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## **Individual differences in the effects of a positive psychology intervention: Applied psychology**

Pascal Antoine a, Bruno Dauvier b, Eva Andreotti a, Anne Congard b

a Univ. Lille, CNRS, UMR 9193 - SCALab - Sciences Cognitives et Sciences Affectives, F-59000 Lille, France

b Centre PsyCLE (AE 3273), Aix-Marseille University, 13624 Aix-en-Provence, France

### **Abstract :**

**Objectives:** A 6-week multicomponent positive psychology intervention (PPI) was assessed with the primary aim of determining its effects on affective variables including anxiety, depression and psychological distress, as well as processual ones, such as mindfulness and emotion regulation. Exploratory investigations were conducted to consider changes in individual differences according to baseline characteristics.

**Method:** Participants were from a community sample of the French population. They were assigned to the control (n = 43) or intervention group (n = 59). Self-assessment measures included the Mindful Attention Awareness Scale, Cognitive Emotion Regulation Questionnaire, Spielberger State-Trait Anxiety Inventory, Beck Depression Inventory and the General Health Questionnaire.

**Results:** Trait anxiety, depressive symptoms and psychological distress significantly decreased over the course of the PPI in comparison to the control group. Regarding processual variables, mindfulness increased with a large effect size, acceptance and positive reappraisal increased, and scores for other-blame strategy significantly decreased. Exploratory analyses showed that mindfulness and positive reappraisal tended to increase even more when participants' initial levels were low.

**Conclusion:** Future clinical interventions should account for baseline characteristics to ensure that participants are referred to the most effective, suitable programs for their own needs.

**Keywords:** Positive psychology Self-help Mindfulness, Differential approach, Positive psychology intervention Cognitive emotion regulation

### **1. Introduction**

In recent years, conducting promising controlled interventions intended to reduce unpleasant feelings and enhance positive attributes has been a priority of the positive psychology field as part of efforts to promote mental health and well-being (Donaldson, Dollwet, & Rao, 2015; Rashid, 2015; Schueller & Parks, 2014). Obtaining a better understanding of how to promote the experience of positive emotions is a fundamental aspect of positive psychology (Kobau et al., 2011). Individuals'

responses to life events involve self-regulatory and conscious cognitive coping strategies. Affective experiences are greatly influenced by the emotion regulation strategies employed, and emotions can also influence the subsequent emotion regulation strategies used (Garnefski, Kraaij, & Spinhoven, 2001; Pavani, Le Vigouroux, Kop, Congard, & Dauvier, 2016). According to Fredrickson's (2001) Broaden- and-Build model, negative emotions narrow the thought-action repertoire and promote reactions that rely on known patterns. Rumination might therefore be a consequence of a narrowed thought-action repertoire that creates the experience of negative affect (Pavani et al., 2016). On the other hand, positive emotions broaden individuals' attentional field and thought-action repertoire. New ideas and actions build resources that can be implemented in various situations (Fredrickson, Cohn, Coffey, Pek, & Finkel, 2008). Thus, positive emotions might counter negative ones through an "undoing effect" (Fredrickson, Mancuso, Branigan, & Tugade, 2000). The positive reappraisal coping strategy, which involves reframing negative events by recalling their positive components, has been shown to prevent the incidence of affective disorders and to trigger positive affect (Garnefski et al., 2002; Levine, Schmidt, Kang, & Tinti, 2012; Pavani et al., 2016). Therefore, conducting and examining interventions that aim to enhance cognitive emotion regulation strategies (Garnefski et al., 2001) appears worthwhile.

Meta-analyses of positive psychology interventions (PPIs) have shown moderate effects on depression and well-being (Bolier et al., 2013; Mitchell, Vella-Brodrick, & Klein, 2010; Sin & Lyubomirsky, 2009). Specific findings have indicated a lower level of depression (Fava, Rafanelli, Cazzaro, Conti, & Grandi, 1998; Proyer, Gander, Wellenzohn, & Ruch, 2016b; Roepke et al., 2015; Schueller & Parks, 2012; Seligman, Rashid, & Parks, 2006; Seligman, Steen, Park, & Peterson, 2005) and negative affectivity (Moskowitz et al., 2012) and increases in well-being (Fava et al., 1998; Proyer et al., 2016b; Seligman et al., 2005), positive affectivity (Emmons & McCullough, 2003; Moskowitz et al., 2012) and life satisfaction (Lyubomirsky, Sousa, & Dickerhoof, 2006), as well as better physical and mental health (Lyubomirsky et al., 2006). The effectiveness of PPI in terms of affective variables has received substantial support; however, clarifying the underlying processes remains of interest.

