatment control group.

The majority of the studies targeted healthy adults, specifically excluding participants undergoing psychotherapeutic or psychopharmacological treatment or those consuming illegal drugs ($n = 7$). Six studies targeted the general adult population with the only exclusion criterion being an age under 18 years. Two studies focused on university students, while one study used a sample of HIV-infected men.

All included studies, except the study by Yu (2020), used an internet research website for both assessments and the delivery of interventions to participants. Yu (2020) utilized Facebook for their study by providing participants with instructions for specific actions to take on the platform. Most of the included studies tested multiple different PPIs, examining a variety of interventions. These ranged from the "Three Good Things" exercise (TGT; $k = 7$), various humor-based interventions ($k = 11$), gratitude exercises ($k = 4$), and the "Three Pleasurable Things" exercise (TPT; $k = 4$). Other interventions included a "Nine Beautiful Things" exercise, a compassionate act intervention, an optimism intervention, a photo diary intervention, one PERMA-based intervention, and five separate interventions focusing each on a different component of the PERMA model individually.

All of the interventions tested in the included studies were assessed to aim at increasing positive emotions, thus connected to the PERMA component of positive emotions. Additionally, two interventions were assessed to both aim at increasing positive emotions and improving relationships, thus connected to both of these components of the PERMA model. These were the expression of gratitude intervention tested by Yu (2020) and the compassionate act intervention tested by Mongrain et al. (2010). Moreover, the optimism exercise in which participants were instructed to imagine a positive future tested by Shapira and Mongrain (2010) was assessed to aim both at inducing positive emotions and facilitating goal striving, thus being connected to the PERMA components of positive emotions and achievement. Lastly, the study by Gander et al. (2016) tested both an intervention specifically focusing on all of the PERMA components and interventions focusing on each of the components individually, therefore the intervention tested in this study was assessed to be connected to all of the components of the PERMA model. To summarize, all of the included studies focused on the PERMA component of positive emotion, 11 of these were assessed to be only connected to this component, while two were assessed to be connected to both positive emotion and relationships. Furthermore, one intervention was assessed to be connected both to positive emotion and achievement and one intervention to all of the components of the PERMA model.

The duration of the interventions varied across studies. Twelve studies tested 1-week interventions with daily tasks, one study tested a 3-week intervention with four sessions per week, one study tested a 4-week intervention with daily tasks, and one study tested a 2-week intervention but did not specify the number of sessions. The dropout rates at the post-intervention level varied significantly between studies, ranging from as low as 3.13% in Li et al. (2021) to as high as 50.20% in Woodworth et al. (2016).

Follow-up data was provided at various time points across the studies. Specifically, two studies provided follow-up data at 1-week and 2-weeks post-intervention, twelve studies included a 1-month follow-up, eleven studies had a 3-month follow-up, nine studies provided data at a 6-month follow-up, and one study extended the follow-up period to 12 months.

For measuring happiness, nine studies used the Authentic Happiness Inventory (AHI; Seligman et al., 2005), four studies used the Steen Happiness Index (SHI; Seligman et al., 2005), one study used the Subjective Happiness Scale (SHS; Lyubomirsky & Lepper, 1999), and one study used the General Happiness Scale (GHS; Lyubomirsky & Lepper, 1999)

Table 4*Characteristics of included studies*

Article	Country	Participants	% F	Mean age (range)	Intervention	Connect ion to the PERMA model	Deliver y mode	Control Group	n sessions, duration in weeks	Measurements	Attrition rate, % (post test)	Outcome Measure Happiness
Gander et al. (2016)	Switzerland, Germany & Austria	Adults not undergoing any psychotherapy or psychopharmacological treatment or consumption of illegal drugs (n= 1359)	79.2	46,13 (18-78)	PERMA-based Interventions with 7 different conditions:	P, E, R, M, A	Internet website	Placebo (Early Memories; n= 132)	7 sessions, 1 week	Pre, Post, 1-month FU, 3-months FU, 6-months FU	16.14	AHI

Gander et al. (2017)	Switzerland, Germany & Austria	Adults not undergoing any psychotherapeutic or psychopharmacological treatment or consumption of illegal drugs (n= 509)	82.7	48.16 (19-86)	PERMA (n = 125) Pleasure-based Intervention with 3 conditions: Cognitive focused (n= 123) Emotional focused (n= 124) Emotional and Cognitive focused (n= 119)	P	Internet Website	Placebo (Early Memories; n = 143)	7 sessions, 1 week	Pre, Post, 2-weeks FU, 1-month FU, 3-months FU	25.47	AHI
Gander et al. (2022)	Switzerland, Germany & Austria	Adults not undergoing any psychotherapeutic or psychopharmacological treatment or consumption of illegal drugs (n= 267)	83	43,16 (18-76)	TGT (n= 141)	P	Internet Website	Placebo (Early Memories, n= 126)	7 sessions, 1 week	Pre, Post, 2-weeks FU, 1-month FU, 3-months FU	26.60	AHI
Leary & Dockray (2015)	Ireland?	Adult women (n= 61)	100	28,35 (18-46)	Gratitude (n= 29)	P	Internet Website	WLC (n= 10)	4 sessions per week,	Pre, Middle of study, Post	43.59	SHI

