

# The Best Possible Self Task Has Direct Effects on Expectancies and Mood, and an Indirect Effect on Anxiety Symptom Severity

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The Best Possible Self task (BPS) is one of the best studied positive psychology interventions, and robustly improves optimism (expectancies) and mood. However, few studies have examined whether the task primarily affects expectancies, which then improve mood, or whether it primarily improves mood, which then affects expectancies. From 2023 to 2024, we conducted a well-powered, preregistered randomized controlled trial, with 240 unselected students at a private university in Istanbul. Mediation analyses showed that, at posttest, the BPS had large direct effects on positive expectancies, negative expectancies, and positive mood; and a small indirect effect on negative mood via negative expectancies. At 1-week follow-up ( $N = 202$ ), the BPS had a small-to-medium effect on positive expectancies, which mediated a similar-sized effect on anxious symptom severity. These results indicate that the BPS affects both expectancies and mood, but its effects on expectancies are longer lasting, and can lead to improvements in anxiety symptoms. More research is needed into the mechanisms of the BPS's effects in other populations, and especially into its possible benefits for people with anxiety.

**Keywords:** Best Possible Self, positive psychology interventions, expectancies, mood, anxiety

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Recent years have seen an explosion in research on positive psychology interventions, and especially in research on the Best Possible Self task (BPS). This task reliably improves both mood and optimism, which is usually operationalized as positive expectancies regarding the probabilities of future events. However, studies on the BPS have tended to use smaller samples, and very few have examined the mechanisms behind the task's effects. This study tested whether the BPS's effects on expectancies and mood are independent, or whether they mediate one another. We also tested whether the BPS's effects on expectancies and mood mediate any effect it has on anxious and depressive symptoms.

## The Best Possible Self Task

Since its creation (King, 2001), the BPS has been used both as a lab manipulation (e.g., Basten-Günther et al., 2022) and as a real-world intervention (e.g., Shapira & Mongrain, 2010) in a great many studies, and has become one of the most popular—and effective—positive psychology interventions (Carrillo et al., 2019; Heckerens & Eid, 2021). Although its precise operationalization varies somewhat

between studies, the task requires participants to imagine and describe a time in the future when everything has gone as well as possible for them, and they have achieved all their goals. Typically (see, e.g., Peters et al., 2010), participants are asked to plan for 1 min and then to write solidly for 15 min, describing their hypothetical future life in detail. Finally, they are asked to vividly imagine the life they have described for a further 5 min. In research, a control group usually describes and then imagines a typical day in their current lives, or their activities during the previous week. Compared to such control groups, both the writing and the imagery components of the BPS seem to be effective in improving expectancies and mood (Boselie et al., 2023).

In dozens of studies (see meta-analyses by Carrillo et al., 2019; Heckerens & Eid, 2021; Malouff & Schutte, 2017), the BPS has been effective in improving positive future expectancies and positive mood or affect. Effects on negative future expectancies, and on negative mood or affect, are less consistent. Researchers have also tested the BPS's effects on many other outcomes, many of which relate to well-being and (mental) health: In particular, several studies have examined its effects on depressive symptoms (which have been

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This experiment was initiated as part of an undergraduate project course, under the supervision of Robert W. Booth. All students on the project are listed as authors, in alphabetical order. The authors report there are no competing interests to declare.

Robert W. Booth played a lead role in conceptualization, data curation,

formal analysis, methodology, project administration, writing—original draft, and writing—review and editing. Kaan Erhan played a supporting role in methodology and writing—review and editing. Ozan Erkocaoğlu played a supporting role in methodology and writing—review and editing. Hasan Kuşpınar played a supporting role in methodology and writing—review and editing. Kaan Yıldırım played a supporting role in methodology and writing—review and editing.

