



# Don't Worry, Be Happy: Associations Between Worry and Positive Emotion Regulation

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## Abstract

Positive emotional experiences are disrupted across a range of anxiety disorders, but little is known regarding specific symptoms that may inhibit positive emotions. Across two studies ( $N=260$  and  $N=119$ ), associations between worry and positive emotion regulation using questionnaires and a lab-based task were examined. Results from study 1 suggested that over 75% of participants reported worrying about a recent positive event, and this was more common for those with greater trait worry. Across both studies, worry was associated with dysregulation in response to positive experiences. In study 2, participants completed an emotion regulation task involving directed cognitive reflection on a past positive event, which resulted in increased positive affect regardless of trait worry. Overall, results suggest that individuals commonly worry about positive events and that worry is associated with the dysregulation of positive emotions. However, the ability to up-regulate positive emotions when directed may be maintained.

**Keywords** Worry · Anxiety · Positive affect · Savoring · Emotion regulation

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Understanding the regulation of positive emotional experiences has been recognized as an important step toward promoting mental health and well-being across a range of psychological disorders (Dunn 2017). To date, the majority of research on the regulation of positive emotion and psychopathology has focused on depression, but an emerging body of evidence also suggests a connection between disrupted positive affect and anxiety symptoms, including symptoms of social anxiety, generalized anxiety disorder, panic disorder, and obsessive-compulsive disorder (Carl et al. 2014; Eisner et al. 2009; Kashdan et al. 2013). Nonetheless, little is known about how anxiety symptoms may contribute to difficulties in processing and regulating positive emotional experiences. Worry is a transdiagnostic symptom of many anxiety disorders (Brown et al. 1992; Molina and Borkovec 1994; Starcevic and Berle 2006) and involves a tendency to engage in repetitive, non-productive thoughts about possible threat and uncertainty and an inability to shift focus away from potential threat (e.g., Borkovec et al. 1983; Hirsch and Mathews 2012; MacLeod et al. 1986; Watkins 2008). As a result, individuals with pathological levels of worry experience reduced quality of life and greater overall emotional difficulties (Henning et al. 2007; Mennin et al. 2005; Stein and Heimberg 2004; Turk et al. 2005). However, research on anxiety and worry has generally focused on negative emotional processes (Altan-Atalay 2018; Maeda et al. 2018; Salters-Pedneault et al. 2006; Zlomke and Hahn 2010), and there is a paucity of empirical studies that have examined how worry might impede experiences of positive affect. When the focus of a positive life event (e.g., taking a vacation, spending time with friends) is on threat or uncertainty, the ability to engage in regulation strategies that maintain or up-regulate experiences of positive emotion may be affected. Thus, the current research sought to examine worry as one transdiagnostic cognitive vulnerability that may inhibit positive emotion regulation.

## Positive Emotion Regulation

Emotion regulation strategies that involve enhancing or maintaining positive affect are commonly referred to as savoring (Bryant and Veroff 2007). Savoring can involve many different types of cognitive processes that actively influence positive emotional experiences, such as reflecting on good feelings or engaging in behaviors to up-regulate positive affect (Gentzler et al. 2016). Engaging in these regulation strategies can occur at different time points throughout a positive experience. For instance, individuals can up-regulate or enhance their good feelings about a positive event before it occurs through increased anticipation, during the moments that a positive event is occurring by focusing on good aspects of the event, or after a positive event occurs by reminiscing on positive aspects of the experience (Bryant and Veroff 2007). Reflecting on a positive event or positive stimulus may result in increased positive affect in the moment (Verduyn et al. 2009; Verduyn et al. 2011), and savoring has been consistently associated with increased experiences of positive affect in daily life (Gentzler et al. 2013; Jose et al. 2012; McMakin et al. 2011; Quoidbach et al. 2010). Anxiety has been consistently connected with increased dysregulation and maladaptive processing of positive experiences. For example, individuals with an anxiety disorder have difficulty imagining themselves experiencing a positive event (Wu et al. 2015) and are less likely to savor and more likely to dampen their emotional reactions to positive experiences

(Eisner et al. 2009). However, little research has explored how cognitive symptoms such as worry may contribute to this dysregulation.

## Worry and Responses to Positive Events

Heightened worry is a form of repetitive thinking common across many anxiety disorders, and may be particularly relevant for savoring. The avoidance model of worry (Borkovec et al. 2004) posits that worry aims to prevent future negative outcomes by allowing individuals to recognize and avoid potential sources of distress (Newman and Llera 2011). However, these biases toward negative information can influence how everyday emotional events are experienced (Hirsch and Mathews 2012). Focusing on possible threat or uncertainty can result in abstract and generalized negative thought patterns about ongoing or future events that are often difficult to define and resolve (Stöber et al. 2000). To date, the majority of research on worry and emotional experiences has primarily focused on negative events (Boehnke et al. 1998; McLaughlin et al. 2007a). However, worry-related biases may also occur during positive experiences, as individuals prone to worry also consistently experience reduced positive affect (Mennin et al. 2005; Turk et al. 2005).

