



Picture This! Bringing joy into Focus and Developing Healthy Habits of Mind: Rationale, design, and implementation of a randomized control trial for young adults



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ABSTRACT

Research shows that daily experiences of awe, curiosity, gratitude, joy, and love can put the average person on a trajectory of growth, success, and positive social connection, and can also prevent those who are suffering from following a downward spiral. Nonetheless, data show that most people are not functioning at optimal capacity. In fact, just 20% of people may be categorized as “flourishing,” with the vast majority of people merely “languishing,” at risk for mental health issues, or with clinical levels of mental health concerns. Despite the success of the Positive Psychology movement and the proliferation of Positive Psychology Interventions, the field remains in need of high quality studies that test potential mechanisms of change. The *Picture This!* intervention, informed by Positive Psychology principles, was designed to improve well-being and decrease depressive symptoms in young adults. This paper details the rationale, design, and implementation of a 4-group randomized control trial (RCT) to test the effectiveness of *Picture This!*. Specific indices of mental health and well-being (e.g., depressive symptoms, gratitude) were measured at baseline and at the conclusion of the intervention along with potential mechanisms of change (i.e., attentional bias, cognitive style), while positive emotion and general well-being were assessed daily over the 21-day intervention period. If successful, this intervention may provide critical behavioral, cognitive, and attentional tools that, once internalized, can be drawn upon for years to come.

1. Background

Although clinical psychology research has historically focused on populations presenting with pathology, the past two decades have seen increased interest in behavioral interventions that may help all members of the population, in addition to those suffering from mental health problems [1,2]. Despite the sheer number of Positive Psychology Interventions (PPIs) created and tested in response to this successful movement [3,4], the science is still catching up to the excitement: it is not always clear how or why interventions work, given limited replications of successful interventions and the fact that tests of mechanism or dismantling studies are in short supply. Moreover, only recently have overarching conceptual frameworks been suggested to integrate findings and identify catalysts responsible for positive change (i.e., [5]).

We designed the current study to advance the state of the field by building upon the PPI literature and testing mechanisms of change – specifically attentional bias – with a novel intervention designed to change habits of the mind in a way that is easily accessible, appealing,

and practical. The intervention approach is also aligned with several strategies (i.e., situation selection, attentional deployment) delineated in the process model of emotion regulation as applied to PPIs [5]. We offered young adults a simple daily exercise hypothesized to increase well-being and decrease common forms of suffering. Our assessments were constructed to measure purported mediators. We first review the literature undergirding the intervention and one potential mechanism of change, then describe the intervention in detail.

1.1. Positive Psychology Interventions

The premise of attending to the good things in one's life as a causal path to well-being is consistent with correlational work from two different, but related, constructs — grateful disposition and savoring — that show robust patterns of association with well-being measures in the broader literature. For example, people with a grateful disposition (i.e., those who tend to recognize and give thanks for the contributions others have made toward their positive experiences) are more likely to experience life satisfaction and happiness and less likely to report

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internalizing symptoms (e.g., Refs. [6,7]). People high in savoring beliefs, defined as confidence in one's ability to increase and expand pleasurable moments, are more likely to report higher levels of current happiness and self-esteem and lower levels of depression and strain [8] compared to people low in savoring beliefs.

One reason we believe this intervention will be beneficial for young adults is that it potentially creates more opportunities to experience positive emotions in daily life. The daily exercises are intended to train attention toward the positive, positing that the cognitive broadening associated with momentary positive emotional experiences [9] may loosen negative habits and replace them with opportunities for growth. In addition to causing attentional shifts, active cultivation of positive emotions like joy and gratitude may promote mental and physical health (e.g., Refs. [10–12]). Grounded in this literature on moments of positive emotions, we believe such effects, if causal, may be due to the attention these people give to positive emotional moments in their everyday lives and the efforts they make to seek out such moments, which, in turn, produce beneficial effects on socioemotional health (e.g., Ref. [13]).