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inconsistent; Boselie et al., 2018; Molinari et al., 2018; Shapira & Mongrain, 2010; Tomczyk et al., 2024), and a few have examined its effects on anxious symptoms (Boselie et al., 2018; Pál & Sebestyén, 2023; Sayis et al., 2023). Online administration of the intervention has become commonplace, and is not obviously less effective than in-person administration (Heckerens & Eid, 2021; Layous et al., 2013). Generally, the BPS's effects tend to be short-lived, being strongest immediately after the intervention (Heckerens & Eid, 2021; Malouff & Schutte, 2017). Curiously, single-session administrations seem to be at least as effective as longer term, multisession intervention programs (Carrillo et al., 2019). All of these conclusions are somewhat hampered, however, by the fairly modest sample sizes that BPS studies tend to employ (for exceptions, see Lyubomirsky et al., 2011; Manthey et al., 2016; Shapira & Mongrain, 2010).

## Mechanisms

Despite the BPS's popularity, few researchers have examined how it actually works. For example, some researchers describe it as an optimism intervention (e.g., Shapira & Mongrain, 2010), while others describe it as a positive mood manipulation (e.g., Tomczyk et al., 2024); a third group examines both expectancies and mood as manipulation checks when testing the BPS's effects on other outcomes (e.g., Hanssen et al., 2013). It is, therefore, unclear whether the BPS primarily improves expectancies, which then tend to improve mood, or whether the BPS primarily improves mood, which then tends to improve expectancies (Heckerens & Eid, 2021; Loveday et al., 2018).

In their reviews, both Heckerens and Eid (2021) and Loveday et al. (2018) concluded that mediation studies were necessary to understand the mechanisms through which the BPS affects expectancies, mood, and other outcomes. We are aware of three such studies. Peters et al. (2010) gave 82 students the BPS or a control task and measured their expectancies and mood before and after the intervention. The BPS increased positive mood and both positive and negative expectancies: The BPS's effect on negative expectancies, but not its effect on positive expectancies, was mediated by its effect on positive mood. Meevissen et al. (2011) gave 54 participants the BPS or a control task and asked them to visualize the life and events they had described for 5 min every day, for 2 weeks. The intervention improved dispositional optimism (as measured with a self-report scale), positive mood, and expectancies. The BPS's effect on dispositional optimism was not mediated by its effect on positive mood, but Meevissen et al. did not report whether mood mediated the BPS's effect on expectancies. Finally, Heckerens et al. (2020) gave 188 students either the BPS or a control task and measured their expectancies and mood before and after the intervention, and again at follow-up about a week later. Between posttest and follow-up, participants completed their intervention three more times as a homework assignment. The BPS improved positive mood but not positive expectancies; changes in expectancies did not mediate changes in mood, nor vice versa, at posttest or follow-up.

These three studies are theoretically important but incomplete. Meevissen et al. (2011) and Peters et al. (2010) only tested whether changes in mood mediated changes in expectancies or optimism; they did not present tests of whether changes in expectancies mediated changes in mood. Heckerens et al. (2020) tested both possibilities, but they only included positive mood and expectancies

in their analyses. Although the BPS's effects on negative outcomes are less consistent than its effects on positive outcomes (Carrillo et al., 2019), smaller changes in negative outcomes could still play important roles in mediating the other effects: For example, positive and negative expectancies can show different relationships with mood and with psychopathological symptoms (MacLeod et al., 1996, 2005). Furthermore, none of these studies examined depressive or anxious symptoms, which have been an important focus of applied research on the BPS and other positive psychology interventions (Shapira & Mongrain, 2010; Tomczyk et al., 2024).

## The Present Study

We conducted a large, preregistered randomized controlled trial to gauge the effects of a single administration of the BPS task over 1 week. We examined both positive and negative expectancies, and positive and negative mood, at pretest, posttest, and follow-up: We wished to see which of these outcomes showed the strongest and longest lasting effects of the BPS and whether changes in some outcomes could account for (mediate) changes in others. Finally, we assessed depressive and anxious symptom severity at pretest and follow-up to see whether they were affected by the BPS, and whether changes in expectancies or mood could account for (mediate) those changes.

We preregistered the predictions that the BPS would improve both positive expectancies and positive mood, at both posttest and follow-up, and that the BPS's effects on positive mood would be mediated by its effects on positive expectancies.