Worry can be especially problematic when genuine threat is minimal and a focus on risk and uncertainty may not be necessary. For example, individuals with generalized anxiety disorder may be more likely to interpret situations as threatening, even in the absence of threatening information (Davey et al. 1992; Eysenck et al. 1991; Hirsch and Mathews 2012; Mathews et al. 1989). One study found that worry was related to increased negative thoughts about non-threatening or positive social experiences (e.g., “when people give signs that they like me, I become concerned that I will disappoint them in the future”; Alden et al. 2008, study 2). This focus on negative information, as opposed to positive aspects of an emotional event, can interfere with savoring by limiting cognitions that would increase positive affect (e.g., reflecting on good aspects of the event or on good feelings). Indeed, one correlational study found that those with high levels of worry endorsed more maladaptive responses to hypothetical positive events using a vignette-based questionnaire (e.g., anticipating negative consequences related to the event, attending to negative elements of a positive situation, not attending to positive aspects of an experience; Nelis et al. 2011). However, more research is needed to determine if the association between worry and positive emotion regulation is detected using other measures of savoring, and how worry might occur in anticipation of and in response to actual positive experiences (as opposed to hypothetical vignette-based scenarios).

## Current Research

In sum, worry is linked with attention and interpretation biases that may influence how emotional events are processed (e.g., Hirsch and Mathews 2012) and may be one transdiagnostic symptom underlying difficulties with positive affect and its regulation. Nonetheless, little research has examined worry about positive life events and how worry may impede the ability to up-regulate or maintain positive emotion in response to

these events. The current research adds to this sparse literature by addressing two main aims. First, given the lack of research on worry about positive emotional experiences more broadly, in study 1, we examined the frequency at which individuals reported worrying about a recent positive event, and how this was associated with trait worry more generally. Our second aim was to examine how trait worry relates to the up-regulation or maintenance of positive emotion in response to positive events. Across both study 1 and study 2, we examined associations between self-reported trait worry and the regulation of positive emotion. In study 2, we also build on these correlational, questionnaire-based findings by examining associations between worry and emotion regulation using an experimental directed regulation task where participants were randomly assigned to savor (i.e., to cognitively reflect on a past positive event). Overall, examining relations between worry and positive emotion regulation can elucidate mechanisms underlying positive emotional deficits and potentially uncover novel prevention and intervention targets for those with high levels of worry.

## Study 1

The purpose of study 1 was to examine initial links between worry and responses to positive events. First, we examined the rate at which participants worried about positive events by asking about specific worries they had regarding a recent positive life event. We also examined if trait worry was associated with emotion regulation in response to positive events at the trait-level (i.e., general tendency to up-regulate or savor). We hypothesized that those who are prone to worry would be more likely to report that they had worries about their recent positive life event and that they would also report more emotion dysregulation in response to their positive experiences.

### Participants and Procedure

Participants included 260 adults (56.5% female;  $M_{age} = 23.24$ ,  $SD_{age} = 4.24$ , age range = 18–48 years). Participants identified as white (68.3%), Black/African American (7.7%), Asian (6.2%), Hispanic/Latino (3.8%), and Native American (1.2%). The majority of participants had completed college (31.9%) or some college (39.2%), while the remaining completed high school or less (7.7%) or completed some graduate school or higher (8.4%). The median income ranged from \$25,000 to \$49,999. Some participants (12.8%) did not report their race/ethnicity, level of education, or income.

The study was advertised on Amazon's Mechanical Turk (a crowdsourcing internet marketplace which allows human workers to earn pay for various tasks, including the completion of social science surveys). Participants received \$0.75 for their participation. Recruitment was restricted to only those in the United States with an approval rating of over 80%, and the survey was only available during regular waking hours (8 A.M. to 10 P.M. EST). Several items were included to assess random responding (e.g., "Please select 4 for this question."), and 20 participants provided incorrect responses and were removed from the sample, resulting in the final sample of 260. Participants completed questionnaires that assessed their demographic characteristics, trait worry, and trait positive emotion regulation. Participants were also asked to recall a recent positive

event and report on the number of worries they had about this event. Informed consent was obtained from all participants.

## Measures

### Positive Event-Related Worry

Participants were asked to think about a recent positive event that they had experienced within the last month and that they knew about beforehand (i.e., it was not a surprise). Participants then provided a brief description of the event. After participants chose their event and provided a description, they were directed to the next part of the survey and were given the following prompt: “*Please list all of the things you worried about or felt unsure about leading up to the event.*” Participants were given the option to list up to five open-ended responses. Participants were unaware that they would be asked about event-related worries until after they chose their positive event (to ensure that participants would not choose events they worried about more than others). Participant responses were coded as either 0 (did not report any worries) or 1 (reported at least one worry). A total score was also created for each participant based on the number of worries that were reported.

