

Of Passions and Positive Spontaneous Thoughts

Elise L. Rice¹ · Barbara L. Fredrickson¹

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Abstract Despite the abundance of research on negative intrusive thoughts, far less is known about their positive counterparts. In two studies, we explored how positive spontaneous thoughts are related to people's favorite activities (i.e., their passions, Vallerand et al. in *J Pers Soc Psychol* 85(4):756–767. doi:[10.1037/0022-3514.85.4.756](https://doi.org/10.1037/0022-3514.85.4.756), 2003), and how passions and associated thoughts contribute to mental health. In Study 1, 170 participants reported on the valence and frequency of the spontaneous thoughts they tend to have about several activities. Harmonious and obsessive passion both predicted more frequent spontaneous thoughts, but only harmonious passion predicted thought positivity. In Study 2, 232 participants completed measures pertaining to physical activity, spontaneous thoughts, and mental health. As predicted, positivity of spontaneous thoughts about physical activity predicted frequency of physical activity. Further, positivity of spontaneous thoughts about physical activity mediated the relationship between harmonious passion and indices of mental well-being.

Keywords Positive emotions · Positive spontaneous thoughts · Passions · Well-being

Introduction

Spontaneous thoughts are a common experience in the everyday lives of most people, and psychologists have created a vast body of literature that speaks to their prevalence. Unwanted intrusive thoughts are a notable feature of many psychopathologies, including depression (Purdon and Clark 1993; Reynolds and Brewin 1998; Wenzlaff et al. 1988), anxiety disorders (Purdon and Clark 1993), obsessive–compulsive disorder (Purdon and Clark 1993; Salkovskis 1989), and posttraumatic stress disorder (Ehlers and Clark 2000; Ehlers and Steil 1995; Reynolds and Brewin 1998). Unpleasant spontaneous thoughts persist outside of clinical contexts as well, unsettlingly popping into people's minds as they struggle with bereavement (Lepore et al. 1996) and extreme stress (Lepore 1997). In fact, some forms of intrusive thoughts are so commonplace, they could even be called mundane if they weren't so unpleasant to experience, such as those that burst into conscious awareness on an everyday basis, reminding people of their worries (Clark and Claybourn 1997) or of the very things they expressly try not to think about (Wegner et al. 1987). Other types of spontaneous thoughts likely arise at least as frequently as these (if not more so), yet have received far less sustained attention from the scientific community. Positive spontaneous thoughts (i.e., pleasant thoughts that arise without the conscious experience of effort or intention) are the primary focus of the present research, which is the first known attempt to understand them on their own terms. In the two studies described herein, we explore how these thoughts may be related to positive mental health and factors that contribute to it.

✉ Elise L. Rice
eliser@live.unc.edu

Barbara L. Fredrickson
blf@unc.edu

¹ Department of Psychology and Neuroscience, University of North Carolina at Chapel Hill, Chapel Hill, NC, USA

What Might We Expect About Positive Spontaneous Thoughts?

Though no prior research directly addresses the causes, characteristics, and consequences of positive spontaneous thoughts, valence asymmetries reported in the broader research literature suggest several basic predictions about positive spontaneous thoughts. Copious research documents a pervasive *negativity bias* in which negative stimuli and events capture attention more strongly than positive stimuli (Baumeister et al. 2001), and as such, it may be that intrusive thoughts demand attention (as the name suggests, they *intrude* on awareness) more intensely than positive thoughts that arise in the same way. However, the research literature in affective science also notes an additional asymmetry, termed the *positivity offset*, in which positive affect is typically more frequent than negative affect, at least among healthy adults (Catalino and Fredrickson 2011; Diener et al. 2015; Fredrickson 2013).

Knowing that affect pervades conscious experience (Barrett and Bliss-Moreau 2009; Rosenberg 1998), we assume spontaneous thoughts also conform to these patterns. Specifically, we expect positive spontaneous thoughts to be more common but less noticeable than intrusive thoughts. Research on involuntary autobiographical memories has uncovered robust support for the positivity offset effect (Berntsen 1996; Berntsen and Rubin 2002), although it may be more challenging to directly test the general propensity to notice positive versus negative spontaneous thoughts. Ultimately, to the extent that subtle but frequent positive thoughts deliver even small doses of positive emotions, they may accumulate to have substantial effects on well-being.

In the present research, we focused on positive spontaneous thoughts about a particular topic: people's favorite activities or *passions*. According to the dominant definition in this area, passions are any activity or meaningful construct that has been internalized as part of the self and that the person enjoys, considers to be important, and devotes significant time to (Vallerand et al. 2003). We believe that these hallmark features of passions make them good candidates for the study of positive spontaneous thoughts. Specifically, in light of the significance of passions by their very definition, one may expect their corresponding mental concepts to have consistently heightened accessibility ("chronic" or "preconscious" automaticity; Bargh 1989, 1994), rendering them more likely to seep into conscious awareness at any given time. As such, passions may be the subject of a disproportionate number of people's positive spontaneous thoughts. However, it is not simply the case that studying passions can help us understand positive spontaneous thoughts. In making our case for how new

insights about positive spontaneous thoughts can contribute to the science of passions as well, we will first review the existing literature in this domain.