## Method

The experiment was approved by the Sabanci University Research Ethics Committee (Approval No. FASS-2023-21). Data were collected from April 2023 to March 2024.

## Transparency and Openness

We report how we determined our sample size and all data exclusions, manipulations, and measures. The experiment was preregistered at <https://doi.org/10.17605/OSF.IO/3X8QT>, the study materials are presented in the *Supplemental Materials*, and the data are available at <https://doi.org/10.17605/OSF.IO/F2C7Y> (Booth, Erhan, et al., 2024).

## Participants

Malouff and Schutte (2017) reviewed available studies on the BPS and expectancies, using student samples, and the reported effect sizes were very variable, ranging from 0.19 to 1.26. We chose 0.40 as a reasonable middle of this range. A sample of 200 (100 per group) yields .80 power to detect a group difference of  $d = 0.40$  using a two-tailed test (based on G\*Power 3.1.9.7). Note that our planned  $N$  of 200 is unusually large for this literature.

Data were collected from 274 students at a private Turkish university. Since we were interested in anxiety and depression, we did not exclude participants reporting a current diagnosed anxiety or depressive disorder, according to the *Diagnostic and Statistical Manual of Mental Disorders, 5th edition*, but we did exclude nine participants who reported a current diagnosis of attention-deficit/hyperactivity disorder and one participant who reported a current

diagnosis of obsessive–compulsive disorder. A further five were not native Turkish speakers, and 20 failed an attention check at the end of the posttest expectancy measure, and these were excluded too. The final sample included 240 students (151 women, 87 men, two other) with a mean age of 21.74 ( $SD = 2.29$ ). They rated themselves as  $M = 7.4$  ( $SD = 1.0$ ) on a 10-point socioeconomic status scale (Adler et al., 2000), where 10 is the highest status. Two hundred four described themselves as Turkish, or partly Turkish. Eighteen reported a current anxiety disorder, and eight reported a current depressive disorder.

Of this initial sample, 202 (123 women, 77 men, two other;  $M_{age} = 21.75$ ,  $SD = 2.43$ ) completed the follow-up measures within the time limit specified, and passed a further attention check at the end of the follow-up expectancy measure. Follow-up analyses were conducted using this reduced sample, which was still consistent with the preregistration.

## Materials and Procedure

The experiment consisted of two phases. Participants first completed a pretest, manipulation, and posttest in a single session; 6–8 days later, they completed follow-up measures. Participants signed up for the first and follow-up phases at the same time, and were emailed a reminder when they were due to complete the follow-up.

At the beginning of the first phase, participants gave informed consent and were then told that in the first session, they would complete a set of questionnaires, followed by a writing task, and then another set of questionnaires.

## Pretest

Participants completed the expectancy measure, Positive and Negative Affect Schedule (PANAS), the Beck Anxiety Inventory (BAI), and the Beck Depression Inventory (BDI). These were presented in a random order.

Expectancies were measured using a scale under development by Booth, Aydın, et al. (2024), which is very similar to the Future Expectations scale (Peters et al., 2016). Participants were presented with 12 positive and 12 negative events, in a random order. For each event, participants were asked to rate the probability of the event happening to them on a 7-point scale from “Would definitely not happen to me” to “Would definitely happen to me.” Only verbal labels were shown on the scale points, but participants’ responses were recoded to a 1–7 numerical scale for analysis. The complete measure, along with psychometric data, are presented in the Supplemental Materials. At both posttest and follow-up, the final question in this measure was an attention check, which stated that participants should select “Would definitely happen to me” if they were still paying attention.

The PANAS (Watson et al., 1988; trans. Gençöz, 2000) consists of two subscales, one measuring positive mood and one measuring negative mood,<sup>1</sup> each consisting of 10 items. We used its “moment” (i.e., state) version: Participants were presented with each word (e.g., interested, distressed) and asked to rate how much they “feel this way at the present moment” on a 1 (*very slightly or not at all*) to 5 (*extremely*) scale.

The BAI (Beck et al., 1988; trans. Ulusoy et al., 1998) asks participants how much they have been “bothered” by 21 cognitive

and somatic symptoms on a 0–3 scale. Symptoms include “nervous,” “fear of dying,” and “feeling of choking.” Usually the BAI asks about the previous month, but for this study, we asked about the previous week.