The positive psychotherapy theory synthesizes the underlying mechanisms of several PPIs: attention and memory re-education, changes in behavioral aspects and strength promotion (Walsh, Cassidy, & Priebe, 2016). For example, present-focused attention would allow for the identification of individuals' potential strengths (Shapiro, Schwartz, & Santerre, 2002) and therefore contribute to reducing psychological disorders, including anxiety and depression (Khoury et al., 2013). According to the positive psychotherapy theory (Walsh et al., 2016), personal characteristics (e.g., motivation, beliefs, affective state, personality, social support, and cognitive abilities; Proyer, Gander, Wellenzohn, & Ruch, 2016a) and intervention features (e.g., dosage, support, and variety; Walsh et al., 2016) moderate the effects of PPI on affective states.

As positive psychology calls for the implementation of activities that favor well-being, we deliberately used a multidimensional and multi-component approach, as variety in programs has been associated with positive benefits (Parks, 2015; Parks, Della Porta, Pierce, Zilca, & Lyubomirsky, 2012; Thompson, Peura, & Gayton, 2015). Six main axes were defined according to the literature. These axes aimed to implement timely intentional activities and are more specifically defined below. According to the positive psychotherapy theory (Walsh et al., 2016), PPIs require three phases: engagement (similar to the committed flow experience when strengths are mobilized to solve a challenge; Nakamura & Csikszentmihalyi, 2014), pleasure (with positive emotions that individuals can mindfully experience, savor and amplify) and meaning and purpose in life (when actions occur in a broader field than one's existence), as outlined in Seligman's (2002) happiness component model. To address these constructs, the PPI we designed focused on both the "subjective" and "individual" levels of positive

psychology (Meyers, van Woerkom, & Bakker, 2013) and purposely adopted notions from eudaemonist and hedonist doctrines (Ryan & Deci, 2001). The activities were designed based on the concept of psychological well-being (Ryff & Keyes, 1995) and therefore encompassed notions of self-acceptance, personal growth, purpose in life, positive relationships, environmental mastery and autonomy. Furthermore, close attention was paid to activities that were in line with life satisfaction and affective life according to the subjective well-being model (Diener, 1994). Therefore, participants were presented with pleasant, engaging and meaningful activities that were consistent with their own aspirations and were included in the positive psychotherapy theory and Seligman (2002). Accordingly, several constructs were considered: the self-concordance motivation model (Sheldon & Elliot, 1999; Sheldon & Lyubomirsky, 2006) and the person-activity fit model, including characteristics of and congruence between activities and individuals as well as psychological processes, involving positive psychology exercises effectiveness (Lyubomirsky & Layous, 2013; Schueller & Parks, 2014).

Moreover, as duration and format have been shown to influence outcomes, with longer interventions producing better outcomes than shorter ones (Sin & Lyubomirsky, 2009), we decided to implement this PPI over 6 weeks.

Self-help interventions might offer an accessible way of overcoming individual's reticence to attend one-on-one therapy and could integrate sessions as complementary resources (Norcross, 2006). As these interventions often rely on self-administered activities, positive psychology approaches seem adequately suited to offer self-help interventions (Mitchell, Stanimirovic, Klein, & Vella-Brodrick, 2009; Parks, 2015).

The PPI we designed was meant to be easily self-administered and to not require clinician intervention. Our approach aimed to address the need to disseminate alternative, innovative, cost-effective and evidence-based self-help psychological tools among the numerous resources available for individuals seeking personal and positive development (Bolier et al., 2014; Kazdin & Blase, 2011; Schueller & Parks, 2014).

In most cases, the effects of PPIs have been studied using between-group analyses; however, such outcomes do not consider variance within groups (Woodworth, O'Brien-Malone, Diamond, & Schüz, 2016). Reducing data to averages might result in a loss of information; for example, participant samples might be heterogeneous and contain several subgroups (Schueller & Parks, 2012; e.g., in terms of psychological distress; Parks et al., 2012), and adverse effects might not be taken into consideration (Parks, 2014; Rozental et al., 2014). Exploratory analyses might highlight the differential effects of this PPI by investigating the affective and processual variables involved and the participants' initial levels of these variables. Indeed, according to their dispositional characteristics, individuals' competencies in emotion regulation and mindfulness might experience different influences throughout the course of the PPI. Accordingly, our intervention design expanded to observe this potential phenomenon.

In summary, this study evaluated a 6-week self-help PPI that was based on six focal areas of activities that were supported by the literature. The primary aim of this study was to assess the effects of this PPI on affective and processual emotion regulation variables. We hypothesized that, compared to a control group, participants in the self-administered PPI group would show significant improvement from pre-test to post-test in variables such as anxiety, depression and psychological distress. Furthermore, we hypothesized that significant processual changes in mindfulness and in cognitive strategies regarding emotion regulation would occur over the course of the PPI, based on comparisons with a control group. The exploratory aim of the study was to consider the differences in individuals' progress according to their specific characteristics at baseline. We aimed to understand the differential effects of the PPI according to the individual's baseline characteristics.