The Dualistic Model of Passion

The prevailing theoretical framework on passions distinguishes between two types of features that tend to characterize people's favorite activities: harmonious and obsessive (Vallerand et al. 2003). In this view, harmonious passions are internalized autonomously and tend not to conflict with other activities and responsibilities, whereas obsessive passions are internalized through controlled processes and are more likely to interfere with one's relationships, obligations, and other domains. Further, people tend to pursue harmonious passions more flexibly whereas obsessive passions are pursued more rigidly. Note that these constructs are not conceptualized as being mutually exclusive. Rather, any given favorite activity may have varying amounts of both harmonious and obsessive tendencies, and that mix may fluctuate over time. For example, a high school musician may primarily play her flute for the sheer enjoyment she derives from making music, though she is also able to put her instrument away when other tasks—perhaps schoolwork or even socializing with her friends from band—require attention. However, when audition season begins, this competitive student may become more preoccupied with external contingencies such as earning first chair, and her practice regimen may become more intense and rigid at the expense of time for friends.

Given that passions are significant and enjoyable by their very definition, it is perhaps not surprising that they seem to impinge on people's well-being, especially to the extent that they are marked by harmonious properties. Two studies (one cross-sectional and the other spanning one year) documented that harmonious passion was associated with greater hedonic and eudaimonic well-being relative to obsessive passion or a lack of passion (Philippe et al. 2009). These data suggest that while harmonious passions seem to facilitate subjective well-being, obsessive passions do not appear to be detrimental relative to having no passion at all.

Separate studies have yielded results consistent with this pattern. Specifically, harmonious passion has been linked to satisfaction with life (Carpentier et al. 2012; Rousseau and Vallerand 2003 as described in Vallerand 2010; Vallerand et al. 2007, 2008), meaning in life, and vitality (Rousseau and Vallerand 2003), and experiences of flow (Carpentier et al. 2012). On the other hand, the relationships between obsessive passion and indicators of

well-being tend to be negative (Carpentier et al. 2012; Rousseau and Vallerand 2003, as described in Vallerand 2010; Rousseau and Vallerand 2008; Vallerand et al. 2007, Study 2), or null (Vallerand et al. 2007, Study 1; Vallerand et al. 2008). Obsessive passion has also been linked to other constructs associated with low levels of well-being, including higher levels of anxiety and depression in senior citizens (Rousseau and Vallerand 2003), and greater cancer worry in a study of breast-cancer survivors (as a rare counter-example, breast-cancer survivors who were more obsessively passionate about their favorite activity did exhibit greater post-traumatic growth; Burke et al. 2012).

Research on the affective processes associated with relatively harmonious and obsessive passions tends to mirror the findings pertaining to well-being. Harmonious passion has been repeatedly linked to experiences of positive emotions both during and after activity engagement (Bureau et al. 2013; Burke et al. 2012; Curran et al. 2015; Mageau and Vallerand 2007; Mageau et al. 2005; Philippe et al. 2010; Vallerand et al. 2003) and, less consistently, to lower negative emotions (Mageau et al. 2005; Philippe et al. 2010). Conversely, although the defining “enjoyment” element of passions applies to both types of passions, features of obsessive passion tend to predict increased negative emotions during activity engagement (Bélanger et al. 2013; Vallerand et al. 2003), when prevented from engaging in the activity (Vallerand et al. 2003), and even in daily life (Burke et al. 2012).

The Present Research

The research described herein extends the rich empirical literature on passions by addressing how patterns of positive spontaneous thoughts differ as a function of harmonious and obsessive features and by also exploring whether positive spontaneous thoughts link harmonious passion in particular with desirable outcomes. More specifically, the aim of Study 1 is to examine the frequency and pleasantness of spontaneous thoughts about passions and non-passions. Given the prominence of passions in people’s lives, we expect them to be the subject of relatively frequent spontaneous thoughts, whether harmonious or obsessive. However, among passions, we expect spontaneous thoughts about those that are more harmonious to be especially positive, consistent with the general affective experiences associated with harmonious passions.

In Study 2, we explore potential outcomes associated with positive spontaneous thoughts. First, we investigate how positive spontaneous thoughts about a passion might nudge an individual to engage in that activity. Recent

research demonstrates that people perceive their spontaneous thoughts to be more informative than their relatively deliberate cognitions (Morewedge et al. 2014). Accordingly, perhaps noticing pleasant spontaneous thoughts about a favorite activity inspires the individual to pursue the activity with even more enthusiasm. Indeed, spontaneous thoughts may drive behavior in a way that is analogous to Zeigarnik intrusions (i.e., intrusive thoughts about unfinished tasks) arising repeatedly to urge individuals to fulfill a goal (Martin and Tesser 1989). Finally, we go a step further by exploring associations between positive spontaneous thoughts and indicators of well-being. Given that harmonious passion has previously been linked to multiple aspects of positive mental health, we test whether positive spontaneous thoughts mediate the link between passions and these desirable outcomes.