Li et al. (2021)	China	HIV-infected adult men (n=404)	0	NA	TGT (n=139) TGT Social Networking (n=129)	P	Internet Website	Placebo (Mental Health Promotion Information (n=136))	7 sessions per week, 4 weeks	3 weeks Pre, Post, 1-month FU, 3-month FU, 6-month FU, 12-month FU	3.13	SHS
Mongrain et al. (2010)	Canada	Adult (n = 719)	83.36 %	33.63 (18-72)	Compassionate Act (n = NA)	P, R	Internet Website	Placebo (Early Memories, n=NA)	7 sessions, 1 week	Pre, Post, 1-month FU, 3-months FU, 6-months FU	34.1	SHI
Mongrain & Anselmo-Matthews (2012)	Canada	Adult (n = 344)	83%	33 (18-72)	TGT (n=81)	P	Internet Website	Placebo (Early Memories (n=81))	7 sessions, 1 week	Pre, Post, 1-month FU, 3-months FU, 6-months FU	NA	SHI
Proyer et al. (2014)	Switzerland and	Adult women aged 50-79 not undergoing any psychotherapeutic or psychopharmacological treatment or consumption	100 %	55.58 (50-79)	Gratitude visit (n=30) Three good things (n=44)	P	Internet Website	Placebo (Early memories; n=34)	7 sessions, 1 week	Pre, Post, 1-month FU, 3-month FU, 6-month FU	26.67	AHI

		of illegal drugs (n= 510)			Three funny things (n= 20),							
Proyer et al. (2016)	German y & Switzerl and	Adults (n= 113)	90.3 %	43.8 (18= 68)	Nine beautiful things (n= 59)	P	Internet Website	Placebo (Early memori es; n= 54)	7 sessio ns, 1 week	Pre, Post, 1-week FU, 1- month FU, 3- month FU, 6- month FU	47.62	AHI
Shapira & Mongrai n (2010)	Canada	Adults (n= 1002)	81.54 %	34 (18- 72)	Optimism (Imagining positive future; n= 322)	P, A	Internet Website	Placebo (Early memori es; n= 353)	7 sessio ns, 1 week	Pre, Post, 1-mont FU, 3- month FU, 6- month FU	34.83	SHI
Tagalid ou et al. (2019)	Austria	University students over the age of 18, no current psychotherapeuti c treatment and no use of psychotropic drugs or illegal drugs in the last 6 month (n= 182)	85.2	24.91 (18- 61)	Coping humour (n= 35) TFT (n= 46) TGT (n= 52)	P	Internet website	Placebo (Early memori es, n= 49)	7 sessio ns, 1 week	Pre, Post, 1-month FU	39.56	AHI

Wellenzohn et al. (2016a)	Switzerland	Adults, not currently seeing a psychotherapist or using psychotropic drugs (n= 632)	81.49	47.4 (18-80)	TFT (n= 101) Collecting funny things (n= 105) Counting funny things (n= 108) Applying humour (n= 104) Solving stressful situations in a humorous way (n= 109)	P	Internet website	Placebo (Early memories, n= 105)	7 sessions, 1 week	Pre, Post, 1-month FU, 3-months FU, 6-months FU	16.09	AHI
Wellenzohn et al. (2016b)	Switzerland & Germany	Adults not undergoing psychiatric treatment or pharmacological treatment, and	85.8	47.5 (NA)	TFT (n= 180) TFT future variant (n= 189)	P	Internet website	Placebo (Early memories, n= 166)	7 sessions, 1 week	Pre, Post	24.95	AHI

		no use of illegal drugs (n= 695)			TFT past variant (n= 160)								
Woodworth et al. (2016)	Australia	Adults (n= 72)	85	43 (18-83)	Gratitude visit (n= 11) TGT (n= 24)	P	Internet website, E-Mail delivery of instructions	Placebo (Early memories, n= 20)	7 sessions, 1 week	Pre, Post, 1-week FU, 1-month FU, 3-month FU, 6-month FU	50.2	AHI	
Yu (2020)	Taiwan	University students (n= 151)	75	NA	Photo Diary (n=NA) Expression of gratitude (n=NA)	P, R	Facebook	No treatment control group (n= NA)	NA, 2 weeks	Pre, Post, 1-month FU	5.88	GHS	

Quality Assessment of included Studies

The results of the quality assessment can be seen in Table 1. The quality score of the included studies ranged from 1 to 7 ($M= 4.93$, $SD= 1.95$). Four of the included fifteen studies have been rated as of high quality, eight studies of medium quality, and three studies of low quality. All of the studies were conducted by experienced, trained, or schooled professionals. All except one study reported the dropout rates and all except 3 studies reported the inclusion or exclusion criteria. The majority (10 out of 15) of the included studies had had an adequate power analysis or a total of minimal 64 participants per group, but only five studies performed an intention-to-treat analysis. Moreover, none of the included studies checked for Treatment integrity. Lastly, nine out of the fifteen studies described their randomization process and assessed the compatibility of the outcome measure at baseline.