## 2. Method

### 2.1. Participants

The participants' characteristics are displayed in Table 1. In total, 167 people from the French population were contacted from September 2013 to December 2013 by Lille University psychology students. The recruitment pool covered their social networks (i.e., relatives, online or leisure networks). Overall, 108 individuals voluntarily agreed to participate and were assigned to the intervention group. The control data corresponded to a control group previously assessed in a study sharing the same methodological design ( $n = 43$ ). The exclusion criteria included people who had Axis 1 disorders, were receiving therapy and were deaf. To be included in the study, participants had to be

**Table 1**  
Participants' characteristics.

Variable	Value	Control group ( $n = 43$ )	Intervention group ( $n = 59$ )
Sex	Female (%)	30 (69.7)	41 (69.5)
Age	Mean (range)	37.2 (20–80)	37.0 (21–67)
Prior meditation experience	Yes (%)	20 (46.5)	29 (49.1)
Education level: years of schooling after primary school	Mean (range)	8.4 (0 – 12)	9.4 (0–17)
Activity	Professional (%)	28 (65.1)	53 (89.8)
	Student (%)	13 (30.2)	4 (6.8)
	Retired (%)	2 (4.6)	2 (3.4)
Marital status	Divorced (%)	4 (9.3)	1 (1.7)
	Married (%)	10 (23.2)	17 (28.8)
	Single (%)	26 (60.4)	36 (61.0)
	Civil union (%)	2 (4.6)	3 (5.1)
	Widowed (%)	1 (2.3)	2 (3.4)

over 18 years old. The criteria were based on participant reports. No re-muneration was provided.

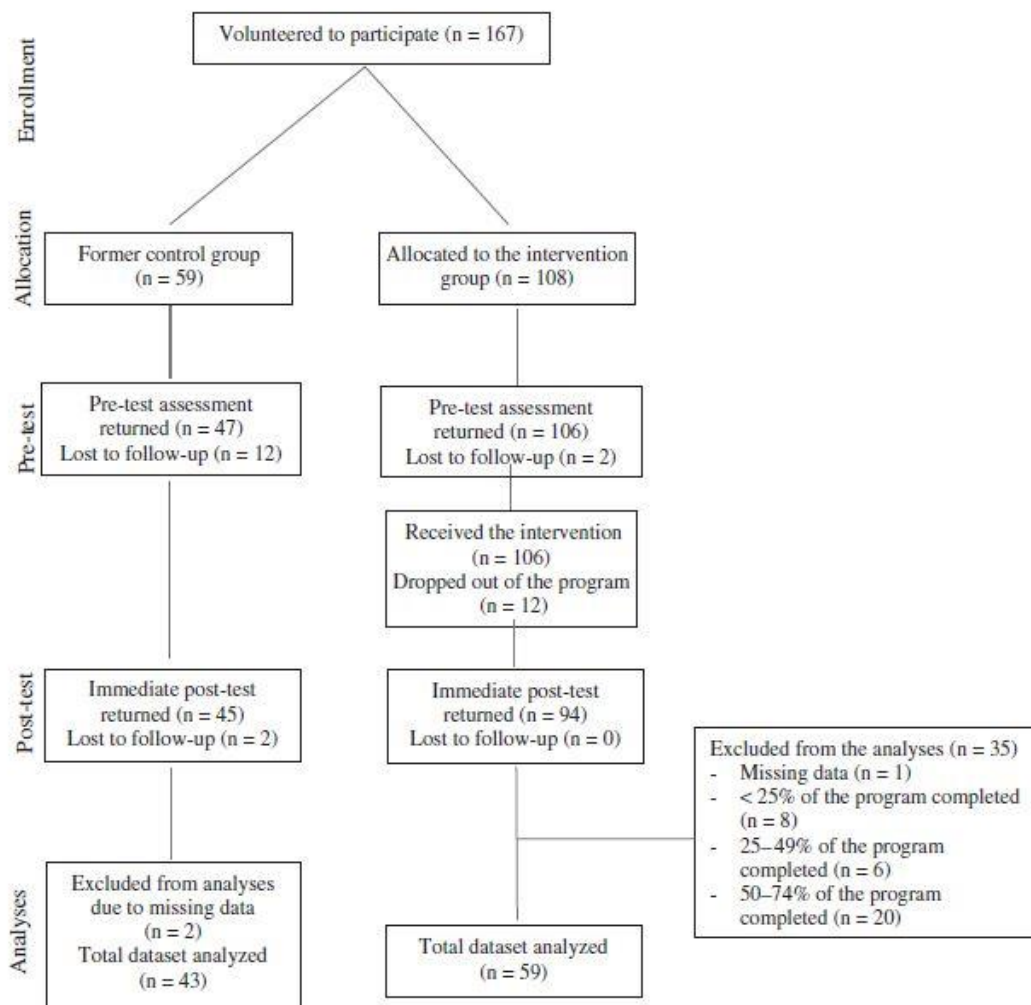


Fig. 1. Procedure flowchart.