The BDI (Beck et al., 1961; trans. Hisli, 1989) presents participants with 21 groups of four statements and asks them to choose the statement which “best describes the way [they] have been feeling.” Each group measures the severity of a particular symptom, including sadness, anhedonia, and sleep changes. Again, we asked these questions about the previous week in the present study.

## Intervention

Participants were randomly allocated to the BPS group or the typical day (TD, control) group. The interventions were based on the commonly employed procedures of Peters et al. (2010). Full text of the interventions is presented in the Supplemental Materials.

The BPS group were first told that they would write about a specific time in their life and that they would have 1 min to think about what to write and 15 min to write. They were reminded that what they wrote would be confidential and anonymous. After clicking to indicate they were ready, they were given 1 min to read the instructions and think about what they would write. They were told to imagine themselves in a future where everything had happened in the best possible way and they had achieved all their goals, and to write down what their life would be like. A timer was visible at the bottom of the page, and when it reached zero, the page automatically proceeded to the writing page. The timer was reset to 15 min, and participants were asked to use all this time to write as much as they could. Finally, participants were given a further 5 min to imagine the life they had described as vividly and clearly as they could; again, this period was explicitly timed by the survey system. Given that the data were collected online, we could not check whether participants were following these instructions; however, this does not affect the validity of the experiment, as in practice an online intervention would typically not include such checks. The TD group were given identical tasks, except that they were asked to write about a typical day in their life.

## Posttest

Following the intervention, participants were told they had finished the writing task and that they would now complete some more questionnaires. They were told that these would be the same as questionnaires they had already completed, and were asked to approach them with a new perspective and to answer according to how they felt at that moment. They then completed the expectancy and PANAS measures again, in a random order. Finally, they gave demographic and psychiatric details and were thanked and dismissed.

<sup>1</sup> Note that, despite its name, the Positive and Negative Affect Schedule measures positive and negative *activation* (Watson et al., 1999), which are conceptually similar to positive and negative high-arousal states. Many BPS researchers use the PANAS to measure a construct they label “affect,” but this is imprecise and not really appropriate (see Ekkekakis, 2013). The PANAS’s items include both moods and emotions, but when their ratings are combined and used to measure fluctuations in general states, which are not referring to any particular stimulus or situation, we feel the term *mood* comes closest to describing the construct being measured. This is why we refer to positive and negative mood throughout this article. See also the “Constraints on Generality” section below.

## Follow-Up

Participants were again told that they would complete questionnaires, which they had already completed early in the study, and that they should approach these with fresh eyes and answer according to how they felt at that moment. They then completed the expectancy measure, PANAS, BAI, and BDI again, in a random order. Following this, they were debriefed.

## Analytic Strategy

We first analyzed posttest scores and then follow-up scores. For both phases of the study, we first examined group differences: Posttest/follow-up scores for each measure were analyzed with analysis of covariance, with group as the independent variable and pretest scores on that measure as the control variable.

Where significant group effects were found, we then checked whether changes in any measures were mediated by changes in other measures. The Process macro (Hayes, 2017) was used to test longitudinal mediation models, with posttest/follow-up scores for the hypothesized outcome measure as the outcome variable, pretest scores for that measure as a control variable, group as the predictor, and the change in the hypothesized mediators—from pretest to posttest, or from pretest to follow-up as appropriate—as the mediators. Indirect effects were estimated by bias-corrected bootstrapping with 10,000 resamples. For all analyses, participants with absolute standardized residuals greater than three were excluded as outliers.

## Results

Descriptive statistics for the two groups are presented in Table 1. Correlations among the variables, and their internal consistencies, are presented in Supplemental Table S1.