1.2. Cognitive Bias Modification (CBM – mechanism of change)

The association between cognitive biases and psychopathology has been well articulated (e.g., Ref. [14]). Biases in information processing, including those related to attention, memory, and interpretation, impact how individuals make sense of, react to, and behave in the face of environmental stimuli; these biases predispose people to clinical disorders like depression (see Ref. [15]; for a review). Cognitive psychologists developed an experimental paradigm, CBM, to manipulate and examine biases in attention [16,17]. Using this paradigm, researchers have successfully induced negative biases and worsened mood symptoms in community samples (e.g. Ref. [18]), and, more recently, *reduced* negative biases and decreased anxiety (see Ref. [16]; for a review) and depressive symptoms (e.g. Refs. [19–23], in clinical samples.

It is becoming clear that training attention is a viable method for changing the ingrained habits of mind that can lead individuals on a downward psychological trajectory [5]. Building on this foundation, the current study targets improvement in mental and physical health and the reduction of depressive symptoms, by training attention toward positively-valenced stimuli, with a focus on enhancing the psychological trajectory, in non-clinical populations.

2. Methods

2.1. Objectives

This paper describes the design and implementation of *Picture This! Bringing Joy into Focus and Developing Healthy Habits of Mind*, an innovative, technology-based intervention designed to train attention toward positive cues, increase savoring, and, in turn, increase well-being and decrease suffering in the form of depressive symptoms. The intervention targeted young adults in a large Northeastern city. After baseline assessment, participants were randomly assigned to one of four conditions: two active experimental conditions – Picture This! (PT) and Picture This! Plus Social Sharing (PTPSS) – and two control conditions – Document This (DT) and a no-photo control group (NPC). For 21 days, participants assigned to the PT and PTPSS active conditions were directed to use their Smartphones at least twice a day to take a photograph of an experience that elicited a positive emotion and *then* to review the photographs and relive those moments that same evening via an online savoring exercise. In addition, PTPSS participants were asked to share their photographs, in person, with a friend or loved one once each week.

Overall, the Smartphone intervention was designed to a) retrain attention in everyday life toward moments of joy, awe, curiosity, and

gratitude, b) encourage the savoring of such moments, c) increase social connectedness by sharing these moments, and, in turn, d) improve mental and physical health indices.

Specific theoretically-derived variables were assessed, and cognitive and behavioral mechanisms will be tested in future analyses. This project was supported by the John Templeton Foundation and approved by the participating universities' Institutional Review Boards.

2.2. Participant recruitment & enrollment

Participants included young adults between the ages of 18–33 years who met the following inclusion criteria: (1) at least 18 years of age, (2) currently enrolled as an undergraduate, graduate, or medical student in the larger catchment area, (3) owned a Smartphone and had an active email address with daily access to the internet, and (4) demonstrated interest in participating in the study and returning for a follow-up lab visit. Recruitment methods ranged from flyering at public locations and Facebook posts to targeted flyering, in-class and email announcements, electronic advertisement boards and tabling on a university campus, and provision of class credit for students in introductory psychology courses. We did not specifically target a clinical sample, however, some recruitment materials were designed to attract participants with negative biases, and flyers were posted in the university Counseling Center.

Interested individuals who met the eligibility requirements at the screener stage provided informed consent and were scheduled to complete the baseline assessment.

2.3. Overview of procedure

Following the baseline assessment, participants were assigned to one of four conditions using a random number generator. This was done in blocks to ensure equal numbers of participants in each condition. Folders with relevant materials for each participant were created in advance, ensuring that research assistants who administered the baseline assessment remained unaware of condition during the assessment phase and only learned the subject's assignment once they referenced instructions regarding participant engagement.

