

How mindfulness, decentering, nonattachment and rumination interact with the temporal associations between emotions and thoughts: An experience sampling study

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The way emotions and thoughts affect each other in daily life deeply impacts an individual's well-being. This experience sampling study ($N = 132$, 24 random-schedule signals in 6 days) aimed to (a) test the bidirectionality of within-person concurrent (simultaneous) and prospective (from time $t-1$ to time t) associations between real-life emotions and thoughts; (b) explore the moderator roles of dispositions involving the ability to take an aware and detached perspective on inner experience (i.e., mindfulness, decentering, nonattachment and low rumination) in the abovementioned associations. Multilevel within-person and multilevel lagged models assessed concurrent and prospective links, respectively. Emotions and thoughts showed concurrent associations, and prospective associations only between same-valence emotions and thoughts. Low rumination and decentering strengthened the—respectively—simultaneous and prospective relationship between positive thoughts and positive emotions; decentering, nonattachment and low rumination suppressed the positive association between lagged negative emotions and present negative thoughts. Decentering also nullified the negative concurrent link between positive thoughts and negative emotions. Mindfulness and nonattachment strengthened the concurrent negative link between negative thoughts and positive emotions. Dispositions involving a detached perspective on inner experience improve individual abilities to deal with negative emotions and promote upward spirals between positive emotions and thoughts.

Keywords: Emotions.Thoughts; Experience sampling; Decentering; Mindfulness;

Daily life is characterised by a multitude of cognitive (e.g., remembering, planning) and emotional phenomena (e.g., worrying, feeling happy). Despite these phenomena being part of the same process—that is, making sense of the world—the human mind momentarily foregrounds either mental contents and processes, thus producing the experience of cognition, or bodily changes, which are closely related to the experience of emotion (Hoemann & Feldman Barrett, 2019). Therefore, most of the time individuals perceive emotions and thoughts as two distinct, although highly interrelated, phenomena. This distinction is found in language as well: thoughts, compared to feelings, are primarily present- and future-oriented, more open-ended and indefinite, and more contextualised; feelings are more past-oriented, completed and definite (Ickes & Cheng, 2011). Bidirectionality between thoughts and emotions is supported by research: Ruby

et al. (2013) found that negative spontaneously generated thoughts measured during a simple choice reaction time task were associated with higher subsequent ($t + 1$) unhappy mood, which in turn predicted increased subsequent off-task negative thoughts. Additionally, Moberly and Watkins (2008) showed that ruminative, self-focused thinking and negative emotions had a reciprocal relationship over time.

The way emotions and thoughts are related to each other in daily life has major consequences on an individual's well-being: for instance, letting positive emotions positively influence thoughts, and vice versa letting positive thoughts positively influence emotions may generate positive spirals, increasing the savouring of pleasant life experiences and situations, and therefore well-being (Jose et al., 2012). As for cognitive and emotional processes with negative valence, emotional well-being may benefit

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from a reduced reactivity to negative thoughts, that is, if the latter's negative impact on emotions is not too strong. Indeed, excessively focusing on negative thoughts, such as in rumination, results in increased negative emotions (Thomsen, 2006). Therefore, daily dynamics between emotions and thoughts can inform us on the way people cope with real or imagined situations, and whether this way can be adaptive.

Importantly, certain skills and dispositions related to awareness and self-distancing can interact with daily dynamics between emotions and thoughts, and let specific patterns emerge. According to multiple authors (e.g., Ayduk & Kross, 2010; Bernstein et al., 2015), the meta-cognitive capacity to watch one's own emotions and thoughts from an aware and distanced perspective allows people to have a healthy relationship with emotions and thoughts, and contributes to positive cognitive, emotional and behavioural outcomes. But how is this self-distancing ability related to real-life dynamics between emotions and thoughts? To answer this question, the present study investigates how the concurrent (i.e., simultaneous) and prospective (i.e., from time $t-1$ to time t) relationships between positive and negative emotions and thoughts in daily life change depending on four dispositions related to awareness and self-distancing: (a) mindfulness, (b) decentering, (c) nonattachment and (d) lack of rumination.

