

ORIGINAL ARTICLE

Do beliefs in the malleability of well-being affect the efficacy of positive psychology interventions? Results of a randomized placebo-controlled trial

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Abstract

The present study examines the role of beliefs about the malleability of well-being in a randomized, placebo-controlled, online positive psychology intervention targeting 267 German-speaking adults (83% women, mean age = 43.16 years). The participants of the experimental group (“three good things” intervention) and placebo control group (“early memories”) reported their levels of happiness before and immediately after the 1-week intervention, as well as 2, 4, and 12 weeks after the intervention. Furthermore, the researchers recorded how participants completed the exercises and to what extent they liked the exercises. This study also assesses the participants’ beliefs surrounding two different aspects of malleability (well-being is modifiable in general, and one knows how to change their well-being). Although both aspects of malleability were strongly intercorrelated, beliefs about how to change one’s well-being seemed particularly relevant in the context of positive psychology interventions: Those who reported a stronger belief about how to change their well-being liked the intervention better and more often completed the activity as

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instructed. Further, they reported greater increases in well-being as compared with the control group. We conclude that beliefs about the malleability of well-being might represent an important moderating variable in the effectiveness of positive psychology interventions.

KEYWORDS

positive psychology intervention, change beliefs, well-being, randomized placebo-controlled study, online intervention, growth mindset

INTRODUCTION

Positive psychology interventions are “treatment methods or intentional activities that aim to cultivate positive feelings, behaviors, or cognitions” (Sin & Lyubomirsky, 2009, p. 468). While there is ample evidence for the effectiveness of such interventions (e.g., Bolier et al., 2013; Carr et al., 2020; Chakhssi et al., 2018; Hendriks et al., 2018), we know comparatively less about potential moderators. Thus, knowledge of conditions under which such interventions work most optimally is still limited. The present study examines the role of one specific moderator in a placebo-controlled online study, namely, beliefs about the malleability of well-being in response to positive psychology interventions. This study tests how these beliefs affect (a) the *outcomes* of an intervention and (b) *how* people work with the intervention.

Lyubomirsky and Layous (2013) introduced the positive-activity model, which suggests several moderators on the side of the activities and the person. Moderators related to the activities include the dosage, or the frequency and timing of an intervention. As for the sample characteristics, Lyubomirsky and Layous (2013) suggest that motivation and effort, efficacy beliefs, baseline affective state, personality, social support, and demographics influence the effectiveness of interventions. While this model has offered an important contribution to the field, putting forth specific hypotheses to guide future research, it is mainly based on theoretical considerations. Empirical evidence supporting its assumptions is largely missing. With regard to moderators related to the sample characteristics, evidence is mixed. With regard to personality, for example, some studies report on the moderating effects of the big five factors of personality, finding stronger effects for a gratitude intervention and a strengths intervention on well-being for individuals with higher scores in extraversion and openness to the experience (Senf & Liau, 2013). Another study has examined the role of the big five personality traits on the effectiveness of a multicomponent intervention program and found no effects for personality (but stronger effects for those with higher psychometric intelligence; Proyer et al., 2016). Other studies have tested whether baseline characteristics in different orientations to well-being affect well-being outcomes. While one study identified some effects for the orientations to pleasure and meaning at pretest (Giannopoulos & Vella-Brodrick, 2011), another study failed to replicate these findings (Gander et al., 2016). A recent intervention study, which asked participants to perform acts of kindness and write gratitude letters, tested 15 different moderators, including personality as well as more specific traits such as sensation seeking, prosociality, and gratitude, and found no

moderating effects for any of these variables (Wang et al., 2017). Thus, overall, the existing data on relevant moderators related to the sample characteristics are far from conclusive, and the list of variables for which researchers have failed to find moderating effects is rather long. Given this context, gaining more insight about the people for whom interventions work best is important in this field, as it might allow for a better understanding of such interventions, as well as help practitioners tailor interventions to individuals or modify interventions to increase their effectiveness. For example, if a relevant moderator related to the sample characteristics can be changed (e.g., effort), an intervention could be designed to facilitate the function of this moderator (e.g., monitoring and providing feedback on the effort invested by the participants). Of course, relevant moderators might also depend on the type of the exercise; for example, extraversion might play a stronger role in interventions that include interacting with other people (Senf & Liau, 2013). We argue for further research on both generalized moderators (i.e., affecting most or all positive psychology interventions) and intervention-specific moderators that are only relevant for specific types of interventions.