Table 5

Quality assessment of the included studies

Article	1	2	3	4	5	6	7	8	Total
Gander et al. (2016)	1	1	1	1	1	0	1	1	7
Gander et al. (2017)	1	1	0	1	1	0	1	1	6
Gander et al. (2022)	1	1	0	1	1	0	1	1	6
Leary & Dockray (2015)	0	0	0	1	0	0	0	0	1
Li et al. (2021)	1	1	1	1	1	0	1	1	7
Mongrain et al. (2010)	0	1	0	1	1	0	0	1	4
Mongrain & Anselmo-Matthews (2012)	0	1	0	1	1	0	0	1	4
Proyer et al. (2014)	1	1	0	1	0	0	0	1	4

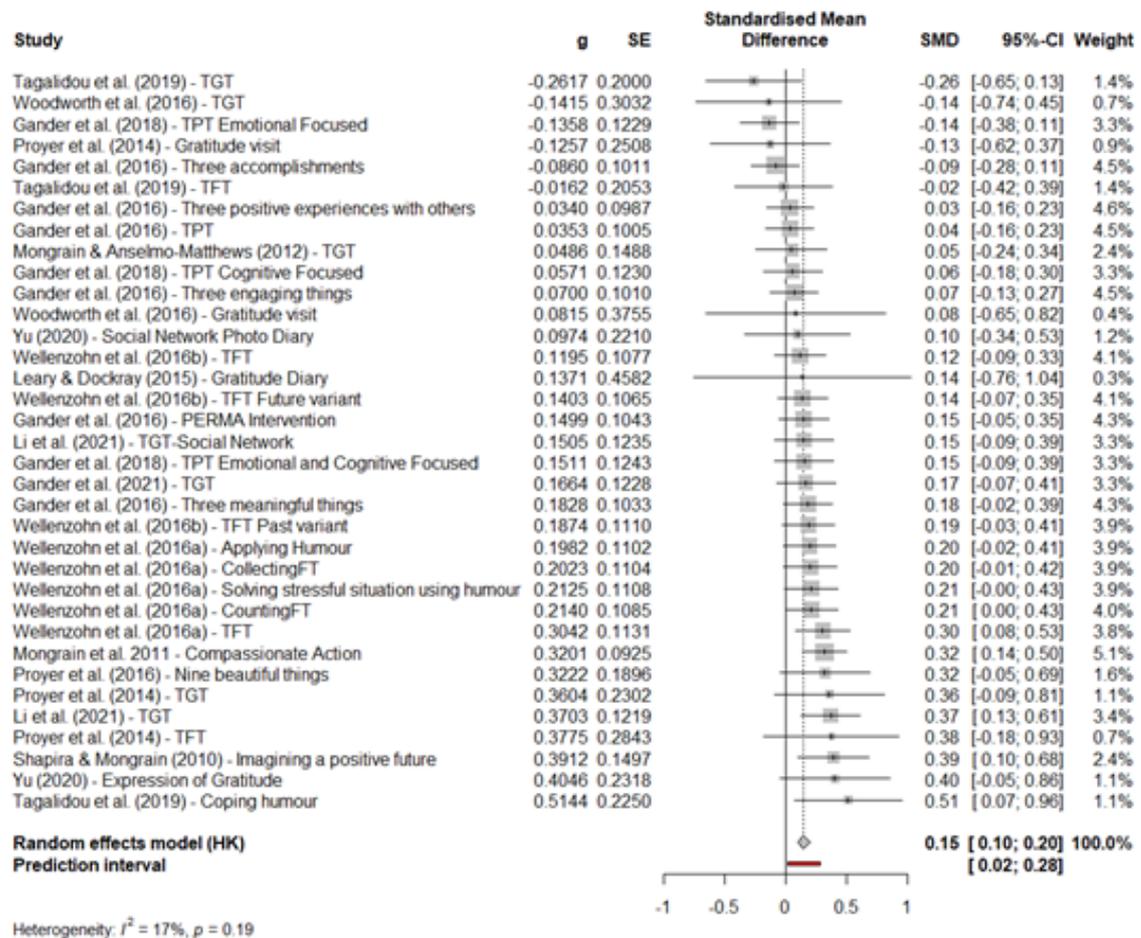
Proyer et al. (2016)	1	1	0	1	0	0	1	1	5
Shapira & Mongrain (2010)	0	1	1	1	1	0	1	1	6
Tagalidou et al. (2019)	1	1	1	1	1	0	1	1	7
Wellenzohn et al. (2016a)	1	1	1	1	1	0	1	1	7
Wellenzohn et al. (2016b)	1	1	0	1	1	0	1	1	6
Woodworth et al. (2016)	0	1	0	1	0	0	0	0	2
Yu (2020)	0	1	0	1	0	0	0	0	2