### Trait Worry

Trait worry was assessed using the Penn State Worry Questionnaire (PSWQ; Meyer et al. 1990). The PSWQ includes 16 items assessing general worry (e.g., “Once I start worrying, I cannot stop”) on a 5-point scale from 1 (not at all typical of me) to 5 (very typical of me). Total scores in the current sample were calculated with higher values representing greater trait worry ( $\alpha = 0.95$ ).

### Trait Savoring

Participants reported on their ability to savor (i.e., enhance or maintain positive affect) in response to positive life events using the Savoring Beliefs Inventory (SBI; Bryant 2003), which includes 24 items related to past, ongoing, and future positive experiences. Items (e.g., “I know how to make the most of a good time”) were rated on a scale from 1 (strongly disagree) to 7 (strongly agree). Responses were averaged, with higher scores indicating more effective savoring ( $\alpha = 0.94$ ).

## Analytic Strategy

First, zero-order correlations were used to explore bivariate associations among all study variables. Next, we examined descriptive statistics for the worries that participants reported in response to their recent positive event, including the rate of participants that reported any worries at all. Using a binary logistic regression model and a linear regression model, we examined if greater trait worry was associated with whether or not participants worried about their recent positive life event, and if this was related to the number of worries participants reported. Finally, a linear regression model was estimated to assess the relationship between trait

worry and savoring. All models adjusted for demographic characteristics (age and gender).

## Results

### Preliminary Analyses

Table 1 displays descriptive statistics and bivariate correlations for all study variables. Women reported greater trait worry and greater savoring, and marginally more worries in response to their recent positive event. Age was associated with lower reports of trait worry.

### Positive Event-Related Worry

First, we examined the number of worries that participants listed in relation to their recent positive event. Notably, the majority of participants reported at least one worry about their event ( $n = 203$ ; 78.1%). On average, participants reported between 2 and 3 worries ( $M = 2.77$ ,  $SD = 1.99$ , range = 0–5, median = 3). Further examination of the specific worries that participants reported indicated that individuals experienced a range of different worries in response to their positive events, including worries related to planning beforehand (e.g., finding a babysitter, choosing what to wear), uncontrollable factors that would prevent the event from occurring (e.g., not having enough money, weather-related cancelations, car breaking down), and interpersonal concerns (e.g., upsetting someone else, being a burden to others, having to meet new people). Results from a logistic regression model (adjusting for age and gender) indicated that trait worry predicted whether or not participants reported any specific worries about their recent positive event,  $b = 0.04$ ,  $SE = 0.02$ , odds ratio = 1.04,  $p = 0.006$ , 95% CI [1.01,

**Table 1** Descriptive statistics and bivariate correlations for study 1 variables

	1	2	3	4	5
1. Gender					
2. Age	0.05				
3. Positive event worries	0.12+	−0.09			
4. Trait worry	0.24***	−0.17*	0.16**		
5. Trait savoring	0.30***	0.03	−0.05	−0.26***	
Mean	–	–	2.77	49.89	4.83
Standard deviation	–	–	1.99	15.51	1.09
Range	–	–	0–5	16–80	1.78–7

\*\*\* $p < 0.001$

\*\* $p < 0.01$

\* $p < 0.05$

+ $p = 0.07$

Gender is coded as follows: 1, male; 2, female

Positive event worries is the number of worries participants reported in response to a recent positive life event

1.07]. Trait worry was also significantly and positively associated with the number of worries participants reported in response to their positive event,  $b = 0.02$ ,  $SE = 0.01$ ,  $p = 0.019$ , 95% CI [0.003, 0.04]. Participants reporting higher levels of trait worry were more likely to worry about their recent positive life event, and experienced more worries related to this event overall.

### Trait Worry and Trait Savoring

A regression model was estimated to assess the relationship between worry and savoring, adjusting for age and gender. These findings are presented in Table 2. The overall model was significant, and results suggest that after accounting for demographic covariates, greater reports of trait worry were related to poorer regulation in response to positive events.