The four abovementioned dispositions capture different aspects of the meta-cognitive process previously explained: mindfulness, which can be defined as a combination of self-regulated attention and a curious and accepting attitude towards present experiences (Bishop et al., 2004), represents the aspect of nonjudgmental awareness. Highly mindful people are expected to be extremely conscious of their emotions and thoughts, and to be able to observe them without a judgmental stance (e.g., Baer et al., 2006). Decentering, instead, represents the self-distanced perspective: decentering is generally defined as the capacity to step outside one's personal perspective of a lived experience (Safran & Segal, 1990), and it involves both the experience of internal states (i.e., thoughts and feelings) as separate from one's self, and a reduced reactivity to the content of one's thoughts (Bernstein et al., 2015).

Nonattachment represents the emotional detachment from ongoing experience: it is defined as a flexible, balanced way of relating to one's experiences and emotions without clinging to or suppressing them, and without needing them to last forever (Sahdra et al., 2016). Nonattachment fosters a release from mental fixations: people with high levels of nonattachment are able to let go of both regrets and positive experiences (Sahdra et al., 2010). Lastly, we used low levels of rumination to represent the lack of excessive self-immersion in one's own cognitive and affective processes. Rumination is the tendency to engage in repetitive, self-focused, maladaptive thinking

and is characterised by a self-immersive cognitive elaboration (e.g., Trapnell & Campbell, 1999). Previous studies showed that rumination is negatively associated with self-distancing and adaptive reactions to stressors (Ayduk & Kross, 2010), and positively related to negative affect and psychological symptoms (Thomsen, 2006).

Mindfulness, decentering, nonattachment and low rumination capture different aspects of the meta-cognitive capacity to take an aware and distanced perspective from one's emotions and thoughts, but they share common features: they are all positively associated with each other (e.g., Fuochi & Voci, 2020a, 2020b; Sahdra et al., 2016), and they all predict higher levels of well-being, lower levels of stress and negative affect, and successful emotion regulation and coping (e.g., Bernstein et al., 2015; Coffey et al., 2010; Fresco et al., 2007; Hill & Updegraff, 2012; Zimmer-Gembeck, 2021). In particular, concerning coping, mindfulness is positively associated with the ability to recognise and regulate emotions (Hill & Updegraff, 2012) and with a higher reliance on adaptive coping strategies, such as approach coping instead of avoidance or fantasising (Keng & Tong, 2016). Decentering is positively related to the ability to employ multiple coping strategies, coping flexibility and the capacity for cognitive control over emotion (Zimmer-Gembeck, 2021). Nonattachment is associated with a higher ability to regulate one's mood and access emotion regulation strategies (Coffey et al., 2010). Rumination is related to maladaptive emotion regulation patterns, as suggested by its positive link with suppression, and negative with reappraisal (Thomsen, 2006; Trapnell & Campbell, 1999). How these four dispositions interact with the way emotions and thoughts reciprocally affect each other in daily life is still an open question.

The aims of this study are: (a) to test the bidirectionality of intra-individual (within-person) associations between emotions and thoughts in the daily life, both simultaneously (concurrent links) and over time (links from time $t-1$ to time t); (b) to explore the moderator roles of dispositions involving the ability to take an aware and detached perspective on inner experience (i.e., mindfulness, decentering, nonattachment and low rumination) in the within-person associations between emotions and thoughts.

In this study, concurrent links show the extent to which having positive and negative thoughts at time t is associated with experiencing positive and negative emotions at time t (and vice versa). Prospective links show the extent to which positive and negative thoughts at time $t-1$ are related to changes in positive and negative emotions from time $t-1$ to time t , as well as the extent to which positive and negative emotions at time $t-1$ are related to changes in positive and negative thoughts from time $t-1$ to time t . Therefore, prospective links show how emotions and thoughts are related over time. Consistent with relevant past research (e.g., Ruby et al., 2013), we hypothesised

that both concurrent and prospective links between emotions and thoughts would be bidirectional (H1). Relying on previous related research (e.g., Bernstein et al., 2015; Sahdra et al., 2016), we expected that at high levels of mindfulness, decentering, nonattachment and low levels of rumination, emotions and thoughts would show more adaptive association patterns (H2).