## Posttest Scores

First, we examined expectancies. The BPS group had significantly higher positive expectancies (estimated marginal mean, EMM = 59.26, 95% CI [58.23, 60.28]) at posttest than the TD group (EMM = 55.67, 95% CI [54.70, 56.64]),  $F(1, 234) = 25.01$ ,  $\eta_p^2 = .10$ ,  $p < .001$ ; three participants were excluded as outliers. The BPS group also had significantly lower negative expectancies (EMM = 39.00, 95% CI [37.79, 40.21]) than the TD group (EMM = 44.69, 95% CI [43.55, 45.83]),  $F(1, 233) = 45.51$ ,  $\eta_p^2 = .16$ ,  $p < .001$ , four outliers.

Next, we examined PANAS scores. The BPS group had significantly higher positive mood (EMM = 30.56, 95% CI [29.57, 31.56]) at posttest than the TD group (EMM = 26.37, 95% CI [25.42, 27.32]),  $F(1, 236) = 35.99$ ,  $\eta_p^2 = .13$ ,  $p < .001$ , one outlier, and somewhat lower negative mood (EMM = 15.38, 95% CI [14.69, 16.07]) than the TD group (EMM = 16.35, 95% CI [15.69, 17.00]),  $F(1, 235) = 3.96$ ,  $\eta_p^2 = .02$ ,  $p = .048$ , two outliers.

Next, we checked whether changes in expectancies mediated the BPS's effect on positive mood. Two outliers were excluded. The direct effect of group on positive mood was significant (coefficient = 2.25, 95% CI [0.93, 3.57],  $p = .001$ ), as was the indirect effect via positive expectancies (coefficient = 1.43, 95% CI [0.74, 2.29]), but

**Table 1**  
*Sample Characteristics and Outcome Scores, Separated by Group*

Variable	BPS group		TD group	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
<i>N</i>	115		125	
Age	21.53	1.76	21.93	2.68
Gender breakdown (women; men; others)	72; 41; 2		79; 46; 0	
With anxiety disorder	7		12	
With depressive disorder	3		5	
Pretest				
Positive expectancies	56.57	10.67	54.57	11.30
Negative expectancies	47.81	11.09	48.22	12.37
Positive mood	27.91	6.69	26.22	7.57
Negative mood	18.06	6.31	19.75	8.14
Depression	12.65	8.85	13.55	8.87
Anxiety	15.06	10.01	14.92	11.72
Posttest				
Positive expectancies	60.69	11.86	54.59	11.46
Negative expectancies	38.90	13.19	45.01	12.67
Positive mood	31.52	8.46	25.60	8.19
Negative mood	14.89	5.57	17.12	7.82
Follow-up				
<i>N</i>	94		108	
Positive expectancies	57.28	11.32	53.62	11.50
Negative expectancies	44.30	12.92	46.54	12.20
Positive mood	26.56	8.08	24.42	8.13
Negative mood	16.71	6.23	18.58	7.98
Depression	10.29	8.20	12.54	9.01
Anxiety	10.81	8.51	13.18	11.30

*Note.* BPS = best possible self, intervention group; TD = typical day, control group.



not the indirect effect via negative expectancies (coefficient = 0.38, 95% CI [−0.23, 1.00]). The indirect effect via positive expectancies was significantly larger than the indirect effect via negative expectancies (difference = 1.05, 95% CI [0.01, 2.30]), but was somewhat smaller than the direct effect.

Next, we checked whether changes in expectancies mediated the BPS's effect on negative mood. Two outliers were excluded, and bootstrap inference was used for all effects as the residual plot showed heteroscedasticity. The direct effect of group on negative mood was not significant (coefficient = 0.09, 95% CI [−0.81, 0.99]), and neither was the indirect effect via positive expectancies (coefficient = −0.34, 95% CI [−0.79, 0.04]), but the indirect effect via negative expectancies was significant (coefficient = −0.72, 95% CI [−1.36, −0.12]).

Next, we checked whether changes in mood mediated the BPS's effect on positive expectancies. Two outliers were excluded. The direct effect of group on positive expectancies was significant (coefficient = 1.96, 95% CI [0.60, 3.32],  $p = .005$ ), as was the indirect effect via positive mood (coefficient = 1.79, 95% CI [0.94, 2.81]), but not the indirect effect via negative mood (coefficient = 0.05, 95% CI [−0.09, 0.26]). The indirect effect via positive mood was significantly larger than the indirect effect via negative mood (difference = 1.74, 95% CI [0.87, 2.78]), but was somewhat smaller than the direct effect.