Post-test effects

The random effects model showed that OPPIs based on the PERMA model were effective in increasing levels of happiness. The pooled effect size of 35 included experimental groups was $g = 0.149$ (95% CI [0.098, 0.199], $p < .0001$), indicating a small but statistically significant positive effect. This suggests a consistent benefit of the interventions across the included studies. Heterogeneity measures indicated low heterogeneity ($I^2 = 17.0\%$, 95% CI [0.0%, 45.5%]; $t^2 = 0.004$, 95% CI [0.000, 0.021]). Moreover, the test for overall heterogeneity ($Q(34) = 40.96$, $p = .192$) was not significant, suggesting that the variability in the effects can largely be attributed to sampling error. The prediction interval for future studies was wide ([0.016, 0.282]), indicating that variations in effect sizes in similar future research can be expected. The effect size of the individual studies at post-test is plotted in Figure 2.

Figure 2

Forestplot for post-test effects of OPPIs based on PERMA on happiness



Sensitivity Analysis

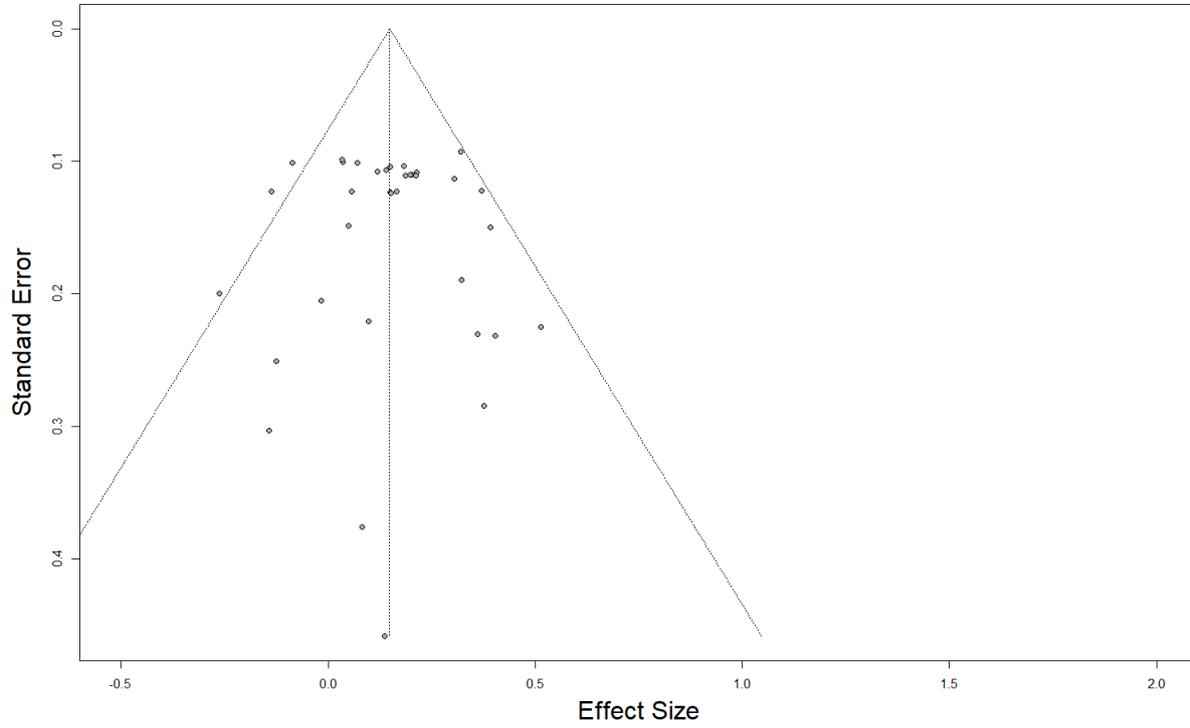
No outliers were detected. Utilizing a Baujat plot three studies were identified that contributed most substantially to the heterogeneity: Gander et al. (2016) – Three accomplishments, Gander et al. (2018) – TPT Emotional Focused, and Tagalidou et al. (2019) – TGT. Leave-One-Out Meta-Analysis indicated that removing these influential studies minimally affected the pooled effect size and showed a slight reduction in the already quite low I^2 , thus demonstrating the robustness of the meta-analytic findings.