### Discussion

Study 1 examined initial relations between worry and responses to positive events. Results suggested that worry about positive events was common in this sample, with over 3 out of 4 participants reporting that they had at least one worry about a recent positive event. The high frequency of positive event-related worry in this sample is notable, particularly given the paucity of research on worry about positive experiences. It is important to note that we did not conduct a clinical interview with these participants, and as a result we cannot be sure the exact number of participants who may have met criteria for an anxiety disorder. Indeed, a number of participants in the current sample (19.2%) reported levels high levels of trait worry on the PSWQ (e.g., based on a recommended cut-off of 62 for identifying generalized anxiety disorder in analogue samples; Behar et al. 2003). Importantly, those reporting higher trait worry were also more likely to report that they worried about their recent positive event and reported more worries about this event overall. While most research to date on worry has focused on negative experiences, these findings support the notion that a focus on threat and uncertainty may generalize to positive contexts. Study 1 also examined how

**Table 2** Study 1: regression model predicting trait savoring

	Trait savoring (study 1)			
	<i>b</i>	SE	$\beta$	95% CI
Age	-0.01	0.02	-0.04	-0.04, 0.02
Gender	0.88***	0.14	0.39	0.61, 1.17
Worry	-0.03***	0.004	-0.37	-0.03, -0.02
<i>F</i> (df)	19.64 (3, 219)			
<i>R</i> <sup>2</sup>	0.21***			

\*\*\* $p < 0.001$

Gender is coded as follows: 1, male; 2, female

trait worry was associated with the regulation of positive emotion in response to positive events using a trait-based questionnaire. Results indicated that greater worry was associated with less savoring, even when adjusting for demographic covariates. Taken together, these results suggest that worry about positive events occurs frequently and may disrupt the ability to savor and enjoy positive life events. This may be particularly problematic as poorer savoring can result in decreased frequency and intensity of positive affective experiences, and in turn can inhibit other benefits that typically stem from positive emotions (e.g., positive self-worth, stronger relationships; Gable et al. 2004; Wood et al. 2003).

Given the paucity of research on worry and positive emotion regulation, further replication of these results is still needed. In addition, depressive symptoms (e.g., anhedonia and blunted positive affect) may partially explain the relationship between worry and disrupted positive experiences, due to high rates of comorbidity with anxiety symptoms such as worry (e.g., Kircanski et al. 2017). Further, the reliance on trait-like measures of savoring may provide information on how individuals typically regulate their affect, but it is unclear if those who worry are less able to up-regulate or maintain positive affect in the moment (i.e., at the state level). Thus, in study 2, we sought to replicate findings from study 1 by examining associations among worry and positive emotion regulation while also accounting for depressive symptoms. We also extended results from study 1 by randomly assigning participants to an experimental directed positive emotion regulation task to assess regulation in the moment.

## Study 2

Given the high frequency of worry about positive events found in study 1 and the association between worry and trait savoring, study 2 further examined worry in relation to positive emotion regulation. As current research on worry and positive emotional processes is limited, our first aim was to replicate associations between worry and emotion regulation in response to positive life events. Building on study 1, we covaried depressive symptoms. We also assessed worry using a different self-report questionnaire to ensure that our findings in study 1 were not an artifact of measurement. We hypothesized that greater worry would be associated with greater difficulties regulating positive emotions (i.e., less savoring).

Building on the trait-level associations, we also further assessed positive emotion regulation using an experimental directed regulation task where participants were given instructions to up-regulate a positive event using a cognitive reflection task. It was expected that participants randomly assigned to the regulation task would experience greater emotional benefits compared with those randomly assigned to a neutral control task. However, we hypothesized that these effects would be moderated by trait worry, with chronic worriers showing attenuated emotional benefits after savoring.

## Participants and Procedure

A total of 119 adults participated (62.2% female;  $M_{\text{age}} = 44.20$ ,  $SD_{\text{age}} = 19.86$ , age range = 18–83 years). Participants were primarily white (87.4%), followed by Black/African American (6.7%), Asian (4.2%), or other (1.7%), with an additional 3.4%



identifying as Hispanic/Latino. Participants were generally well-educated (28.6% completed graduate school; 6.7% had completed some graduate school or were currently enrolled in graduate-level courses; 24.3% graduated from college; 33.9% completed some college or were currently completing a college degree; and 5.2% completed high school). Participants were recruited through a variety of community events, flyers, and university email lists. All participants provided informed consent prior to participating in the study. Participants completed self-report questionnaires on their demographics, trait worry, and trait savoring, and within one week participated in an in-person visit which included the experimental regulation task.

## Measures

### Trait Worry

Worry was assessed using a variation of the Habit Index of Negative Thinking Questionnaire, which has been used in previous emotion research (Verplanken 2012; Verplanken et al. 2007). Participants listed thoughts that they find worrying and responded to 12 questions about their worrying thoughts following the stem “Having those worrying thoughts is something ...” (e.g., “... I do frequently”, “... I do automatically”) on a 5-point scale from 1 (strongly disagree) to 5 (strongly agree). Items were averaged to create an overall worry scale, with higher numbers indicating more habitual worry ( $\alpha = 0.93$ ).

### Trait Savoring

Similar to study 1, participants reported on their trait savoring in response to positive events using the SBI (Bryant 2003). Scores on each item were averaged across subscales, with higher scores on each scale indicating more effective savoring ( $\alpha = 0.84$ ).