Study 1

The primary purpose of the first study was to evaluate how different kinds of passions relate to patterns of spontaneous thoughts. We predicted that activities about which participants were more passionate (regardless of passion type) would be the subject of more frequent spontaneous thoughts, given that, by definition, passions have heightened significance in people’s lives. Further, in light of previous findings on how emotional experiences differ across passion type, we predicted that perceived spontaneous thoughts about harmonious passions would be more pleasant than spontaneous thoughts about obsessive passions. To test these hypotheses, we recruited an Amazon MTurk sample and asked each participant to report on three different activities.

Methods

Participants

One hundred seventy adults living in the United States completed the study through Amazon Mechanical Turk. Due to experimenter error, demographic data were not collected for the first 20 participants, but of the 150 participants who reported age, the mean was 35.45 ($SD = 13.72$); of the 149 participants who reported gender, 94 (63 %) were female. All participants received monetary compensation (\$0.45) for completing the study.

Procedure

Informed consent was obtained from all participants. Participants reported on one neutral activity and two of their

favorite activities in randomized order.¹ The questionnaire was organized in a block setup, so that participants completed all items described below for a given activity before moving on to the next activity.

After describing the first activity, participants responded to three items designed to measure the defining criteria of passions. The first asked participants to indicate how often they engage in the activity using a 6-point response scale ranging from “Less than once a month” to “Daily.” The second question asked participants to indicate how much they enjoy the activity using a 5-point response scale ranging from “Not at all” to “Extremely.” The third question asked participants to indicate how important the activity was to them using a 5-point response scale ranging from “Not at all” to “Extremely.”

Next, participants answered two questions about the spontaneous thoughts they tended to notice about the activity in question. First, participants were asked “how often do thoughts about this activity seem to pop into your head?” and responded using a 5-point response scale ranging from “Never” to “All the time.” The second question asked “When thoughts about this activity pop into your head or just come to you, what do they tend to be like?” and listed four categorical response options: “Entirely or mostly negative,” “Entirely or mostly positive,” “A fairly equal mix of negative and positive,” and “Fairly neutral (neither positive nor negative).”

Last, participants completed the Passion Scale (Vallerand et al. 2003) for the focal activity. The Passion Scale is a psychometrically sound and validated (Marsh et al. 2013) Likert scale with 14 items pertaining to characteristics of harmonious passion (e.g., “This activity allows me to live a variety of experiences”) and obsessive passion (e.g., “I am emotionally dependent on this activity”). As in past research, the overall scale and both subscales demonstrated adequate reliability in our sample ($\alpha s > 0.87$).

After completing the first block, participants completed the same set of measures for the remaining two types of activities. Last, participants provided demographic

information and read a debriefing statement that explained the purpose of the experiment and the hypotheses.

Analytic Methods

SAS 9.3 was used to conduct the analyses in this study. After evaluating descriptive statistics, we tested our primary hypotheses using multilevel modeling procedures (PROC MIXED) with restricted maximum likelihood (REML) estimation. Model-building was entirely theory driven, and individual parameters were examined to determine significance at the level of $\alpha = 0.05$. Missing data (i.e., occasional items left unanswered by participants, <1 % of cases for each variable) were handled using listwise deletion.

Results

Descriptive Statistics

Representative neutral activities include reading the news, doing the dishes, and going on walks. Participants reported activities such as reading, playing video games, and playing a sport as among their favorites, and several activities appeared in all three categories across participants. See Table 1 for descriptive statistics.

Primary Analyses

To test our hypothesis that people would report perceiving more frequent spontaneous thoughts for activities about which they were more passionate, we submitted our thought-frequency data to two-level hierarchical linear models with the three activities (level 1) nested within participants (level 2). Consistent with our hypothesis that both subtypes of passion would positively predict thought frequency, harmonious ($\beta = 0.577$, $SE = 0.040$, $p < .001$) and obsessive ($\beta = 0.536$, $SE = 0.035$, $p < .001$) subscale

Table 1 Descriptive statistics for Study 1

Variable	<i>N</i>	<i>Min</i>	<i>Max</i>	<i>Mean</i>	<i>SD</i>
Activity frequency	509	1	6	4.662	1.429
Enjoyment	509	1	5	3.786	1.117
Significance	508	1	5	3.728	1.015
HP subscale	507	1	5	3.475	0.828
OP subscale	507	1	5	2.657	0.985
Thought frequency	509	1	5	3.438	0.913

Activities are nested within participants, so *n* corresponds to cases within individuals. Activity frequency, Enjoyment, and Significance refer to the three variables that correspond to the defining criteria of passions. HP Subscale and OP Subscale are the subscale scores taken from the larger Passion Scale