## 2.2. Procedure

This study was approved by the French Ethical Research Comity Nord Ouest III. Information about the study was provided through letters, emails, phone calls, and face-to-face meetings. All the participants included in the study provided written informed consent. Detailed information regarding the experimental procedure is displayed in the flow chart (Fig. 1). Baseline questionnaires were completed by the intervention group participants, and they began the 6-week PPI three days later. The PPI was mailed to each participant with detailed instructions and the investigators' contact information. Immediate posttest questionnaires were completed three days after the end of the program. The control group had already completed the pre-test and post-test questionnaires during a former study based on the same design.

## 2.3. Positive psychology program overview

This program was based on a review of the PPIs in the literature and was adapted for the French population. The intervention included a diary that the participants kept as well as daily activities that required no more than 20 min per day to complete. This PPI was organized around six main axes:

- "A pleasant life": participants looked for and savored positive emotions in their daily experience. Additionally, they learned how to recognize pleasant moments and to cultivate feelings of gratitude (Bryant, Smart, & King, 2005; Emmons & McCullough, 2003; Seligman et al., 2005; Sheldon & Lyubomirsky, 2006).

- "Self-discovery": participants were invited to discover their key strengths and qualities as well as ways to apply them concretely in their daily life. Development of kindness was especially emphasized (Moskowitz et al., 2012; Otake, Shimai, Tanaka-matsumi, Otsui, & Fredrickson, 2006).

- "Positive relationships with others": participants' practices were shifted towards building and maintaining quality relationships by acknowledging others' qualities, experiencing gratitude, savoring fulfilling relationships, reflecting about a difficult communication exchange, and practicing listening to others effectively (Gable, Reis, Impett, & Asher, 2004).

- "Negative events/positive reappraisal": this aspect of the program aimed to reduce the emotional impact of a negative event (Gross, 2001). To do so, participants were suggested to observe and to approach negative life events by taking a step back, while considering emotions that rose; this method allowed them to reframe the facts and to look for potential benefits in the particular situation (Seligman et al., 2006).

- "Mindfulness": participants were taught to contemplate rising emotions, thoughts, and sensations as they experienced them. The suggested exercises included two formal meditation practices, i.e., a body scan and a mindful breathing exercise, and informal practices, such as walking mindfully and discovering their environment as if for the first time.

- "Personal development, meaning and purpose in life": this axis encompassed aspects of control over the environment and autonomy.

Participants were encouraged to find themselves in situations in which the decisions they made were congruent and true to their life purpose, allowing them to evolve in a chosen direction. Questions about values transmitted and shared with others were raised (Ben- Shahr, 2010). Participants were invited to plan ahead to identify ways of continuing to practice certain positive psychology activities.

## 2.4. Measures

### 2.4.1. Observance

The number of positive psychology activities completed was reported daily by the participants on a separate form.

### 2.4.2. Socio-demographic variables

A questionnaire was administered to collect information about participants' age, sex, family, education status and previous experience with mindfulness.

### 2.4.3. Mindfulness

Competence in mindful attention and awareness towards present experiences were measured using the French version of the Mindful Attention Awareness Scale (Brown & Ryan, 2003; Jermann et al., 2009).

This questionnaire evaluates the perceived frequency of trait mindful awareness as a single construct. The 15 items ask participants to reply on a 6-point Likert scale ranging from 0 (almost always) to 6 (almost never). The internal consistency of the French version was 0.84 (Jermann et al., 2009).