### Depressive Symptoms

Participants reported on their depressive symptoms using the 20-item Center for Epidemiological Studies-Depression scale (CES-D; Radloff 1977) by indicating how often they experienced each symptom over the past week from 0 (rarely or none of the time) to 3 (most or almost all the time). Items were totaled, with higher values indicating greater depressive symptoms ( $\alpha = 0.86$ ).

### Directed Savoring Task

The directed regulation task was completed in two parts. First, all participants were asked to think of a very positive experience that has happened to them that still makes them feel good when they think about it. Once the participant had thought of an event, they were asked to recall what happened, who was involved, and how the event made them feel while they described the event in detail to the experimenter. After recalling the event, participants were randomly assigned to an experimental condition. The experimenter, who was masked to the participant’s condition, provided the participant

with an opaque envelope that contained instructions for the second part of the task based on their assigned condition, and then left the room so the participant could read the instructions and complete the task in private.

Participants randomly assigned to the directed positive affect regulation (i.e., savoring) condition were asked to up-regulate their positive affect. Specifically, they were encouraged to re-experience and reflect on the positive event they had described based on instructions used in savoring exercises that have produced increases in positive affect in previous research and interventions (e.g., Bryant and Veroff 2007, p. 211; McMakin et al. 2011). Participants were provided with two minutes to reflect on this event using the strategies provided. For full instructions, see Supplemental File 1. Pilot testing of this directed regulation task indicated that participants who savored using these instructions reported higher post-task positive affect when compared with those randomly assigned to the control task (Palmer and Gentzler 2018). Participants assigned to the neutral control task condition were asked to reflect on their daily morning routine, which has been used as a control in previous research using similar positive reflection tasks (e.g., Thoman 2011). Both before and after the task, participants reported on their positive affect and negative affect using items from the Positive and Negative Affect Schedule (PANAS-X; Watson and Clark 1994). Participants completed the 10-item positive affect scale and select negative affect items (e.g., angry, guilty, afraid, sad, worried) to indicate how they felt *at that moment* on a scale from 1 (very slightly or not at all) to 9 (extremely). The total for each subscale was calculated by taking the mean of each set of items. Internal consistency for positive affect at baseline and after the savoring task was  $\alpha = 0.90$  and  $\alpha = 0.93$ , whereas internal consistency for negative affect was  $\alpha = 0.78$  and  $\alpha = 0.87$ , respectively.

## Analytic Strategy

To replicate findings from study 1, a regression model adjusting for demographic characteristics (age and gender) and depressive symptoms was conducted to test whether positive emotion regulation was predicted by trait worry. To examine if worry is related to the ability to regulate positive affect using the directed experimental task, we conducted two moderation models in PROCESS (Hayes 2013), with worry as a moderator of participant condition (savoring or control task) on positive and negative affect after the task, and the corresponding baseline affect variable as a covariate. All moderation analyses also controlled for demographic characteristics (i.e., gender and age) and depression and used 5000 bootstrapped samples and bias-corrected 95% confidence intervals.

## Results

### Preliminary Analyses

Bivariate correlations and descriptive statistics for the variables of interest are presented in Table 3. Men reported higher levels of trait positive affect compared with women. Age was positively associated with baseline positive affect, and negatively associated with negative affect and depressive symptoms. Trait worry was negatively related to savoring and baseline positive affect, and positively related to baseline negative affect.

Self-reported savoring was related to greater positive affect and less negative affect at baseline. Depressive symptoms were associated with greater worry, less savoring, greater negative affect, and less positive affect at baseline.

Preliminary *t* tests indicated that there were no differences in trait worry, trait savoring, baseline positive affect, or negative affect between those randomly assigned to the savoring or control groups. There were also no gender or age differences based on group assignment. Negative affect both before and after the task were negatively skewed, and log transformations were calculated. The regression analysis including these variables was run with and without the log transformed values, and the direction and significance of results did not change, therefore, all results reported represent analyses with the non-transformed values.

### Trait Worry and Savoring

We examined whether worry was associated with trait-levels of savoring in response to positive life events, adjusting for gender, age, and current depressive symptoms. The overall model was significant, and findings suggested that greater worry was significantly associated with reports of poorer savoring. These results are presented in Table 4.