The day following the baseline, individuals in *all* groups began receiving an automated email with a link to a daily survey about their emotions and general satisfaction with life (described below); emails were sent for 21 consecutive days with the link and a reminder for participants to complete the daily survey. Participants in three conditions (PT, PTPSS, DT) were randomly assigned to take photographs and complete an additional savoring/documentation exercise at the end of each day, as described below, whereas the fourth (NPC) did not receive those additional instructions. In addition, PT, PTPSS, and DT individuals were provided a daily text or email reminder (based on participant preference) to take the photographs; reminders were sent daily for the first week and then titrated to every 3rd day for 3 additional reminders before discontinuing. Participants in the picture taking conditions were oriented to the platform for uploading pictures to a shared drive accessible only by study staff. Finally, all participants also completed a weekly web-based questionnaire to assess whether photos taken as a part of the intervention (for the PT, PTPSS, and DT groups) were shared or whether photographs taken as a part of daily life (NPC) were shared. Approximately four weeks after the baseline assessment, all participants were invited back to the lab to complete the follow-up assessment, and to be remunerated for their participation.

2.4. Description of study arms

The PT condition served as the primary experimental condition, and the PTPSS condition was considered a potentially enhanced experimental condition given research regarding the impact of sharing positive experiences [24]. To rule out intervention effects based solely on taking daily photographs (without regard to content), we utilized an

active control condition, DT, described below. Finally, a passive, no photo control (NPC) was also utilized.

2.4.1. Intervention instructions: Picture This!

Participants in the PT condition were instructed to use their Smartphones to take at least two photographs of an event/moment/place that stimulated a positive mood state, each day for 3 weeks and to upload those photographs to a server available to study staff. Examples of photo suggestions provided to participants included “the color of the sky at sunset,” “seeing a good friend,” and “getting back a good grade on a paper or test you worked hard for.” They were also instructed to focus on the physical sensations and cognitive and emotional responses that accompanied the positive moment they chose to photograph (i.e., sensory-perceptual sharpening; [25]. Each evening, they were directed to (1) review their photos, (2) relive and savor the sensations evoked by the photograph(s) taken that day (which theoretically sharpened awareness of sensory-perception and built positive memories), and (3) complete a web-based survey, designed in part to encourage memory, and further processing and savoring, of those moments.

2.4.2. Intervention instructions: Picture This! Plus Social Sharing

Participants in the PTPSS condition were given the same instructions as those in the PT Condition, with the added component of reviewing the photographs in person with a friend, relative, or loved one of their choosing at the end of each week. A suggested script was provided to aid participants in successfully negotiating this sharing experience.

2.4.3. Intervention instructions: Document This active control

Participants in the DT condition were asked to take at least two photographs each day using a Smartphone. However, they took photographs to document the details of their day, producing photos of “a day in the life.” Examples of photographs provided to participants included “your grocery list,” “the book you’re currently reading,” and “the steps of your morning routine.” This meant that participants were not directed to focus on positive emotions but rather could naturalistically choose the emotional content of the photos at a given time, whether positive, negative, or neutral. Parallel to the experimental intervention conditions, participants in this condition were asked to review and relive their photos each evening and complete a series of questions via an internet-based survey.

2.4.4. Intervention instructions: No photo control (NPC)

Participants in the NPC group were not directed to take or review any photographs or to complete nightly exercises designed to enhance savoring.

3. Measures & statistical methods

3.1. Power analysis and sample size

The RCT was designed to have adequate power to statistically detect effects, if present (i.e., minimum of 95% power). Using small to medium estimates of effect size, we determined a minimum sample size of 144 (36 in each group) would be necessary to conduct our primary analyses with repeated measures ANOVAs. However, given expected attrition, we planned to over-enroll and succeeded in enrolling 256 participants who were consented and completed the baseline assessment, of which 223 (87%) completed the intervention and follow-up assessment.

3.2. Assessment and hypotheses

At the initial baseline assessment, as well as the post-intervention follow up, all participants completed a packet of self-report questionnaires, which would allow for testing changes in the primary outcomes, and a computerized dot-probe attention task, to allow for testing

Table 1
Assessments administered at each time point.