A further potentially relevant generalized moderator related to participants in positive psychology intervention studies that has not been empirically examined are participants' beliefs about the malleability of well-being. Lyubomirsky and Layous (2013) have hypothesized that participants' beliefs about whether conducting a positive intervention will pay off might affect the outcome. As suggested by Dweck (e.g., 2008), mindsets about the malleability of personality traits might affect the ability of an intervention to alter these traits, and there are cross-sectional data on the robust positive association between subjective ratings of a growth mindset and happiness ($r = .53$ in $N = 251$ gifted students from China; Chan, 2011). An association has also been found between a growth mindset and one's satisfaction with their relationships, health, and one's job (van Tongeren & Burnette, 2018). The latter study also found that priming instructions toward a growth mindset had a positive effect on well-being ratings. Furthermore, there is some evidence that mindsets, which are characterized by beliefs that traits can be changed ("growth mindset"), can be taught: Paunesku et al. (2015) reported in a randomized, controlled online intervention study the effects of a growth-mindset intervention of intelligence. These students had to read an article about the malleability of intelligence and wrote a letter of advice to a fictional struggling student. Results suggested that in at-risk-students, a growth-mindset intervention of intelligence can foster both seeing intelligence as more malleable and achieving better grades. Yeager et al. (2016) confirmed these results by evaluating an improved version of this growth-mindset intervention in a large-scale intervention study. While we are unaware of an intervention study targeting malleability beliefs of well-being, we argue that studying such beliefs in positive psychology interventions might yield relevant information for the advancement of such interventions.

We argue that when participants perform a self-directed and intentional well-being activity, their beliefs about the malleability of well-being will have an impact on the outcomes of the activity. These beliefs may lead to participants' greater engagement in the activity and may be associated with early perceived benefits of the interventions. The latter have been identified as important moderators of the effectiveness of positive psychology interventions (e.g., Proyer et al., 2015). A well-being-related *growth mindset* may also encourage participants to try different approaches when engaging in an activity and perceive themselves as being more effective in doing so (e.g., thinking of good things that have happened during the day that triggered different senses, from tactile to visual senses, or being more effective when "translating" a daily experience into a "good thing" of the day when thinking of what has happened after the experience or what emotions were involved, etc.).

The present study

The main aim is to study the role of beliefs about the malleability of well-being in a randomized, placebo-controlled positive psychology intervention. In order to develop a comprehensive understanding of well-being, we asked participants about the malleability of life satisfaction and other components of a “good life” based on Seligman’s (2011) well-being theory. These components include positive emotions, engagement, positive relationships, meaning, and accomplishment. We examined the role of these beliefs in a well-validated positive psychology intervention: the “three good things” intervention (Seligman et al., 2005). In this intervention, participants are generally asked to write down three things that went well on the present day and contemplate why these things happened every day for 1 week. Several randomized controlled studies have yielded evidence that this intervention is effective in increasing well-being and ameliorating depressive symptoms (Gander et al., 2013; Mongrain & Anselmo-Matthews, 2012; Seligman et al., 2005). This study compares the effects of this intervention with a placebo control exercise that asked participants to write down an early childhood memory every day for 1 week (“early memories”; Seligman et al., 2005). We were interested in exploring the relationships between malleability beliefs and well-being outcomes following the interventions, as well as how participants operated within the intervention.

As for the latter research objective, we expected that those who believe that well-being is malleable would work better during the exercises (i.e., both the intervention and the placebo control exercise), that is, engage in the exercises as instructed, put more effort into practice, like the exercises more, perceive more benefits from the exercises, and consider them easier than those who considered well-being less malleable. Furthermore, we expected that a belief in the malleability of well-being would lead participants to continue the exercise beyond the instructed time period. For well-being outcomes, we expected that believing in the malleability of well-being would be positively related to intervention effectiveness, that is, that the difference between the conditions in well-being increases would be strongest for those who considered well-being more malleable.

METHODS

Participants

A total of $n = 840$ participants registered online and provided basic demographic information. The final sample consisted of $N = 267$ participants (31.8% of the 840 participants who initially registered online). Inclusion criteria for the final sample were being ≥ 18 years of age, not regularly using illegal drugs, not currently undergoing psychotherapeutic or psychopharmacologic treatment, and having completed the assigned exercise and all measurement time points (see Figure 1 for details).