¹ We created prompts based on the definition of passions and features of harmonious and obsessive passions to target (1) a neutral activity that participants engage in often, (2) a favorite activity about which participants were relatively more harmonious, and (3) a favorite activity about which participants were relatively more obsessive, though the prompts did not use the terms “harmonious” or “obsessive.” Scores on the passion scale revealed that whereas the neutral prompt was effective in drawing out non-passions, the prompts for harmonious versus obsessive passions did not reliably yield these different forms of passions. As such, following the approach used in the majority of prior research on passions, we used subscale scores (rather than prompt type) as the independent variable in primary analyses. The analyses reported herein include all activities, and analyses that exclude the neutral activities do not produce patterns of results that are appreciably different (see the note below Table 2 for more information).

scores were both significant as predictors of thought frequency in models in which each was a sole predictor (see Models 1 and 2, respectively, in Table 2). Further, when both subscale scores were included in the model simultaneously, they each continued to predict thought frequency above and beyond the effects of the other (see Table 2, Model 3). Finally, both remained significant as predictors of thought frequency above and beyond enjoyment, significance, and activity frequency when the latter variables were included as covariates in subsequent models, ruling out the possibility that differences in these features account for the hypothesized effects (see Table 2, Models 4–6).

To test our second hypothesis that harmonious passion is associated with greater positivity in spontaneous thoughts, we created a multilevel logistic regression model (with activities at level 1 and participants at level 2) with harmonious and obsessive subscale scores predicting responses to the thought-valence item. Increasingly harmonious passions were associated with lower likelihoods of endorsing any other response option relative to “mostly or entirely positive” (see Table 3 for parameter estimates). By contrast, increasingly obsessive passions were not related to the likelihood of endorsing any particular response option relative to “mostly or entirely positive.”

Discussion

The results of Study 1 illustrate systematic differences in self-reported patterns of spontaneous thoughts within and between harmonious and obsessive passions. Consistent with our first hypothesis, features of harmonious and obsessive passion each independently predicted increasing frequency of spontaneous thoughts about the activity in question, even when both were included in the model simultaneously and above and beyond the effects of other features of those activities. It may not be surprising that obsessive passion predicted increasing thought frequency in this way given how researchers often conceptualize obsessions as involving preoccupation with a topic, yet harmonious passion predicted the same pattern above and beyond obsessive passion, which may be less intuitive. If the nature of the relationship between passions and spontaneous thoughts is indeed causal, harmonious and obsessive passions may give rise to spontaneous thoughts in very different ways. Although such a question is beyond the scope of the current dataset, a test of our second hypothesis speaks to the kinds of thoughts associated with harmonious and obsessive passions.

Consistent with our second hypothesis, more harmonious passions were more likely to be associated with

Table 2 Parameter estimates for Study 1 equations predicting thought frequency

Model	Parameter	β	SE	<i>p</i>	CI Lower	CI Upper
1	Intercept	1.428	0.144	.001	1.143	1.713
	HP	0.577	0.040	.001	0.499	0.656
2	Intercept	2.011	0.103	.001	1.807	2.215
	OP	0.536	0.035	.001	0.467	0.606
3	Intercept	1.227	0.135	.001	0.960	1.494
	HP	0.368	0.044	.001	0.282	0.455
	OP	0.349	0.040	.001	0.270	0.428
4	Intercept	1.175	0.131	.001	0.916	1.434
	Enjoyment	0.241	0.039	.001	0.164	0.318
	HP	0.132	0.057	.022	0.019	0.245
	OP	0.335	0.039	.001	0.259	0.411
5	Intercept	0.808	0.135	.001	0.542	1.075
	Significance	0.318	0.036	.001	0.247	0.388
	HP	0.239	0.043	.001	0.154	0.325
	OP	0.231	0.040	.001	0.153	0.309
6	Intercept	0.814	0.163	.001	0.492	1.135
	Activity frequency	0.099	0.022	.001	0.054	0.143
	HP	0.392	0.043	.001	0.306	0.477
	OP	0.300	0.041	.001	0.220	0.380

Confidence intervals displayed correspond to $\alpha = 0.05$. All models included a random intercept and one random slope. In models with more than one predictor variable, harmonious passion was selected for the random slope because it was the primary variable of interest. When neutral activities were excluded from the analyses above, all effects that are significant remained significant with the exception of the effect of harmonious passion in model 5

Table 3 Likelihood of endorsing other response options relative to “Mostly or entirely positive”

Parameter	Response	DF	Estimate	SE	Wald X^2	<i>p</i>	Odds ratio
Intercept	Negative	1	3.384	1.276	7.034	.008	–
	Neutral	1	3.571	0.537	44.208	.001	–
	Mix	1	3.306	0.934	12.523	.001	–
HP	Negative	1	–1.904	0.430	19.569	.001	0.149
	Neutral	1	–1.509	0.188	64.752	.001	0.221
	Mix	1	–1.375	0.289	22.585	.001	0.253
OP	Negative	1	0.215	0.214	1.009	.315	1.240
	Neutral	1	0.246	0.161	2.337	.126	1.279
	Mix	1	–0.192	0.197	0.951	.330	0.825

When neutral activities were excluded from the analysis above, several effects drop from significance, notably the effect of HP on the likelihood of endorsing the negative or mixed response options. However, this may be due to a shortage of such responses in the sample. When neutral activities are excluded, only 9 of the 336 remaining activities in the sample were reported as inspiring “mostly or entirely negative” thoughts, and only 18 were reported as inspiring “a fairly equal mix of positive and negative” thoughts

predominantly positive spontaneous thoughts, whereas no relationship emerged between obsessive passion and valence of spontaneous thoughts. This pattern of results mirrors previous research on the general affective experiences associated with harmonious and obsessive passions.