Pre & Post	
Construct	Measure
Demographics	1. Measure created for study (pre-intervention only)
Positive/Negative Emotion	2. Modified Differential Emotion Scales (MDES) [26];
Savoring	3. Savoring Beliefs Inventory (SBI) [8];
Depression	4. Beck Depression Inventory – II [27];
General Satisfaction	5. Satisfaction with Life Scale [28];
Self Esteem	6. Rosenberg Self Esteem Measure [29];
Gratitude	7. Gratitude Questionnaire – 6 [6];
Mindfulness	8. Carolina Empirically-Derived Mindfulness Inventory [30];
Health	9. Scale of Physical Symptoms [31];
Sleep	10. Pittsburgh Sleep Quality Inventory [32];
Emotion Regulation	11. Emotion Regulation Questionnaire [33];
Anxiety	12. State Trait Anxiety Inventory – Trait Subscales [34];
Social Support	13. Medical Outcomes Study Social Support Survey [35];
Social Connection	14. Social Connectedness Scale [36];
Cognitive Style	15. Cognitive Style Questionnaire-Short Form [37];
Interpretation Bias	16. Scrambled Sentences Test [38];
Interpretation Bias	17. Ambiguous Situation Task [18];
Attentional Bias	18. Computerized Task
Daily Positive/Negative Emotion	1. Modified Differential Emotion Scales (MDES) [26];
Well being; gratitude	2. Questions created for study and also drawn from several measures: The Gratitude Questionnaire-6 (GQ-6) [6]; Satisfaction with Life Scale (SWLS) [28]
Nightly Exercise	3. Questions designed for the study to increase sensory sharpening
Photographs	4. Participants upload photos and respond to 3 questions about the photography exercise

differences in one proposed catalyst for change – the attentional mechanism of positive cognitive bias. In addition, daily questionnaires included questions regarding emotions and well-being. This experience sampling methodological (ESM) approach was undertaken because of the advantages it offers with regard to (1) establishing engagement with the intervention, (2) determining whether the picture taking exercise had the intended emotional impact (manipulation check), and (3) linking the daily exercise to nightly and end of study outcomes (see [74]McKee, Algae, Faro, & O’Leary, accepted for publication, for additional discussion of ESM as an integral method for testing PPIs). Specific measures are described with hypotheses below (see Table 1 for assessments at each time point).

3.2.1. Demographics and self-reported diagnostic status

In addition to age, sex, income, relationships status, race, primary language, income range, and educational attainment, participants also reported on mental health diagnoses and treatment seeking, as well as family history of psychiatric disorders (e.g., Major Depressive Disorder, Posttraumatic Stress Disorder).

3.2.2. Engagement

It is important to gauge whether participants received an adequate “dose” of the intervention, so we included several potential measures of engagement. First, given that all participants were asked to complete a daily survey, we can compare engagement between individuals in the no photo control group and individuals in the three picture taking groups. Second, participants in the three picture taking groups were also asked to complete nightly exercises, which can serve as one indicator of compliance with the intervention protocol. Another indicator of compliance is the number of photographs taken by individuals in the PT, PTPSS, and DT groups. Beyond compliance, these data points can also be compared across groups to determine whether the individuals in the PT group, for example, were more likely to stay engaged than

individuals in the DT or NPC groups.

3.2.3. Proximal measures

To ascertain whether a successful manipulation had a cumulative effect on the proximal mechanisms of change, we will utilize paired samples T-tests within condition to compare levels of positive emotion (Modified Differential Emotion Scales (MDES) [26]; and savoring beliefs (Savoring Beliefs Inventory (SBI) [8]; at pre and post intervention time points. We will also examine individual trends in daily reports of positive mood on the MDES within group across time.

