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A PEACEFUL MIND: HOW DISPOSITIONAL MINDFULNESS IS RELATED TO EMOTIONAL STABILITY OVER TIME AND ACROSS EVENTS

A PEACEFUL MIND: COME LA MINDFULNESS DISPOSIZIONALE SI ASSOCIA A STABILITA' EMOTIVA NEL TEMPO E ATTRAVERSO GLI EVENTI

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DOCTORAL THESIS

A Peaceful Mind: How Dispositional Mindfulness is related to Emotional

Stability over Time and across Events

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Abstract

Emotional stability is an essential ingredient of long-term mental health. Building on the

well-known link between dispositional mindfulness and well-being, this project investigated

the role of diverse aspects of dispositional mindfulness in emotional stability. We

hypothesized that people higher in dispositional mindfulness would display more stable

emotions, as reflected by lower emotional reactivity to self-relevant events, flatter emotion

trajectories, smaller effects of negative and positive events on negative and positive affect

respectively, and lower emotional variability and instability. We systematically tested these

hypotheses through one cross-sectional, three longitudinal, and one experience sampling studies, analyzing data with simple linear, multilevel, and multilevel growth regression models. Results supported our hypotheses, especially for negative emotions. Dispositional mindfulness was associated with lower negative emotions felt when thinking about a self-relevant negative or positive event, flatter negative affect trajectories, weaker relationships between intra-individual variations in negative events and negative affect, and lower emotional variability and instability for negative emotions. Analyses of specific facets of mindfulness revealed that these effects were due mostly to differences in *awareness*, *nonjudgment*, and *nonreactivity to inner experience*, and that *nonjudgment* and *nonreactivity* also moderated the effect of intra-individual variations in positive events on positive affect. Moreover, the relationship between these three aspects of dispositional mindfulness and life satisfaction was partly mediated by lower emotional variability. These findings provide a novel perspective on the link between dispositional mindfulness and well-being, suggesting that a fundamental benefit of dispositional mindfulness is living a life imbued with greater equanimity and emotional stability.

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INTRODUCTION

Pain is inevitable, suffering is not. Pain and suffering are two different animals.
Bhante Henepola Gunaratana, *Mindfulness in plain English*

He whose senses are mastered like horses well under the charioteer's control,
he who is purged of pride, free from passions,
such a steadfast one even the gods envy (hold dear).
Walpola Rahula, *What the Buddha taught [Dhammapada: 94]*

The beneficial outcomes of positive emotions, and happiness in particular, are indisputable, spanning a range of domains involving health, satisfying and supportive social relationships, work life and performance, and prosocial behavior, to name just a few (for a comprehensive review, see Lyubomirsky, King, & Diener, 2005). Additionally, recalling positive emotions when facing negative events promotes resilience, helping people broaden their scope of attention and regulate their emotions in times of stress (Fredrickson, 2001; Tugade & Fredrickson, 2004).

However, happiness may not be valuable at every intensity level and in every situation (Gruber, Mauss, & Tamir, 2011). For instance, a tendency to experience very intense positive emotions can increase risky behaviors (Cyders & Smith, 2008), decrease creativity (Davis, 2009), and promote negative outcomes for people with certain psychological problems (Gruber, Johnson, Oveis, & Keltner, 2008). Furthermore, excessively valuing happiness is associated with lower well-being, probably because of unmet expectations regarding positive emotions and events (Mauss, Tamir, Anderson, & Savino, 2011), and with greater loneliness (Mauss et al., 2012). But, if intense positive emotions are not always functional, what should people aim for? One answer is *affective balance*—that is, relatively high levels of positive emotions and low levels of negative emotions. But besides this, overall well-being and happiness are promoted by having relatively stable emotions over

time (Gruber, Kogan, Quoidbach, & Mauss, 2013; Houben, Van Den Noortgate, & Kuppens, 2015; Kuppens & Verduyn, 2017) and in reaction to daily hassles (Charles, Piazza, Mogle, Sliwinski, & Almeida, 2013; Piazza, Charles, Sliwinski, Mogle, & Almeida, 2013).

Emotional stability involves small fluctuations in emotional states, such that when positive or negative self-relevant events occur, people respond without experiencing intense emotional spikes. Manifest emotion stability patterns involve what is often called "equanimity" – "an even-minded mental state or dispositional tendency toward all experiences or objects, regardless of their affective valence (pleasant, unpleasant or neutral) or source" (Desbordes et al., 2015, p. 357).

According to both Eastern philosophy and psychological research, equanimity can be attained by paying attention to outer and inner phenomena with open and receptive awareness, a process that is commonly known as mindfulness. Having a non-judgmental, non-reactive, present-focused orientation helps people accept changing life circumstances, thereby enabling equanimity (e.g., Hanh, 1998; Kumar, 2002; Leary & Tate, 2007; Wallace & Shapiro, 2006). The idea that present-moment awareness and balanced affective reactions contribute to enduring happiness is not new. In fact, Buddhist writings dating to around 400 BCE, state that "He dwells in happiness who has equanimity and is mindful" (N. Thera, Saṃyutta Nikāya 36.31).

The present project bridges research on emotion dynamics, affective reactivity, and mindfulness by investigating the role of diverse aspects of dispositional mindfulness in emotional responses, changes, and fluctuations in reaction to negative and positive events and over time. We expected that being more mindful would mitigate affective reactivity, changing the way that emotions unfold during and after emotionally-relevant episodes and across time.

In the following sections, first we define mindfulness both as a disposition and as a practice, and we explain how we study mindfulness while acknowledging the criticisms to the operationalizations of mindfulness in current research. Second, we review how dispositional mindfulness and emotions are associated over time; third, we recall the possible cognitive mechanisms explaining this association; fourth, we explain how emotion dynamics are related to well-being and to dispositions and processes associated with well-being, including mindfulness. Then, we state the aims of this research project and define the specific research goals and hypotheses through eight research questions. To answer these eight research questions, we conducted five empirical studies: these are described after the Aims and Hypotheses section. Finally, we interpret the results of this project in a General Discussion section, where we answer each of the eight research questions separately, while acknowledging the limitations of the studies and drawing a final conclusion.

Mindfulness and its Multi-faceted Complexity

Mindfulness is a complex phenomenon, entailing both stable cognitive tendencies and temporary mental states, which can purposefully be improved through meditation and awareness-based trainings. In the popular works by Jon Kabat-Zinn (1990, 1994, 2003), mindfulness is described as the act of focusing one's attention on the unfolding of experience in the present moment, with an open and nonjudgmental awareness. In particular, Kabat-Zinn defined mindfulness as "the intentional self-regulation of attention from moment to moment" (1982, p. 34) and the "awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmentally to the unfolding of experience moment by moment" (Kabat-Zinn 2003, p. 145). Similarly, Bishop et al. (2004) identified two core aspects of mindfulness: self-regulation of attention and an attitude of openness and acceptance, both directed toward present experiences. Recurring elements of most definitions of mindfulness

include awareness, attention, acceptance, and nonjudgment, all characterized by a focus on the present moment (e.g., Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006; Brown & Ryan, 2003; Wallace & Shapiro, 2006). When referring to dispositional mindfulness, these attitudes and abilities are conceptualized as relatively stable individual characteristics in the degree to which people attend to their present-moment experience with openness and nonjudgment. For instance, Brown and Ryan (2003) defined dispositional mindfulness as the tendency to think, feel, and act with an open and receptive awareness.

However, mindfulness is more than a trait-like individual feature: it can also be seen as the practice of deliberately attending to present experiences, which lies at the core of Buddhist meditation (e.g. Wallace & Shapiro, 2006), and of mindfulness-based interventions (gathered under the label MBIs), like the Mindfulness-Based Stress Reduction program (MBSR; Kabat-Zinn, 1990). Mindfulness meditation practices are based on the cultivation of non-judgmental awareness in every action and feeling experienced during the daily life (Gunaratana,1993; Kabat-Zinn, 1990), and on specific exercises to train the ability to focus on the present moment, such as breathing meditation (Kabat-Zinn, 1990), where the object of meditation is breath. Mindfulness practice helps people be more aware of – and observe with curiosity – their bodily sensations, thoughts, feelings, behaviors, surroundings, and accept them even if they may generate discomfort, hence reducing the use of avoidance and suppression coping strategies (Baer, 2003; Hayes & Feldman, 2004). As a result, people may experience emotions and events more fully, but without being completely immersed into them (Shapiro, Carlson, Astin, & Freedman, 2006). Training the ability to dis-identify from the contents of consciousness makes people more resilient to stress and negative events, thereby promoting higher well-being (Bajaj & Pande, 2016).

The MBSR protocol was created by Jon Kabat-Zinn in the 1970s with the specific goal of reducing stress-related symptoms and helping individuals have mindful reactions to

stressful situations. Specifically, the MBSR is an 8-week intervention including both group and individual meditation exercises, the latter to be continued after the end of the program. Nowadays, the MBSR is also employed in hospital and workplaces. Since the birth of MBSR, many other mindfulness trainings have been developed with similar goals, such as the Mindfulness-based Cognitive Therapy (MBCT), and several times they have been based on a combination of mindfulness and other positive individual characteristics and strengths, such as gratitude in the Positive Mindfulness Program (Ivtzan et al., 2016), and self-compassion in the Mindful Self-Compassion Program (Neff & Germer, 2013).

It is important to mention that both dispositional mindfulness and mindfulness practice are related to higher affective, subjective, and psychological well-being (e.g., Anderson, Lau, Segal, & Bishop, 2007; Baer et al., 2008; Brown & Ryan, 2003; Carmody & Baer, 2008; Giluk, 2009; Josefsson, Larsman, Broberg, & Lundh, 2011), and to many other positive individual characteristics that are also mediators of its association with well-being, such emotional intelligence (Schutte & Malouff, 2011), self-esteem (Bajaj, Gupta, & Pande, 2016), hope and optimism (Malinowski & Lim, 2015), self-compassion and gratitude (Voci, Veneziani, & Fuochi, 2018), and low rumination (Ciesla, Reilly, Dickson, Emanuel, & Updegraff, 2012).

However, a vigorous debate has arisen regarding the definition of mindfulness and the attempts to translate Buddhist virtues and teachings into Western-based psychological constructs (e.g., Mikulas, 2011), especially when mindfulness is considered as a disposition and is measured by self-report scales (for a review, see Van Dam et al., 2018), to some extent departing from the original concept of mindfulness practice (e.g., Grossman & Van Dam, 2011). It is therefore important to define precisely how we conceptualize mindfulness for purposes of this research.

First, this project focused specifically on dispositional mindfulness, defined as a relatively stable tendency to remain focused on, and aware of, one's present-moment experience, with an attitude of nonjudgment and acceptance. Given the multifaceted nature of the construct (Leary & Tate, 2007), we will make explicit which aspect(s) of dispositional mindfulness we are assessing, depending on the measure being used. For instance, the Mindful Awareness Attention Scale (MAAS; Brown & Ryan, 2003) measures dispositional present-moment awareness and attention, with a focus on the ability to act in non-automatic ways, but it does not assess the degree to which people usually approach their present experience with an attitude of nonjudgment or acceptance.

Second, we acknowledge that dispositional mindfulness is not equivalent to the effects of mindfulness meditation, especially if considering cases of frequent and longtime practice (e.g., Van Dam et al., 2018). Consistent with this distinction, in discussing past work we deal only with research on dispositional and state mindfulness, and we do not extend our findings to the practice of meditation.

Third, we regard the various aspects of dispositional mindfulness as relatively stable psychological characteristics that people, even those who are not meditators, may possess without reflecting on them or labeling them as mindfulness. We further acknowledge that these characteristics might depart from the traditional definition of mindfulness offered in Buddhism. Even though research has shown similar associations between dispositional mindfulness and measures of well-being when comparing American college students with Thai Theravāda monks (Christopher, Christopher, & Charoensuk, 2009), people without experience in mindfulness and meditation may interpret the items on self-report measures of mindfulness in ways that differ from traditional definitions of mindfulness (e.g., Grossman & Van Dam, 2011). Therefore, we place our findings in the broader framework of psychological characteristics that involve the degree to which people focus on the present moment and

accept the flow of experience, rather than transcending the "here and now" (Liberman & Trope, 2008), enacting automatic behaviors (Kang, Gruber, & Gray, 2013), or engaging in experiential avoidance (Mitmansgruber, Beck, Höfer, & Schüßler, 2009).

Mindfulness, Well-being and Emotions over Time

The beneficial effect of dispositional mindfulness on well-being and emotions, especially the negative ones, has been confirmed by a large number of studies, which are diverse in terms of geographic location, research design, sample, and measures of both mindfulness and well-being (e.g., Kong, Wang, & Zhao, 2014; Mitmansgruber et al., 2009; Weinstein, Brown, & Ryan, 2009; regarding affect, see the meta-analysis by Giluk, 2009). However, only a small number of these studies have investigated the longitudinal effects of mindfulness on emotions and well-being, i.e. with at least three repeated measures of the outcome variable, to disentangle true change from measurement error (Ployhart & Ward, 2011). Moreover, repeated measures should be considered as nested within each individual, and an even smaller proportion of studies on mindfulness and well-being managed to do this.

Many studies have instead measured dispositional mindfulness at the beginning of a period and well-being and psychological symptoms at the end of the period. For instance, MAAS scores were found related to lower self-reported stressfulness of events and ill-being (measured by a composite of negative affect and depressive symptoms) and greater well-being (measured by averaging life satisfaction and positive affect items) collected one month after the mindfulness measure (Weinstein et al., 2009). In another study, the awareness subscale of the Philadelphia Mindfulness Scale (PHLMS-A; Cardaciotto, Herbert, Forman, Moitra, & Farrow, 2008) was positively associated with 4-month (but not 2-month) follow-up depression scores, and negatively associated with psychological quality of life, controlling for psychological flexibility (Long & Hayes, 2014).

Also dispositional nonjudgment, measured by the Kentucky Inventory of Mindfulness Skills (KIMS; Baer, Smith, & Allen, 2004), was positively correlated with life satisfaction and psychological well-being, and negatively correlated with depressive and anxiety symptoms, assessed six months later (Ford, Lam, John, & Mauss, 2017).