This study contributes to the literature on personality and cognitive and emotional processes in several ways: first, it sheds light on how positive and negative thoughts are linked to positive and negative emotions in daily life and in a naturalistic setting, exploring within-person processes and considering relations that unfold over time; second, it shows how having an aware and detached perspective on inner experience interacts with the links between cognitive and emotional processes; third, it sheds light on potentially adaptive emotion-thought patterns (for instance, reciprocal positive relationships between positive emotions and thoughts) and on the dispositions favouring them. From a practical point of view, identifying dispositions positively contributing to one's thought and emotion patterns in daily life can be useful for both the clinical practice and programmes and interventions aiming to increase individual well-being.

METHOD

Ethical approval was given by the Psychological Research Ethics Committee of the University of Padova, Italy, protocol #2417.

Research design

Respondents first completed an online questionnaire with time-invariant variables (sociodemographic characteristics and dispositions), then received instructions on how to download and use the free experience sampling app Personal Analytics Companion (PACO; <https://www.pacoapp.com/>),¹ to participate in the experience sampling method (ESM) part of the study. Our ESM study had four signals per day for 6 days, yielding a maximum number of 24 data points for each participant (in the case of no missing answers); the signals were message notifications from the PACO app to complete the ESM questionnaire. Signals were randomly distributed between 10 a.m. and 10 p.m., with a minimum interval of 90 minutes (maximum interval about 220 minutes) between two subsequent signals. Consistent with many ESM studies (Myin-Germeys & Kuppens, 2022), the signal to complete the ESM questionnaire disappeared after 15 minutes (timeout): if participants did not respond within this 15-minute interval, that data point was missing. Having a timeout with a fairly short interval helps

to have similar lags between two subsequent signals, and minimises the possibility that participants choose their preferred time to complete the questionnaire; for instance, once participants see the notification message (signal), they could wait for a happier or calmer moment to answer the ESM questionnaire, thereby underrepresenting negative emotions and reducing the reliability of the data (Myin-Germeys & Kuppens, 2022). Respondents gave their informed consent both before the online questionnaire and before the ESM phase. We did not perform power analyses because no previous research could inform us on the possible effect size, but we aimed to reach at least 120 participants, as in studies with similar procedure and topics (e.g., Moberly & Watkins, 2008; Shackman et al., 2018).

Participants

Convenience sampling was employed. Participants were recruited by psychology master's degree students in return for course credit. Each student identified two Italian adults (native speakers of Italian) who were not students of the course, possessed a smartphone and a [gmail.com](mailto:) address, and did not frequently interact with each other, to avoid dependence among observations. The smartphone and the [gmail.com](mailto:) address were both necessary to let the PACO app work.

The initial sample size was 164, but to have enough observations per individual and compute reliable within-person variation, only respondents with more than 50% (12 out of 24) responses to the experience sampling were retained, as in previous research (e.g., Shackman et al., 2018). The final sample size was 132 (81% of initial sample; 59% women; age: range 18–79, $M = 26.40$, $SD = 9.78$, 85% of respondents in the age range 20–28), yielding 2462 valid observations, because respondents gave on average 18.69 answers ($SD = 3.27$, range 12–24). The highest education level achieved was secondary school for the 5% of the sample, high school diploma for the 43%, and higher degrees for the 52%. As for occupations, 62% were university students, 3% manual workers, 16% office workers, retailers or teachers, 9% professionals; the others were unemployed or did not answer. We compared this sample with the initial one with unpaired t -tests on the variables of interest: no differences emerged (Table S1).

Measures

Dispositions

Dispositional mindfulness was measured with the Five Facet Mindfulness Questionnaire (FFMQ; Baer

¹ The study was conducted few months before PACO interrupted its use in the EU, due to changes in European privacy laws.

et al., 2006; Italian validated version by Giovannini et al., 2014). As the nonreactivity facet has one item less than the other facets (i.e., seven instead of eight), to avoid underrepresentation of nonreactivity in the total score of dispositional mindfulness we computed the total mindfulness score as the mean of facets' average scores (acting with awareness: $\alpha = .90$; nonjudging; $\alpha = .86$; nonreactivity: $\alpha = .72$; describing: $\alpha = .90$; observing: $\alpha = .71$), rather than the overall mean of items. Decentering was measured with the Decentering subscale of the Experiences Questionnaire (Fresco et al., 2007; Italian version by Fuochi & Voci, 2020b; $\alpha = .86$). We measured nonattachment with the seven-item Nonattachment scale (NAS-7; Sahdra et al., 2016; Italian version by Fuochi & Voci, 2020a; $\alpha = .84$). Dispositional ruminative thinking was assessed with the self-rumination subscale ($\alpha = .92$) of the Rumination-Reflection Questionnaire (RRQ; Trapnell & Campbell, 1999; Italian validated version by Vannucci & Chiorri, 2018).