Most participants in the final sample (83%) were women aged 18 to 76 ($M = 43.16$, $SD = 12.10$). They were mainly from Germany (66%), Switzerland (29%), and Austria (4%). Participants were highly educated as the majority (60%) held a degree from a university or a university of applied sciences, while 19% held a diploma allowing them to attend an institution of higher education; 19% of the participants had completed vocational training and 2% had completed mandatory school.

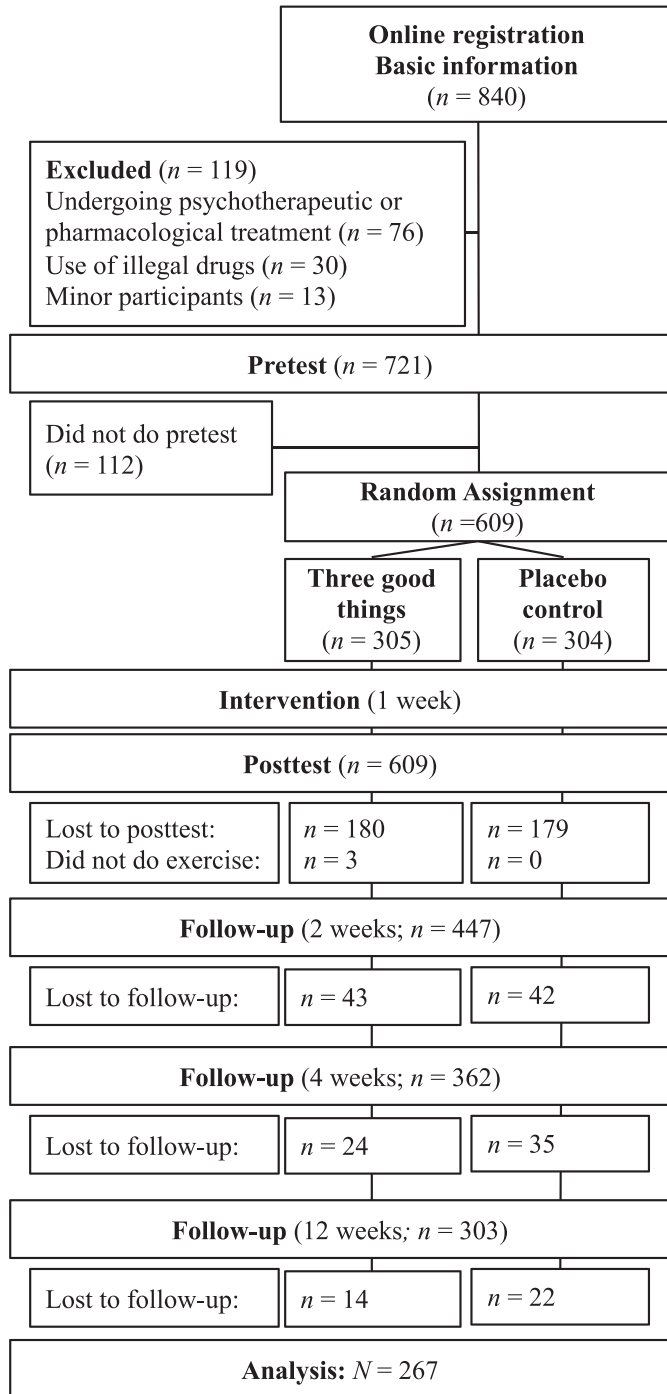


FIGURE 1 Flow of participants. Lost to posttest/follow-up: Participants did not complete this assessment. Did not do exercise: Participants completed this assessment, but indicated that they did not complete the exercise

The final sample did not differ from those who dropped out of the study with regard to sex ($\chi^2[1, N = 609] = 0.75, p = .387$), education ($\chi^2[5, N = 609] = 8.26, p = .142$), baseline well-being ($F[1, 607] = 0.32, p = .574$), or change beliefs (general: $F[1, 607] = 2.36, p = .125$; instrumental: $F[1, 607] = 1.69, p = .194$). However, those who completed the study were on average 3.79 years older than those who dropped out ($F[1, 607] = 15.48, p < .001$).