In a study that measured mindfulness with the Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006), the facets that negatively correlated with college students' depressive symptoms over the course of the semester were *acting with awareness*, *nonreactivity* (to inner experience), and *nonjudgment*, although the effect of *awareness* disappeared when all facets were considered together (Barnes & Lynn, 2010). The remaining facets, *describe* and *observe* (representing the ability to label thoughts and feelings and to notice sensations and stimuli, respectively), did not follow the patterns of the other three facets, as frequently found in the literature (Brown, Bravo, Roos, & Pearson, 2015; López, Sanderman, & Schroevers, 2016; Haddock, Foad, Windsor-Shellard, Dummel, & Adarves-Yorno, 2017; Reese, Zielinski, & Veilleux, 2015). Similarly, in an adolescent sample, specific mindfulness elements had diverse long-term consequences. In particular, *emotional awareness*, *action awareness* (engaging fully in one's current activity with undivided attention), and *experience acceptance* (all derived from KIMS) predicted lower negative affect one year later, but *acceptance* also predicted higher positive affect one year later, controlling for baseline affect (Ciarrochi, Kashdan, Leeson, Heaven, & Jordan, 2011).

These beneficial effects of dispositional mindfulness also arise in the presence of challenging situations. College freshmen who scored higher on dispositional mindfulness at the beginning of the academic year reported lower anxiety and sadness at the middle and end of the semester, and these relationships were partially mediated by adaptive coping strategies (Weinstein et al., 2009). Moreover, dispositional mindfulness was found to be negatively associated with avoidance and thought-suppression tendencies, depression scores, and

difficulty identifying one's own feelings, in a sample of police recruits after one year of service (Williams, Ciarrochi, & Deane, 2010), and with general distress, anxiety, and hyperarousal symptoms one year after return from deployment in Iraq or Afghanistan, in National Guard soldiers (Call, Pitcock, & Pyne, 2015).

The positive long-term relationships between dispositional of mindfulness and well-being encompass physical and relational benefits. In a sample of female college students, dispositional present-moment awareness (measured by MAAS) was related to healthier eating practices, better quality of sleep, and better physical health five academic quarters later (Murphy, Mermelstein, Edwards, & Gidycz, 2012). As for relational well-being, MAAS scores were positively related to relationship satisfaction 10 weeks later among dating college students (Barnes, Brown, Kruseman, Campbell, & Rogge, 2007), and to lower probability of breakup over one year among people involved in romantic relationships who scored high in anxious attachment (Saavedra, Chapman, & Rogge, 2010). Nonetheless, in the latter study, mindfulness was also negatively related to changes in relationship satisfaction over one year (Saavedra et al., 2010), suggesting a decreasing or a flatter trajectory for mindful individuals, compared to less mindful ones. However, the possibility of a flatter trajectory over time, indicating stability of relationship quality, was not addressed by the authors.

Dispositional mindfulness is rather stable over time (Brown & Ryan, 2003), but mindfulness interventions can change people's tendency to be mindful to some extent. Indeed, increases in dispositional mindfulness stimulated by an intensive mindfulness training, involving 10–12 hours of mindfulness practice per day for one month, were related to improvements in psychological symptoms, well-being, and resilience over time (Orzech, Shapiro, Brown, & McKay, 2009).

Compared to long-term and longitudinal studies, intensive longitudinal data from daily diary and experience sampling studies provide more information on the stability of

emotions and daily emotion regulation of mindful individuals. Moreover, such studies allow an examination of both trait and state mindfulness, which may act independently and differently, although being correlated (Brown & Ryan, 2003; Nezlek, Holas, Rusanowska, & Krejtz, 2016).

In experience sampling method (ESM) studies, MAAS scores predicted lower negative – but not higher positive – affect (e.g. Brown & Ryan, 2003), while FFMQ total scores were associated with less variable experience-sampled emotions (Hill & Updegraff, 2012). In both a diary and an ESM study, state present-moment awareness was found related to higher positive and lower negative emotions (Brockman, Ciarrochi, Parker, & Kashdan, 2016; Brown & Ryan, 2003), even when controlling for daily suppression and reappraisal strategies employed (Brockman et al., 2016).

However, different aspects of mindfulness may relate to emotions in different ways. One ESM study found that momentary positive affect was associated with momentary present-moment attention and, to a lesser extent, with momentary nonjudgmental acceptance, but was not associated with state awareness (Blanke, Riediger, & Brose, 2018). On the other hand, momentary negative affect was strongly – and negatively – associated with state nonjudgmental acceptance, which also buffered the effect of daily hassles on positive affect.

Such dynamics may be partially explained by more effective reactions to stressful situations. Diary and experience sampling studies suggest that people who score high in dispositional mindfulness regard daily events as less stressful and more positive (Nezlek et al., 2016; Weinstein et al., 2009, Study 3). Furthermore, the typical negative impact of daily stress on daily mood is attenuated by high dispositional mindfulness (Ciesla et al., 2012; Dixon & Overall, 2016), independently of emotion regulation, affect, and neuroticism (Dixon & Overall, 2016). A 14-day diary study showed that dispositional nonjudgment predicted lower negative emotions, but not positive emotions, felt during the most stressful event of the

day, and that this link mediated the relationship between nonjudgment and various well-being

measures, such as satisfaction with life, depressive symptoms, psychological well-being, and

trait and social anxiety (Ford et al., 2017; Study 3).

What characteristics make people high in dispositional mindfulness more resilient to

daily hassles and transient stressful situations? Intensive longitudinal studies suggest that the

best candidates are lower rumination (Ciesla et al., 2012), higher ability to recognize and

regulate emotions (Hill & Updegraff, 2012), and a richer and less maladaptive repertoire of

coping and self-regulatory skills (Keng & Tong, 2016; Weinstein et al., 2009). When they

face stressful experiences, more mindful individuals rely more on approach coping

(Weinstein et al., 2009) and less on coping strategies characterized by avoidance, fantasizing,

or venting (Keng & Tong, 2016); moreover, they engage more in autonomous, self-regulated

behavior in day-to-day life (Brown & Ryan, 2003). Present-moment awareness helps people

to respond to challenging situations in ways that are more consistent with their values, while

feeling more self-efficacious (Donald, Atkins, Parker, Christie, & Ryan, 2016).

Mechanisms of Mindfulness

In sum, several aspects of dispositional and state mindfulness – especially those

involving present-moment awareness, a nonjudgmental attitude, and low reactivity – help

people to cope with stressful and emotionally-relevant events, with the result of higher

momentary and long-term well-being, and perhaps more stable emotions. What are the

underlying, mediating mechanisms behind these effects? One is likely to be the ability to see

mental events as simply thoughts and feelings, without identifying with them. This ability is

partially captured by the nonreactivity component of the FFMQ (e.g., "When I have

distressing thoughts or images, I just notice them and let them go"). Another likely

mechanism is non-attachment (Coffey, Hartman, & Fredrickson, 2010), which is the capacity to experience life without excessive involvement (Sahdra, Shaver, & Brown, 2010).

These two mechanisms are intertwined. In two experiments, Papies, Pronk, Keesman and Barsalou (2015) showed that training participants to observe their reactions to pictures of appetitive stimuli, exemplified by food and attractive people, as passing mental events decoupled sexual and food motivation from the related appetitive behavior. Disengaging from the content of thoughts results in less immersion in mental events, thereby mitigating craving (Papies et al., 2015; Westbrook et al., 2013).

Decentering, the capacity to step outside one's personal perspective of a lived experience (Safran & Segal, 1990), is recognized as correlate and possible mediator of mindfulness (e.g., Shapiro et al., 2006). Decentering has been conceptualized as an umbrella term that includes multiple abilities involving three processes: meta-awareness (i.e., the awareness of subjective experience), disidentification from internal experience, and reduced reactivity to the content of one's thoughts (Bernstein et al., 2015). A considerable part of these processes pertains to mindfulness skills. Shapiro et al. (2006) theorized that the main mechanism and mediator of mindfulness is decentering, which increases four second-level mediators: values clarification, exposure (the ability to stay with unpleasant feelings), self-regulation, and cognitive flexibility. These second-level processes would enhance psychological health. This mediation model received some empirical confirmation both when assessing mindfulness as dispositional attention and awareness (Pearson, Brown, Bravo, & Witkiewitz, 2015) and using the act-with-awareness, nonjudgment, and nonreactivity facets of the FFMQ (Brown et al., 2015).

Besides a reduced reactivity to thoughts, mindful people also have more present-focused thoughts, which improves life satisfaction by reducing negative rumination (Felsman, Verduyn, Ayduk, & Kross, 2017), lowering negative thoughts, and more non-valenced

thoughts in general (Kiken & Shook, 2014). Moreover, dispositional mindfulness may enhance the clarity of the situation and whatever emotions arise. Path and structural equation analyses showed that clarity mediated the relationship between mindfulness, measured as a composite of present-centered attention and acceptance, and negative emotion regulation, thereby reducing psychological distress (Coffey et al., 2010).

At the level of the brain, a number of cognitive abilities may be enhanced in "a mindful mind" such as sustained attention, attention switching, and inhibition of secondary elaborative processing (Bishop et al., 2004; Teper, Segal, & Inzlicht, 2013), abilities that help the mind focus and disregard thoughts and emotions irrelevant to the present situation (Riggs, Black, & Ritt-Olson, 2015).

Studies involving mindfulness meditators or applying short experimental mindfulness training show that mindfulness is associated with improvements in executive function, especially in the inhibitory sub-domain (for a review, see Gallant, 2016), where inhibition involves suppression of information and automatic responses that are unrelated to the present task (Miyake et al., 2000). However, dispositional mindfulness was also associated with neurocognitive benefits: MAAS scores were negatively related to three self-report indexes of frontal lobe dysfunction (apathy, disinhibition, and executive dysfunction), also controlling for stress, depression and anxiety symptoms, emotion regulation, and alexithymia (Lyvers, Makin, Toms, Thorberg, & Samios, 2014). Moreover, in a sample of adolescents, MAAS scores were strongly and positively correlated with a latent factor composed of inhibitory control, working memory, and cognitive flexibility; only inhibitory control and working memory were statistically significant when the three processes were analyzed separately (Riggs et al., 2015).

Preliminary evidence that executive function mediates the link between dispositional mindfulness and emotions was offered by Short, Mazmanian, Oinonen, and Mushquash

(2016). They showed that executive function deficits – specifically, planning and monitoring, working memory, modulation of emotional responses, and inhibition of impulses – mediated the relationship between mindfulness and negative (but not positive) affect. The mindfulness facets of acting with awareness, non-judgment, and describing were the most negatively correlated with executive function deficits.

Summarizing, the brain of a mindful person may be more able to hold information related to the present-moment without intrusive thoughts and irrelevant emotions and feelings, which may stem from mind wandering (Mrazek, Franklin, Phillips, Baird, & Schooler, 2013), as well as from mental habitus and automatized processes (Kang et al., 2013).

The Stability, Instability, and Variability of Emotions

Most research has studied emotions from a static perspective, focusing on their mean levels and assessing them either only once or only before and after an eliciting stimulus (Kuppens, 2015). However, emotions are inherently dynamic, and their intraindividual dynamics have an effect on well-being (Kuppens & Verduyn, 2017). In particular, both the range of emotions' fluctuations across time (emotional variability) and the magnitude of emotional changes from one moment to the next (emotional instability) are associated with lower well-being (for an overview, see the meta-analysis by Houben et al., 2015). Surprisingly, these patterns hold also for positive emotions, while controlling for their overall mean level (Gruber et al., 2013).

Emotional variability is usually computed as the intra-individual standard deviation (ISD) or variance of emotional states across time, while emotional instability is calculated as the mean squared successive difference (MSSD) between consecutive emotion scores (Houben et al., 2015). Both measures tap into intraindividual variability in emotions (Ram &

Gestorf, 2009; Wang, Hamaker, & Bergeman, 2012) and are usually based on a large number

of emotion assessments, as are often obtained in diary data and ESM studies. However, only

the MSSD takes into account the temporal dependency in repeated assessments (i.e., the

correlation of current observation with previous observations; Wang et al., 2012). In emotion

dynamics research, temporal autocorrelation represents emotional inertia, the extent to which

emotions remain constant across successive moments (Kuppens, Allen, & Sheeber, 2010).

Notably, emotional inertia also correlates negatively with well-being (Houben et al., 2015).

Being person-specific, both emotion stability and variability indexes can be viewed as

trait-like measures. Emotional variability is quite stable (Eid & Diener, 1999) and correlates

with several personality dispositions. For example, variability in negative affect is positively

associated with neuroticism and psychoticism (Eid & Diener, 1999; McConville & Cooper,

1999) and negatively related to dispositional self-concept clarity and self-esteem (Nezlek &

Plesko, 2001). Variability indexes in positive and negative affect are associated positively

with impulsivity, as well as with schizotypal and borderline symptoms (McConville &

Cooper, 1999), while relating negatively with self-control (Daly, Baumeister, Delaney, &

McLachlan, 2014), mindfulness, and the ability to differentiate among one's emotions (Hill

& Updegraff, 2012). Overall emotional variability also relates to a flatter diurnal cortisol

slope, a pattern frequently linked with adverse health outcomes (Daly et al., 2014).

Emotional instability, which combines emotional variability with low emotional

inertia, has a negative relationship with parasympathetically-mediated heart rate variability, a

physiological indicator of emotion regulation (Koval et al., 2013). Given that high emotional

instability is also a feature of borderline personality disorder (Trull et al., 2008) and bipolar

disorder (Gruber, Harvey, & Purcell, 2011), it may be regarded as a broad signal of mood-

related dysfunction. Overall, emotional variability and instability can be regarded as two by-

products of heightened sensitivity of the valuation systems involved in emotion generation

and regulation. On the other hand, emotional inertia, which is an extended carry-over of emotions over time, could be connected to both a regulation failure and a lower reactivity pattern (Kuppens & Verduyn, 2015). Relevant to this research, a study by Keng and Tong (2016) showed that dispositional mindfulness, measured by MAAS scores, was related to lower emotional variability, instability, and inertia, but only concerning negative emotions, and that lower use of maladaptive coping mediated these relationships.