Finally, we checked whether changes in mood mediated the BPS's effect on negative expectancies. Three outliers were excluded. The direct effect of group on negative expectancies was significant (coefficient = −4.12, 95% CI [−5.81, −2.42],  $p < .001$ ), as was the indirect effect via positive mood (coefficient = −1.22, 95% CI [−1.94, −0.54]), but not the indirect effect via negative mood (coefficient = −0.15, 95% CI [−0.57, 0.17]). The indirect effect via positive mood was significantly larger than the indirect effect via negative mood (difference = 1.07, 95% CI [0.32, 1.81]), but was substantially smaller than the direct effect.

## Follow-Up Scores

Participants who dropped out of the study between sessions were marginally more likely to be male, Welch's  $t(56.88) = 1.71$ ,  $p = .09$ , and to have higher pretest depression scores,  $t(238) = 1.71$ ,  $p = .09$ , than those who completed the follow-up. They did not differ in age, socioeconomic status, probability of a current psychiatric diagnosis, group allocation, or any of the other pretest measures.

Missing follow-up data were imputed using SPSS's (Version 26) Multiple Imputation tool. Ten data sets were created, in which missing follow-up data were imputed based on the participants' groups and all available outcome scores from all timepoints. The fully conditional specification method was used, using linear models. The analyses of covariance reported below were all repeated using these data sets to check the robustness of the findings.

First, we examined expectancies. The BPS group had significantly higher positive expectancies (EMM = 56.68, 95% CI [55.48, 57.88]) at follow-up than the TD group (EMM = 54.41, 95% CI [53.30, 55.52]),  $F(1, 198) = 7.47$ ,  $\eta_p^2 = .04$ ,  $p = .007$ , one outlier. This effect reached significance in nine of the 10 imputed data sets. The BPS group also had marginally lower negative expectancies (EMM = 44.70, 95% CI [43.52, 45.89]) than the TD group

(EMM = 46.19, 95% CI [45.09, 47.29]),  $F(1, 196) = 3.30$ ,  $\eta_p^2 = .02$ ,  $p = .071$ , three outliers, significant in seven imputed data sets.

Next, we examined mood. The BPS group's positive mood score (EMM = 25.94, 95% CI [24.62, 27.25]) was not significantly different from the TD group's score (EMM = 24.96, 95% CI [23.74, 26.18]),  $F(1, 198) = 1.15$ ,  $\eta_p^2 = .01$ ,  $p = .29$ , no outliers, non-significant in all imputed data sets. The BPS group's negative mood score (EMM = 17.02, 95% CI [16.05, 17.99]) was also not different from that of the TD group (EMM = 17.82, 95% CI [16.91, 18.73]),  $F(1, 193) = 1.40$ ,  $\eta_p^2 = .01$ ,  $p = .24$ , five outliers, non-significant in all imputed data sets.

Then, we looked at symptom severity. There was no difference between the BPS group's depression score (EMM = 10.81, 95% CI [9.92, 11.69]) and the TD group's score (EMM = 11.62, 95% CI [10.79, 12.44]),  $F(1, 196) = 1.72$ ,  $\eta_p^2 = .01$ ,  $p = .19$ , two outliers, nonsignificant in all imputed data sets. However, the BPS group's anxiety score (EMM = 10.52, 95% CI [9.25, 11.79]) was significantly lower than the TD group's score (EMM = 13.11, 95% CI [11.91, 14.30]),  $F(1, 197) = 8.59$ ,  $\eta_p^2 = .04$ ,  $p = .004$ , two outliers, significant in all imputed data sets.