Furthermore, no differences between the intervention and the control condition were observed with regard to sex ($\chi^2[1, N = 267] = 2.43, p = .119$), age ($F[1, 266] = 2.15, p = .144$), education ($\chi^2[5, N = 267] = 0.80, p = .977$), baseline well-being ($F[1, 266] = 0.42, p = .516$), or change beliefs (general: $F[1, 266] = 0.19, p = .660$; instrumental: $F[1, 266] = 0.03, p = .859$).

A priori power analyses suggested that a sample size of 277 participants would be needed to detect a small effect ($f = .15$) with a power of $\beta = .80$ in a one-tailed test.

Instruments

The *Authentic Happiness Inventory* (AHI; Seligman et al., 2005; German version: Proyer et al., 2017) is a self-report instrument for the assessment of well-being. It uses 24 sets of five statements describing one's feelings during the past week (e.g., "I have sorrow in my life" to "My life is filled with joy"). Proyer et al. (2017) report good internal consistency and retest reliability of the AHI and found support for its factorial, convergent, and discriminant validity. Internal consistency in the present study was high at all measurement time points (all $\alpha \geq .93$).

The *Well-Being Change Beliefs Rating Scale* was developed for the purpose of this study in order for the researchers to assess the degree to which participants believe in the malleability of well-being. We wrote items that assessed three different aspects of change beliefs: (i) whether well-being in general is modifiable regardless of whether their own well-being can be influenced; (ii) whether their own well-being can be influenced; and (iii) whether they knew how to change their well-being. On a conceptual level, the latter aspect of change beliefs is closely related to having an internal locus of control, and high well-being-related self-efficacy (Farnier et al., 2021). These three questions were asked for six different aspects of well-being based on Seligman's (2011) well-being theory: satisfaction with one's life in general; the experience of fun, joy, and pleasure; spending time on activities that challenge and allow one to losing oneself in them; having more or deeper relationships with other people; having a sense of meaning and purpose in life; and being successful and attaining one's goals. Each question was rated on a Likert-style scale ranging from 1 (*does not apply at all*) to 10 (*applies completely*).

For examining the structure of these items, we randomly split the initial sample ($n = 721$) in half and conducted a principal component analysis with the first half of the sample ($n = 360$), and a confirmatory factor analysis with the second half of the sample ($n = 361$). For determining upon the number of components in the principal component analysis, we conducted a parallel analysis. Results suggested the retention of two factors (the first five empirical Eigenvalues were 7.83, 2.08, 1.31, 1.13, 0.96; the Eigenvalues of random data were 1.49, 1.38, 1.32, 1.26, 1.21). Results from principal component analyses extracting two and three (Promax rotated¹) factors suggested that the questions regarding whether well-being can be changed in general (i) and whether they can change their well-being (ii) could not be separated and that the two-factor solution provided a better fit to the data in terms of simple structure (i.e., all items had the highest loading on the intended factor) and interpretability. Therefore, we extracted two factors, jointly explaining 60.0% of the variance in the items. The 12 items

assessing whether well-being can be changed in general (i) and whether participants think they can change their well-being (ii) loaded on the first factor, named *general change beliefs* (explaining 31% of the variance). The six items assessing whether participants know how to change their well-being (iii) loaded onto the second factor, named *instrumental change beliefs* (explaining 24% of the variance).

With the second part of the sample, we conducted a confirmatory factor analysis (using lavaan: Rosseel, 2012) and estimated the fit of the data to one- to three-factorial models (using a robust weighted least squares estimator; WLSMV). Results suggested a better fit of the data to the two-factorial model ($\chi^2[134] = 1321.90, p \leq .001, CFI = .90, RMSEA = .163 [.155 - .171]$) than to the one-factorial model ($\chi^2[135] = 2885.78, p \leq .001, CFI = .77, RMSEA = .247 [.239 - .255]$), while a three-factorial model did not yield a substantial improvement in fit ($\chi^2[132] = 1271.38, p \leq .001, CFI = .90, RMSEA = .161 [.153 - .169]$). Therefore, we decided to retain the more parsimonious two-factorial model.

Subsequently, we computed scores for general and instrumental change beliefs by averaging the respective items. The two scores were positively related but not redundant, $r[265] = .59, p < .001$. Internal consistencies were high for both general and instrumental change beliefs ($\alpha = .92/.92$). Further, the scale showed robust relationships to well-being, as expected and as shown for similar scales (Farnier et al., 2021): Correlations with well-being at pretest were $r = .52$ and $.53$ for general and instrumental change beliefs.