Each index of intraindividual variability in emotions gives an important piece of information on how a person's emotions fluctuate, but none of them considers the conditions that may contribute to those fluctuations. Emotions change following the occurrence of both stressful and non-stressful situations, with implications for well-being.

In particular, intense affective reactivity (sharp increases in negative affect and decreases in positive affect) to minor daily stressors is related to higher levels of inflammation markers (Sin, Graham-Engeland, Ong, & Almeida, 2015) and to long-term psychological and physical distress, including the likelihood of reporting chronic health conditions up to a decade later (Charles, Piazza, Mogle, Sliwinski, & Almeida, 2013; Piazza, Charles, Sliwinski, Mogle, & Almeida, 2013). Importantly, these long-term effects also hold when controlling for the number of stressors generating these emotional reactions (Charles et al., 2013; Piazza et al., 2013). These findings, coming from different research strands, converge to suggest that different patterns of emotions changes and fluctuations, either in relation to time or to events, affect psychological well-being, and that emotional stability is an important consideration.

One of the main reasons for studying emotional stability is its deep connection with the concept of resilience. Despite the existence of self-report scales that putatively measure trait resilience, resilience is better represented as a process (Montpetit, Bergeman, Deboeck, Tiberio, & Boker, 2010) that involves "a stable trajectory of healthy functioning" following

extreme adversity (Bonanno, 2012, p. 755). From this perspective, in the absence of potentially traumatic events, the term "resilience" is not appropriate. However, other researchers have pointed out that even trivial events require coping, so resilience can be observed in the management of everyday stressors (Liu, Reed, & Girard, 2017; Seery & Quinton, 2016).

If we enlarge the set of adverse conditions to medium-intensity negative events and daily hassles (e.g., Almeida, 2005; Demes & Geeraert, 2015; Neff & Broady, 2011), resilience appears as a process of functional recovery from any stressful situations, characterized by lower affective reactivity and quicker return to emotional baseline (Montpetit et al., 2010). The resilience process, which is promoted by dispositional and social support factors (Montpetit et al., 2010), is thus intertwined with patterns of emotional variability and instability.

Equanimity, mentioned previously as a feature of mindfulness (Salzberg, 1995), is also intimately related to emotional variability and instability. According to Desbordes et al. (2015, p. 363), "a primary 'signature' of equanimity is in the temporal domain, in the form of a rapid disengagement from initial emotional response and faster return to baseline." So, how emotions change over time may reflect people's ability to adapt to events and to defend themselves from the negative consequences of affective reactivity.

Aims and Hypotheses

Numerous research findings suggest that people who are higher in dispositional mindfulness report greater long-term well-being and cope better with daily stress, but research has scarcely examined the relationship between dispositional mindfulness and how emotions fluctuate or remain stable. In particular, stability can be operationalized in a variety of ways, including how emotions change over long periods of time, how rapidly they

fluctuate (e.g., emotion stability and variability), and how they change in relation to everyday stimuli ad self-relevant events. Notably, most mindfulness research has considered stressful events without taking into account the link between dispositional mindfulness and reactivity to positive events. Moreover, limited attempts have been made to study how dispositional mindfulness relates to intraindividual variability in emotions, separating within- and between-person dynamics.

The current project investigated the relationship between dispositional mindfulness and various forms of affective stability, considering both negative and positive affect, negative and positive self-relevant events, and diverse time spans and frequencies of measurements. We tested this relationship systematically, measuring numerous aspects of affective stability with multiple analytical strategies and statistical indexes, to portray as fully and accurately as possible the ways in which emotions change and fluctuate. As emotional stability is an essential ingredient of long-term mental health and functional well-being, this contribution provides a new perspective on the well-known and strong link between dispositional mindfulness and well-being.

We aimed to answer eight research questions:

(Q1) How does dispositional mindfulness relate to reactivity to self-relevant recalled negative and positive events?

(Q2) How does dispositional mindfulness relate to baseline and changes over time of positive and negative affect?

(Q3) How does dispositional mindfulness moderate the within-person effects of negative and positive events on negative and positive emotions?

(Q4) Overall, does dispositional mindfulness show different patterns when comparing positive and negative events, or positive and negative emotions?

(Q5) What aspects of dispositional mindfulness are most important for emotional stability over time and in reactions to events?

(Q6) Does lower emotional variability explain part of the relationship between dispositional mindfulness and well-being?

(Q7) How does dispositional mindfulness relate to measures of emotional variability, instability, and inertia?

(Q8) How is dispositional mindfulness related to momentary negative and positive affect, and to their intra-individual variability?

We examined these questions across five studies, one cross-sectional study and four others that employed longitudinal and intensive longitudinal data. Based on the literature on mindfulness, stress, and emotions (e.g., Donald et al., 2016; Weinstein et al., 2009) and on the theoretical link between mindfulness and equanimity (Desbordes et al., 2015; Salzberg, 1995), we hypothesized that people higher in dispositional mindfulness display more stable emotions, as reflected by lower emotional reactivity to self-relevant events, flatter emotion trajectories, lower effects of negative and positive events on negative and positive affect respectively, and lower emotional variability and instability. Consistent with research showing that dispositional mindfulness attenuates the perception of stress and its impact on emotions (Ciesla et al., 2012; Dixon & Overall, 2016; Weinstein et al., 2009), we expected the relationship between dispositional mindfulness and emotional stability to be greater for negative than positive emotions.

STUDY 1

We began by investigating the relationship between dispositional mindfulness and reactivity to a recalled recent self-relevant event (Q1), using two measures of dispositional mindfulness. The aspect of affective stability of interest in Study 1 (cross-sectional) and Study 2 (repeated measures) is the magnitude of positive and negative emotional reactions to one negative and one positive recent self-relevant event, to see also if dispositional mindfulness shows different patterns when comparing positive and negative events, or positive and negative emotions (Q4). Although experiencing emotions that are not consistent with the valence of the related event may seem unusual, this phenomenon can be driven by both features of the event and specific individual tendencies. For instance, the ability to recall positive emotions when facing negative events is associated with resilience and effective emotion regulation strategies (Tugade & Fredrickson, 2004). For this reason, we also studied positive emotional reactions to the self-relevant negative event, as well as negative emotional reactions to the self-relevant positive event.

Method

The Psychological Research Ethics Committee of the University of Padova approved the procedures of this study within the project "Indagine su eventi e benessere (Investigation on events and well-being)", protocol number 1948.

Participants. Two hundred and ninety-nine participants (66% women) voluntarily participated in this study by completing an online questionnaire. Participants, all of whom were Italian, ranged in age from 18 to 72 years ($M = 31.15$; $SD = 12.10$). Their occupations were mixed: 38% of participants were retailers, employees, or teachers in primary schools; 22% were students, 14% were manual workers, 8% were professionals, high school teachers,

or university professors, while 6% were housekeepers, unemployed, or retired. The remainder of the sample did not provide this information.

Measures. After completing measures of the dispositional variables described below, as well as some that were not relevant to the present research questions, participants answered questions about recent negative events that they had experienced, followed by the same questions for positive events.

Mindfulness. Dispositional present-moment awareness was measured with the validated Italian version of the Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003; Veneziani & Voci, 2015a). Respondents answered on a 7-point scale, from 1 (*almost never*) to 7 (*almost always*). Higher scores indicated higher levels of trait mindfulness ($\alpha =$ .85). To see whether similar effects would be obtained when dispositional mindfulness was assessed with a measure that encompassed other aspects besides attention and awareness, we also administered the Cognitive and Affective Mindfulness Scale-Revised (CAMS-R; Feldman, Hayes, Kumar, Greeson, & Laurenceau, 2007; Italian validated translation by Veneziani & Voci, 2015b). The CAMS-R ($\alpha = .78$) blends attention, present-focus, awareness, and acceptance of thoughts and feelings in a compact set of 12 items.

Although the MAAS and the CAMS-R each have advantages and disadvantages, we rely primarily on the MAAS because the CAMS-R includes items that assess the willingness and potential ability to be mindful rather than actual mindful behaviors in everyday life, as assessed by the MAAS (Bergomi, Tschacher, & Kupper 2013). Moreover, compared to other measures of dispositional mindfulness, CAMS-R scores have stronger associations with emotion regulation, psychological distress, and well-being (Baer et al., 2006; Thompson & Waltz, 2007; Voci, Veneziani, & Fuochi, 2018), suggesting that the CAMS-R may capture aspects of psychological health and adjustment in addition to mindfulness.

Questions about negative and positive events. First, participants were told "Sometimes negative events occur, more or less unexpected. Think about the last few weeks while you answer the following question: How much do you feel that the last few weeks have been marked by negative events (for instance, health issues involving you or people close to you, changes, difficulties at work)?", answering the question on a scale from 1 (*not at all*) to 7 (*a great deal*). Then, they were asked to recall the most impactful, self-relevant recent negative event – the negative event in the last few weeks that "had the strongest impact on you and your mood" – and rated how negative this event was from 1 (*minimum negativity*) to 10 (*maximum negativity*). Finally, participants rated how they felt when recalling that negative event on 14 emotions (half positive, half negative) used by Tugade and Fredrickson (2004) to assess emotional reactions during a stressful situation. The emotions, which were rated from 0 (*not at all*) to 8 (*a great deal*), were fear, amusement, anger, anxiety, contentment, disappointment, disgust, eagerness, excitement, frustration, happiness, interest, surprise, and sadness. Immediately after the set of questions about negative events, the questions were repeated for positive events. The emotion ratings were averaged within four sets that reflect event-related emotional reactivity: negative emotions related to the negative self-relevant event ($\alpha = .89$), positive emotions related to the negative self-relevant event ($\alpha = .82$), positive emotions related to the positive self-relevant event ($\alpha = .90$), and negative emotions related to the positive self-relevant event ($\alpha = .88$).

Big Five traits. As suggested by Giluk (2009), we performed robustness checks for our analyses by re-running the models including the Big Five traits to see if dispositional mindfulness retained its predictive power on affective reactivity when Big Five traits were accounted for. We measured the Big Five using the Italian version (Chiorri et al., 2015) of the Ten-Item Personality Inventory (TIPI; Gosling, Rentfrow, & Swann, 2003) that assesses each trait by two items. As recommended by Eisinga, Grotenhuis, and Pelzer (2013), we assessed

the reliability of each two-item subscale using the Spearman-Brown statistic (extraversion: ρ = .47; agreeableness: ρ = .24; conscientiousness: ρ = .51; neuroticism: ρ = .46; openness: ρ = .43). Although reliabilities did not meet standard levels of acceptability, these reliability levels are not unusual for two-item scales.

Results and Discussion

Means, standard deviations, and correlations between the primary variables are reported in Table A1 of the Appendix. To understand the relationship between dispositional present-moment awareness and emotional reactions to the most self-relevant negative and positive events, we performed four linear regression models, one for each emotional reactivity index. The predictors were MAAS scores, age, gender, and the respective event-related variables. To control for the potential cumulative effects of further self-relevant situations, which could contribute to the reactivity to the chosen event, we included as control variables the occurrence of recent negative events and the negativity of the chosen self-relevant event in the models for the negative event, and the occurrence of recent positive events and the positivity of the selected self-relevant event in the models for the positive event. The results are reported in Table 1, together with 95% Confidence Intervals (CI) and standardized beta coefficients.

As can be seen, dispositional present-moment awareness was negatively associated with both negative and positive emotions related to the negative and the positive event, controlling for age, gender, intensity of the selected event, and occurrence of recent negative or positive events. Thus, participants who were more aware and attentive to the present moment showed a pattern of globally lower emotional reactivity related to self-relevant events. This pattern held for both valence-consistent and valence-inconsistent emotions, but the effect sizes were greater for negative emotions, whether related to the negative and the

Table 1. The effect of dispositional mindfulness (MAAS) on emotional reactions to events: linear regressions (Study 1)

	Reference to self-relevant negative event						Reference to self-relevant positive event					
	Negative emotions			Positive emotions			Positive emotions			Negative emotions		
	b[CI]	*β*	*p*	*b[CI]*	*β*	*p*	*b[CI]*	*β*	*p*	*b[CI]*	*β*	*p*
Intercept	4.61[3.26, 5.96]		<.001	4.28[2.97, 5.58]		<.001	3.15[1.89, 4.40]		<.001	4.22[3.15, 5.29]		<.001
Age	0.00[-0.02, 0.02]	.00	.943	0.00[-0.01, 0.02]	.01	.812	0.00[-0.01, 0.02]	.00	.949	-0.00[-0.02, 0.01]	-.04	.528
Gender	0.40[0.01, 0.80]	.11	.044	-0.47[-0.85, -0.09]	-.15	.015	-0.12[-0.48, 0.23]	-.03	.494	-0.27[-0.57, 0.03]	-.10	.078
MAAS	-0.68[-0.89, -0.47]	-.34	<.001	-0.41[-0.61, -0.21]	-.25	<.001	-0.26[-0.45, -0.07]	-.13	.006	-0.51[-0.67, -0.35]	-.36	<.001
Event intensity	0.23[0.14, 0.32]	.30	<.001	-0.08[-0.17, 0.01]	-.12	.069	0.47[0.38, 0.56]	.60	<.001	-0.20[-0.27, -0.12]	-.34	<.001
Other events	0.14[0.01, 0.26]	.13	.035	0.04[-0.08, 0.16]	.05	.490	0.03[-0.11, 0.16]	.02	.721	0.24[0.12, 0.36]	.28	<.001
Observations	266			265			278			277		
R^2	.31			.09			.40			.21		

Notes. CI = 95% Confidence Intervals. Event intensity refers to self-reported negativity of the self-relevant negative event in the first two columns, and to the self-reported positivity of the positive event in the last two columns. Similarly, Other events refers to the occurrence of recent negative events in the first two columns, and to the occurrence of recent positive events in the last two columns.

positive self-relevant event. The results stayed the same when controlling for the Big Five traits (Table A2 in the Appendix), with the negative coefficients of MAAS scores ranging from b = -0.59, 95% CI [-0.82, -0.36], β = -.30, *p* < .001 (negative event, negative emotions) to b = -0.35, 95% CI [-0.56, -0.14], β = -.18, *p* = .001 (positive event, positive emotions).