Experience sampling

Items were in the same order for every report and all had the same response scale (1 = *not at all*; 7 = *very much*). First, participants were asked how much they felt angry, sad, worried, frustrated, happy, amused, serene and grateful, in that very moment. Each emotion was a single item. This list of emotions was adapted from the nine-item emotion scale by Diener and Emmons (1984; Study 3), to have four items for negative emotions (i.e., angry, sad, worried and frustrated) and four items for positive emotions (i.e., happy, amused, serene and grateful), portraying diverse activation levels. We assessed the validity of this measure through a Multilevel (observations nested in participants) Confirmatory Factor Analysis testing a two-factor structure in which angry, sad, worried and frustrated loaded on a negative emotions factor, whereas happy, amused, serene and grateful loaded on a positive emotions factor. Fit indexes and factor loadings were satisfactory (details in Data S1). Therefore, we computed mean scores for negative emotions by averaging the four items of negative emotions, and we did the same for positive emotions. Then, the quantity of thoughts with negative or positive valence was measured through two single-item questions: "How much are you having negative thoughts?"; "How much are you having positive thoughts?" (response scale: 1 = *not at all*; 7 = *very much*).

Analytic strategy

Analyses were conducted with R (R Core Team, 2022). All multilevel models (signals nested within individuals) included the time trend (signal number, from 1 to 24) as control variable and a random intercept, and were performed with Restricted Maximum Likelihood (REML).

We investigated concurrent (simultaneous) links between emotions and thoughts (H1) with random-intercept, random-slope multilevel models separating between-person from within-person effects through person-mean centering (e.g., Curran & Bauer, 2011; Hoffman & Stawski, 2009). Before the analyses, we computed the person means (between-person effects) and the deviations of time-varying scores from their respective person mean (within-person effects), for positive and negative emotions and thoughts. Both between-person and within-person effects were included in the models for concurrent associations. This analysis allows to understand how the dependent variable (e.g., negative thoughts) changes when a person's level of the predictor has increased or decreased compared to that person's usual level (e.g., within-person negative emotions), while controlling for that person's average level of the predictor (e.g., between-person negative emotions). Within-person effects represent concurrent links, portraying to what extent emotions and thoughts fluctuate together. Random slopes were put on within-person predictors.

Prospective links between emotions and thoughts (H1) were instead investigated with multilevel lagged models (Hamaker & Wichers, 2017): emotions (thoughts) at time t , the present signal, were predicted by thoughts (emotions) at time $t-1$, the previous signal, while controlling for the dependent variable at time $t-1$. This analysis allows to understand whether and how lagged ($t-1$) predictors (e.g., lagged negative emotions) at time $t-1$ are associated with the variation of the dependent variable from time $t-1$ to time t (e.g., present negative thoughts). We followed all methodological recommendations for multilevel lagged models suggested by Hamaker and Wichers (2017): Level-1 predictors were person-mean centered before being lagged; lagged variables were set as missing on the first signal of each day to avoid computing the prospective link between the first observation of the day (time t) and the last observation of the previous day (time $t-1$), thereby keeping lagged effects within—not across—days; residual autocorrelation (AR1) was included to account for moment-to-moment stability.

To test H2, we repeated concurrent and prospective models by additionally including as predictors each disposition and its interactions with the main explanatory variables, namely within-person or lagged positive and negative thoughts (emotions) in the models for emotions (thoughts). Because the four dispositions were strongly correlated with each other (see Table 1), to keep model parsimony and avoid multicollinearity issues, each disposition and its interaction with the main predictor (i.e., within-person or lagged emotions or thoughts) were included in a separate model. All the models with interactions included a random intercept; concurrent models with interactions also included random slopes on within-person predictors, as recommended for cross-level interactions (Heisig & Schaeffer, 2019),

whereas prospective models with interactions included residual autocorrelation. Statistically significant interactions (p -value $<.05$) were then decomposed at high (1 SD above mean) and low (1 SD below mean) levels of each disposition, consistent with the procedure elaborated by Aiken and West (1991). All the equations of the multilevel and multilevel lagged models employed in the analyses are reported in detail in the Data S1.