Process questions: We asked participants during the posttest whether they had completed the assigned exercise (*completion*: “No” [these participants were excluded], “Yes but I did less than instructed” = 0, “Yes, as instructed” and “Yes, I did more than instructed” = 1); how much time in minutes they invested throughout the week (*effort*); how much they liked the exercise (*liking*: ranging from 1 = *very bad* to 7 = *very good*); whether they perceived a benefit from the exercise (*benefit*: ranging from 1 = *not at all* to 5 = *very much*); and whether the exercise was easy to complete (*easiness*: ranging from 1 = *not at all* to 5 = *very much*). Furthermore, at every follow-up, we assessed whether the participants continued the exercise voluntarily beyond the instructed time period (*continuation*: 0 = “No,” 1 = “Yes”).

Procedure

The local ethics committee approved the study before it was launched. The study was conducted online using a website we created for the purpose of running intervention studies. The study was advertised through online forums (on diverse topics, such as well-being, health, and psychology studies), mailing lists (i.e., mailing lists of people who were interested in participating in psychological experiments and mailing lists of psychology students), and press releases (e.g., university press releases on earlier studies that also included an invitation to participate in this study). Participants were not aware of the existence of different conditions. After providing their informed consent, registering, and sharing basic demographic information, participants could decide when to start the intervention themselves. As soon as they decided to start, they completed a pretest (AHI and Well-Being Change Beliefs Rating Scale), were randomly assigned to either of the two conditions (i.e., “three good things” or “early childhood memories”) based on an automatic algorithm, and received their exercise assignment with the instruction to complete it every day for 1 week. After the intervention week, as well as at follow-up sessions 2, 4, and 12 weeks after the intervention, participants were reminded via email to return to the website to complete the questionnaires (AHI and process questions). After completion of the

program, participants received automatically generated feedback on their questionnaire results as a reward for their participation.

Data analysis

For the main analyses, we only analyzed data from the final sample, that is, those participants who completed the assigned exercise and all measurement time points. We used R (Version 4.1.0; R Core Team, 2021) and the R packages dplyr (Version 1.0.7; Wickham et al., 2021), psych (Version 2.1.6; Revelle, 2021), lme4 (Version 1.1-27.1; Bates et al., 2015), and lmerTest (Version 3.1-3; Kuznetsova et al., 2017).

RESULTS

Are change beliefs associated with how participants conduct the exercises?

Means and standard deviations of well-being across the different time points, the beliefs about well-being, and variables on how participants engaged with the interventions are given in Tables 1 and 2. All intercorrelations among the study variables are given in Table S1.

An inspection of means of the beliefs about the malleability of well-being (see Table 2) showed that they were on average above the theoretical scale midpoint. Thus, participants in general considered well-being to be malleable.

To examine the relationships between beliefs about the malleability of well-being and how participants approached the intervention, we computed zero-order correlations between change beliefs and the process questions (see Table 3).

Table 3 indicates that change beliefs positively related to most variables on how participants conducted the intervention. Instrumental change beliefs were positively associated with participants' completion of the exercise as instructed (*completion*), doing more than instructed (as opposed to less than instructed), liking the exercise more (*liking*), perceiving more benefit in it (*benefit*), and considering it easier (*easiness*). General change beliefs only positively related to considering the exercise easy and benefitting from the exercise. The time invested for the exercise (*effort*) and continued practice beyond the instructed time period (*continuation*) did not relate to any of the variables.

TABLE 1 Means and standard deviations for the two conditions in well-being at the five time points

	3 good things (N = 141)		Placebo control (N = 126)	
	M	SD	M	SD
Pre	2.96	0.54	3.01	0.55
Post	3.16	0.52	3.07	0.56
2 weeks	3.13	0.60	3.07	0.56
4 weeks	3.15	0.60	3.10	0.53
12 weeks	3.19	0.56	3.15	0.51

Note: Well-being: Authentic Happiness Index.