When replicating the same analyses with the CAMS-R (Table A3 in the Appendix), the effect of dispositional mindfulness held only for negative emotions related to the negative event, suggesting that the overall low-reactivity pattern may be driven by the attention and awareness dispositions, that is, by the capacity to stay in the "here and now." On the other hand, a blend of other aspects of dispositional mindfulness, involving not only present-moment attention and awareness but also acceptance of thoughts and feelings, may result in lower negative emotions rather than mitigating overall reactivity.

STUDY 2

The aim of Study 2 was to replicate the main analysis of Study 1 – answering (Q1) and (Q4) – in a different sample, relying on a four-wave time-repeated measures design with a four-week interval between waves, to assess events and reactivity in four equally-spaced occasions. In Study 1, results could be partly due to the specificity of the self-relevant event identified by each person. Repeated-measures data allowed us to extend the time span and the within-individual variety of self-relevant events, as participants reported one positive and one negative self-relevant event in each wave they completed, together with related emotional reactions.

Method

The Psychological Research Ethics Committee of the University of Padova approved the procedures of Study 2 and Study 3 within the project "Differenze interindividuali nelle dinamiche di benessere (Inter-individual differences in well-being dynamics)", protocol number 1990.

Participants. Participants, who were recruited by psychology master students in return for a course-related bonus, completed online questionnaires. Each student identified four individuals (when possible, two men and two women) who met three requirements: they were willing to participate in a study involving four data collections across 12 weeks, they were not students in the course, and they did not know each other in order to decrease possible dependence among observations. The questionnaire included all the variables in the first wave and only time-varying variables in the subsequent three waves.

The sample size was 356 in the first wave, 329 in the second one (92% of the former), 312 in the third one (88% of the first wave), and 305 in the fourth wave (86% of the first wave). We handled attrition by linear mixed models, which do not require the same number

of individuals at each time point. Women represented the 53% of the sample in all waves. Age ranged from 18 to 67 years ($M = 27.62$; $SD = 10.94$), and all participants were Italian. The highest education level achieved was secondary school for 4% of the sample, high school diploma for 46% of the sample, bachelor's degree for 34% of the sample, and higher degrees (master's, Ph.D.) for 16% of the sample. As for participants' occupations, 60% were students; 16% were retailers, employees, or teachers in primary schools; 8% were manual workers; 9% were professionals, high school teachers, or university professors; and the rest were unemployed or did not report any occupation.

Measures. We collected the measures used in the main analysis of Study 1, together with other measures not relevant to the aims of Study 2.

Mindfulness. As previous research showed high 4-week test-retest reliability for the MAAS (intraclass correlation = .81; Brown & Ryan, 2003), we considered dispositional mindfulness as a stable, individual-level variable, and measured it only in the first wave ($\alpha = .87$). We did the same for age and gender.

Events questions. Events-related variables and emotional reactions to events were measured in each wave, specifically four times with a four-week interval. Because of this time span, all questions about events in Study 2, including emotional reactivity to the events, referred to the preceding *four* weeks (e.g., "Think about the last four weeks, and in particular about the time passed since the last time you filled in this questionnaire, while you answer the following question…"). Thus, at each wave, participants reported the occurrence of negative and positive events (How much do you feel that the last four weeks have been marked by negative events?) in the four weeks before the data collection (from 1 = *not at all* to 7 = *a great deal*). They then rated the negativity (or positivity) of the most impactful self-relevant negative (or positive) event occurred in the preceding four weeks from 1 = *minimum*

negativity (or positivity) to 10 = *maximum negativity (or positivity)* and emotional reactions related to the selected self-relevant negative (or positive) event, on the same set of 14 emotions used in Study 1 (Tugade & Fredrickson, 2004). Ratings were from 0 (*not at all*) to 8 (*a great deal*).

We aggregated the emotions to create, for each individual in each wave, the four indexes of event-related emotional reactivity used in Study 1. Internal consistency was assessed by Cronbach's alpha coefficient computed for each index in each wave (negative event, negative emotions: αs = .79-.84; negative event, positive emotions: αs = .83-.87; positive event, positive emotions: αs = .86-.87; positive event, negative emotions: αs = .81-.90). To determine the degree to which variability in the emotional reactivity indexes was due to individual-level differences versus within-individual contextual variations, we computed Intraclass Correlation Coefficients (ICCs), the ratio of between-individuals variance to total variance. Variability was distributed similarly across the four indexes, both for the negative event (negative emotions: ICC = .43; positive emotions: ICC = .39) and for the positive event (positive emotions: ICC = .45; negative emotions: ICC = .47), suggesting that emotional reactions to important events depend both on contextual and individual features.

Results and Discussion

Means, standard deviations, and correlations between the variables are reported in Table A4 of the Appendix. We replicated the analyses in Study 1 in a repeated measurement framework by treating the dataset hierarchically with the four waves nested within individuals. Consequently, we performed linear mixed effects models, also known as multilevel models, entering mindfulness, age, and gender as Level 2, time-invariant variables, while letting the event-related variables vary over time points (Level 1). We imposed random

intercepts and a random slope on the occurrence of recent negative/positive events to let the effect of these variables vary between individuals.

The issue of computing p-values in linear mixed models is controversial because it is unclear whether the number of Level-1 observations or the number of Level-2 clusters, or both, should constitute the denominator degrees of freedom, especially in the case of unbalanced data (Baayen, Davidson, & Bates, 2008). However, research has shown that when models are fitted using Restricted Maximum Likelihood (REML) and p-values are derived using the Kenward-Roger or Satterthwaite approximations, Type 1 error rates are closest to .05 (Luke, 2017). Thus, when dealing with mixed models, we computed Kenward-Roger approximated p-values, together with the 95% CI on unstandardized coefficients, as standardizing is not recommended for multilevel models (Hox, 2010). To interpret the results, we generally rely on the size of the effects more than on their mere statistical significance. In Studies 2, 3 and 4A, linear mixed models were conducted using the R (R Core Team, 2018) package lme4 (Bates, Maechler, Bolker, & Walker, 2015). In all the studies, results are reported with the help of the packages *sjPlot* (Lüdecke, 2018) and *effects* (Fox, 2003).

As can be seen in Table 2, the results largely confirmed those of Study 1. MAAS scores were associated with lower negative and positive emotions related to the self-relevant negative event, and to lower negative emotions related to the positive event. The effect was weaker for positive emotions related to the positive self-relevant event, suggesting that dispositional present-moment awareness does not always flatten positive emotional states. The findings of Study 2 support the pattern of lower emotional reactivity related to self-relevant events for mindful people. Moreover, the fact that the coefficients for MAAS scores were larger when the dependent variable involved negative than positive emotions suggests that dispositional mindfulness attenuates mostly negative affective reactivity, and to a lesser extent positive affective reactivity related to a negative event.

Table 2. The effect of dispositional mindfulness (MAAS) on emotional reactions to events: linear mixed effects models (Study 2)

| | Reference to self-relevant negative event | | | | | | Reference to self-relevant positive event | | | | | |
| | Negative emotions | | | Positive emotions | | | Positive emotions | | | Negative emotions | | |
	b	CI	p	b	CI	p	b	CI	p	b	CI	p
Intercept	2.62	1.89 – 3.36	<.001	1.91	1.36 – 2.46	<.001	2.14	1.46 – 2.82	<.001	2.11	1.57 – 2.66	<.001
Age	-0.01	-0.02 – 0.00	.060	-0.00	-0.01 – 0.01	.507	-0.01	-0.02 – -0.00	.035	-0.01	-0.01 – 0.00	.154
Gender	0.36	0.13 – 0.60	.003	-0.27	-0.45 – -0.09	.003	0.09	-0.12 – 0.30	.386	-0.16	-0.33 – 0.01	.073
MAAS	-0.31	-0.43 – -0.19	<.001	-0.10	-0.19 – -0.01	.031	-0.09	-0.20 – 0.01	.087	-0.20	-0.29 – -0.11	<.001
Event intensity	0.33	0.28 – 0.37	<.001	-0.02	-0.05 – 0.01	.237	0.38	0.33 – 0.42	<.001	-0.03	-0.07 – -0.00	.028
Other events	0.11	0.04 – 0.18	.001	0.04	-0.01 – 0.09	.088	0.18	0.11 – 0.24	<.001	0.04	-0.00 – 0.09	.059
Within variance		1.368			0.814			1.193			0.557	
Between variance		1.402			0.332			1.803			0.649	
Individuals		344			344			349			349	
Observations		1185			1185			1231			1231	
R^2		.71			.55			.69			.65	

Notes. Event intensity refers to self-reported negativity of the self-relevant negative event in the first two columns, and to the self-reported positivity of the positive event in the last two columns. Similarly, Other events refers to the occurrence of recent negative events in the first two columns, and to the occurrence of recent positive events in the last two columns. Models are fitted with REML. P-values are computed through Kenward-Roger approxima

STUDY 3

Study 3 was designed to go beyond reactivity to a singular event to assess the relationship between dispositional mindfulness and people's affect trajectories over 12 weeks, considering both within-person and between-person dynamics, time, and the occurrence of positive and negative events, and attempting to answer research questions (Q2), (Q3), and (Q4). In this study, we looked at the stability of emotions both over time and under circumstances in which negative and positive events occur more frequently than usual for a person. In particular, Study 3 examined how dispositional present-moment awareness is associated with baseline affect, interacts with within-person variations in positive and negative events and with the passing of time, and how these interactions are related to negative and positive affect.

Study 3 was part of the same data collection as Study 2, but we kept the studies separate because they addressed different research questions, their samples only partly overlapped, and they did not share the main measures.

Method

Participants. Study 3 relied on a subsample of Study 2, specifically the 323 respondents in Study 2 (91% of the original sample) who completed the questionnaire at least twice after the first wave. This selection was based the fact that to investigate longitudinal trajectories, at least three waves are necessary (Ployhart & Vandenberg, 2010), and the first wave was needed to provide time-invariant variables. After this sample selection, the number of participants in Study 3 was 323 (52% women; age: $M = 27.52$; $SD = 10.87$), with socio-demographic characteristics very similar to those of the sample of Study 2.

Measures. Two single-item questions measured the occurrence of recent negative and positive events (1 = *not at all* to 7 = *a great deal*), and dispositional present moment-

awareness was measured with the MAAS (Brown & Ryan, 2003; α =.87), considered as a time-invariant interindividual variable. Moreover, we assessed positive and negative affect felt in the preceding four weeks with the Italian version (Terracciano, McCrae, & Costa, 2003) of the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). Events variables and the PANAS were measured four times with a 4-week interval, so the reference period of those questions was "the preceding four weeks."

The PANAS was reliable in all waves (αs = .87-.90 for both negative and positive affect), and the variability of negative (ICC = .58) and positive affect (ICC = .55) was almost equally due to individual-level and within-individual variations.

Results and Discussion

We employed linear growth models (i.e., multilevel models for change; Singer & Willet, 2003) to analyze the relationships between dispositional mindfulness and (a) baseline affect, (b) linear changes in affect over time, and (c) events-related changes in affect. Linear growth models include time as a Level-1 variable representing the linear change in the outcome, whereas the effects of Level-2 (individual-level) variables can be interpreted as effects on the baseline of the dependent variable, and the interaction between a Level-2 variable and time portrays the effect of that variable on the rate of change of the outcome. These models suited both the research questions on stability and the need to control for an expected slight decreasing trend in negative (b = -0.04, p = .003) and positive affect (b = -0.09, p < .001) over time, which were observed when we conducted multilevel random-intercept models of positive and negative affect as a function of time only. Indeed, when the dependent variable shows a time effect that is irrelevant to the research question (in our case, there was no treatment or intervention explaining the downward trend), the best practice is to detrend the analysis by adding time as a Level-1 covariate (Wang & Maxwell, 2015).

Moreover, people differ in the degree to which they recurrently experience, or perceive, negative and positive events. In fact, some people may regularly experience, on average, higher levels of stressful events than other people do. Because this person-specific effect may be confused with variations from the typical frequency of negative and positive events, we disaggregated within-persons from between-persons effects in order to investigate interindividual differences in intraindividual emotion changes. This allowed us to isolate and study within-person dynamics.

This disaggregation is performed by computing the within-person mean (Level-2 variable) of a time-varying variable of interest, and the deviation of each score (Level-1 variable) from the person-mean (e.g., Curran & Bauer, 2011; Hoffman, 2015; Hoffman & Stawski, 2009). In our case, the time-varying variables of interest were the frequency of negative events and the frequency of positive events. Person-mean centering these variables (i.e., computing the deviations from the person mean of the frequency of negative and positive events) separates the effect of the person's usual level of negative and positive events from the effect of experiencing more negative and positive events than usual (Hoffman, 2015).

This simple way of person-mean centering can be applied only to cases where the time-varying predictor of interest is unrelated to time (Curran & Bauer, 2011). To check this, we conducted multilevel regression analyses with the frequency of negative and the frequency of positive events as a function of time and found no effect for either negative events (b = 0.009, p = .823) or positive events (b = 0.005, p = .889). Hence, we disaggregated between- and within-person levels of events in the way previously explained.

Finally, we modeled negative and positive affect as a function of MAAS scores, time (using integer values from 0 to 3 to reflect the baseline and subsequent three waves), the person mean and the person-mean centered variables of the frequency of recent negative and

positive events, and the interaction between events and MAAS scores, controlling for age and gender. As a second step, we added the interaction between MAAS scores and time. Allowing dispositional mindfulness to interact with person-mean centered events and time separately permitted us to assess the effect of being dispositionally aware and focused on the present moment on the stability of emotions when events happen more than usual (the average level of events for a person) and time passes. In particular, an interaction between time and Level-2 MAAS scores shows how the rate of change in negative and positive affect varies among people who are higher or lower in dispositional present-moment awareness.

All of the models had a random intercept and a random slopes for events to allow the effect of negative and positive events vary between individuals. To choose the random slope, we compared the fit of three alternative models that included a random slope on time, a random slope on events, and a random slope on both time and events. Fit was assessed with the BIC, which portrays the amount of information lost and values model parsimony. The lowest BIC was obtained for the second model that included random slope on events.