### Worry and Savoring During the Experimental Task

Participants randomly assigned to the savoring group reported significantly more post-task positive affect ( $M = 6.43$ ,  $SD = 1.53$ ) after the task compared with those randomly assigned to the control group ( $M = 5.80$ ,  $SD = 1.57$ ),  $t(117) = -2.24$ ,  $p = 0.03$ ,  $d = 0.41$ . There were no significant differences in negative affect between the savoring ( $M =$

**Table 3** Descriptive statistics and bivariate correlations for study 2 variables

	1	2	3	4	5	6	7
1. Gender							
2. Age	0.04						
3. Trait worry	0.05	-0.07					
4. Savoring	0.08	0.11	-0.40***				
5. Baseline positive affect	-0.20*	0.19*	-0.30***	0.40***			
6. Baseline negative affect	-0.04	-0.26**	0.30***	-0.22*	-0.22*		
7. Depression	-0.09	-0.34***	0.40***	-0.37***	-0.38***	0.57***	
Mean	-	-	3.24	5.57	5.68	1.43	10.95
Standard deviation	-	-	0.94	0.87	1.43	0.83	9.61
Range	-	-	1-5	3-7	1.10-9	1-6.80	0-39

\*\*\* $p \leq 0.001$

\*\* $p < 0.01$

\* $p < 0.05$

Gender is coded as follows: 1, male; 2, female

Baseline values are from self-reports of affect prior to the start of the directed regulation task

**Table 4** Study 2: regression model predicting trait savoring

	Trait savoring (study 2)			
	<i>b</i>	SE	$\beta$	95% CI
Age	-0.001	0.004	0.01	-0.01, 0.01
Gender	-0.20	0.16	-0.11	-0.51, 0.11
Depressive symptoms	-0.02**	0.01	-0.26	-0.04, -0.01
Worry	-0.27**	0.09	-0.30	-0.44, -0.10
<i>F</i> (df)	7.50 (4, 113)			
<i>R</i> <sup>2</sup>	0.22***			

\*\* $p < 0.01$ \*\*\* $p \leq 0.001$ 

Gender is coded as follows: 1, male; 2, female

1.17,  $SD = 0.52$ ) and control groups ( $M = 1.41$ ,  $SD = 1.06$ ) after the task,  $t(86.05) = 1.62$ ,  $p = 0.11$ .

Regression analyses examining worry as a moderator of affect after the directed regulation task suggested that worry did not significantly predict post-task affect and was also not a significant moderator of the effect of group on post-task affect (see Table 5). In other words, participants in the savoring group experienced increased positive affect irrespective of their reported trait worry. Exploratory analyses of the simple slopes testing the relationship between group and post-task positive affect at different levels of worry indicated that individuals in the savoring group experienced increased positive affect at both low ( $b = 0.60$ ,  $SE = 0.24$ ,  $p = 0.02$ , 95% CI [0.12, 1.08]) and high ( $b = 1.18$ ,  $SE = 0.29$ ,  $p < 0.001$ , 95% CI [0.61, 1.75]) levels of worry (as measured by  $\pm 1$  standard deviation). For negative affect, worry and the interaction between worry and group were also not significantly related to post-task affect (see Table 5). Simple slopes indicated that the relationship between participant group and post-task negative affect was not significant at both low ( $b = -0.07$ ,  $SE = 0.09$ ,  $p = 0.47$ , 95% CI [-0.23, 0.11]) and high ( $b = -0.13$ ,  $SE = 0.14$ ,  $p = 0.35$ , 95% CI [-0.41, 0.14]) levels of worry.

## Discussion

One aim of study 2 was to replicate initial associations between trait worry and the regulation of positive emotions in response to positive events. Consistent with hypotheses and with findings from Study 1, greater trait worry was related to poorer regulation of positive experiences (i.e., less savoring), even after adjusting for demographic characteristics and depressive symptoms. A second aim of study 2 was to examine the role of worry using an experimental directed regulation task where participants were asked to cognitively reflect on a past positive event by up-regulating their positive affect. Overall, participants assigned to the regulation task experienced increased positive affect compared with those assigned to a neutral control task. However, contrary to expectations, participants experienced these emotional benefits regardless of reported trait worry. Even individuals reporting high levels of trait worry experienced greater positive affect while engaging in this intentional cognitive reflection

**Table 5** Study 2: worry predicting post-task affect after savoring and control tasks

	Positive affect			Negative affect		
	<i>b</i>	SE	95% CI	<i>b</i>	SE	95% CI
Age	0.003	0.004	-0.01, 0.01	0.003	0.002	-0.001, 0.01
Gender	0.25	0.21	-0.16, 0.67	-0.02	0.09	-0.20, 0.16
Depressive symptoms	-0.01	0.01	-0.04, 0.01	-0.01	0.01	-0.02, 0.01
Baseline affect	0.87***	0.07	0.70, 1.04	0.96***	0.21	0.55, 1.37
Group	-0.12	0.68	-1.47, 1.23	0.02	0.25	-0.48, 0.52
Worry	-0.33	0.34	-1.01, 0.26	0.06	0.13	-0.20, 0.32
Worry × group	0.31	0.21	-0.11, 0.73	-0.04	0.08	-0.21, 0.13
<i>F</i>	29.47			8.47		
<i>R</i> <sup>2</sup>	0.67***			0.78***		

\*\*\* $p < 0.001$

Group is coded as follows: 1, control; 2, savoring

Gender is coded as follows: 1, male; 2, female

compared with those randomly assigned to the control task. Together, these findings suggest that trait worry is related to poorer regulation of positive emotions. However, worry may not impede the ability to up-regulate positive affect when directed, suggesting that the ability to savor may still be maintained when provided with adequate opportunity and instruction.