3.2.4. Primary outcome measures

It is hypothesized that PT and PTPSS participants will evidence increased well-being from pre-to post-intervention relative to participants in the DT and NPC conditions as indexed by measures of depressive symptoms (Beck Depression Inventory – II; [27], general life satisfaction (Brief Satisfaction with Life Scale; [28], self-esteem (Rosenberg Self Esteem Measure; [29], gratitude (Gratitude Questionnaire – 6; [6], mindfulness (Carolina Empirically-Derived Mindfulness Inventory; [30], physical health (Scale of Physical Symptoms [31]; Pittsburgh Sleep Quality Inventory; [32], and emotion regulation (Emotion Regulation Questionnaire; [33]. Repeated measures ANOVAs will be utilized to compare changes among groups over time. We will also assess anxiety (State Trait Anxiety Inventory – Trait Subscales [34]; in order to document differential specificity with depression, as we do not expect anxiety to change. Individuals in the PTPSS group are expected to report an increased perception of social support (Medical Outcomes Study Social Support Survey [35]; and connectedness (Social Connectedness Scale; [36], given their weekly sharing encounters with friends and family of their choosing.

3.2.5. Mechanistic outcome variables

A novel contribution of our design is the ability to test potential mechanisms expected to account for the improvements over the course of the intervention. First, we expect that participants in the PT and PTPSS conditions will show significant changes in automatic cognitive processes (i.e., attentional biases and cognitive style) and positive emotions, which were assessed via behavioral tasks and self report. Further, we expect that such changes will account for improvement in some primary outcome measures.

First, behavioral data were collected via a computerized dot probe task that assesses attentional bias. Over the course of many trials, participants were presented with a pair of faces simultaneously for a duration of 500 ms; pairs either included one face with a sad expression and the other with an emotionally neutral expression or one face with a happy expression and the other with an emotionally neutral expression. All photos were selected from the Pictures of Facial Affect [39]. Following the presentation of the faces, an asterisk appeared on an otherwise empty black background until the participant indicated whether it had replaced the happy or sad face or the neutral face. Accuracy data and latency times were captured and will be utilized to create “happiness bias” and “sadness bias” scores. Based on prior Cognitive Bias Modification work demonstrating that (1) attention biases can be manipulated and, (2) such training is responsible for changes in depressive symptoms, we expect that change in attention bias (a decrease in negative bias and/or an increase in positive bias) will act as a key mechanism underlying change in depressive symptoms.

A second source of behavioral data is the number and quality of the photographs. We anticipate participants in both active experimental conditions will a) take increasingly more photographs over the course of the intervention and that participants in the PTPSS condition will b) include more social behavior as the focal point. It is expected that these indicators will explain changes in depressive symptoms for PT and PTPSS groups and perception of social support in the PTPSS group.

Third, we hypothesize that changes in cognitive style (Cognitive Style Questionnaire-Short Form [37]; and Scrambled Sentences Test

[38]; and interpretation bias (Ambiguous Situation Task; [18], as assessed by self-report and process measures, will also explain changes in depressive symptoms.

Finally, we anticipate that increases in daily positive emotion (Modified Differential Emotions Scale [26]; experienced by participants in the PT and PTPSS groups and measured each evening, will explain pre to post changes in general life satisfaction, physical health, savoring beliefs, and mindfulness.

3.2.6. Exploratory analyses

In order to inform future implementation and potential mechanisms of change, we will examine the emotional valence of the photographs. We anticipate changes in the quality of the photographs over the course of the intervention for participants in both active experimental conditions. It is possible that the photographic content would be judged by independent raters to be increasingly positive over the course of the intervention. Alternatively, it is plausible that as the participant's ability to attune to the positive cues in the environment develops, the capacity to find joy in even the most mundane objects/moments will be evident in photographs judged by independent raters to have less objectively-rated positive appeal.

4. Discussion

Picture This! is a brief daily technology-based intervention that capitalizes upon prior research with PPIs and CBM with the goal of increasing well-being and decreasing depressive symptoms among young adults. Our goal in the current study is to use a randomized control trial to test rigorously the impact of the intervention and to identify mechanisms underlying change.