RESULTS

Means, variability and correlations of time-varying variables are reported in Table 1; as for the four dispositions, their correlations are reported in Table 1 and their descriptive statistics are reported in Table S1. The variance of emotions and negative thoughts was almost equally distributed between and within individuals (ICCs between .45 and .56), whereas positive thoughts fluctuated more (ICC = .31). Pearson correlations between person-mean centered emotions and thoughts were strong, with larger correlation coefficients between same-valence ($r = .64$, $r = .68$, $p < .001$) than between opposite-valence ($r = -.48$, $r = -.42$, $p < .001$) emotions and thoughts. Correlations suggest that despite emotions and thoughts being grounded on language differences (Ickes & Cheng, 2011), when they have the same valence (i.e., positive–positive or negative–negative) they strongly covary, as it happens in many cognitive and affective phenomena (Hoemann & Feldman Barrett, 2019).

We tested H1 by performing multilevel models separating between-person from within-person effects to investigate concurrent links, and multilevel lagged models to investigate prospective links (as explained in the Analytic strategy section). Results of within-person effects in concurrent links (Table 2) showed that when people had

more positive thoughts (emotions) than usual, they also had more positive and less negative emotions (thoughts) than usual; similarly, when people had more negative thoughts (emotions) than usual, they also had more negative and less positive emotions (thoughts) than usual. In summary, emotions and thoughts had bidirectional concurrent (simultaneous) links, suggesting that real-life emotions and thoughts fluctuate together.

Results of prospective associations (Table 2) showed that lagged ($t-1$) negative (positive) thoughts predicted an increase in negative (positive) emotions from time $t-1$ to time t , and that lagged ($t-1$) negative (positive) emotions predicted an increase in negative (positive) thoughts from time $t-1$ to time t . Moreover, lagged positive emotions predicted a decrease in negative thoughts from time $t-1$ to time t . In summary, bidirectional prospective links emerged mainly between same-valence emotions and thoughts.

We tested H2 by adding the interaction terms between each disposition and the main predictors to the models for concurrent and prospective links (as explained in the Analytic strategy section). Results (Tables S2–S9) showed eight statistically significant interactions (four in concurrent models, four in prospective models): interactions terms and their decompositions (simple slopes) at high (+1 SD above the mean) and low (–1 SD below the mean) levels of each disposition are reported in Table 3.

Regarding concurrent links, the negative association between within-person negative thoughts and positive emotions was stronger for respondents scoring high on mindfulness (+1 SD: $b = -.26$, $p < .001$) and nonattachment (+1 SD: $b = -.27$, $p < .001$), than for respondents scoring low on these dispositions (mindfulness, –1 SD: $b = -.19$, $p < .001$; nonattachment, –1 SD: $b = -.19$, $p < .001$). The negative association between positive

TABLE 1
Means, variability, correlations of positive and negative emotions and thoughts

	<i>Negative emotions</i>		<i>Positive emotions</i>		<i>Negative thoughts</i>		<i>Positive thoughts</i>	
Mean of person means	2.56		3.50		2.99		3.59	
Between-person variance	1.05		.74		1.28		.72	
Within-person variance	.83		.91		1.55		1.58	
Intraclass correlation coefficient (ICC)	.56		.45		.45		.31	
Correlations between emotions and thoughts								
Positive emotions	−.51***							
Negative thoughts	.68***		−.48***					
Positive thoughts	−.42***		.64***		−.36***			
Correlations among dispositions and emotions and thoughts								
	2.	3.	4.					
1. Mindfulness	.64***	.59***	−.48***	−.25***	.07***	−.29***		.02
2. Decentering		.68***	−.53***	−.37***	.20***	−.37***		.12***
3. Nonattachment			−.54***	−.41***	.21***	−.45***		.02
4. Rumination				.41***	−.25***	.45***		−.18***

Note: Correlations computed with Pearson-method, listwise deletion; correlations between emotions and thoughts are computed on person-mean centered scores; correlations of emotions and thoughts with dispositions are computed on the person means of emotions and thoughts, because dispositions are on the level of the individual (Level 2, time invariant). *** $p < .001$.