This study is subject to several limitations. Most notably, data in this study were self-reported, which may have introduced bias. Even so, significant associations between obsessive passions and negative spontaneous thoughts might have been expected if participant bias were a substantial issue. Further, although we designed our measures of spontaneous thought frequency and valence to be relatively straightforward for participants to answer, they are rather blunt in their current form, so we refined our measure of thought valence in Study 2 in an attempt to increase precision. Further research should continue to develop these and other measures of spontaneous thoughts.

Study 2

Having uncovered evidence of a link between harmonious passion and positive spontaneous thoughts, we sought to replicate this effect in Study 2 and explore whether such thoughts predict behavior. It certainly seems plausible that catching oneself repeatedly thinking about a particular activity could nudge a person to pursue that activity, especially in light of research showing that people perceive their spontaneous thoughts to be especially meaningful (Morewedge et al. 2014). As such, we hypothesized that harmonious passion about physical activity would be associated with more positive spontaneous thoughts about physical activity, and the positivity of those thoughts should in turn predict more frequent engagement in physical activity, mediating the effect of harmonious passion on behavior.

In Study 2, we also conducted exploratory analyses to determine whether positive spontaneous thoughts might also account for previously identified relationships between harmonious passion and indicators of well-being, including satisfaction with life, subclinical depressive symptoms, meaning in life, and flourishing. As such, we predicted that positivity of spontaneous thoughts should be associated with greater mental well-being.

Methods

Participants

Participants included 232 adults recruited from the Chapel Hill community for a larger study on improving health. Among the 225 who provided demographic information, the average age was 48.49 ($SD = 8.90$, $Min = 34$, $Max = 65$), and 61.33 % identified as female. Though the sample was predominantly Caucasian (77.33 %), other ethnicities were represented (17.33 % Black or African American, 4.89 % Asian).

Procedures

Informed consent was obtained from all participants. Participants completed daily measures of physical activity over 2 weeks during the pre-testing phase of a larger, multi-wave study on wellness behaviors (to be reported elsewhere). Each day, participants indicated whether, during the previous 24 hours, they had engaged in any vigorous exercise (described as activities causing large increases in breathing and heart rate), moderate exercise (described as activities causing small increases in breathing and heart rate), or muscle-strengthening activities.

Once during the baseline period, participants also completed the Passion Scale in reference to “a cherished

physical activity” as well as an additional item that simply asked participants whether that activity was a passion. Participants also completed a measure of thought valence that asked them to estimate the percentage (0–100) of their typical spontaneous thoughts about physical activity that are positive, though we ultimately divided these scores by 10 to make the scale more comparable to those of our other measures. As in Study 1, the overall Passion Scale and both subscales demonstrated adequate reliability (α s > 0.91).

In addition, participants completed several scales to assess baseline levels of well-being. The Satisfaction with Life Scale (Diener et al. 1985) is a five-item measure that includes prompts such as “In most ways, my life is close to ideal,” and “I am satisfied with my life” (α = 0.89). The Center for Epidemiological Studies Depression scale is a 20-item measure that was developed for use in the general population (Radloff 1977). It asks participants to consider how often they’ve felt various states in the past week and includes items such as “I felt like everything I did was an effort” and “I felt that people disliked me” (α = 0.70).² The Meaning in Life scale is a four-item measure that includes prompts such as “In my life, I have very clear goals and aims” and “My personal existence is very purposeful and meaningful” (α = 0.87; Hicks and King 2007). The short form of the Mental Health Continuum is a 14-item measure that assesses flourishing by asking participants to report how often in the past week they have felt a variety of states (Keyes 2002).³ Sample items include “How often did you feel interested in life?” and “How often did you feel that you had something to contribute to society?” (α = 0.91). During the baseline period and again over the following months, participants completed additional measures not reported here.

Analytic Methods

To create an aggregate score for physical activity that would control for differences in rates of survey completion, we calculated a proportion that represents the number of times each participant indicated engaging in physical activity (combining vigorous, moderate, and strengthening activities into one aggregate measure) divided by the total number of daily reports they provided, which ranged from 1 to 14. We note that 75.22 % of participants completed at least 10 reports, and 23.48 % of participants completed all 14. Preliminary analyses were conducted in SAS 9.3. To

² Because the four reverse-scored items from the CES-D measure have been widely used to assess positive affect (Moskowitz 2003; Ostir et al. 2001), they were excluded from current analyses. However, including them does not alter the pattern of results.