TABLE 2 Means and standard deviations of beliefs about the malleability of well-being and variables on how participants engaged with the interventions

	Min	Max	M	SD	Skewness	Kurtosis
Completion	0	1	0.72	0.45	—	—
Effort	1	190	46.43	37.30	1.03	1.44
Liking	3	7	5.68	1.01	−0.89	0.36
Benefit	1	5	3.22	0.76	0.03	0.27
Easiness	1	5	3.54	0.95	−0.48	−0.75
Continuation	0	1	0.14	0.29	1.89	2.31
General change beliefs	2.25	10	8.11	1.16	−1.01	2.99
Instrumental change beliefs	1.83	10	7.00	1.86	−0.55	−0.27

Note: $N = 267$. Completion: (0 = “Yes, but I did less than instructed”, 1 = “Yes, as instructed”/“Yes, I did more than instructed”), effort: “How much time (in min) did you invest throughout the week?”, liking: “How did you like the exercise?” (1 = very bad to 7 = very good), benefit: “Did you benefit from the exercise?” (1 = not at all to 5 = very much), easiness: “Was the exercise easy to complete?” (1 = not at all to 5 = very much), continuation: “Did you conduct the exercise beyond the instructed time period?” (0 = “No”, 1 = “Yes”; asked at every follow-up). General change beliefs: Whether well-being in general is modifiable; instrumental change beliefs: Whether they knew how to change their well-being (1 = does not apply at all; 10 = applies completely).

TABLE 3 Intercorrelations of beliefs about the malleability of well-being and correlations with variables on how participants engaged with the interventions

	General change beliefs	Instrumental change beliefs
Completion	.08	.11*
Effort	−.06	.04
Liking	.11	.20**
Benefit	.14*	.24**
Easiness	.28***	.21**
Continuation	.00	.05

Note: $N = 267$. Completion: (0 = “Yes, but I did less than instructed”, 1 = “Yes, as instructed/Yes, I did more than instructed”), effort: “How much time (in min) did you invest throughout the week?”, liking: “How did you like the exercise?” (1 = very bad to 7 = very good), benefit: “Did you benefit from the exercise?” (1 = not at all to 5 = very much), easiness: “Was the exercise easy to complete?” (1 = not at all to 5 = very much), continuation: “Did you conduct the exercise beyond the instructed time period?” (0 = “No”, 1 = “Yes”; asked at every follow-up).

* $p < .05$. ** $p < .01$. *** $p < .001$ (one-tailed tests).

Are change beliefs associated with higher scores in well-being?

We computed a series of regression analyses in order to determine whether the intervention was effective in increasing well-being. We predicted the well-being scores after the intervention (averaged across posttest and the follow-ups after 2, 4, and 12 weeks) by the baseline well-being scores, the condition (0 = placebo, 1 = intervention), change beliefs (separately for general and instrumental change beliefs), and the condition \times change beliefs interaction. All predictors were mean centered before the analysis for preventing issues of multicollinearity. Therefore, no

noteworthy correlations among the predictors remained (all correlations of interaction terms with the predictors were $r < .10$ and all variance inflation factors were < 1.60 ; see Table S1 for correlations among other predictors). The same analyses were repeated for the individual time points after the intervention as dependent variables, that is, for the posttest, and for the follow-ups after 2, 4, and 12 weeks (see Table 4).

Table 4 demonstrates that across all time points after the intervention, we found an interaction between the condition and instrumental change beliefs ($\Delta R^2 = .007$), suggesting that those

TABLE 4 Regression of well-being after the intervention (all time points combined) on well-being at baseline, group membership, change beliefs, and their interaction

	General change beliefs			Instrumental change beliefs		
	β	p	ΔR^2	β	p	ΔR^2
All time points						
Pretest	.74	<.001	.400	.76	<.001	.407
Condition	.09	.023	.008	.09	.022	.008
Change beliefs	.06	.189	.003	.05	.231	.002
Interaction	.04	.257	.002	.08	.035	.007
Posttest						
Pretest	.77	<.001	.429	.77	<.001	.422
Condition	.11	.002	.012	.11	.002	.012
Change beliefs	.08	.062	.004	.08	.049	.005
Interaction	-.03	.445	.001	.02	.684	<.001
2 weeks						
Pretest	.75	<.001	.409	.75	<.001	.404
Condition	.08	.037	.007	.08	.036	.007
Change beliefs	.01	.816	<.001	.03	.533	.001
Interaction	.07	.071	.005	.09	.020	.009
4 weeks						
Pretest	.64	<.001	.301	.67	<.001	.321
Condition	.07	.112	.005	.07	.104	.005
Change beliefs	.07	.213	.003	.03	.524	.001
Interaction	.02	.680	<.001	.08	.069	.007
12 weeks						
Pretest	.61	<.001	.271	.63	<.001	.283
Condition	.07	.158	.004	.07	.153	.004
Change beliefs	.07	.189	.004	.06	.267	.003
Interaction	.10	.034	.010	.11	.015	.013