### 2.4.4. Cognitive emotion regulation measure

**Table 2**  
Comparison of control group and intervention group means from pre-test to post-test.

		Pre-test					Post-test					Interaction effect	
		df	M	SD	t	M	SD	ES <sub>w</sub>	t	ES <sub>B</sub>	F		
MAAS	CONT	42	58.04	11.53	- 0.358	56.72	12.61	0.19	1.267	- 0.804	18.071 <sup>***</sup>		
	INT	58	58.20	11.61		65.91	10.48					- 0.69	- 4.705 <sup>***</sup>
STAI-T	CONT	42	47.74	8.81	0.368	47.00	10.44	0.11	0.772	0.474	7.926 <sup>**</sup>		
	INT	58	47.03	10.18		42.18	9.92					0.61	4.772 <sup>***</sup>
GHQ	CONT	42	12.51	5.58	- 1.037	11.34	6.55	0.19	1.26	0.443	10.40 <sup>**</sup>		
	INT	58	13.74	6.18		8.62	5.83					0.83	6.372 <sup>***</sup>
BDI	CONT	42	5.32	5.07	0.238	5.18	4.82	- 0.03	0.229	0.413	3.889 <sup>*</sup>		
	INT	58	5.08	5.02		3.37	4.04					0.43	3.316 <sup>**</sup>
CERQ self-blame	CONT	42	9.72	3.04	- 0.011	9.65	3.35	- 0.02	0.176	0.208	1.538		
	INT	58	9.72	3.89		8.94	3.39					0.25	1.981
CERQ acceptance	CONT	42	13.14	3.21	0.790	13.46	3.46	- 0.10	0.176	- 0.236	4.514 <sup>*</sup>		
	INT	58	12.61	3.42		14.27	3.37					- 0.54	- 4.154 <sup>***</sup>
CERQ rumination	CONT	42	11.69	3.52	0.071	11.95	3.51	- 0.07	- 0.461	0.177	0.014		
	INT	58	11.64	3.92		11.30	3.76					0.10	0.777
CERQ positive refocusing	CONT	42	9.65	4.50	0.218	10.74	4.37	- 0.33	- 2.176 <sup>*</sup>	- 0.095	0.643		
	INT	58	9.47	3.68		11.11	3.62					- 0.46	- 3.585 <sup>***</sup>
CERQ planning	CONT	42	14.00	3.49	0.890	14.07	3.61	- 0.02	- 0.166	- 0.009	1.097		
	INT	58	13.37	3.52		14.10	3.64					- 0.21	- 1.652
CERQ positive reappraisal	CONT	42	13.07	4.14	1.184	13.39	4.35	- 0.12	- 0.828	- 0.164	5.977 <sup>*</sup>		
	INT	58	12.05	4.39		14.11	4.45					- 0.50	- 3.857 <sup>***</sup>
CERQ putting into perspective	CONT	42	13.88	3.41	1.772	14.44	3.98	- 0.21	- 1.391	0.10	1.649		
	INT	58	12.67	3.54		14.03	3.76					- 0.39	- 3.065 <sup>**</sup>
CERQ catastrophizing	CONT	42	7.18	3.02	0.053	6.90	2.96	0.09	0.618	0.078	0.138		
	INT	58	7.15	3.19		6.67	2.89					0.20	1.545
CERQ other-blame	CONT	42	6.46	1.93	- 1.895	7.18	2.43	- 0.33	- 2.219 <sup>*</sup>	0.165	8.278 <sup>**</sup>		
	INT	58	7.37	2.67		6.78	2.47					0.24	1.915

Note: CONT: Control group, INT: Intervention group, MAAS: Mindful Attention Awareness Scale, GHQ: General Health Questionnaire, STAI-T: State-Trait Anxiety Inventory Trait, BDI: Beck Depression Inventory, CERQ: Cognitive Emotion Regulation Questionnaire, SD: standard deviation, F: Fisher's test, ES<sub>w</sub>: Cohen's d within-group effect size, ES<sub>B</sub>: Cohen's d between-groups effect size, df: degree of freedom.

\*  $p < 0.05$ .

\*\*  $p < 0.01$ .

\*\*\*  $p < 0.001$ .



The Cognitive Emotion Regulation Questionnaire (CERQ) was used to identify specific and conscious cognitive emotion regulation strategies exhibited by the individual after experiencing aversive life events (Garnefski et al., 2001). This 36-item questionnaire encompasses nine subscales representing nine coping strategies: Self-Blame, Acceptance, Rumination, Positive Refocusing, Planning, Positive Reappraisal, Putting into Perspective, Catastrophizing and Other-Blame. Answers are rated on a 5-point scale ranging from 1 (almost never) to 5 (almost always).

The internal consistencies of the French version of the CERQ subscales were found to range from 0.68 to 0.87 (Jermann, Van der Linden, d'Acremont, & Zermatten, 2006).

#### 2.4.5. Affective variables

Anxiety was assessed with the French version of the Spielberger State- Trait Anxiety Inventory (STAI, Spielberger, Gorsuch, & Lushene, 1970; Gauthier & Bouchard, 1993). The trait anxiety scale is composed of 20 items that measure trait anxiety as the frequency of perceiving external events as threatening on a 4-point scale ranging from 1 (no) to 4 (yes).

This scale showed a 0.91 internal consistency in this population.

Depressive symptomatology was assessed with the 13-item Beck

Depression Inventory – Short Form (Beck & Beamesderfer, 1974).

Participants selected the responses to three suggestions that reflected their state of mind on a 4-point scale from 0 (none) to 3 (severe depressive symptom). The internal consistency of the French version was  $\alpha = 0.90$  (Bourque & Beaudette, 1982).

To evaluate psychological morbidity and distress and to uncover any arising psychiatric disorders, the General Health Questionnaire – 12 (GHQ-12, Goldberg et al., 1997) was used. This self-assessment measure is rated on a 4-point scale (0–3) outlining the frequency with which respondents had experienced the symptoms described in the 12 items in the past weeks (from “more so than usual” to “more less able” for positive questions and from “not at all” to “much more than usual” for negative questions). The French translation has been validated and found to have an internal consistency of 0.78 (Salama-Younes, Montazeri, Ismail, & Roncin, 2009).

#### 2.5. Statistical analyses

Statistical analyses were conducted with R software version 3.1.2 for Windows. Groups were compared regarding socio-demographic information and baseline variables with chi-square analyses, between-group differences were assessed with two-tailed t-tests (see Table 2), and subgroups were analyzed with the Mann-Whitney U test. A repeated-measures analysis of variance (ANOVA) was conducted to study the interaction effects between group and time. Effect sizes were calculated to rate the significance of the intervention's impact on several variables. Inter-individual differences in variables were analyzed with a generalized linear model (GLM), which required the “lme4” library.