Sensitivity analysis, conducted by excluding the three identified influential studies, resulted in a slight increase in the pooled effect size ($g = 0.1761$, 95% CI [0.1341, 0.2181], $p < .0001$) and showed that heterogeneity was effectively null ($\tau^2 = 0$ [95% CI [0.0000, 0.0075]]; $I^2 = 0.0\%$ [95% CI [0.0%, 39.7%]]; $Q(31) = 24.59$, $p = .7857$), suggesting extremely consistent effect sizes across the remaining studies.

Moreover, a subgroup analysis on study quality was conducted, comparing studies assessed as of high quality to those assessed as low or medium quality. The results indicate that both high-quality ($k = 16$) and low or medium-quality studies ($k = 19$) showed small positive effects. Specifically, the effect size for the high-quality studies was $g = 0.141$ (95% CI [0.063, 0.220]), and $g = 0.159$ (95% CI [0.085, 0.232]) for the low or medium-quality studies. Heterogeneity was low across both subgroups, with $I^2 = 33.2\%$ for high-quality studies and $I^2 = 1.6\%$ for low or medium-quality studies, indicating little variation in the observed effect sizes within each group. The test for subgroup differences did not indicate any statistically significant differences between the high- and low or medium-quality studies ($Q = 0.12$, $p = 0.7299$), suggesting that study quality did not significantly influence the overall effect size.

Publication Bias

Publication bias was assessed through the creation of a funnel plot (see Figure 3) and subsequent statistical testing via Egger's regression test. The funnel plot showed a symmetrical distribution and the regression intercept does not suggest that publication bias exists (intercept = 0.084, $t(34) = 0.146$, $p = .885$). Given the absence of detected asymmetry and non-significant Egger's regression test, the Duval & Tweedies Trim and Fill method was not applied.

Figure 3*Funnel plot***Follow Up Results**

Of the included 16 studies 14 collected follow-up data from 1 week after the intervention up to 12 months after the intervention. Considering that most studies collected follow-up data for 1-month, 3-month, and 6-months, and only a few included a 1-week and 12-month follow-up, it was decided to examine follow-up effects for the 1-month, 3-month, and 6-month follow-up data. For the 1-month follow-up data, 28 experimental groups from 11 studies were available, for the 3-month follow-up data 26 experimental groups from 11 studies were available, and for the 6-month follow-up data, 22 experimental groups from 9 studies were available. The random-effects model demonstrated small but significant effects for the 1-month follow-up ($g = 0.154$, 95% CI [0.080, 0.228], $p = 0.0002$) and 3-month follow-up ($g = 0.258$, 95% CI [0.034, 0.483], $p = 0.026$). For the 6-month follow up a non-significant effect was found ($g = 0.249$, 95% CI [-0.026, 0.524], $p = 0.073$). Heterogeneity

measures showed non-significant heterogeneity for the 1-month follow-up ($Q= 44.72$, $p= 0.017$) and I^2 statistic indicated low heterogeneity ($I^2 = 39.6\%$, 95% CI [4.9%, 61.7%]). For the 3-month follow up a significant moderate and high heterogeneity was found ($Q= 250.66$, $p < 0.0001$; $I^2 = 90\%$, 95 CI [86.6%; 0.568]), as for the 6-month follow-up ($Q= 192.70$, $p < 0.0001$; $I^2 = 89.1\%$ [84.9%, 92.2%]).

Discussion

This meta-analysis sought to answer the research questions: Are Online Positive Psychology Interventions (OPPIs) that are based on the PERMA model effective in increasing happiness among adults? Consistent with prior research, we hypothesized that OPPIs would achieve significant low to moderate improvements in happiness. Our findings supported this hypothesis, showing a small but significant positive effect on happiness across the included studies. The result aligns with previous meta-analyses of PPIs (Bolier et al., 2013; Sin & Lyubomirsky, 2009) which found small to moderate effects on well-being. While these previous meta-analyses focused on all PPIs, this study focused solely on OPPIs, thus showing that these positive effects seem to be also present in online interventions. By narrowing the scope to online-delivered interventions, this meta-analysis extends prior research by demonstrating that the positive effects of PPIs can be effectively translated into digital formats, showing their potential to provide scalable and accessible options for enhancing happiness. Furthermore, while previous research demonstrated significant effects on broader well-being outcomes, this study specifically highlights the significant impact that OPPIs can have on happiness, supporting their potential to improve this specific dimension of well-being.

Furthermore, the low heterogeneity observed in our results suggests that the effectiveness of OPPIs based on the PERMA model is generally consistent across different

studies, providing robust evidence that these interventions reliably improve happiness in adult populations. The subgroup analysis on study quality further supports this consistency, as no significant differences between high-quality and low or medium-quality studies were found. Additionally, no evidence of publication bias was detected, no outliers were found, and the conducted sensitivity analysis showed minimal to no difference when removing influential cases. These findings support the robustness of the evidence found, suggesting that the small positive effects of OPPIs on happiness are consistent and reliable across the included studies.