Next, we checked whether changes in expectancies mediated the BPS's effect on the anxiety score. Two outliers were excluded. The direct effect of group on anxiety was not significant (coefficient = −0.47, 95% CI [−2.62, 1.68],  $p = .67$ ), but the indirect effect via positive expectancies was significant (coefficient = −0.64, 95% CI [−1.39, −0.07]); the indirect effect via negative expectancies was not significant (coefficient = −0.13, 95% CI [−0.66, 0.15]). We then checked whether changes in mood mediated the BPS's effect on anxiety score. Four outliers were excluded. The direct effect of group on anxiety was significant (coefficient = −2.37, 95% CI [−3.98, −0.77],  $p = .004$ ), but the indirect effects via positive mood (coefficient = −0.01, 95% CI [−0.18, 0.10]) and negative mood (coefficient = −0.18, 95% CI [−0.96, 0.39]) were not significant.

## Sensitivity Analyses

Although they were not included in our preregistration, we conducted exploratory alternative analyses of our data to test the robustness of our results.

## Mediation Analyses

On the advice of an anonymous reviewer, we tested alternative mediation models, which avoided using change scores as mediators. The results were generally consistent with those reported above and were consistent with our conclusions given below. These results are presented in the [Supplemental Materials](#).

## Outliers

As described above, we chose to exclude outliers from each analysis on a case-by-case basis; this was intended to avoid biasing our estimates of our effect sizes and was specified in our preregistration. However, including the outliers makes no difference to the conclusions of the analyses above, with the exception that the BPS's effect on negative mood at posttest did not reach significance,  $F(1, 237) = 3.37$ ,  $\eta_p^2 = .01$ ,  $p = .07$ .

## Discussion

In a well-powered preregistered trial, the BPS task caused medium-to-large improvements in positive and negative expectancies at posttest, as predicted; it also caused a large improvement in positive mood and a small improvement in negative mood. That improvement in negative mood was mediated by the improvement in negative expectancies. The other improvements, although interrelated (every mediation model found one significant indirect effect), were somewhat independent from one another (their direct effects were significant, and larger than the indirect effects in their respective models). This essentially replicates the findings of Heckerens et al. (2020) and Peters et al. (2010), who similarly found that the BPS's effects on positive expectancies and positive mood did not fully mediate (i.e., account for) one another. At 1-week follow-up, the BPS had caused a small improvement in positive expectancies, but no changes in positive or negative mood or in depressive symptom severity. However, the BPS did cause a small-to-medium improvement in anxious symptom severity, and this improvement was mediated by the improvement in positive expectancies.

In other words, the BPS directly causes improvements in both expectancies and mood. In the case of positive expectancies, this improvement seems to persist for at least 1 week and can apparently lead to an improvement in anxious symptom severity. On the other hand, while the BPS causes substantial short-term improvements in both positive and negative mood, these are short-lived.

In the introduction, we discussed the ambiguity in the literature regarding whether the BPS can be called an optimism intervention (i.e., an expectancies intervention) or a mood intervention (Heckerens & Eid, 2021). Based on these results, we can conclude that it is both (Heckerens et al., 2020; Peters et al., 2010; see also Meevisen et al., 2011). However, its effects on expectancies seem to be somewhat stronger and longer lasting. We replicated the common finding (Carrillo et al., 2019) that the BPS affects positive mood more than it affects negative mood; somewhat unusually, we found a large effect on negative expectancies at posttest, but this had disappeared by the 1-week follow-up (it was still present in seven imputed data sets, however). The change in negative expectancies at posttest seemed to explain the (more modest) change in negative mood, showing that short-term improvements in pessimistic expectancies can improve mood. This is important, as improving mood is one of our field's central motivations for studying such interventions in the first place. The BPS may not be the most effective method for achieving this in applied settings, however (see, e.g., Gangemi et al., 2019).

We found that the BPS affects negative expectancies as much as positive expectancies at posttest; this is somewhat unusual (Boselie et al., 2018; Heckerens & Eid, 2021; although see Boselie et al., 2023; Hanssen et al., 2013). Our experiment has used a new expectancy measure, which may be more sensitive to changes in negative expectancies than the measures used in previous work. Alternatively, effects on negative expectancies may be more prominent in this particular culture, in which BPS research is only now getting started. It is plausible that the BPS's effects, both on negative expectancies and in general, might be more visible in participants with more negative moods; note however that our samples' pretest scores for mood, depressive, and anxious symptoms were not unusually high for unselected student samples (see Table 1).