### 3. Results

#### 3.1. Differential attrition

In total, 102 datasets were examined: 59 in the intervention group and 43 in the control group (see Fig. 1). Two sets of questionnaires from the control group and one from the intervention group were excluded because of missing data. Table 1 presents the participants' general characteristics. The inclusion criterion for the analyses of the intervention effects and processes was set at completion of 75% of the activities. This strict adherence level was based on a desire to increase the reliability of the assessment of this PPI's quality and efficacy. Twelve participants dropped out over the course of the program. Eight persons did not complete more than one-fourth of the program, and six completed between 25% and 49% of the suggested activities. Twenty participants completed between 50% and 75% of the program.

The baseline characteristics of the participants who dropped out ( $n = 12$ ) were compared with those of the intervention group using the Mann-Whitney U test and X<sup>2</sup> test. Marital status was the only nonequivalent variable at baseline, with 61% of the participants in the intervention group being single compared to 16% in the drop-out group [X<sup>2</sup> (4,  $n = 71$ ) = 12.6,  $p = 0.013$ ]. Participants who completed <75% of the program ( $n = 34$ ,  $M = 41.6$ ,  $SD = 13.73$ ) tended to be older than those who completed > 75% ( $n = 59$ ,  $M = 37.0$ ,  $SD = 12.29$ ),  $t(91) = 1.669$ ,  $p = 0.09$ .

### 3.2. PPI effects

The groups were found to be equivalent at pre-test for all variables except education level and professional status based on X<sup>2</sup> and t-tests.

Intervention participants had on average 9.4 years of schooling after primary school ( $SD = 3.02$ ), whereas control group participants had received 8.3 years ( $SD = 3.19$ ),  $t(100) = 1.90$ ,  $p = 0.05$ . In the intervention group, 89.8% of the participants were professionals and 6.8% were students, whereas in the control group, 65.1% were professionals and 30.2% were students [X<sup>2</sup> (2,  $n = 102$ ) = 10.22,  $p = 0.006$ ].

To study the effects of the group x time interaction on the variables of interest, repeated-measures ANOVA was conducted (see Table 2).

Affective variables such as trait anxiety, psychological distress and depressive symptoms significantly decreased in the intervention group, with a moderate effect size, whereas the control group displayed no such improvements. Processual variables such as daily mindful attention increased with a large effect size in the intervention group but not in the control group. Some cognitive emotion regulation strategies significantly changed over the course of the program in the intervention group compared to the control group: acceptance and positive reappraisal scores increased with small effect sizes, while use of the otherblame strategy decreased. Other-blame and positive refocusing increased in the control group but not in the intervention group. Although putting into perspective and positive refocusing strategies increased significantly in the intervention group, no between groups interactions were found. No significant effects were observed for catastrophizing, planning, rumination or self-blame.

### 3.3. Individual differences in PPI effects according to baseline characteristics

#### 3.3.1. General procedure

Inter-individual differences for all variables showing significant comparison outcomes were assessed using a GLM. The aim of these exploratory analyses was to identify the profiles that would benefit from the PPI by comparing differences in effects according to differences in baseline characteristics between the two groups from pre-test to post-test.

### 3.3.2. Individual differences in PPI effects according to MAAS and CERQ positive reappraisal scores

In Fig. 2, the graph on the left shows the evolution of individual MAAS scores from pre-test on the x-axis to post-test on the y-axis; each single dot represents a participant. Gray dots indicate control group participants, and black dots represent PPI participants. In this type of graph, if there was no intervention impact, the dots would be around the diagonal dotted line (light gray), demonstrating an identical score before and after the PPI. Thus, dots located under the diagonal dotted line represent individuals whose scores decreased from pre-test to posttest.

In most cases, the black dots are above the diagonal dotted line, indicating that participants who completed the PPI showed improved MAAS scores during the intervention. The GLM analyses indicated what occurred in the control group (gray line) and the intervention group (black line). The experimental group black line is above the diagonal line on the left side of the graph and thus shows that MAAS scores increased significantly for individuals starting with a lower level. A significant interaction effect was observed between the MAAS baseline and post-test levels by group, with  $r$  reflecting the interaction coefficient

[ $t = -3.319$ ,  $r = -0.47$ ,  $p < 0.001$ ]. Participants' levels of daily mindful attention increased even more when they had low baseline scores, whereas participants who started with higher MAAS scores did not progress from pre-test to post-test.

Subsequently, analyses of the CERQ subscales were conducted and showed significant mean changes from baseline to post-test. In these analyses, we aimed to account for specific variables that might exhibit potential for improvement. Positive reappraisal was the only subscale that showed such a tendency, as shown in the graph on the right.

Indeed, an interaction effect between the evolution of positive reappraisal from pre-test to post-test and group was observed, although it was not significant [ $t = -1.825$ ,  $r = -0.27$ ,  $p = 0.07$ ]. Thus, participating in the PPI led to an increased frequency of positive reappraisal use among participants, especially when their baseline levels were low.