³ The Mental Health Continuum was not included in the study until the third wave, so the sample size for this measure is smaller than for the other variables.

test our hypotheses concerning path analysis, we used the model indirect command in Mplus 7.11 with 5000 bootstrapping samples. Missing data (i.e., individual items left unanswered by participants, daily reports not completed, and the Mental Health Continuum for a subset of the sample, see footnote 4) were processed using listwise deletion.

Results

Descriptive Statistics

See Table 4 for descriptive statistics corresponding to key variables and Table 5 for correlations among them. Although participants were not prompted to report on a passion per se, the average score on an item that asked whether the target activity was a passion was 4.387 (SD = 1.846, Min = 1, Max = 7), which corresponded to just above moderate agreement. As in Study 1, positivity of spontaneous thoughts was associated with harmonious passion. In this sample, there was also a significant correlation between positivity of spontaneous thoughts and obsessive passion, although follow-up analyses with multiple regression revealed that only harmonious passion was a significant predictor of positive spontaneous thoughts when both passion subscales were included in the model.

Physical Activity

To test our hypothesis that positivity of spontaneous thoughts would account for (mediate) the link between harmonious passion and frequency of behavior, we created a path model with harmonious passion about physical

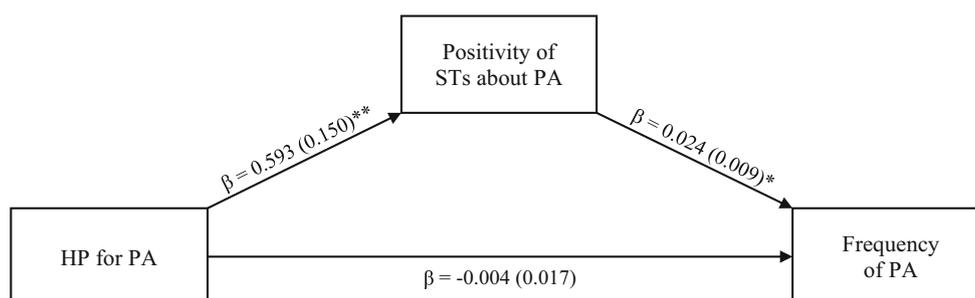
Table 4 Descriptive statistics for Study 2

Variable	<i>n</i>	<i>Min</i>	<i>Max</i>	<i>Mean</i>	<i>SD</i>
Positivity of STs	160	0	10	7.058	2.889
HP subscale	155	1	7	4.331	1.524
OP subscale	155	1	7	2.346	1.334
Behavior	228	0	1	0.620	0.314
Satisfaction with life	215	1	7	4.294	1.417
Depression	215	1	3.188	1.506	0.439
Meaning in life	214	1	7	4.709	1.441
Flourishing	138	0.214	4.929	3.240	1.009

Differences in sample size across variables are largely due to the schedule for data collection. Some measures (e.g., satisfaction with life) were included in questionnaires administered during lab visits, so those data were acquired for nearly all participants. By contrast, the measure of spontaneous thoughts was included in only one of the fourteen daily questionnaires participants completed during the baseline period, so any participants who happened not to complete the questionnaire that day provided no data for this variable

Table 5 Correlations among key variables in Study 2

	1	2	3	4	5	6	7	8
1 Positivity of STs	–							
2 Harmonious passion	.321**	–						
3 Obsessive passion	.177*	.499**	–					
4 Physical activity	.255*	.055	.119	–				
5 Satisfaction with life	.268**	.207*	.217*	.130	–			
6 Depressive symptoms	–.309**	–.088	–.054	–.065	–.525**	–		
7 Meaning in life	.410**	.375**	.186*	.136*	.542**	–.542**	–	
8 Flourishing	.417**	.361**	.087	.049	.607**	–.539**	.637**	–

* $p < .05$; ** $p < .001$ **Fig. 1** Positive spontaneous thoughts about physical activity mediate the effect of harmonious passion for physical activity on behavioral engagement. Note * $p < .05$, ** $p < .001$; Standard errors are given inparentheses; *HP* harmonious passion, *PA* physical activity, *ST* spontaneous thoughts

activity predicting positivity of spontaneous thoughts, which in turn predicted frequency of physical activity over the baseline period. Bootstrapping analysis revealed that the indirect effect was significant (estimate = 0.014, $SE = 0.006$, $p = .022$, 95 % CI = [0.006, 0.027]); Fig. 1 provides the path diagram with regression coefficients.