## Overall Discussion

Overall, this research fills critical gaps in the literature on positive emotions and mental health by providing support for the role of worry as one transdiagnostic symptom that may disrupt positive affective processes. To our knowledge, this is the first study to examine associations among worry and responses to personal positive life events. Results from study 1 suggested that worrying about positive events is common, particularly among those reporting high levels of general trait worry. Notably, over 75% of participants reported worrying about a recent positive event, and this was more common in those reporting high levels of trait worry. This high frequency highlights the importance of examining how worry-prone individuals think about and process their positive emotional events in addition to negative emotional events. Further, across both study 1 and study 2, greater worry was related to poorer regulation in response to positive events. These findings were replicated using two different measures of trait worry and held even when adjusting for age, gender, and concurrent depressive symptoms. However, experimental evidence from study 2 suggests that despite a decreased tendency to savor in those who report higher levels of worry, the ability to up-regulate positive affect may be maintained when directed. Taken together, these findings suggest that worries surrounding positive events are common and are

associated with savoring positive affective experiences, but that the up-regulation of positive affect may be a modifiable or teachable skill for those prone to high levels of worry.

It is important to note that the majority of participants reported that they had at least some worries about their positive events. This high prevalence is of particular importance given the few number of studies that have investigated the role of worry in positive emotional processes. Building on prior research suggesting that worry can result in a focus on threat and uncertainty in benign situations where actual threat is minimal (Davey et al. 1992; Eysenck et al. 1991; Hirsch and Mathews 2012; Mathews et al. 1989), the current research extends these findings by suggesting that worry is associated with thoughts about threat even during positively-valenced situations. As we did not conduct clinical interviews and our findings across both studies were limited to samples recruited online and in the general community, understanding the rate at which positive events can be overrun by worrying thoughts may be particularly important to further explore in clinical samples experiencing excessive worry. Although further research is needed, negative cognitions surrounding positive emotional experiences may be one mechanism underlying associations among worry and overall reduced quality of life (Henning et al. 2007; Stein and Heimberg 2004) and lower levels of positive affect (Mennin et al. 2005; Turk et al. 2005).

The associations found in both studies between worry and trait savoring build on research demonstrating the role of worry in disrupting regulation processes aimed at reducing negative affect (McLaughlin et al. 2007b; Salters-Pedneault et al. 2006; Zlomke and Hahn 2010). These findings further suggest that that worry is associated with disrupted affect regulation more broadly, regardless of the emotional valence. Additionally, as worry is a commonly reported symptom across many anxiety disorders (Brown et al. 1992; Molina and Borkovec 1994; Starcevic and Berle2006), worry may be one mechanism linking anxiety disorders and lower levels of positive affect (Carl et al. 2014; Eisner et al. 2009; Kashdan et al. 2013). As research has yet to explicate the precise components or symptoms of anxiety disorders that may disrupt positive regulatory processes, these findings suggest that worry may be one cognitive vulnerability that contributes to poorer positive affect regulation in anxious individuals. In addition, other aspects of anxiety may also be exerting an influence on positive emotion regulatory abilities. For example, Eisner et al. (2009) found that symptoms of social phobia, obsessive-compulsive disorder, and panic still contributed to greater down-regulating of positive affect, even after adjusting for symptoms of generalized anxiety disorder (which may be largely driven by worry-related symptoms). Thus, investigating how other facets of anxiety (e.g., physiological hyperarousal) and a how a range of different cognitive symptoms related to worry and repetitive thinking relate to savoring may be an important next step for future research.

Participants randomly assigned to the directed regulation task experienced increased positive affect compared with those in the control group. However, contrary to expectations, the affective benefits of savoring occurred regardless of whether participants reported high or low levels of trait worry. While more research is needed, these results provide preliminary evidence that providing directed instruction may allow those who frequently worry to “override” negative cognitive processes that may typically disrupt affect regulation. This suggests that the ability to savor could be a possible intervention target for those with high levels of worry. It is notable that the directed regulation task used in the current research was

a cognitive reflection task, which we expected might be vulnerable to the effects of worry. Yet, trait worriers were still able to benefit from focusing on a positive life event. These findings are in line with research that suggests that with training, individuals with generalized anxiety disorder are able to adequately focus on positive images unrelated to their worries (Eagleson et al. 2016). However, some evidence suggests that habitual worriers experience more signs of distress after a visual imagery task designed to induce positive feelings of nostalgia (Verplanken 2012). Importantly, the adaptiveness of certain emotional regulatory strategies may depend on the individual and the current context (Kashdan et al. 2015). Thus, research should continue to examine the type of regulation strategies and savoring interventions that are most efficacious among those who experience high levels of worry (e.g., imagery vs. verbal-based tasks; Hirsch and Mathews 2012).