TABLE 2
Concurrent and prospective associations between emotions and thoughts: multilevel and multilevel lagged models

	Negative emotions			Positive emotions			Negative thoughts			Positive thoughts		
	<i>b</i>	95% <i>CI</i>	<i>p</i>	<i>B</i>	95% <i>CI</i>	<i>p</i>	<i>b</i>	95% <i>CI</i>	<i>p</i>	<i>b</i>	95% <i>CI</i>	<i>p</i>
Concurrent links												
Intercept	0.40	−0.07 to 0.86	.093	1.37	0.82 to 1.91	<.001	1.07	0.59 to 1.55	<.001	1.20	0.67 to 1.73	<.001
B-P negative thoughts	0.77	0.70 to 0.85	<.001	−0.10	−0.19 to −0.01	.028						
W-P negative thoughts	0.43	0.40 to 0.47	<.001	−0.23	−0.26 to −0.19	<.001						
B-P positive thoughts	−0.03	−0.13 to 0.07	.569	0.71	0.60 to 0.83	<.001						
W-P positive thoughts	−0.15	−0.18 to −0.12	<.001	0.39	0.35 to 0.43	<.001						
B-P negative emotions							0.98	0.89 to 1.07	<.001	−0.06	−0.15 to 0.04	.265
W-P negative emotions							0.80	0.73 to 0.86	<.001	−0.16	−0.23 to −0.10	<.001
B-P positive emotions							−0.14	−0.24 to −0.03	.012	0.72	0.60 to 0.83	<.001
W-P positive emotions							−0.25	−0.31 to −0.19	<.001	0.72	0.66 to 0.79	<.001
Time	−0.00	−0.01 to 0.00	.093	−0.01	−0.01 to −0.01	<.001	−0.01	−0.01 to −0.00	.003	0.00	−0.00 to 0.01	.464
Observations	2443				2437			2425			2423	
Prospective links												
Intercept	2.61	2.41 to 2.82	<.001	3.51	3.33 to 3.69	<.001	3.03	2.79 to 3.27	<.001	3.53	3.31 to 3.74	<.001
Lagged negative thoughts	0.08	0.03 to 0.13	.001	−0.01	−0.06 to 0.04	.729	0.14	0.07 to 0.20	.001			
Lagged positive thoughts	−0.03	−0.08 to 0.01	.095	0.11	0.06 to 0.16	<.001				0.03	−0.04 to 0.09	.434
Lagged negative emotions	0.19	0.12 to 0.25	<.001				0.16	0.06 to 0.25	<.001	−0.04	−0.13 to 0.04	.310
Lagged positive emotions				0.26	0.19 to 0.33	<.001	−0.09	−0.17 to −0.01	.028	0.17	0.07 to 0.26	.001
Time	−0.01	−0.01 to 0.00	.109	0.00	−0.01 to 0.01	.871	−0.01	−0.02 to 0.00	.081	0.00	−0.01 to 0.02	.401
Observations		1483			1474			1481			1476	

Note: B-P = between-person; the effect of the person mean; W-P = within-person; the effect of within-person deviations from the person mean. Lagged predictors are lagged person-mean centered scores of predictors (at time $t - 1$).

TABLE 3

Decompositions (simple slopes) of the interactions between each disposition (mindfulness, decentering, nonattachment and rumination) and the concurrent and prospective links between emotions and thoughts

Predictor	Moderator	Outcome	Interaction term		−1 SD moderator		+1SD moderator	
			b	p	b	p	b	p
Concurrent links								
W-P negative thoughts	Mindfulness	Positive emotions	−0.08	.038	−0.19	<.001	−0.26	<.001
	Nonattachment		−0.04	.024	−0.19	<.001	−0.27	<.001
W-P negative emotions	Decentering	Positive thoughts	0.11	.028	−0.23	<.001	−0.09	.067
W-P positive emotions	Rumination	Positive thoughts	−0.05	.043	0.79	<.001	0.66	<.001
Prospective links								
Lagged positive thoughts	Decentering	Positive emotions	0.07	.029	0.06	.094	0.15	<.001
Lagged negative emotions	Decentering	Negative thoughts	−0.16	.007	0.26	<.001	0.04	.479
	Nonattachment		−0.08	.044	0.22	<.001	0.06	.373
	Rumination		0.07	.039	0.05	.423	0.22	<.001