Note: $N = 267$. The different columns show the results when using the different facets (general vs. instrumental change beliefs) of change beliefs as a predictor. Pretest = well-being scores at baseline, Condition = placebo control condition (0) versus intervention condition (1), Change beliefs = general or instrumental change beliefs (depending on column), Interaction = interaction term between condition and the general or instrumental change beliefs (depending on column).

with stronger beliefs in the malleability of well-being benefited more from the intervention. No significant interactions between condition and change beliefs were found for general change beliefs ($\Delta R^2 = .002$). There was a significant main effect of condition ($\Delta R^2 = .008$), suggesting that the intervention condition reported higher gains in well-being also independent from their change beliefs. No significant main effects for change beliefs were found ($\Delta R^2 = .002$ to $.003$), suggesting that those in the control condition did not report higher well-being after the intervention if they had stronger beliefs in the malleability of well-being.

Analyses of the separate time points revealed that at the immediate posttest, there was a main effect of instrumental change beliefs ($\Delta R^2 = .005$), but no interaction with condition ($\Delta R^2 \leq .001$), suggesting that both conditions reported higher well-being scores after the intervention if they had stronger beliefs in the malleability of well-being, but there was no difference between the conditions at this point in time. At the follow-ups after 2 and 12 weeks (and partially at the follow-up after 4 weeks), there was a significant interaction between the condition and the change beliefs, with stronger and more robust results for instrumental change beliefs ($\Delta R^2 = .009/.007/.013$ after 2, 4, and 12 weeks) than general change beliefs ($\Delta R^2 = .005/<.001/.010$ after 2, 4, and 12 weeks).

As a robustness check, we repeated the analyses using all the data of all participants who fulfilled the inclusion criteria and completed the pretest and at least one of the posttest measures ($n = 469$) using hierarchical linear models: We predicted well-being after the intervention by the pretest scores, time (coded as 0, 2, 4, 12 = 0, 2, 4, and 12 weeks after the intervention), condition (0 = placebo control, 1 = intervention condition), and the beliefs about the malleability of well-being (separate analyses for general and instrumental beliefs), and the two- and three-way interactions among time, condition, and malleability beliefs. Models allowed for a random intercept and used a fixed slope for each participant and used a restricted maximum likelihood estimation. All predictors were (grand) mean centered before the analysis. Results suggested a time \times condition \times malleability beliefs interaction with larger differences between the intervention and the control condition for those with higher beliefs in malleability of well-being; further, these differences increased at later time points (see Table S2 and Figure S1 for detailed results). Thus, the results paralleled the complete case analyses above and confirmed the relevance of malleability beliefs, also when taking the data of participants into account that did not complete the full study protocol.

DISCUSSION

The results of the present study indicate that beliefs about the malleability of well-being are associated with how people engage in positive psychology interventions and the outcomes of such interventions. The study demonstrates that especially beliefs in knowing how to change one's own well-being go along with more often completing the exercise as instructed, liking the exercise more, reporting higher subjective benefit from an exercise, and considering it less difficult to conduct.

In addition, those who believed that they know how to change their well-being benefited more from a positive psychology intervention than those in the placebo control condition. This effect was mostly observable for those in the intervention condition at the later measurement time points. However, during the posttest immediately following the intervention, this effect was present in both the intervention and the placebo control conditions. One might assume that

those who believe that they can change their well-being tend to perceive increases in well-being, regardless of the intervention they are conducting and thus are able to benefit more strongly from a placebo effect. At the same time, we argue for not overinterpreting this finding, because it only applied to the immediate posttest, but did not appear at the other time points. All these findings do need to be replicated, but they were widely in line with the researchers' expectations and provide a useful starting point for the consideration of beliefs in the study of positive psychology interventions.

Our results support earlier notions that beliefs of participants affect the outcomes of positive psychology interventions (Lyubomirsky & Layous, 2013). While this effect has been widely discussed (e.g., Hudson & Fraley, 2015) and empirically corroborated in literature on the changeability of personality traits (Yeager et al., 2013), it has not been empirically tested in positive psychology interventions thus far.