One of the remarkable things about the scientific evidence emerging from the field of Positive Psychology is that it draws attention to the tremendous opportunity to significantly improve the lives of many. Of note, work by Ref. [40] demonstrates that just under 20% of people lead “flourishing” lives, which are characterized by emotional, social, and psychological well-being: the majority of those people who are not burdened with psychopathology still find themselves in the midst of what Keyes calls a “languishing” state (i.e., low levels of emotional, social, and psychological well-being that result in a sense of emptiness and stagnation). In addition, Fredrickson's broaden-and-build theory of positive emotions — and the accumulating empirical evidence — shows how and why promoting moments of positive emotional experience may help pull people out of depression and set even so-called “languishers” on a trajectory of growth [9,10,41,42].

Building on this work, many interventions of various shapes and sizes have sprung up in the past decade (see reviews by Refs. [4,43]; and a meta-analysis by Ref. [3]. Some rely on teaching a smorgasbord of “skills” over the course of several weeks and meetings [44,45], while others are exceptionally simple (e.g., Ref. [43]. Although, on average, the interventions are effective [4], it is often not known how, why, or for whom the intervention works, which limits the potential for application in different contexts and populations. For example, a meta-analysis by Ref. [4] concluded that PPIs were more effective for people who are depressed; however, other work suggests that there may be an optimal emotional zone (e.g., dysphoric relative to not depressed or moderately/severely depressed) that enables the participant to receive the most benefit (e.g., Ref.[47]; [46] as cited in [48]. Here, we draw on the literature regarding positive emotions to make the case for how and why our proposed attention-training intervention holds promise for optimal success *across populations*.

It has long been established that positive emotions are not simply the opposite of negative emotions [49]. As Fredrickson articulates, positive emotions identify opportunities that have arisen in the environment and momentarily broaden people's cognitive and perceptual capacities [42,50,51] creating a cognitive shift that supports more creative, intuitive, contextually-appropriate, and resilient action in the

moment. Moreover, the “build” aspect of Fredrickson's [9] broaden-and-build theory of positive emotions posits that such moments are functional because they provide opportunities to build durable personal resources, like mindfulness, social intelligence, and trait resilience. Thus, in addition to causing attentional shifts, active cultivation of positive emotions like joy, gratitude, and awe may promote mental and physical health (e.g., Refs. [10,11]).

Some of the strongest evidence to date for the benefits of focused attention on positive emotions uses loving-kindness meditation as a vehicle for self-generating genuine and contextually-appropriate positive emotions [10,11]. The great news about these studies is that social benefits can come from increasing a daily diet of positive emotions. For example, participants who engaged in weekly meditation reported increases in positive emotions (i.e., awe, joy, gratitude), which, in turn, enhanced social relationships and perception of social support, which further impacted life satisfaction [10]. Similarly, Kok and colleagues (2013) documented that the positive emotions generated through the loving-kindness practice were related to social connectedness, which improved their physical health over time. Loving-kindness meditation is a time-intensive practice that requires motivation and resources to attend multiple training sessions over the course of weeks. We posit that our proposed approach, with its deceptively light touch of training toward the positives in everyday life, will be similarly effective in producing positive social effects.

In addition, evidence about the disclosure or expression of positive emotions [24,52–57] suggests this is a powerful vehicle through which the expresser may reap greater personal psychological rewards from positive events while simultaneously — through self-disclosure [58] and shared positive emotions — promoting a relationship with a discloser. Thus, in addition to training individuals to intentionally focus attention on positive moments (PT group), we include a potentially enhanced experimental condition in which participants also share the photographs of joyful moments with someone else (PTPSS). This is an important experimental condition in light of the robust links between high-quality relationships and mental health and well-being (e.g. Ref. [59], physical health (e.g. Ref. [60], and even longevity (e.g., Ref. [61]. We acknowledge, however, that how the friend/family member responds to the participant's positive disclosures may mitigate these potential benefits [53,57], which is why we included a script to facilitate the process, as well as a questionnaire gauging the sharing experience, and why we need to carefully test the efficacy of this approach using the current RCT design.