Analysis of follow-up data showed that the effectiveness of these interventions was relatively stable over time, with small but significant effects observed at both 1-month and 3-month follow-ups. However, the effect size at 6 months was not statistically significant, suggesting that while OPPIs can lead to short-term happiness improvements, their long-term impact may diminish. Interestingly, our analysis showed that the effect size increased at the 3-month and 6-month follow-up. This suggests that, even though the interventions were brief, participants continued to experience positive changes in happiness up to 6 months post-intervention. However, the effect at 6 months, despite being larger than post-intervention and 1-month follow-up effect size, did not reach statistical significance. These results are partly in line with the results of previous meta-analyses on follow-up data. Studies by Bolier et al. (2013) and Carr et al. (2023) showed small significant effects at 3 to 6 months and significant effects at 7.5 months follow-up on well-being, respectively. Thus, similarly to these earlier studies, significant small effects were found in the short term and long term. Contrary to these studies the effect size at 6-month follow-up showed no statistical significance. One possible explanation for the increased effect size but non-statistical significance at the 6-month follow-up could be an issue of statistical power. Statistical power is determined by both the size of the effect and the sample size. In the case of the 6-month follow-up, while the effect size increased, the sample sizes in many of the studies were reduced due to participant

dropout, which is common in long-term follow-up studies. Moreover, not all of the included studies provided follow-up data for 6 months post-intervention, reducing the sample size included in the meta-analysis. As sample sizes decrease, the ability to detect statistically significant effects diminishes, even if the effect size remains moderate or increases. This reduction in statistical power may explain why the observed effect at 6-month follow-up was not significant, despite being of a comparable size to the 3-month follow-up.

Moreover, high and significant heterogeneity was observed at 3-month and 6-month follow-up compared to low and non-significant heterogeneity at post-intervention and 1-month follow-up. This increase in heterogeneity suggests that the effects of OPPIs on happiness may vary more across studies for long-term outcomes. This high heterogeneity complicates the interpretation of the long-term effects of OPPIs. While the increasing effect sizes suggest that the interventions may continue to benefit participants over time, the wide variability across studies indicates that these benefits are not experienced uniformly. This means that while some participants or studies may show strong positive effects at 3 and 6 months, others may show little to no improvement, leading to a broader range of outcomes. As a result, it is important to interpret the long-term findings with caution and recognize that the effectiveness of OPPIs may depend on factors such as participant engagement, study design, and contextual variables. Future research should aim to explore the moderators that contribute to this heterogeneity to better understand for whom and under what conditions OPPIs are most effective for positive long-term outcomes.

The findings of this study align with and expand the existing literature on OPPIs. Previous reviews, such as those conducted by Baños et al. (2017) and Francis et al. (2021), summarized the results of OPPI in the adolescent population and school settings, using a narrative synthesis, showing positive results of the included studies. Both reviews highlighted the need for more controlled studies and a quantitative analysis to better determine the

effectiveness of these online interventions. In line with the positive outcomes reported in these studies, this meta-analysis demonstrated the positive effects of OPPIs on happiness. Importantly, this study contributes to the literature by offering a quantitative summary and analysis of the effectiveness of these interventions, while also shifting the focus to the adult population. By doing so, it provides a more comprehensive understanding of the impact of OPPIs across different age groups and underscores their potential for promoting well-being beyond adolescent and school-based contexts.

Furthermore, this study extends the research by utilizing the PERMA model as a theoretical framework, which provides a more structured approach to understanding and enhancing well-being. The small but significant effect sizes observed in our analysis are consistent with previous meta-analyses on PPI (Bolier et al., 2013; Carr et al., 2023; Sin & Lyubomirsky, 2009), which found low to moderate improvements in well-being. However, unlike earlier studies, this review offers a more precise assessment by narrowing the scope to interventions explicitly aligned with the PERMA model, focusing on happiness as the primary outcome and specifically focusing on online interventions.

The low heterogeneity observed in this study contrasts with the high heterogeneity reported in earlier meta-analyses (Bolier et al., 2013; Carr et al., 2023; Sin & Lyubomirsky, 2009), which included a broader range of interventions and outcomes. This suggests that by focusing on a specific theoretical model and outcomes, we can achieve more consistent and reliable results, providing a more robust picture of the efficacy of these specific interventions on happiness.

To conclude, this was the first meta-analysis conducted on specifically OPPIs. The results showed similar effect sizes to previous meta-analyses that focused on PPIs, thus suggesting that these interventions can also provide significant positive effects in an online

format. Moreover, considering that most of the included studies tested a short 1-week intervention, the results suggest that these brief online interventions can meaningfully contribute to enhancing happiness among adults. This finding is particularly relevant in the context of the increasing demand for scalable and accessible mental health interventions (Alvarez et al., 2022). The observed effect indicates that even short engagement with OPPIs can lead to improvements in happiness even in 3 months follow-up, supporting their potential as valuable tools in promoting mental health and well-being on a broader scale. However, a non-significant effect size at the 6-month follow-up and high heterogeneity observed at the 3-month and 6-month follow-up, raise concern about their effectivity in maintaining improvements in happiness. Further longitudinal research is needed to provide clearer insights into the long-term effectiveness of these interventions.