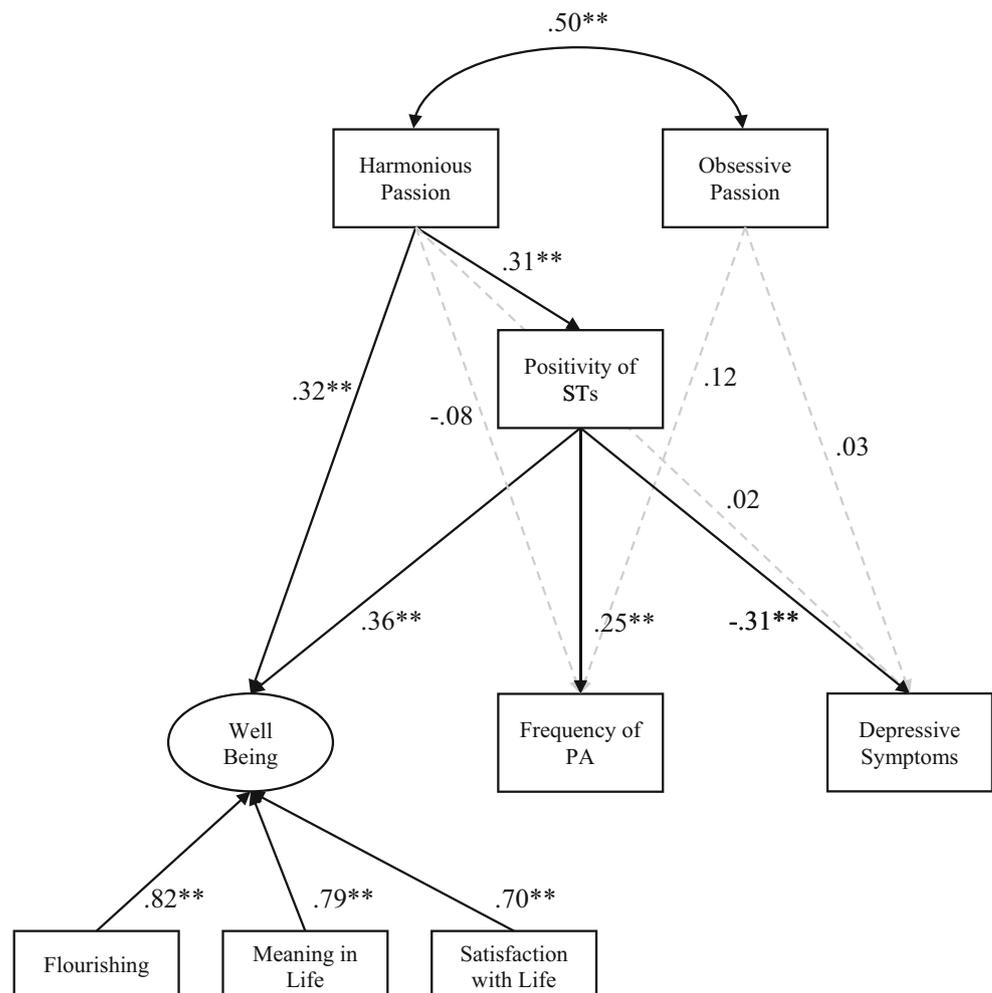
Mental Health

Exploratory analyses revealed that indices of well-being and mental health included in the dataset were related to positivity of spontaneous thoughts (see Table 5). As such, we devised a structural equation model based on these associations and on prior findings. In this hypothesized model, harmonious passion predicted more positive spontaneous thoughts, which in turn predicted greater mental well-being (a latent variable with three indicators: flourishing, meaning in life, and satisfaction with life), more frequent physical activity, and fewer depressive symptoms. Likewise, we included direct paths from harmonious passion to well-being, frequency of physical activity, and depressive symptoms. Given the consistency of null associations between obsessive passion and positivity of spontaneous thoughts in our prior research, we simply

tested direct effects from obsessive passion to frequency of physical activity and depressive symptoms. See Fig. 2 for an illustration of the path model with standardized coefficients.

According to multiple indices, the hypothesized model fit the data well ($\chi^2(12) = 18.432$, $p < .103$, $RMSEA = 0.048$, $CFI = 0.981$, $TLI = 0.957$, $SRMR = 0.033$). Closer inspection of specific paths reveals a pattern of significance that is consistent with our predictions. Most notably, harmonious passion predicted greater positivity of spontaneous thoughts, which in turn predicted all three outcomes of interest: greater mental well-being, greater frequency of physical activity, and fewer depressive symptoms. Though the direct paths from harmonious passion to depressive symptoms and frequency of physical activity were not significant, harmonious passion did continue to predict mental well-being directly. Further, the indirect effects of harmonious passion on mental well-being (estimate = 0.073, $SE = 0.027$, $p = .006$, 95 % CI = [0.037, 0.127]), frequency of physical activity (estimate = 0.016, $SE = 0.007$, $p = .015$, 95 % CI = [0.007, 0.030]), and depressive symptoms (estimate = -0.027 , $SE = 0.011$, $p = .012$, 95 % CI = [-0.050 , -0.013]) through positivity of spontaneous thoughts were all significant.

Fig. 2 Path model from Study 2 with standardized coefficients. Note * $p < .05$, ** $p < .001$; ST spontaneous thoughts, PA physical activity



Discussion

In Study 2, we replicated the link between harmonious passion and positive spontaneous thoughts using a more nuanced measure of perceived thought valence, and again, there was no association between obsessive passion and positive spontaneous thoughts when controlling for harmonious passion. Further, we found support for the hypothesis that positive spontaneous thoughts might encourage behavior: our analyses revealed an indirect effect through which participants whose passion for physical activity was relatively harmonious reported more positive spontaneous thoughts about physical activity and in turn, they engaged in physical activity more frequently over the next 2 weeks.