Given pessimism and hopelessness's links to depression (Abramson et al., 1989; Alloy & Ahrens, 1987), some researchers

have tested whether the BPS affects depressive symptoms (Molinari et al., 2018; Shapira & Mongrain, 2010; Tomczyk et al., 2024). Their results have tended to be disappointing, and we also found no effect of the BPS on depressive symptom severity at follow-up. Note however that participants with higher depression scores were marginally more likely to drop out of the study before follow-up, and such participants may show the most improvements in their depression scores following positive interventions (Sin & Lyubomirsky, 2009). Relatively few studies have examined the BPS's effect on anxiety (Boselie et al., 2018; Pál & Sebestyén, 2023; Sayis et al., 2023): We found a robust, small-to-medium sized effect of the BPS on anxious symptom severity at follow-up. Even this modest effect size is impressive,<sup>2</sup> a week after participants completed a single, 21-min online intervention: A similar improvement, relative to placebo, typically requires 5–6 weeks of selective serotonin reuptake inhibitors in patients with anxiety disorders (Jakubovski et al., 2019). While pessimistic expectancies (also called “probability bias”) are most robustly associated with depression (Booth et al., 2023; Booth, Mackintosh, & Haşşerbetçi, 2024; Strunk et al., 2006), they are also associated with anxiety (Butler & Mathews, 1987; Mitte, 2007; Smith & Bryant, 2000) and have received more theoretical attention from anxiety researchers than they have from depression researchers (e.g., Grupe & Nitschke, 2013; Heimberg et al., 2014). Furthermore, changes in expectancies have been seen to mediate improvements in symptoms during treatment for anxiety disorders (Draheim & Anderson, 2021; Smits et al., 2012). If the effects reported here turn out to be reliable in samples of participants with elevated anxiety, this would suggest the BPS might potentially be useful when deployed alongside other more conventional treatments for anxiety disorders.

## Constraints on Generality

Here, we were interested in the relatively short-term effects of a single administration of the BPS, as the literature suggests the task is most effective when employed in this way (Carrillo et al., 2019). However, similar studies looking at longer interventions, with longer follow-up periods, are now required.

Given that the BPS is a positive psychology intervention, most researchers are interested in its effects on positive outcomes, and most previous studies on its effectiveness have used unselected, fairly healthy samples. To maximize our study's comparability with others in this literature, we also used such a sample. However, previous work suggests that less-healthy individuals may show the most benefit from positive interventions (Sin & Lyubomirsky, 2009). It is therefore quite plausible that a sample of depressed or anxious patients might show stronger effects on negative expectancies, negative mood, and psychopathological symptoms; it is also plausible that, for example, changes in negative expectancies might show stronger mediation of changes in other outcomes in such individuals.

Similarly, we used the PANAS because it is among the most commonly used measures of mood in this literature. However, this measure is not the most suitable for assessing the effects of positive psychology interventions, since it only measures high-activation

<sup>2</sup> Its Cohen's *d* is 0.40, 95% CI [0.12, 0.68]. Based on VanderWeele and Ding (2017), we can estimate that an unmeasured confounder would need to be related to anxiety with a *d* of at least 0.71 to reduce this effect to nonsignificance.

states, and leaves out low-activation states such as contentment, calmness, and boredom (Ekkekakis, 2013; Watson et al., 1999). Low-activation positive states seem crucial for assessing well-being and for understanding reductions in anxious or depressive symptoms. We hope this literature continues to explore alternative measures of mood.

## Conclusion

Our results show that the BPS can continue to be used as a lab manipulation to increase both positive expectancies and positive mood; it can also continue to be used to improve expectancies in applied settings. However, we hope it will become standard practice to check whether the task's effects on other outcomes are more attributable to its effects on expectancies or to its effects on mood. We also hope this study will encourage researchers to focus on the BPS's potential to reduce negative outcomes and psychopathological symptoms, not just its ability to increase positive expectancies and mood.

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