Limitations

While this systematic review and meta-analysis provide valuable insights into the efficacy of OPPIs, several limitations must be acknowledged.

First, the generalizability of the findings may be limited by the characteristics of the included studies. The majority of the included studies focused on well-educated and predominantly Western populations, which may not fully represent the diversity of the global adult population. This potential sampling bias limits the applicability of the results to individuals from non-western cultures or those with different socio-economic backgrounds. Cultural factors, such as values around well-being and mental health, may influence the effectiveness of OPPIs. Therefore, the observed effects may not be generalizable to more diverse populations. Future research should aim to include a broader range of participants to better assess how cultural and socioeconomic factors influence the effectiveness of OPPIs.

Second, the included studies relied on self-reported measures of happiness, which introduces potential response biases such as the social desirability bias. Self-reported measures may inflate the observed effects due to participants' desire to present themselves in a positive light, particularly in studies advertised as interventions to enhance well-being. While it was not possible to fully eliminate this bias due to the nature of the studies included, the use of validated, widely accepted happiness measures that were used by the included studies, helps to standardize self-reporting across studies. Additionally, most of the included studies were advertised as intervention studies for increasing well-being, to prospective participants. Those who self-select into these kinds of studies may already be more inclined towards self-improvement, potentially reporting more positive outcomes simply due to their enthusiasm or optimism about the intervention, rather than the intervention itself. While it is challenging to mitigate self-reporting biases, as it is difficult to measure happiness in any other way, self-selection bias can be addressed in future research, by using a random sampling method to recruit participants from a broader population rather than allowing self-selected individuals to enroll in the study. Random sampling can reduce the likelihood that only people who are already motivated toward self-improvement or well-being interventions will participate. This helps to ensure that the study sample is more representative of the general population and provides a clearer picture of the potential positive impact these interventions can have.

Third, the follow-up periods in the included studies were relatively short, with most studies providing data for only up to 3 months post-interventions. The non-significant effects observed at the 6-month follow-up indicate a lack of power and the lack of long-term data limits the ability to draw definitive conclusions about the sustainability of these effects. The inclusion of the available 6-month data allowed for some analysis of longer-term effects, though the results were limited by smaller sample sizes. To address this limitation, future

research should aim for longer follow-up periods to provide a more comprehensive understanding of the lasting effects of OPPIs.

Furthermore, certain limitations in the review process must be acknowledged. First, this meta-analysis relied on published data, which may not always provide all the necessary details for thorough analysis. For instance, several studies did not report complete information on the distribution of participants between intervention and control groups. This lack of transparency regarding participant allocation could obscure potential imbalances that may compromise the internal validity of these studies. Uneven distributions across conditions can skew the outcomes, potentially leading to over- or underestimation of the true effects of the interventions. To mitigate this issue, this review assessed the methodological quality of the included studies and conducted a sensitivity analysis, comparing meta-analytical results between studies with high methodological quality and those with low to moderate methodological quality. Future research should emphasize transparent and comprehensive reporting, adhering to established guidelines such as PRISMA guidelines (Page et al., 2021), to ensure that all relevant information is fully documented and accessible for thorough evaluation.

Second, the review process involved a single reviewer for the study selection, quality assessment, and data extraction, which increases the risk of selection and extraction bias. Without a second independent reviewer, there is a higher likelihood of subjective judgments influencing the inclusion and exclusion of studies, the assessment of their quality, and the accuracy of data extraction. This lack of independent verification can introduce errors or biases at multiple stages, which may compromise the objectivity and rigor of this review. Although a second reviewer was not available for this review, systematic procedures were followed to minimize bias, including the use of predefined inclusion and exclusion criteria, a predefined extraction form, and the use of a predefined quality assessment tool. These steps

helped to ensure consistency and reduced the likelihood of errors. However, the lack of independent verification remains a limitation, as systematic reviews with multiple reviewers tend to produce more reliable and accurate results (Waffenschmidt et al., 2019).

Implication for Practice, Policy, and Future Research

The findings of this study have important implications for the application of OPPIs in both practice and policy, as well as for guiding future research in the field of positive psychology.

Implication for Practice

The small but significant positive effects of OPPIs on happiness highlight their potential as valuable tools for enhancing well-being in various adult populations. While the effect is significant the effect size is rather small suggesting that the effect may not be sufficient for profound changes in happiness. Particularly in clinical settings where larger effects are often necessary to address more severe well-being deficits. However, the small effects could be particularly valuable in population-wide interventions, where even a modest increase in happiness could have significant aggregate benefits across a large group of people. Especially considering that most of the interventions in the included studies are short 1-week interventions and provide advantages in accessibility and scalability due to being delivered online. This scalability and accessibility make OPPIs particularly attractive for broad application in non-clinical contexts, such as workplaces, schools, and communities. Given their brief duration, often just one week, these interventions are easy to integrate into existing programs without requiring significant time or resource investment. For example, in organizational settings, OPPIs could be used as part of employee well-being programs to boost overall happiness and productivity, even if the individual impact is small. Similarly,

educational institutions could incorporate OPPIs to promote mental well-being among students, contributing to a positive learning environment.