Note: W-P = within-person: the effect of within-person deviations from the person mean (concurrent links). Lagged predictors (at time *t*−1) are lagged person-mean centered scores of predictors (prospective links).

thoughts and within-person fluctuations of negative emotions was statistically significant only for respondents scoring low (−1 SD: $b = -.23$, $p < .001$), but not for those scoring high (+1 SD: $b = -.09$, $p = .067$), on decentering. The positive relationship between within-person fluctuations of positive emotions and positive thoughts was weaker for respondents scoring high (+1 SD: $b = .66$, $p < .001$), than for those scoring low (−1 SD: $b = .79$, $p < .001$), on rumination.

Regarding prospective links, lagged positive thoughts predicted an increase in present positive emotions for respondents scoring high (+1 SD: $b = 0.15$, $p < .001$), but not for those scoring low (−1 SD: $b = 0.06$, $p = .094$), on decentering. Lagged negative emotions predicted an increase in present negative thoughts for respondents scoring low—but not for those scoring high—on decentering (−1 SD: $b = 0.26$, $p < .001$; +1SD: $b = 0.04$, $p = .479$) and nonattachment (−1 SD: $b = 0.22$, $p < .001$; +1 SD: $b = 0.06$, $p = .373$), and for respondents scoring high—but not for those scoring low—on rumination (−1 SD: $b = 0.05$, $p = .423$; +1 SD: $b = 0.22$, $p < .001$).

DISCUSSION

This study aimed to investigate within-person concurrent and prospective associations between emotions and thoughts, and to explore whether dispositions involving the ability to take an aware and detached perspective on inner experience (i.e., mindfulness, decentering, nonattachment and low rumination) could moderate the within-person associations between emotions and thoughts. We hypothesised bidirectional concurrent and prospective links between real-life emotions and thoughts (H1), and that at high levels of mindfulness, decentering, nonattachment and at low levels of rumination, emotions and thoughts would show more adaptive association patterns (H2).

Regarding H1, we found that emotions and thoughts had bidirectional simultaneous links, and that bidirectional prospective links emerged mainly between same-valence emotions and thoughts. Our findings suggest that emotions and thoughts fluctuate together, in line with reciprocal relationships between emotions and thoughts reported in previous studies (Moberly & Watkins, 2008; Ruby et al., 2013); moreover, they show that bidirectional links regard emotions and thoughts not only with negative valence (e.g., Ruby et al., 2013), but also with positive valence, consistent with previous research on savouring and happiness (e.g., Jose et al., 2012). Considering that concurrent associations held between same-valence and opposite-valence emotions and thoughts, whereas prospective associations mainly between same-valence emotions and thoughts, same-valence links seem more persistent over time than opposite valence-links. This finding suggests that positive and negative affective-cognitive processes may follow independent paths over time.

Regarding H2, we found that several dispositions moderated the concurrent and prospective links between emotions and thoughts. Regarding concurrent associations, mindfulness and nonattachment strengthened the concurrent negative link between within-person fluctuations in negative thoughts and positive emotions. Such a result suggests that these dispositions may be related to enhanced awareness of negative thoughts (e.g., Baer et al., 2006), thereby decreasing momentary positive mood. Negative thoughts are neither avoided, nor immediately overwritten by positive emotions, but instead accepted, with the result of being less happy and serene, but not more worried or sad. In this perspective, this effect may be seen as an act of realism by individuals with high levels of mindfulness and nonattachment, and as a potentially painful, but perhaps adaptive process in the long run, thereby partially supporting H2.

Other results from concurrent links instead fully supported H2: decentering nullified the negative concurrent link between positive thoughts and negative emotions, and lack of rumination strengthened the simultaneous relationship between positive thoughts and positive emotions. Similarly, but regarding prospective links, positive thoughts predicted an increase in subsequent positive emotions only at high levels of decentering. Results suggest that high decentering and low rumination may promote an adaptive focus on positive thoughts, thereby reinforcing their present and future associations with positive emotions. These relationships may generate a beneficial upgrade spiral in which positive emotions and positive thoughts reciprocally feed each other and enhance well-being (e.g., Jose et al., 2012). In this perspective, scoring high on decentering and low on rumination might contribute to adaptive thought-emotion patterns characterised by positive valence, thereby supporting H2 and previous research on the benefits of keeping a balanced, non-immersive perspective on one's internal processes (e.g., Ayduk & Kross, 2010).