For the sake of clarity, we report multilevel equations for the full model, including also the interaction term between MAAS scores and time that was added in the second step. We use the notation from Singer and Willett (2003) for linear growth models:

$$\text{Level 1:} \quad NA_{ij} = \pi_{0i} + \pi_{1i}TIME_{ij} + \pi_{2i}(NE - pm(NE))_{ij} + \varepsilon_{ji}$$

$$\text{Level 2:} \quad \pi_{0i} = \gamma_{00} + \gamma_{01}age_i + \gamma_{02}gender_i + \gamma_{03}MAAS_i + \gamma_{04}pm(NE)_i + \xi_{0i}$$

$$\pi_{1i} = \gamma_{10} + \gamma_{11}MAAS_i$$

$$\pi_{2i} = \gamma_{20} + \gamma_{21}MAAS_i + \xi_{2i}$$

In the equations above, NA_{ij} stands for negative affect, varying both across i individuals and j time measurements; π_{0i}, which is the intercept, can be interpreted as the baseline of

negative affect, that is the score of negative affect you have when time is zero and the negative events equal the within-person mean of negative events; π_{1i} is the conditional rate of change of negative affect (conditional because of the presence of other predictors); π_{2i} is the effect of person-mean centered negative events; and ε_{ji} is the Level-1 random effect. At Level 2, the baseline of negative affect (π_{0i}) is predicted by MAAS scores, the person mean of negative events $pm(NE)_i$, age, and gender. Moreover, dispositional mindfulness is also a predictor of the rate of change of negative affect and of the effect of person-mean centered negative events. Letting the Level-1 coefficients of time and events depend on dispositional mindfulness equals the computation of their cross-level interactions. Multilevel equations were the same for positive affect and positive events.

Models were fit with maximum likelihood in order to compare model fit indexes, and p-values were computed through Kenward-Roger approximation as in Study 2. Results are reported in Table 3, together with fit indexes in the lower portion of the table; when comparing nested models, the lower the BIC, the higher the fit. The goodness of fit of the models was also evaluated by examining the distribution of residuals, which showed no grouping structure or trend.

In additional models, we included the interaction between the person mean of events and MAAS scores. We report these alternative models only in the Appendix (Table A5) because adding this interaction term neither improved the fit of the models nor resulted in a sizeable or statistically significant effect.

As reported in Table 3, dispositional mindfulness predicted lower baseline levels (the main effect of MAAS) of negative affect, as well as slightly higher baseline levels of positive affect. Both the person mean of events and the events deviation scores predicted affect consistent with the positive or negative valence of the events.
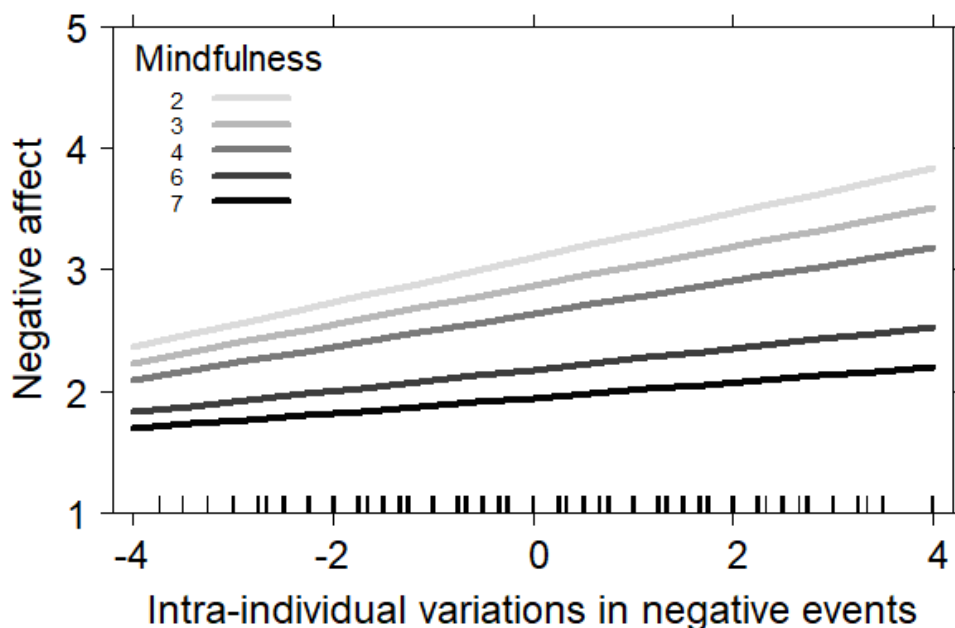
Table 3. The effect of dispositional mindfulness (MAAS) on trajectories of negative and positive affect: linear growth models (Study 3)

	Negative affect			Negative affect			Positive affect			Positive affect		
	b	*CI*	*p*	*b*	*CI*	*p*	*b*	*CI*	*p*	*b*	*CI*	*P*
Intercept	2.90	2.52 – 3.28	<.001	3.20	2.78 – 3.62	<.001	1.73	1.32 – 2.14	<.001	1.56	1.12 – 2.00	<.001
Age	-0.01	-0.02 – -0.01	<.001	-0.01	-0.02 – -0.01	<.001	0.00	-0.00 – 0.01	.478	0.00	-0.00 – 0.01	.482
Gender	0.06	-0.06 – 0.17	.331	0.06	-0.06 – 0.17	.311	-0.09	-0.20 – 0.02	.115	-0.09	-0.20 – 0.02	.112
PM events	0.27	0.22 – 0.32	<.001	0.27	0.22 – 0.32	<.001	0.32	0.27 – 0.38	<.001	0.32	0.27 – 0.38	<.001
PM-C events	0.23	0.12 – 0.34	<.001	0.22	0.11 – 0.34	<.001	0.14	0.03 – 0.26	.017	0.15	0.03 – 0.27	.013
MAAS	-0.23	-0.29 – -0.17	<.001	-0.30	-0.37 – -0.23	<.001	0.06	0.01 – 0.12	.028	0.10	0.04 – 0.17	.003
Time	-0.04	-0.06 – -0.01	.004	-0.24	-0.37 – -0.12	<.001	-0.08	-0.11 – -0.06	<.001	0.04	-0.08 – 0.15	.519
PM-C events*M	-0.02	-0.05 – -0.00	.047	-0.02	-0.05 – 0.00	.072	-0.01	-0.03 – 0.02	.627	-0.01	-0.03 – 0.02	.544
Time*M				0.04	0.02 – 0.07	<.001				-0.03	-0.05 – 0.00	.034
Within variance		0.240			0.235			0.202			0.201	
Between variance		0.207			0.208			0.207			0.207	
Individuals		318			318			318			318	
Observations		1206			1206			1217			1217	
BIC		2287			2283			2148			2150	

Notes. M=MAAS. PM = Person-Mean. PM-C = Person-Mean Centered (within-person deviations from the person mean). Events refer to negative events in the first two columns, and to positive events in the last two columns. P-values are computed through Kenward-Roger approximation. Models are fitted with ML.

The interaction between dispositional mindfulness and person-mean centered events had an effect only regarding negative events and negative affect, suggesting that the stabilizing effect of dispositional mindfulness on emotions is stronger for negative emotions, when negative events are more frequent than usual. While the main effect of time on negative affect was negative, consistent with the trend noted earlier, dispositional mindfulness had a slightly positive effect on the rate of change of negative affect (the interaction between MAAS and time). Although negative affect declined over time for the sample overall, mindful people showed less of a decrease in negative affect. The interaction between MAAS and time was statistically significant for negative affect, and adding it to the model improved the model fit, as shown by the reduced BIC. Plotting the two interactions between mindfulness and person-mean centered negative events (Table 3, column 1) and between mindfulness and time (Table 3, column 2) clarifies the results.

Figure 1. The effect of MAAS scores on the effect of negative events on negative affect (Study 3)

Dispositional mindfulness buffered the effect of negative events on negative affect (Figure 1) while also flattening the trajectory of negative affect (Figure 2). Participants higher in dispositional mindfulness had a very low baseline of negative affect, and their negative affect was barely affected by both experiencing more negative events than usual and the passage of time. Compared to participants lower in mindfulness, they showed greater emotional stability over the period of the study. The same pattern was not observed in the models for positive affect: MAAS scores were associated with slightly higher positive affect at the baseline but did not moderate the relationship between positive events and positive affect, and only weakly interacted with the positive affect trajectory. The interaction between time and positive events plotted in Figure 3 also suggests the possibility of regression toward the mean of positive affect over time.

Figure 2. The effect of MAAS scores on the rate of change of negative affect (Study 3)
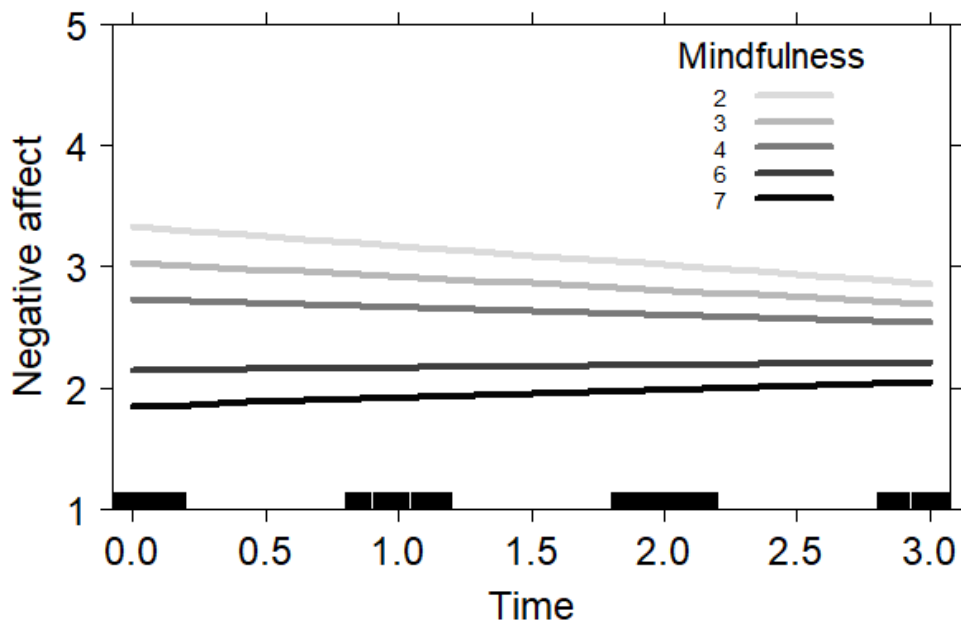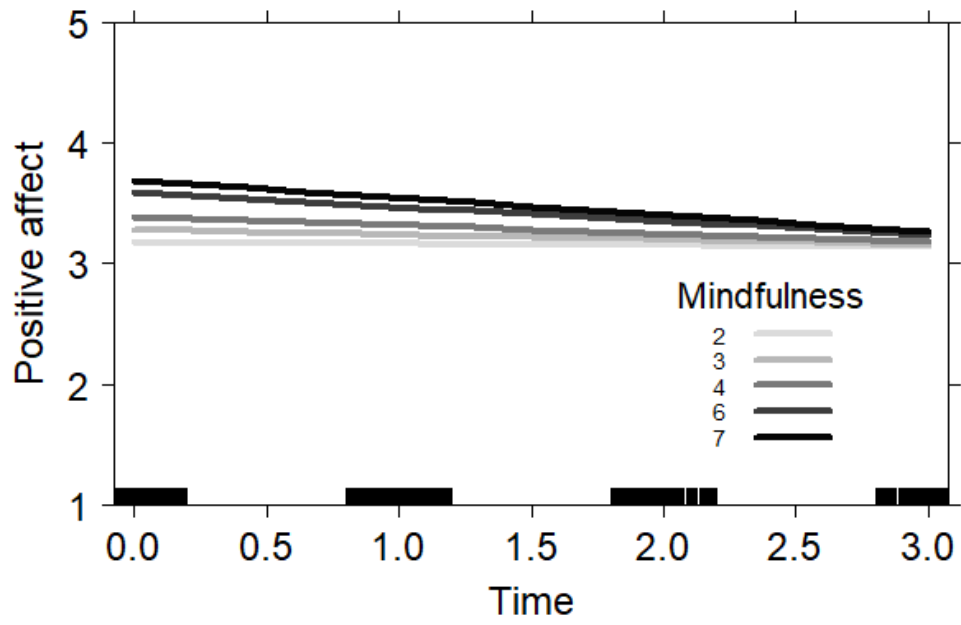
Figure 3. The effect of MAAS scores on the rate of change of positive affect (Study 3)

STUDY 4A

Study 4A was designed was to disentangle the effects of specific aspects of dispositional mindfulness on the stability of emotions in relation to the passage of time and the occurrence of events. In particular, Study 4A replicated Study 3 in a larger sample and with a different, multifaceted measure of dispositional mindfulness. Its goal was to confirm the results of Study 3 with respect to Q2, Q3, and Q4, and to address Q5 to understand which specific aspects of mindfulness contribute to the baseline and stability of negative and positive affect.

Method

The Psychological Research Ethics Committee of the University of Padova approved the procedures of Study 4A and Study 4B within the project "Consapevolezza, contatto e pregiudizio (Mindfulness, contact and prejudice)", protocol number 2339.

Participants. The procedure was similar to Study 2. Participants were recruited by psychology undergraduates, all different from the ones involved in Study 2, to complete online questionnaires in return for course credit. Each student identified six individuals (if possible, three men and three women) who met three requirements: they were willing to participate in a study involving four data collections across 12 weeks, could not be students in the course, and could not have frequent interactions with each other to decrease possible dependence among observations. The questionnaire included all of the variables (both time invariant and time-varying) in the first wave, and only time-varying variables in the following three waves.

The sample sizes for the waves were 724, 664, 636, and 616 for Waves 1, 2, 3, and 4 respectively. As in Study 3, attrition was handled by using linear mixed models, although we used only the respondents who completed at least three waves (including the first one),

resulting in 631 participants (52% women). Age ranged from 18 to 72 years ($M = 29.23$; $SD = 12.70$), and all participants were Italian. The highest education level achieved was secondary school for the 8% of the sample, high school diploma for the 62% of the sample, bachelor's degree for the 18% of the sample, and higher degrees (master, PhD) for the 12% of the sample. As for the occupations, 59% were students, 18% were retailers, employees or teachers in primary schools, 7% were manual workers, 10% were professionals, high school teachers or university professors, and the rest of the sample was unemployed or did not declare any occupation.