We had expected to see a significant direct effect of harmonious passion on behavior, but this effect did not emerge, perhaps because this particular study targeted “a cherished physical activity” rather than participants’ absolute favorite activity. We empirically evaluated this speculation post hoc by testing whether overall passion

(indexed as participants’ response to the item that directly asked whether the target activity was a passion) moderated the effect of harmonious passion on frequency of behavior. In a multiple linear regression model with frequency of behavior as the outcome variable, overall passion emerged as a significant predictor ($\beta = 0.100$, $SE = 0.041$, $p = .016$), whereas harmonious passion did not ($\beta = 0.045$, $SE = 0.043$, $p = .301$), and the interaction term neared statistical significance ($\beta = -0.016$, $SE = 0.009$, $p = .073$). In this case, it seems overall passion for the target activity was the better predictor of frequency of physical activity, which seems reasonable. Ultimately, our primary concern in this study is with the relationship between spontaneous thoughts and passions, which did emerge as predicted.

Although the current investigation explores only behavior frequency, it would be interesting to determine in future studies whether positive spontaneous thoughts predict other features related to behavior, especially how flexible people are in pursuing their passions. It could be that the positive emotions derived from pleasant

spontaneous thoughts broaden cognition in ways that enable people to see a wider array of opportunities for pursuing their favorite activity (as in previous research on positive emotions and thought-action repertoires; Fredrickson and Branigan 2005), which could reinforce the harmonious nature of the passion.

Study 2 also enabled us to explore whether positive spontaneous thoughts are one mechanism by which harmonious passions are related to mental health. Simple correlational analyses revealed that positivity of spontaneous thoughts about physical activity was positively related to satisfaction with life, meaning in life, and flourishing and negatively related to depressive symptoms. Harmonious passion was not correlated with satisfaction with life or depressive symptoms in this sample (again, perhaps because we targeted “a cherished physical activity,” which may not have been a passion per se for all participants). Harmonious passion was, however, correlated with meaning in life and flourishing. We created a path model that allowed us to test the indirect effect of harmonious passion on indicators of mental health through spontaneous thoughts, and as predicted, these effects were significant. Beyond the direct positive effect of harmonious passion on mental well-being (indexed by flourishing, meaning in life, and satisfaction with life), harmonious passion exerted robust indirect effects on well-being, physical activity, and depressive symptoms as mediated through positivity of spontaneous thoughts.

Granted, these findings concerning well-being are preliminary and raise many more questions (especially about specific mechanisms of action) than they answer. For example, one possibility is that positive spontaneous thoughts about physical activity in this analysis act as an indicator of more general patterns of spontaneous thoughts about many other activities or topics, and so people who tend to have more positive spontaneous thoughts tend to have greater eudaimonic well-being. Or perhaps positive spontaneous thoughts about a favorite activity constitute an added source of positive emotions that accumulate to facilitate well-being over time. Further, there may be direct pathways between physical activity and well-being that we did not explore in this dataset in light of the low baseline associations among those variables; other studies have indeed found support for associations of this nature (Hogan et al. 2015). Although the mechanisms remain unclear, these preliminary data suggest that positive spontaneous thoughts may have substantial implications for mental health and well-being, and that they thereby deserve further attention.

In addition to refining techniques for measuring spontaneous thoughts, future studies should also explore these processes in broader samples. The participants in the current sample volunteered for a study on improving health, and thus may have been especially motivated to change

their behaviors than the general population. This potential limitation should be taken into account when considering the implications of the results of Study 2.

Conclusion

Across two studies, we consistently found that positive spontaneous thoughts about people’s favorite activities were related to levels of harmonious passion. Further, our data suggest that positive spontaneous thoughts about a favorite physical activity predict subsequent patterns of engagement in physical activity and are also related to notable indicators of well-being. Subsequent research should explore whether positive spontaneous thoughts indeed have causal effects on behavior and well-being and should aim to identify relevant mechanisms of action.

Though previous research on spontaneous thoughts has focused on unwanted varieties, the current studies demonstrate that positive spontaneous thoughts are consequential in their own right. For instance, we found that in regards to physical activity, people’s positive spontaneous thoughts about their passions predicted their behavior. Additionally, positive spontaneous thoughts about physical activity were related to indicators of positive mental health, and as such, they may facilitate the many desirable outcomes associated with it, including increases in potentially health-supporting patterns of leukocyte gene expression (Fredrickson et al. 2013, 2015), lower incidence of chronic health problems (Keyes 2005a), and more effective psychosocial functioning (Keyes 2005b). Though they may not demand much (if any) attention when they arise, positive spontaneous thoughts may have substantial implications for health and well-being.

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Compliance with Ethical Standards

Conflict of Interest Elise L. Rice and Barbara L. Fredrickson declare that they have no conflict of interest.

Informed Consent All procedures performed in studies involving human participants were in accordance with the ethical standards of

the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Animal Rights No animal studies were carried out by the authors for this article.

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