These results potentially bear important implications for the practical application of positive psychology interventions. It is recommended that interventions include a psychoeducative aspect that informs participants about the malleability of well-being. This would be aimed at altering (or strengthening) participants' existing beliefs that well-being can be changed by deliberate interventions (which has been demonstrated for beliefs about intelligence, Paunesku et al., 2015; Yeager et al., 2013, 2016; similar suggestions have also been made for changing personality traits; see Allemann & Flückiger, 2017; van Tongeren & Burnette, 2018). The present study offers two justifications for this suggestion. First, the interventions were more effective in comparison with the placebo control group in increasing well-being in those with stronger beliefs in the malleability of well-being. Second, those with stronger beliefs in the malleability of well-being exhibited better compliance (i.e., they completed the intervention more often as instructed), as well as liked and subjectively benefited more from the intervention. These factors have also been found to be associated with higher levels of well-being in the long run (Proyer et al., 2015). Moreover, participants' belief in the malleability of well-being also had some positive effects in the placebo control condition, especially at the posttest immediately following the intervention. In practical terms, it is desirable to make use of the truly "active ingredient" of an intervention (see, e.g., Gander et al., 2020), as well as the placebo effect, in order to obtain the most optimal outcomes. Thus, convincing participants that they can change their well-being before an intervention may be beneficial, regardless of whether they complete an effective or an ineffective intervention.

Based on the comparison of different aspects of malleability beliefs tested in the present study (general and instrumental change beliefs), the results suggest that it is most fruitful to focus on instrumental beliefs, that is that people can be provided with the tools to do so and thereby increase their well-being-specific self-efficacy, or internal locus of control. For example, people could be taught about positive psychology interventions or general factors that are known to affect well-being (i.e., social relationships).

Several limitations of the present study have to be acknowledged. Most importantly, beliefs in well-being changes were only examined quasi-experimentally; thus, no causal conclusions can be made. Although the relationships between participants' beliefs and how they engaged with the intervention can only be described as operating in one direction (i.e., whether someone completed the intervention as instructed cannot influence whether they considered well-being to be modifiable before the activity), effects of third variables cannot be excluded. Additionally, we used an ad hoc measure of change beliefs, based on the different aspects of Seligman's (2011) well-being theory,² and there might have been a variance restriction in the beliefs about the

malleability of well-being in our sample. On average, rather high scores were obtained, especially for general change beliefs, as not uncommon for similar measures (e.g., Farnier et al., 2021). Thus, it is possible that the assessment procedure used in this study was not sensitive enough for this sample, which could have resulted in an underestimation of the effects of change beliefs. Overall, future studies might use different operationalizations that better differentiate among people who are already rather confident that well-being is malleable and that know how to alter their well-being.

While the present study confirmed the role of change beliefs in positive psychology interventions, the logical next step for future research would be to compare a positive psychology intervention with a psychoeducative session on the malleability of well-being with an intervention without such a session. While our findings suggest that those obtaining such a session would engage in the intervention in a more preferable way and would report higher increases in well-being, only an experimental study can settle this question. If such an experimental study would yield positive results, including a growth-mindset component to positive psychology interventions could make an important addition to the field. The work by Paunesku et al. (2015) and Yeager et al. (2016) provides an excellent example how such a component could be developed. For example, participants could be taught about the malleability of well-being and asked to write a letter of advice to another person who would like to foster their well-being.

Furthermore, as in most online studies, the present study also suffered from a large number of dropouts, which limits the generalizability of the findings, despite the fact that no relationships between the outcome variables and the baseline scores were found. In addition, because the effects identified were smaller than expected, several of our analyses are presumably underpowered, in particular those addressing the interaction effects. Finally, the generalization of the findings is limited to well-educated, German-speaking participants and depends on a replication of this study and extensions of the findings.

Overall, the present study has provided further knowledge on relevant moderators of the efficacy of positive psychology interventions, demonstrating that the belief that well-being is modifiable is associated with better engagement in and more benefit from a positive psychology intervention.

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ETHICS STATEMENT

The local ethics committee approved the study before it was launched.

CONFLICT OF INTEREST

The authors state that there are no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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ENDNOTES

¹ We decided for an oblique rotation because people who believe in the malleability of well-being presumably also tend to know how to change their well-being (instrumental change beliefs). This is also reflected by the intercorrelations between the manifest scores of the two scales (see below).

² See also Farnier et al. (2021) for a recently developed measure for global well-being-specific locus of control.

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