## Limitations and Future Directions

While these findings provide initial evidence for the role of worry in disrupted positive emotional processes, future research is still needed. Notably, the correlational and concurrent nature of some of the data precludes the ability to determine causality. While we proposed that worry may impair savoring, it is possible that there are bidirectional influences between worry and savoring frequency (e.g., an inability to focus on and attend to positive information during positive events may further perpetuate negative cognitive biases). For example, a study manipulating attentional biases found that increasing focus on threat resulted in increased worry (Hirsch et al. 2011). Further research is also needed to examine how these regulatory deficits may contribute to psychopathology over time. For example, the inability to savor due to worry may contribute to the development of problematic positive affect deficits, and in turn, depression. This may be one mechanism underlying high rates of comorbidity between anxiety and depressive disorders (Kaufman and Charney 2000), especially given research that suggests anxiety disorders commonly predate the development of depression (e.g., Kessler et al. 2008; Fava et al. 2000).

Results from study 1 suggested that over 75% of participants reported worrying about a recent positive event, and this was more common for those with greater trait worry. However, it is possible that our prompt to list out all of the worries they had about this event may have led some individuals to list worries that they might not have otherwise if we had included an explicit option to indicate that they did not worry. As a result, these prevalence rates of worry in relation to positive events should be interpreted with caution. It is important to note that our qualitative responses in study 1 indicated that participants experienced worries that concerned both controllable aspects of their positive event (e.g., performing well) along with uncontrollable aspects of the event (e.g., flights getting canceled). Prior studies suggest that at non-pathological levels, worrisome thoughts about possible anticipated and controllable obstacles may serve to be a form of active, mental problem solving, whereas at pathological levels it may actually impair problem-solving ability (Davey 1993; Metzger et al. 1990; Stöber and Joormann 2001). Other studies have found that having positive thoughts and fantasies about future events, when also avoiding thoughts about the steps needed to achieve this future event, can impede effort and success (Oettingen and Mayer 2002) and relates to long-term negative emotional outcomes such as



depressive symptoms (Oettingen et al. 2016). As a result, some of the worries our participants reported about their positive event may have been centered on legitimate obstacles, and may have actually increased the odds of experiencing the event positively. Future research should consider how worry about controllable compared with uncontrollable aspects of upcoming positive events may relate to savoring experiences, and whether or not there is an ideal type or amount of worry about future positive events that is adaptive.

Finally, it is also important to note that the savoring task occurred within a lab-based setting. Previous research suggests that individuals with generalized anxiety disorder experience more fear of positive emotion (Turk et al. 2005), which involves feeling like experiences of positive emotions themselves may be problematic due to a lack of self-control or impaired judgment. It is possible that savoring a positive experience in a lab-based setting may be less threatening regardless of clinical diagnosis, versus losing oneself in a positive moment in other contexts (e.g., at work, in the presence of a significant other). While the current findings have important implications and suggest that effective up-regulation of positive affect can be promoted in some contexts, future research should continue to examine the efficacy of savoring interventions outside of the lab (e.g., Bryant and Veroff 2007) or for those experiencing a range of clinical and subclinical levels of worry. Associations among trait worry and savoring replicated in both of our samples using two different measures of worry. However, Gustavson et al. (2018) found that across five samples, correlations between the Habit Index of Negative Thinking and the Penn State Worry Questionnaire ranged from small to large, with correlation coefficients ranging from 0.29 to 0.66, suggesting that these questionnaires may be assessing slightly different aspects of worry. Future research may benefit from replicating these findings using a wide range of measures to assess worry.

## Conclusion

In sum, the current research provides evidence that the majority of individuals report some level of worry about a recent positive event, and that worry is associated with a reduction in the up-regulation or experience of positive affect. These findings further highlight the need to better understand the intersection between worry and disrupted positive experiences. Traditionally, emotion regulation-related skills are often an underrepresented component of many cognitive behavioral therapies, despite the importance of these skills for decreasing overall symptoms (Mennin et al. 2005; Mennin et al. 2002). In addition, positive emotion dysregulation is present across a range of disorders, such as anxiety, mood, and alcohol use disorders (Hechtman et al. 2013). Promoting more adaptive regulation can aid in the development of efficacious intervention and prevention efforts for high worriers. A greater understanding of these associations may help to implement positive emotion-focused skills in clinical practice and may uncover putative mechanisms for affective dysfunction more broadly.

## Compliance with Ethical Standards

**Conflict of Interest** On behalf of all the authors, the corresponding author states that there is no conflict of interest.



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