Measures. Dispositional mindfulness was measured with the FFMQ (Baer et al., 2006; Italian validated version by Giovannini et al., 2014), calculating scores for each of the five facets – act with awareness ($\alpha = .89$), nonjudgment ($\alpha = .86$), nonreactivity ($\alpha = .72$), describe ($\alpha = .88$), and observe ($\alpha = .77$) – as time-invariant interindividual differences. We computed FFMQ scores only for respondents who completed at least two-thirds of the items for each facet, which led to the exclusion of one respondent who left most of the items blank.

As in Study 3, we used the single-item questions regarding the frequency of recent negative and positive events ("How much do you feel that the last four weeks have been marked by negative [positive] events?"). However, this time participants answered these questions on a 10-point scale (1 = *not at all*; 10 = *a great deal*) rather than the 7-point scale used in the other studies. Positive and negative affect were measured with the Italian version of the PANAS (Terracciano, McCrae, & Costa, 2003). As in Study 3, events-related variables and the PANAS were measured four times with a four-week interval between each wave, and the reference period of those questions was consistent with that time span.

The PANAS was reliable in all waves (negative affect: $\alpha s = .89$-$.90$; positive affect: $\alpha s = .88$-$.90$). The variability of negative (ICC = .61) and positive affect (ICC = .54) was

almost equally due to individual-level and to within-individual variations, with slightly higher between-individual variance for negative affect, as in Study 3.

Results and Discussion

Means, standard deviations, and correlations between the variables in the first wave are reported in Table A6 of the Appendix. Preliminary data analyses revealed severe skewness in the frequency of negative events, which was not present in the preceding studies. In Study 4A, only a few people chose the response options from 8 to 10 on the negative events variable, possibly because this study used a 10-point scale instead of a 7-point scale (as in Study 3) to assess negative and positive events (Cox, 1980; Dawes, 2008). For example, while the wave-specific skewness values for negative events ranged from 0.16 (fourth wave) to 0.38 (second wave) in Study 3, in Study 4 values ranged from 0.44 (first wave) to 0.87 (second wave). To correct this positive skewness and make the negative events variable more consistent with the one used in Study 3, we performed a logarithmic transformation on this variable (see Álvarez-Jiménez et al., 2010; Brundidge, Reid, Choi, & Muddiman, 2014; Dubé, Lavoie, Blais, & Hébert, 2017). In this way, the distribution of the transformed negative events can be compared to the distribution of the original variable and to the corresponding variable in Study 3 through histograms reported in the Appendix. The frequency of positive events had a slight negative skew, but respondents used all response options, so we did not transform that variable.

As in Study 3, linear growth models (Singer & Willet, 2003) were used to analyze the relationship between dispositional mindfulness and both baseline affect and changes in affect (over time and in relation to events). Also, multilevel random-intercept models for positive and negative affect as a function of time only revealed a slight decreasing trend in negative (b = -0.03, $p < .001$) and positive affect (b = -0.05, $p < .001$) over time. In both Study 3 and 4A,

this decreasing trend might be due to respondents choosing less extreme response options as they get used to completing the questionnaire. Multilevel growth models suited both the research questions and the need to control for this time trend (Wang & Maxwell, 2015).

In order to disaggregate within-persons from between-persons effects as in Study 3, events and time had to be unrelated to each other (Curran & Bauer, 2011). We tested their relationship by regressing the log frequency of negative events and the frequency of positive events on time, in two separate multilevel models. Results revealed no effect for negative events (b = -0.007, p = .391) and a small negative effect for positive events (b = -0.078, p = .008). Hence, the within-person mean of negative events and the deviation of each score of negative events was calculated from each person's mean as in Study 3.

As for positive events, we followed the recommendations of Curran and Bauer (2011) for centering a time-varying covariate exhibiting a trend. We conducted within-person regression analyses of the positive events variable on grand-mean centered time and used the resulting intercept and residuals as between-person and within-person components of positive events.

The five facets of FFMQ were not highly correlated with one other: absolute values of Pearson correlation coefficients ranged from 0.02 to 0.27, except for the correlation between *awareness* and *nonjudgment*, which was 0.41, p < .001 (see Table A6). Moreover, consistent with past research (Brown et al., 2015; López et al., 2016; Peters, Eisenlohr-Moul, & Smart, 2016; Reese et al., 2015), the *observe* facet correlated negatively with the *awareness* (r = -.12, p < .001) and *nonjudgment* (r = -.20, p < .001) facets, together with a weak positive correlation with negative affect (r = .12, p = .002). *Observe* might relate to judgmental tendencies in people who do not usually practice mindful attention thorough heightened attention to bodily sensations or external experiences (Bergomi et al., 2013).

Because the facets were only weakly related, we did not aggregate all five facets in an overall score but rather conducted the analyses separately for each facet. We also analyzed an aggregated score of the *awareness*, *nonreactivity*, and *nonjudgment* facets ($\alpha = .85$) because these factors are most closely related to the concept of dispositional mindfulness, and previous research has focused primarily on these three facets (Bergman, Christopher, & Bowen, 2016; Feldman, Dunn, Stemke, Bell, & Greeson, 2014; Reese et al., 2015) or excluded the *observe* facet (Peters et al., 2016; Williams, Dalgleish, Karl, & Kuyken, 2014). As these three FFMQ dimensions had different number of items, we summed the averaged score for each facet so each facet had equal weight in the overall score.

Negative affect. We conducted the models used in Study 3 separately for each facet and for the composite score of *awareness*, *nonjudgment*, and *nonreactivity* (Table 4). PANAS negative affect was modeled as a function of each FFMQ facet, a time variable taking integer values from 0 (the baseline wave) to 3 (the last wave), the person mean and the person-mean centered variables of the log frequency of recent negative and positive events, and the interaction between negative/positive events and the facet, controlling for age and gender. As a second step, we added the interaction between the FFMQ facet and time. The analytic strategy is the same as reported in the multilevel equations of Study 3, and included the random slope again on negative events because it was the solution yielding the lowest BIC.

In Table 4, each model is reported in a row, together with the BIC to compare the fit of the two models for each facet, and, for space reasons, only results for the main variables of interest are reported (full results are available upon request). The variables not reported in Table 4 showed effects similar to the ones observed in Study 3 (shown in Table 3). For instance, gender was not related to negative affect for any facet, while age showed a slightly negative relation (for all the facets, $b = -0.01$, $p < .001$), and time only a negative association, ranging between $b = -0.03$, $p < .001$, and $b = -0.17$, $p < .001$. The person mean of negative

Table 4. The effect of FFMQ facets on trajectories of negative affect: linear growth models (Study 4A)

	PM-C Negative events			FFMQ Facet			Facet X PM-C NE			Facet X Time			BIC
	b	CI	p	b	CI	p	b	CI	p	b	CI	p	
Awareness	0.74	0.48 – 0.99	<.001	-0.20	-0.25 – -0.14	<.001	-0.07	-0.14 – 0.00	.052				4162
	0.72	0.47 – 0.98	<.001	-0.24	-0.30 – -0.17	<.001	-0.07	-0.13 – 0.00	.062	0.03	0.01 – 0.05	.010	4163
Nonjudgment	0.63	0.41 – 0.86	<.001	-0.31	-0.36 – -0.26	<.001	-0.04	-0.11 – 0.02	.211				4086
	0.63	0.40 – 0.85	<.001	-0.34	-0.40 – -0.28	<.001	-0.04	-0.11 – 0.02	.217	0.02	0.00 – 0.04	.030	4090
Nonreactivity	0.72	0.46 – 0.98	<.001	-0.20	-0.27 – -0.13	<.001	-0.08	-0.17 – 0.01	.083				4182
	0.72	0.46 – 0.98	<.001	-0.20	-0.29 – -0.12	<.001	-0.08	-0.17 – 0.01	.084	0.00	-0.03 – 0.03	.873	4190
Describe	0.49	0.25 – 0.72	<.001	-0.10	-0.16 – -0.05	<.001	0.00	-0.07 – 0.07	.958				4198
	0.48	0.25 – 0.71	<.001	-0.11	-0.17 – -0.05	<.001	0.00	-0.07 – 0.07	.950	0.01	-0.02 – 0.03	.604	4206
Observe	0.39	0.14 – 0.63	.002	0.09	0.02 – 0.15	.008	0.03	-0.04 – 0.11	.397				4203
	0.39	0.14 – 0.63	.002	0.08	0.00 – 0.15	.042	0.03	-0.04 – 0.11	.391	0.01	-0.02 – 0.03	.506	4211
Composite (A+NJ+NR)	0.91	0.56 – 1.26	<.001	-0.18	-0.21 – -0.15	<.001	-0.04	-0.08 – -0.01	.017				4059
	0.90	0.55 – 1.24	<.001	-0.20	-0.23 – -0.17	<.001	-0.04	-0.08 – -0.01	.021	0.01	0.00 – 0.02	.012	4061

Notes. All the models include age, gender, time and the person mean of log negative events as controls. PM-C=Person Mean-Centered. NE= Negative events. 630 individuals and 2,420 observations in all the models. P-values are computed through Kenward-Roger approximation. Models are fitted with ML.

events always had a strong positive relationship to negative affect, ranging from b = 0.59 to b = 0.77, ps < .001.

Consistent with past research (e.g., Brown et al., 2015; Peters et al., 2016), all FFMQ facets were associated with lower negative affect at baseline except *observe*, which was weakly but positively related to negative affect. Moreover, *nonjudgment* showed the strongest negative relation with negative affect at baseline. Importantly, the effect of the occurrence of negative events on negative affect was moderated by *awareness* (Figure 4), *nonreactivity* (Figure 5), and by the composite of *awareness*, *nonjudgment*, and *nonreactivity* (Figure 6). Although the p-values for *awareness* are on the threshold of significance, the same models with a random slope on time (instead of imposing it on the events variable) yielded a statistically significant beta coefficient for the interaction between awareness and events, with the same magnitude as the one reported in Table 4 (b = 0.07, 95% CI [-0.13, -0.01], p = .016).

Figure 4. The effect of FFMQ awareness on the effect of negative events on negative affect (Study 4A)
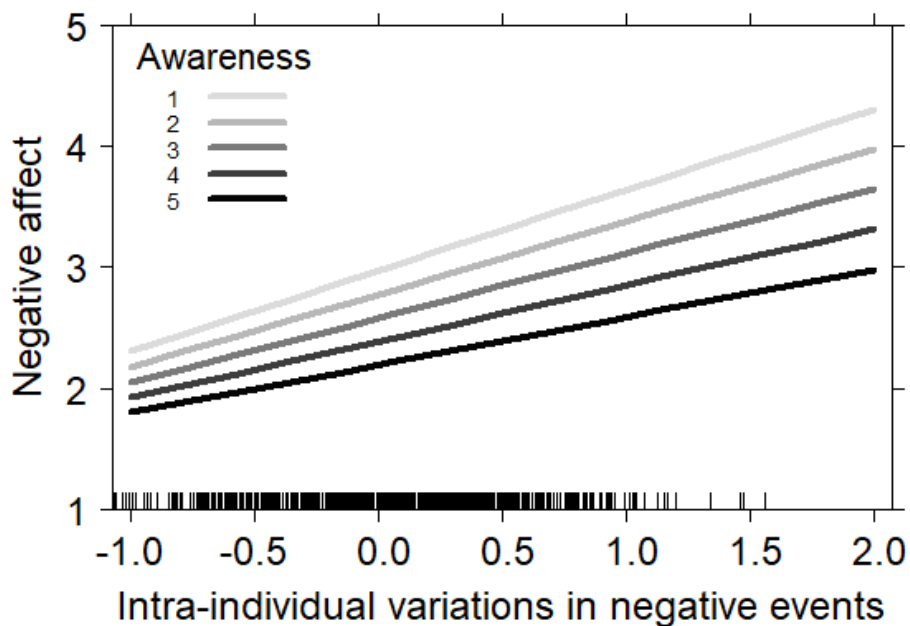
Figure 5. The effect of FFMQ nonreactivity on the effect of negative events on negative affect (Study 4A)
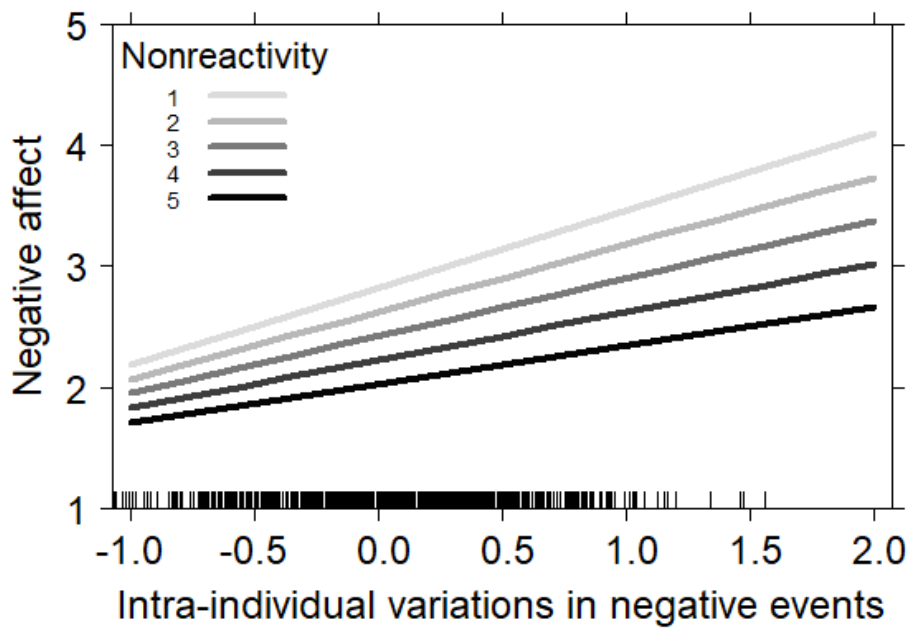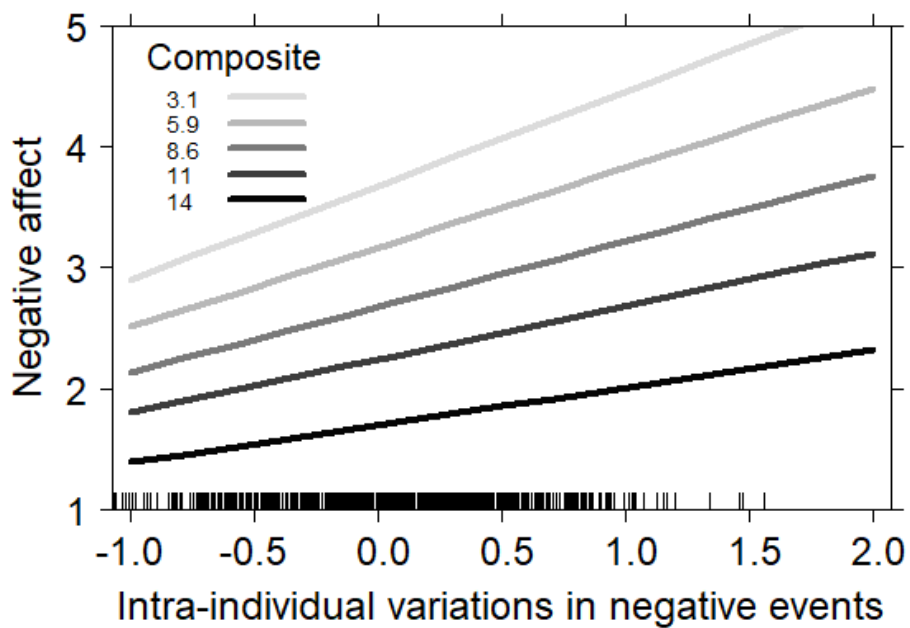

Figure 6. The effect of FFMQ composite (A+NJ+NR) on the effect of negative events on negative affect (Study 4A)

Similarly, putting a random slope on time in the models for *nonreactivity* yielded a statistically significant beta coefficient for the interaction between *nonreactivity* and events, with the same size as the one reported in Table 4 (b = -0.08, 95% CI [-0.16, -0.00], *p* = .044).