## 4. Discussion

This study investigated how a multicomponent PPI could promote changes in affect by exploring the underlying potential mechanisms and the different patterns of change over the course of the intervention.

First, this self-administered intervention experienced less attrition than the rates reported in the literature. Indeed, up to 87% of the initial sample returned post-test data, and 54% of the intervention group completed > 75% of the activities. As hypothesized, and consistent with the literature, we witnessed moderate changes between pre-test and post-test in affective variables such as trait anxiety, depression symptoms and psychological distress (Sin & Lyubomirsky, 2009). Mindful attention in daily life significantly improved over the course of the intervention with a strong effect, while slight patterns

in change occurred for acceptance, positive reappraisal and other-blame among the cognitive emotion regulation strategies assessed with the CERQ (Garnefski et al., 2001).

This multicomponent intervention represented an opportunity to target different underlying regulatory processes through six main axes (Quoidbach, Mikolajczak, & Gross, 2015). The variety of activities might explain the slightly better attrition rate compared to those of other studies, as this diversity could have acted as a protective factor against hedonic adaptation to positive outcomes (Parks et al., 2012; Parks-Sheiner, 2009; Roepke et al., 2015; Schueller & Parks, 2012). Indeed, the participants might have found adequate and relevant activities that they could implement in their daily life, as proposed in the person-activity fit model (Schueller & Parks, 2012). Considering the discrepancy between engagement in appreciated activities and the benefits received, offering a large variety of activities by axis might have enhanced strategies that otherwise were neglected (Parks et al., 2012). Additionally, given the mostly fixed program, participants could experiment with activities they were not familiar with, potentially building additional competencies (Quoidbach et al., 2015; Schueller & Parks, 2012).

Measuring mindfulness in a PPI was an innovative step that resulted in major improvements. Mindfulness has a shared history with positive psychology (Hamilton, Kitzman, & Guyotte, 2006; Niemiec, 2012; Shapiro et al., 2002) and emotion regulation strategies (Brockman, Ciarrochi, Parker, & Kashdan, 2017; Chambers, Gullone, & Allen, 2009).

One axis was dedicated to mindfulness and was incorporated throughout the PPI. Mindfulness might play a significant role in the initiation of emotion regulation strategies, which in turn could reduce perceived distress, anxiety and depressive symptoms (Chiesa, Anselmi, & Serretti, 2014; Garland, Farb, R. Goldin, & Fredrickson, 2015). Furthermore, trait mindfulness mediates the use of maladaptive coping (Keng & Tong, 2016), such as rumination and experiential avoidance strategies (Chiesa et al., 2014). Recently, mindfulness was considered an emotion regulation strategy that represented an overarching contextual adaptive profile (Brockman et al., 2017; Chambers et al., 2009).

One of the main contributions of this study was that it provided evidence that a PPI could enhance positive reappraisal and acceptance and reduce other-blame. Other cognitive emotion regulation strategies did not evolve over the course of the program; it is possible that our PPI did not implement activities targeting all strategies. Other-blame represents a sense of powerlessness and absence of mastery, which would not allow for transformations in experience (Tedeschi, 1999); this strategy has been found among people experiencing relational stress (Schroevens, Kraaij, & Garnefski, 2007). Two of the activities in the "Positive relationships with others" axis encouraged individuals to take a step back in relational situations, and these activities might have influenced the use of this strategy. Acceptance and positive reappraisal were found to reduce psychological distress and avoidance strategies when facing adverse events (Wolgast, Lundh, & Viborg, 2011). Acceptance appears to be strictly opposed to experiential avoidance and would enable increased tolerance to aversive emotional stimuli (Wolgast et al., 2011). Acceptance seems to be covered by both emotion regulation and mindfulness concepts, given the overlap between attention towards the moment, acceptance of experience, identification of one's inner experience and ability to address unpleasant experiences (Bishop et al., 2004; Coffey, Hartman, & Fredrickson, 2010; Shapiro et al., 2002). Therefore, this strategy might have been enhanced by the axes selected to orient the program.

One program axis was specifically dedicated to regulating negative emotions with positive reappraisal; participants could thus learn to transform the content of their cognitive and affective events (Chambers et al., 2009). Developing this type of strategy might enhance positive attitudes towards life challenges and contribute to individuals' wellbeing (Levine et al., 2012). Positive reappraisal is

hypothesized to be supported by mindfulness through a metacognitive process involving decentering, alternatively approaching life events with acceptance and changing usual cognitive patterns (Garland, Gaylord, & Park, 2009; Garland, Kiken, Faurot, Palsson, & Gaylord, 2016). This process, which represents an upward spiral, would broaden the attention field and enhance savoring, and thus all experiences would be considered factors in individuals' growth and transformation (Garland et al., 2015; Garland et al., 2016). Experiencing rewards from beneficial daily events and savoring were specifically addressed in the "Pleasant life" axis and would also foster this upward spiral (Garland et al., 2015, 2016). The relationship between positive reappraisal and mindfulness was found to be reciprocal, according to the process model of mindful positive emotion regulation (Garland et al., 2016). Nevertheless, this finding introduces a paradox: mindfulness favors a non-evaluative perspective, and antithetically, positive reappraisal reframes meanings of adverse experiences to assign a positive valence (Chambers et al., 2009; Garland et al., 2015). Accordingly, individuals would not only interpret fixed and negative events without changing the reality but would also broaden their understanding spectrum from negative aspects to positive aspects. Awareness of this cognitive phenomenon would occur simultaneously, allowing individuals to "let go".