A foundational assumption of our approach is that it is possible to create lasting change in people's habits of mind, not only for a few hours after a lab session, but even after a weeks-long training intervention has been completed. Principles of neuro-plasticity suggest it is possible with practice (e.g., Ref. [62]; [75]), and some recent data show growth in positive outcomes 4 and 12 weeks following a PPI used as an adjunctive intervention to psychotherapy [63]. To achieve this, we see everyday life as the optimal training ground.

As described, participants in our *Picture This!* intervention were asked to take at least two photos each day of something that elicits joy, happiness, a sense of peace, gratitude, etc., and to review those photos each evening with additional savoring instructions. This method circumvents obstacles to other training techniques and may improve relevance and potency for several reasons, delineated below.

First, a major time commitment and resources to attend training are not needed and some estimates suggest that only approximately 30% of people who are suffering enough to be diagnosed with a mental disorder are receiving treatment services, not to mention those who are languishing but do not meet formal criteria for disorder [64]. Why? Numerous barriers prevent access to and delivery of traditional interventions. The widespread use of technology, however, has had a positive impact on the accessibility of interventions. Smartphones have been utilized in a number of creative ways as effective delivery systems for stand-alone programs (e.g., Refs. [65,66]. Our intervention

capitalizes on the fact that approximately 85% of young adults in the US own Smartphones [67], so the intervention is not only accessible but attractive and culturally relevant. Plus, the intervention itself only takes minutes per day, which reduces burden and may increase engagement.

Second, more frequent doses of training are provided. Findings from both the CBM and Positive Psychology literature suggest that more frequent engagement with the intervention may be associated with stronger effects (e.g., Refs. [16,68]. Based on the promise of these findings, the current protocol provides a minimum of 42 daily training trials with the opportunity to review and relive those experiences each of 21 evenings, which should provide durable and sustainable effects.

Third, more impactful training materials are incorporated. As noted above, the accessibility of the Smartphone as a training tool may translate to higher likelihood of “practice”, and our approach is consistent with the ways young adults are already engaging with their world around them (i.e., taking photos and sharing on social media), potentially reducing the perceived burden of the intervention. In fact, a recent naturalistic examination of user frequency of different positive psychology activities demonstrated that a savoring photographic activity was highly preferred [68]. Moreover, mindful photography as a practice has been recommended for use in PPIs designed to increase flourishing [69]. For example, in an intervention with undergraduate students, Kurtz [70] discovered that participants prompted to take photographs of their surroundings in a mindful, intentional way demonstrated positive shifts in state mood, motivation, and appreciation relative to a neutral photography condition. In sum, photography appears to be a promising tool for increasing positive emotion, decreasing depression, and cultivating the ability to appreciate past events and anticipate future ones, particularly for adolescents and young adults who increasingly use smartphone cameras for taking and posting photos (e.g., Instagram). Additionally, traditional attentional training paradigms utilize words and stock images flashed on computer screens. In their novel CBM research, however, Murphy et al. [71] cite the importance of dynamic, self-relevant imagery for increased attention and retention of positive stimuli. The current study has relatively high external validity, which is an important marker of an effective intervention, and utilizes powerful images that are self-relevant and chosen by the participant. Furthermore, because positive emotions are attractive targets, an intervention that trains the positive may have more user “buy-in” than traditional dot probe tasks that attempt to correct negative attentional biases. This focus on positive emotions may set people on a trajectory for growth [9], which is to say that once the positive impacts begin, they may continue and build upon themselves (see Ref. [10]. Finally, by incorporating the training into a device participants already use and imbuing it with positive emotions, we have provided a tool and a skill easily accessed for continued practice, long after training has officially ended.

Developing and testing accessible, engaging tools designed to support flourishing and decreasing suffering in youth is more important now than ever [72]. Based in sound theory and empirical work, the *Picture This!* study provides one investigation of a daily technology-based intervention and purported mechanisms of change. Should it prove beneficial to the young adult sample, implementation and dissemination on a larger scale could provide an impactful product for broad swaths of the population.

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