For individuals, especially those seeking significant and lasting improvements in happiness, the small effect may not be sufficient, and more extensive intervention may be necessary for more profound changes. More intensive, face-to-face, hybrid, or multi-component intervention may be required for stronger effects on happiness. However, for those looking for smaller boosts in happiness or those looking for short exercises exercise to integrate into their daily life to boost their happiness and well-being, OPPIs could serve as a useful tool. Furthermore, using OPPIs as a supplementary activity alongside other therapeutic approaches could help individuals, especially those needing more extensive therapeutic care, to sustain or enhance their happiness.

Implications for Policy

The demonstrated effect of OPPIs on improving happiness offers important opportunities for shaping public health and mental health policies. Given the scalability, cost-effectiveness, and accessibility of these interventions through digital platforms, policymakers should consider their inclusion in well-being initiatives aimed at large populations. OPPIs could be integrated into national and community mental health programs to promote well-being at a broader scale. Their ease of delivery and low cost make them ideal for public health campaigns targeting the general population. Governments could fund and support digital well-being platforms that incorporate OPPIs as part of national mental health strategies aimed at improving well-being and overall life satisfaction.

Implication for Future Research

Several implications for future research were identified. First, future research should further investigate the long-term effectiveness of OPPIs, as a lack of power was present for

the 6-month follow-up data in this meta-analysis. Research on follow-up periods is essential for determining whether the positive effects of OPPIs are being sustained over time.

Longitudinal studies with extended follow-up periods would provide valuable insights into whether these interventions can achieve sustained effects on happiness.

Furthermore, given the significant heterogeneity observed in the results at the 3- and 6-month follow-ups, future studies should aim to understand the moderators that influence the effectiveness of OPPIs in long-term outcomes. This includes potential factors such as participant engagement, intervention design, cultural differences, or baseline happiness levels. Research that identifies for whom and under what conditions OPPIs achieve lasting effects would help optimize the application of these interventions for different populations and settings.

Moreover, the majority of the included studies in this meta-analysis focused on well-educated, predominantly Western populations. To improve the generalizability of the findings, future research should aim to include a more diverse range of participants in terms of cultural background and socio-economic status. This will help assess how cultural and socioeconomic factors influence the effectiveness of OPPIs and ensure that the interventions apply to a broader audience.

Additionally, more research on clinical populations is needed, to assess whether PPIs in an online format can increase happiness and well-being in a clinical setting. Such studies would provide valuable insights into the applicability and efficacy of OPPIs for individuals with mental health conditions, informing their use in clinical practice. Research should aim to investigate whether these interventions can also have a significant impact on more vulnerable populations and assess whether OPPIs can serve as a valuable complement to traditional therapeutic approaches.

Lastly, given the small effect sizes observed, future research should explore whether multicomponent or more extensive, longer-duration OPPIs could achieve stronger effects on happiness. Most of the studies included in this review tested short 1-week interventions, typically consisting of brief daily exercises. This raises the question of whether more intensive or prolonged interventions, which involve multiple components or extended engagement, might lead to more substantial improvements in happiness. Investigating the potential for longer interventions to enhance happiness could provide valuable insights into the optimal structure and duration of OPPIs to maximize their impact.

Conclusion

This systematic review and meta-analysis provides compelling evidence for the effectiveness of OPPIs based on the PERMA model in enhancing happiness among adults. While the observed effects are small, they are consistent and significant, supporting the potential of these interventions as accessible, scalable tools for improving happiness. These results extend prior research by demonstrating that the positive effects of PPIs can be effectively translated into digital formats, making OPPIs a promising option for promoting well-being on a broad scale.

However, the small effect sizes observed, raise important questions about the practical significance of these interventions. While the effects are statistically significant, their magnitude may not be sufficient to produce profound individual changes in happiness, particularly in clinical settings where larger effects are often necessary. Nevertheless, these small effects might be meaningful when applied to large populations, as even modest increases in happiness can lead to substantial aggregate benefits. Future research should further investigate whether more intensive or multi-component OPPIs can achieve stronger

effects and explore ways to maximize the impact of these interventions, especially when considering their application for individual use in clinical and therapeutic settings.

Overall, this meta-analysis contributes to the growing body of literature on digital interventions for well-being and underscores the potential of OPPIs to be integrated into broader public health and mental health strategies. However, more research is required to optimize these interventions, ensure their applicability across diverse populations, and determine how best to enhance their effectiveness.

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