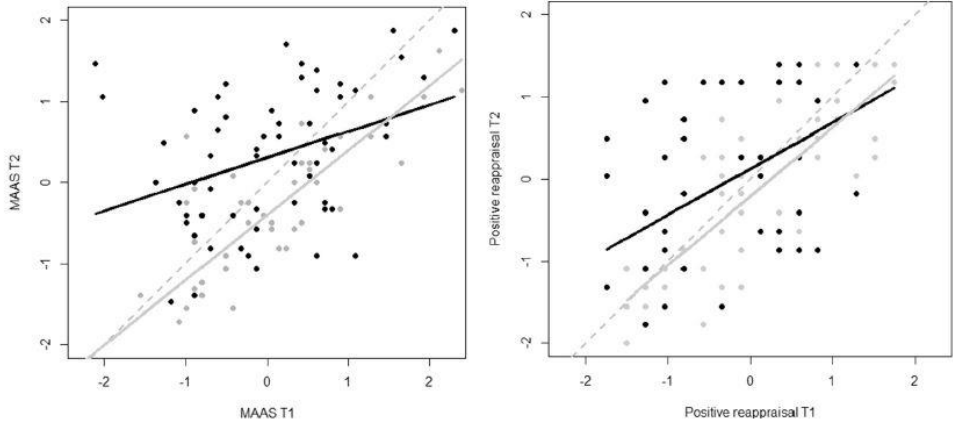
Another contribution of this study was the investigation of different patterns of change according to individuals' baseline characteristics. The exploratory analyses highlighted that mindfulness and positive reappraisal tended to increase to a greater extent when participants' initial levels were low. A similar pattern was previously observed for mindfulness in a mindfulness-based intervention, but no relation could be found between positive reappraisal at baseline and its progression (Garland et al., 2016). This growth might have been enhanced as part of the upward spiral proposed in the process model of mindful positive emotion regulation (Garland et al., 2015). Our design addressed several of the limitations of PPIs that were primarily based on aggregated interindividual data analyses; however, more effort should be devoted to account for differential and intra-individual perspectives (Molenaar & Campbell, 2009; Woodworth et al., 2016).

The limitations of this study should be discussed as well as the resulting implications. The sample was self-selected, which might contribute to enhancing the program impact, as PPIs have been found to be more effective when congruent with individuals' interests, motivations, needs and values (Lyubomirsky, Dickerhoof, Boehm, & Sheldon, 2011; Sin & Lyubomirsky, 2009). Identifying methods to evaluate factors influencing participants' outcomes might be an interesting perspective.

Considering the composite nature of the program design, the findings cannot be attributed to any particular activity, as they stem from a combination of approaches; accordingly, whether combining positive psychology and mindfulness masked the specific effects remains unclear. Future research is still needed to establish the differential effects of activities at the individual level (Woodworth et al., 2016), as well as to personalize activities according to participants' characteristics (Quoidbach et al., 2015). Moreover, as the relationship between the number of activities delivered and the outcomes seems to be curvilinear (Schueller & Parks, 2012), more studies are needed to address this topic and to study the optimal number of daily exercises needed to produce lasting positive results. Adding well-being and affectivity measures appears necessary for outcomes to be considered within the scope of the literature. In addition, follow-up assessments to consider the evolution of the sample should be added to future study designs.

Overall, this study provided evidence that a 42-day PPI enhanced mindfulness and emotion regulation strategies as well as reduced anxiety, depression and psychological distress. The exploration of differences in outcomes identified a greater progression in mindfulness and a tendency towards positive reappraisal throughout the PPI among participants who had lower baseline levels. As emotional dysregulation appeared to be associated with affective disorders (Chambers et al., 2009),

further empirical research in the emotion regulation field is warranted to better understand the influence of PPIs.



**Fig. 2.** Graphic GLM representation of MAAS and CERQ positive reappraisal scores pre-test (T1) and post-test (T2)  
Legend. A dot represents a participant. Gray indicates the control group, and black indicates the PPI group. The diagonal, dotted, light gray line indicates no score evolution during the intervention. Participants whose dots are above the diagonal dotted line showed an increase in their score from before to after the PPI. Gray and black lines are linear regression lines of the control and PPI groups, respectively. A linear regression line below the diagonal dotted line indicates that the scores decreased over time, whereas the opposite indicates that the scores increased from pre-test to post-test.