Regarding prospective links, decentering, nonattachment, and lack of rumination suppressed the positive association between lagged negative emotions and subsequent negative thoughts, again supporting H2. Decentering, nonattachment and low rumination may change the way people deal with negative emotions because they favour a distanced, less self-immersed perspective on negative feelings and events (e.g., Bernstein et al., 2015; Sahdra et al., 2010). Being able to take a step back from negative emotions could reduce their ability to increase subsequent negative thoughts: in this way, facing negative feelings does not result in a spiral of negative thinking (e.g., Moberly & Watkins, 2008). In summary, decentering, nonattachment and lack of rumination can help coping with negative internal states.

It is interesting to notice that, compared to the other dispositions, decentering was the one interacting more frequently with the links between emotions and thoughts. Findings suggest that decentering helps distancing from negative feelings and thoughts, while savouring pleasant mental states. Based on the literature defining decentering as composed of meta-awareness, disidentification from internal experience, and reduced reactivity to the content of one's thoughts (Bernstein et al., 2015), we may conclude that it is the mix of all these aspects, not just one of them, that contributes to one's healthier relationship with inner experience.

This study has some limitations. First, we employed a non-representative convenience sample of Italian respondents, which cautions against generalising our findings to other samples. Second, the self-report measures used may be affected by socially desirable responding. Third, to reduce the survey response fatigue potentially experienced by participants, we kept the number of signals within the day lower than the usual in experience

sampling studies; this choice increases the risk of underestimating the variability of emotions within the day and the size of prospective associations between emotions and thoughts. Fourth, emotions and thoughts showed strong correlations between each other, suggesting the possibility that respondents may have struggled to distinguish between emotions and thoughts. Although emotion research recognised a substantial overlap between cognitive and affective processes (e.g., Hoemann & Feldman Barrett, 2019), this overlap might limit the strength of our findings. Fifth, we performed many moderation analyses, and this increases the probability of Type 1 error. Sixth, we acknowledge that we did not consider associations between mindfulness, decentering, nonattachment, and rumination, keeping them separate in the models; future research could extend these results by also studying the combined effects of and the interactions between the four dispositions.

Despite these limitations, this study made several innovative contributions to research on emotions and thoughts, and on individual ways to deal with them. In particular, we found that emotions and thoughts have bidirectional simultaneous relationships, and that this bidirectionality holds over time especially for emotions and thoughts with the same valence (i.e., positive or negative). Our results also showed that mindfulness, decentering, nonattachment, and lack of rumination interact with the concurrent and prospective links between real-life emotions and thoughts in adaptive ways, for instance by weakening the simultaneous and prospective associations between negative emotions and (positive and negative) thoughts, and by strengthening the simultaneous and prospective links between positive emotions and positive thoughts. Our findings support the cognitive and affective benefits of dispositions that are connected to the ability to see emotions and thoughts from a detached perspective, especially decentering, when dealing with inner experience. The meta-cognitive capacity to watch one's internal experience from an aware and distanced perspective could help individuals to build coping strategies useful to deal with emotions and thoughts.

COMPLIANCE WITH ETHICAL STANDARDS

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee at the University of Padova and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Ethical approval was given by the Psychological Research Ethics Committee of the University of Padova, protocol #2,417. Informed consent was obtained from all individual adult participants included in the study.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Data S1. Supporting information.

Table S1. T-tests with unequal variances on the means of the variables of interest.

Table S2. The moderating role of mindfulness in the concurrent associations between real-life emotions and thoughts.

Table S3. The moderating role of decentering in the concurrent associations between real-life emotions and thoughts.

Table S4. The moderating role of nonattachment in the concurrent associations between real-life emotions and thoughts.

Table S5. The moderating role of rumination in the concurrent associations between real-life emotions and thoughts.

Table S6. The moderating role of mindfulness in the prospective associations between real-life emotions and thoughts.

Table S7. The moderating role of decentering in the prospective associations between real-life emotions and thoughts.

Table S8. The moderating role of nonattachment in the prospective associations between real-life emotions and thoughts.

Table S9. The moderating role of rumination in the prospective associations between real-life emotions and thoughts.

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