Finally, as in Study 3, although the main effect of time on negative affect was negative, the interaction between dispositional mindfulness and time had a slightly positive effect – not improving the model fit – for the *awareness* and *nonjudgment* facets, and the composite score. So, although negative affect declined over time for the sample overall, people higher in *awareness* and *nonjudgment* showed less of a decrease in negative affect (Figure 7 and Figure 8), and the same was true for the composite score of *awareness*, *nonreactivity*, and *nonjudgment*, although with a weaker effect.

Figure 7. The effect of FFMQ awareness on the rate of change of negative affect (Study 4A)
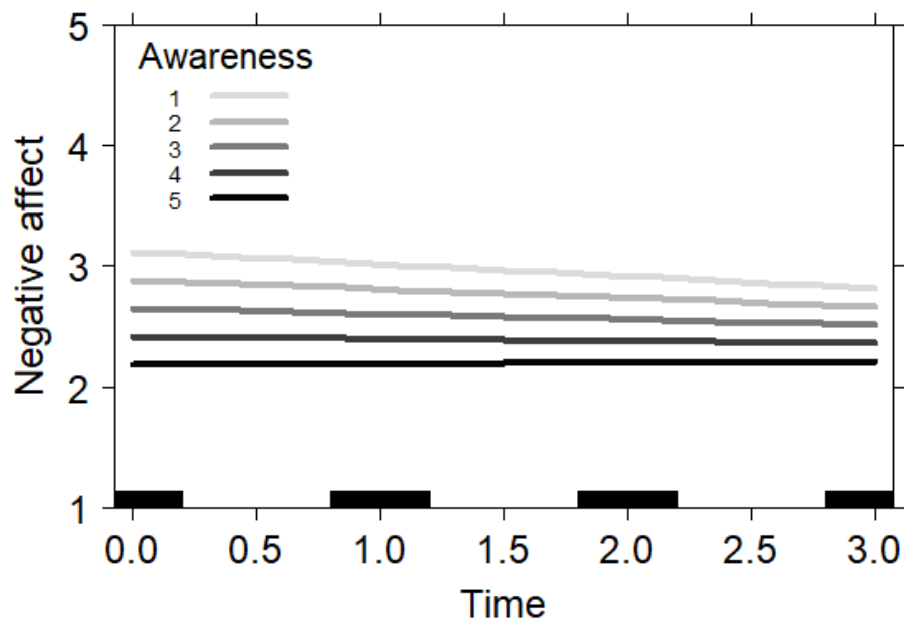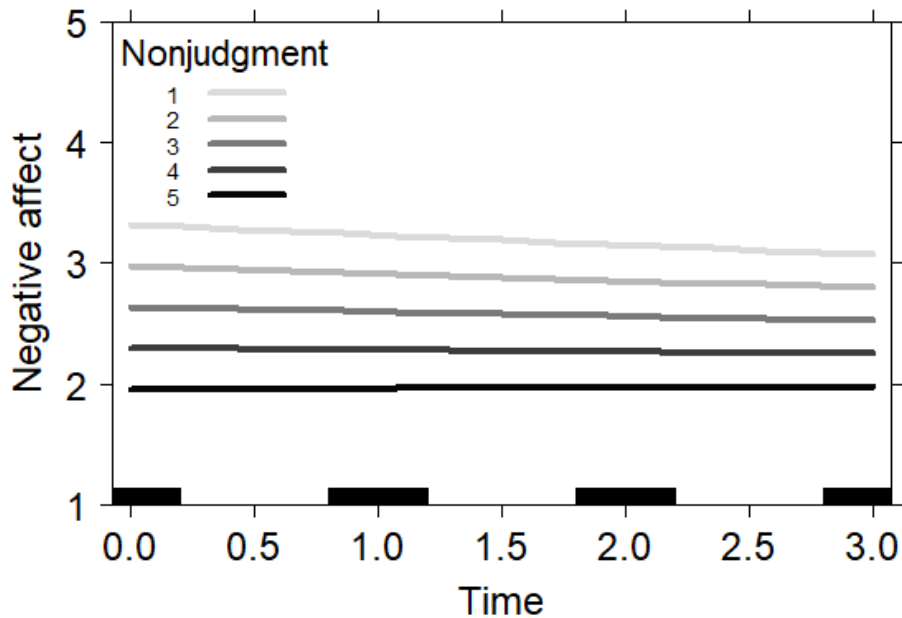
Figure 8. The effect of FFMQ nonjudgment on the rate of change of negative affect (Study 4A)

Overall, these results suggest that *awareness*, *nonjudgment*, and *nonreactivity* are more strongly related to low and stable negative affect; *awareness* and *nonreactivity* seem to be the components of dispositional mindfulness that have the greatest buffering effect on reactions to negative events; and *awareness* and *nonjudgment* seem to have a stabilizing effect on negative affect over time.

Positive affect. We repeated the models for negative affect on positive affect, relying on the person mean and person-mean centered positive events calculated as explained earlier. As in the former studies, we chose the random effects based on the BIC: the models with the highest fit were the ones with random intercept and random slopes on both positive events and time, so we selected and reported them in Table 5.

The variables included in the models but not reported in Table 5 (age, gender, the person mean of events) showed effects similar to the ones observed in Study 3 (shown in Table 3) for positive affect. Age and gender were not related to positive affect, and the person

Table 5. The effect of FFMQ facets on trajectories of positive affect: linear growth models (Study 4A)

	PM-C Positive events			FFMQ Facet			Facet X PM-C PE			Facet X Time			BIC
	b	CI	p	b	CI	p	b	CI	p	b	CI	p	
Awareness	0.15	0.07 – 0.23	<.001	0.13	0.09 – 0.18	<.001	-0.00	-0.02 – 0.02	.861				3948
	0.15	0.07 – 0.23	<.001	0.17	0.12 – 0.23	<.001	-0.00	-0.02 – 0.02	.826	-0.03	-0.05 – -0.00	.031	3951
Nonjudgment	0.23	0.16 – 0.30	<.001	0.10	0.05 – 0.14	<.001	-0.03	-0.05 – -0.01	.009				3957
	0.23	0.16 – 0.30	<.001	0.12	0.07 – 0.18	<.001	-0.03	-0.05 – -0.01	.009	-0.02	-0.04 – 0.01	.156	3963
Nonreactivity	0.16	0.07 – 0.24	<.001	0.10	0.04 – 0.16	.002	-0.01	-0.03 – 0.02	.740				3971
	0.16	0.07 – 0.24	<.001	0.11	0.04 – 0.19	.005	-0.01	-0.03 – 0.02	.730	-0.01	-0.05 – 0.02	.473	3978
Describe	0.10	0.03 – 0.17	.005	0.11	0.07 – 0.16	<.001	0.01	-0.01 – 0.03	.270				3955
	0.10	0.03 – 0.18	.005	0.14	0.08 – 0.20	<.001	0.01	-0.01 – 0.03	.288	-0.02	-0.04 – 0.01	.119	3960
Observe	0.09	0.01 – 0.17	.024	0.07	0.02 – 0.12	.007	0.02	-0.01 – 0.04	.184				3971
	0.09	0.01 – 0.17	.025	0.06	-0.01 – 0.13	.087	0.02	-0.01 – 0.04	.180	0.01	-0.02 – 0.04	.556	3978
Composite (A+NJ+NR)	0.23	0.12 – 0.33	<.001	0.08	0.06 – 0.11	<.001	-0.01	-0.02 – 0.00	.108				3935
	0.23	0.12 – 0.34	<.001	0.10	0.07 – 0.13	<.001	-0.01	-0.02 – 0.00	.103	-0.01	-0.03 – -0.00	.031	3938

Notes. All the models include age, gender, time and the log person mean of negative events as controls. PM-C=Person Mean-Centered. PE= Positive events. 630 individuals and 2,423 observations in all the models. P-values are computed through Kenward-Roger approximation. Models are fitted with ML.

mean of positive events always had a strong positive relation with positive affect (bs = 0.22-0.24, *p*s < .001). The time variable was negatively associated with positive affect (b = -0.05, *p* < .001) in all the models without the interactions between time and mindfulness, and statistically non-significant in the others.

As in Study 3, experiencing more positive events than usual was positively related to positive affect. Moreover, higher scores on the FFMQ facets were associated with higher baseline positive affect (i.e., the main effect of the facet) – with a weaker association for *describe* and *observe*, consistent with the literature and the results reported earlier.

The interaction between *awareness* and time (Figure 9) might suggest that people higher in *awareness* have a decreasing positive affect trajectory during the study. However, because the main effect of time loses its effect in this model, and the trajectories in Figure 9 are all quite flat, we interpret this result with caution and acknowledge the possibility of ceiling effects or regression to the mean, similar to what observed in Figure 3.

Finally, the interaction between within-person variation in positive events and the five facets of dispositional mindfulness showed that when positive events occurred more than usual, people high in *nonjudgment* tended to experience the same positive affect of those low in *nonjudgment*, but when positive events occurred less than usual, people high in *nonjudgment* experienced more positive affect of those low in *nonjudgment* (Figure 10). Having a nonjudgmental attitude towards oneself and one's experiences appears to make positive affect stable and less dependent on positive events.

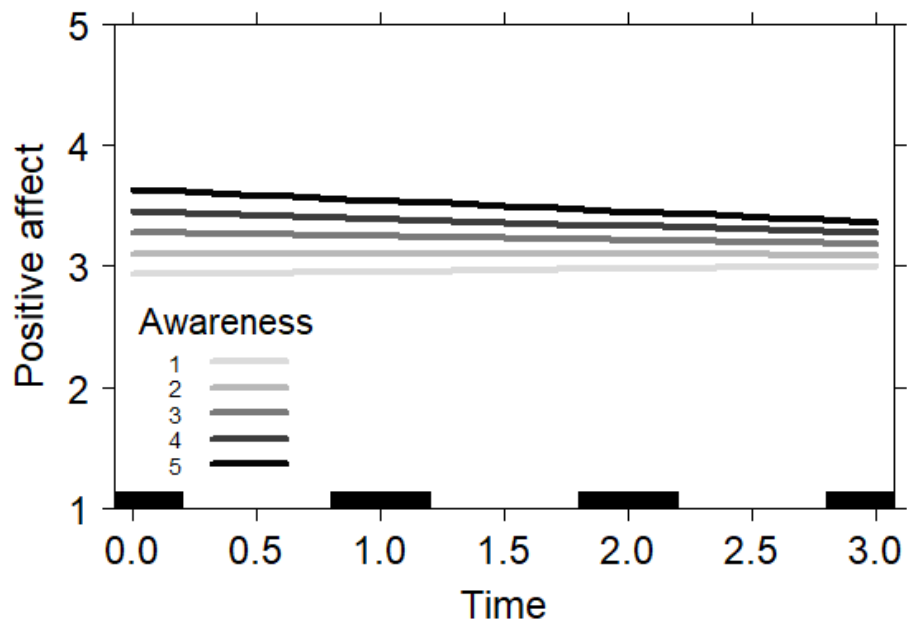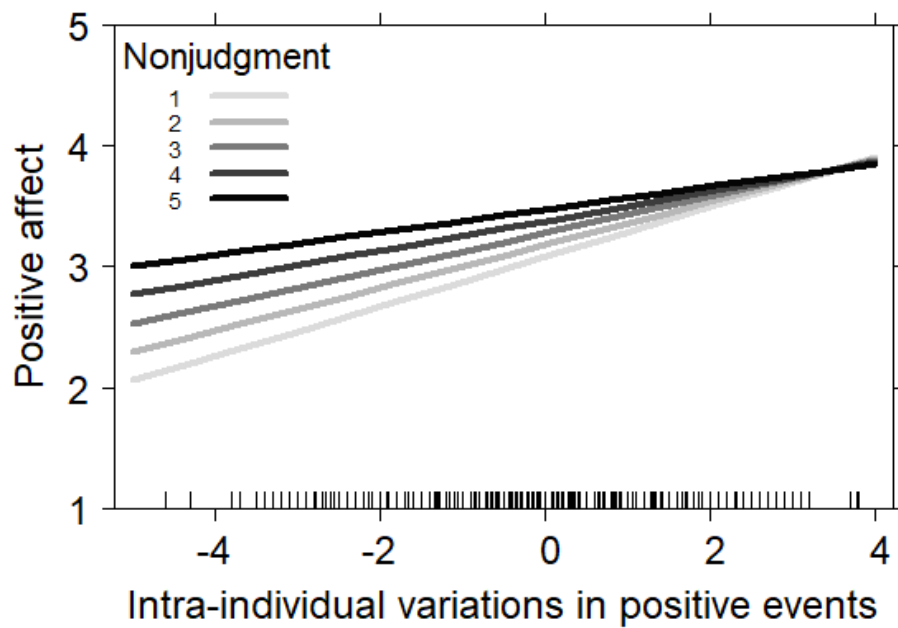Figure 9. The effect of FFMQ awareness on the rate of change of positive affect (Study 4A)

Figure 10. The effect of FFMQ nonjudgment on the effect of positive events on positive affect (Study 4A)

STUDY 4B

The aim of this study was to examine whether lower emotional variability in negative and positive emotions helps to explain the relationship between dispositional mindfulness and well-being (Q6). To answer this question, we tested path models for the three FFMQ facets associated with more stable emotions in relation to time or events in Study 4A (*awareness, nonjudgment, nonreactivity*).

Method

Participants. The sample relied on a subsample of Study 4A. To have comparable emotional variability scores, we used only the respondents who completed all waves ($n = 547$, 51% women). Age ranged from 18 to 72 years ($M = 29.54$; $SD = 12.79$). Similarly to age and gender, the distributions of education and jobs were very similar to the ones of the full sample.

Measures. Dispositional mindfulness was measured with the FFMQ, considering only the *awareness, nonjudgment*, and *nonreactivity* scores, and emotional variability was computed as the intra-individual standard deviation (ISD) of PANAS negative and positive emotions, calculated separately. Well-being was measured, in each wave, with one question on life satisfaction ("In the last four weeks, how satisfied were you with your life as a whole?"), answered on a scale from 1 (*completely dissatisfied*) to 10 (*completely satisfied*).

Results and Discussion

As FFMQ scores and emotional variability were time-invariant and person-specific (i.e., they were Level-2 variables), whereas life satisfaction was time-varying (Level-1 variable), the mediation was assessed with 2-2-1 unconflated multilevel modeling (UMM), separating the within- and between-persons components of life satisfaction (Preacher, Zhang,

& Zyphur, 2011). This model estimates the within-person and between-person residual variances, but the effects of the variables are estimated at the between-person level.

Because life satisfaction was measured with a single indicator, we conducted path models with observed variables. Multilevel Structural Equation Modeling (MSEM) would have provided more accurate estimates, but simulations have shown that the bias of UMM is negative (Preacher et al., 2011); hence, the estimates are likely to be underestimated rather than overestimated.

Preliminary tests showed that the correlation between emotional variability in negative affect and emotional variability in positive affect was not large ($r = .32$, $p < .001$). Thus, to assess separately the mediational role of variability of positive and negative emotions, we conducted six multilevel mediation models having one predictor, one mediator, and one outcome variable. The predictor was one of the three FFMQ facets, the mediator was either the ISD of negative affect or the ISD of positive affect, and the outcome was the single-item rating of life satisfaction.

We also examined the correlations between the ISDs of negative and positive emotions with the within-person mean (across the four waves) of negative and positive emotions to determine whether the relationships of the variables in the models with emotional variability could be due to the average level of emotions. The ISD of positive affect correlated negatively and weakly with the within-person mean of positive affect ($r = -.17$, $p < .001$), and the correlation between the ISD and the within-person mean of negative affect was only $-.27$ ($p < .001$).

Path models (performed by *MPlus 7*; Muthén & Muthén, 2015) with statistically significant mediating effects are reported in Figure 11, where the indirect effects are specified by IND. Consistent with the results of Study 4A in relation to time and events, all three facets were related to negative emotional variability, but only *nonjudgment* was related to positive

emotional variability. No association was found between the ISD of positive affect and either *awareness* (b = -0.03, 95% CI [-0.06, 0.00]) or *nonreactivity* (b = -0.02, 95% CI [-0.06, 0.01]), and the ISD of positive affect did not mediate the relationship between these two facets and life satisfaction.

Figure 11 shows that the three FFMQ facets had a strong relationship with life satisfaction, and that part of the effect was mediated by lower emotional variability in negative affect; also, for *nonjudgment*, the effect was mediated by lower emotional variability in positive affect. As expected, the relationships between FFMQ facets and life satisfaction were slightly stronger when negative emotional variability was not controlled for (*awareness*: b = 0.46[0.27, 0.66]; *nonjudgment*: b = 0.59 [0.42, 0.77]; *nonreactivity*: b = 0.49[0.26, 0.73]).

Figure 11. Path models (between-level) testing the mediation of emotional variability in the relationship between FFMQ facets and life satisfaction (Study 4B)
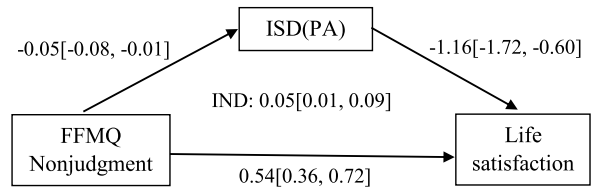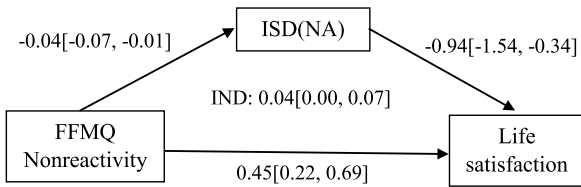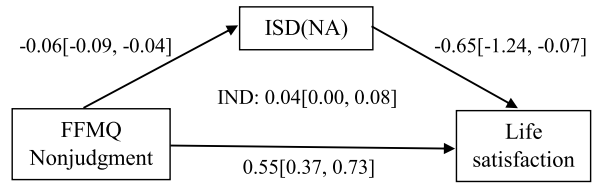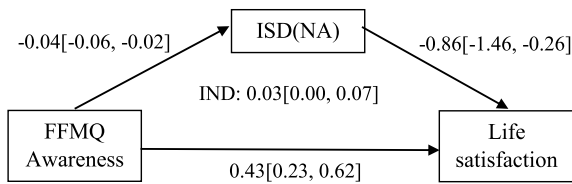
STUDY 5

Study 5 tested the relationship between dispositional mindfulness and emotion fluctuations (both related and unrelated to events) in an intensive longitudinal framework. In an experience sampling study, individuals were prompted four times per day for six days (24 beeps), providing answers to the research questions Q3, Q4, Q5, Q6, and Q7.

Method

The Psychological Research Ethics Committee of the University of Padova approved the procedures of this study within the project "Consapevolezza e flessibilità cognitiva nella vita quotidiana (Mindfulness and cognitive flexibility in the daily life)", protocol number 2417.

Participants. The data collection procedure was similar to Studies 2, 3, and 4A. Participants were recruited by psychology master's degree students in return for course credit. Each student identified two adults (preferably one man and one woman) who met these requirements: they had to be willing to participate in the study, possess a smartphone and a gmail.com address, and be comfortable using smartphone applications. Moreover, they could not be students of the course, and they could not have frequent interactions with each other. Before the data collection started, the selected participants received detailed instructions on how to download and use the free ESM app Personal Analytics Companion (PACO) throughout the study.

The original sample size was 164, but in order to have a sufficient number of observations per individual to allow analyses of stability and variability, only respondents with more than 50% (12 out of 24) responses to the experience sampling were retained, as in previous research (Richards et al., 2004; Kubey & Larson, 1990). The final sample size was 132 (81% of the original sample, 59% women). Age ranged from 18 to 79 years ($M = 26.40$;

SD = 9.78), and all participants were Italian. The highest education level achieved was

secondary school for the 5% of the sample, high school diploma for the 43% of the sample,

bachelor's degree for the 42% of the sample, and higher degrees (master, PhD) for the 10%

of the sample. As for the occupations, 62% were students, 16% were retailers, employees or

teachers in primary schools, 3% were manual workers, 9% were professionals, high school

teachers or university professors, and the rest of the sample was unemployed or did not

declare any occupation.

Measures. Respondents completed an initial questionnaire with time invariant

variables (sociodemographic characteristics and traits), then participated in the ESM study.

Initial questionnaire. Dispositional mindfulness was measured with the FFMQ, and

focused on the three facets of *awareness* (α = .90), *nonjudgment* (α = .86) and *nonreactivity*

(α = .72), as they showed stronger relationships to affective stability in the preceding studies.

To be consistent with Study 4a, we also computed a composite index of dispositional

mindfulness as the sum of *awareness*, *nonjudgment,* and *nonreactivity* average scores (α =

.89).

Experience sampling. Participants were contacted on their smartphones four times

each day for six days, with a random sampling of beeps between 10 a.m. and 10 p.m., and a

minimum interval of 90 minutes between two subsequent beeps. The frequency of and

intervals between momentary assessment were chosen with the aim of letting different daily

events happen between beeps. As commonly done in ESM research, we retained as valid

reports only reports that were entered within 15 minutes of the beep. The 132 participants

completed 2,467 valid reports (78% of the received beeps), with an average number of 18.74

reports per person (*SD* = 3.23).

The questions were in the same order for every report, and were all answered on a 7-

point response scale (1 = *not at all*; 7 = *very much*). Participants were asked about their

momentary emotions (adapted from the 9-item mood rating scale by Diener and Emmons [1985]) and negative and positive events occurred from the last beep. The emotion items asked the extent to which participants felt e *angry*, *sad*, *worried*, *frustrated*, *happy*, *amused*, *serene*, and *grateful*. We tried to include positive emotions characterized by various levels of activation, and the ones selected for the questionnaire might involve on average a lower arousal compared to the positive affect items of the PANAS.

To support the validity of this set of items to measure positive and negative affect, we conducted a Multilevel Confirmatory Factor Analysis (beeps nested within participants) with the Robust Maximum Likelihood estimator, using *MPlus 7*. We tested a two-factor model with the first four items loading on a negative affect factor, and the others on a positive affect factor. The model fit was good (RMSEA: 0.05; CFI: 0.94; TLI: 0.92; SRMR within: 0.04; SRMR between: 0.15); standardized factor loadings were between .61 (worried) and .73 (frustrated) for negative affect, and between .55 (grateful) and .80 (happy) for positive affect. Eliminating the emotion item with the lowest factor loading (grateful) did not improve the model fit, so we kept the 8-item and two-factor solution, and we aggregated the emotions accordingly.

Results and Discussion

The variability of emotions within days, across days, and across individuals is reported in the first three columns of Table 6. Most of the variance in emotions was across moments and individuals, and to a lesser extent across days, suggesting that emotions fluctuate frequently and that the extent to which they are felt is related to individual differences as well.

Emotional variability and instability. To answer research question (Q6), we computed the emotional variability (ISD) and instability (MSSD) indexes for each person and

each emotion, and computed Pearson correlations between them and the three facets of dispositional mindfulness. Results are reported in Table 6, starting from the fourth column. The correlation coefficients are quite small, but similar to those obtained correlating emotional variability and instability with the total scores of FFMQ and MAAS, as shown in previous research (Hill & Updegraff, 2012; Keng & Tong, 2016).

All the facets correlated negatively with emotional variability and instability in negative emotions, in particular *nonjudgment* with sadness and anger, and *nonreactivity* with anger and frustration. Variability and instability of overall negative affect were negatively correlated with all mindfulness facets, especially *nonreactivity* and *nonjudgment*. As for positive emotions, correlations were weaker, except for the negative relationship between the *nonreactivity* facet and happiness instability.

We also computed an index of emotional inertia (e.g. Koval, Kuppens, Allen, & Sheeber, 2012), building a multilevel model where at Level 1 each emotion score at time t is regressed on the same emotion at time (t-1), and at Level 2 both the intercept and the coefficient of the autoregressive effect are a function of the trait, in our case the three FFMQ facets separately. The only relationship between FFMQ facets and emotional inertia was a positive effect of *nonreactivity* on happiness inertia (b = 0.12, 95% CI [0.05, 0.19], *p* = .001), suggesting that happiness lasts longer for people who acknowledge their feelings without reacting to them. Given that emotional instability combines emotional variability and inertia (Wang et al., 2012), the relation between *nonreactivity* and happiness inertia is consistent with those between *nonreactivity* and happiness variability and instability.

Three-level models on momentary affect. We replicated the linear mixed models of Study 3 with a three-level nesting structure (beeps nested in days, and days nested in individuals) but without random slopes – only random intercept – due to the small sample size (in terms of number of clusters-individuals; see Snijders, 2005). Moreover, we did not

Table 6. Variance decomposition of emotions and correlations of emotional variability and instability indexes with mindfulness facets (Study 5)

Emotions	Variance decomposition			Emotional variability (ISD)			Emotional instability (MSSD)		
	Moment	Day	Individual	r(aware)	r(nonjudge)	r(nonreact)	r(aware)	r(nonjudge)	r(nonreact)
Angry	1.11(46%)	0.34(14%)	0.96(40%)	-.14***	-.29***	-.23***	-.03	-.14***	-.16***
Worried	1.15(38%)	0.39(13%)	1.49(49%)	.02	-.08***	-.06**	.02	-.12***	-.06**
Sad	1.03(42%)	0.36(15%)	1.06(43%)	-.14***	-.25***	-.17***	-.12***	-.19***	-.12***
Frustrated	1.05(36%)	0.41(14%)	1.47(50%)	-.15***	-.17***	-.21***	-.04*	-.11***	-.20***
NA	0.58(30%)	0.30(16%)	1.02(54%)	-.10***	-.18***	-.19***	-.04*	-.10***	-.18***
Happy	1.02(47%)	0.44(21%)	0.69(32%)	.00	-.04*	-.09***	.00	-.08***	-.22***
Serene	1.10(42%)	0.43(17%)	1.05(41%)	-.01	.06**	-.06**	.02	.12***	-.06**
Amused	1.56(58%)	0.34(13%)	0.79(29%)	-.02	.07***	.03	-.09***	-.01	-.03
Grateful	0.88(27%)	0.46(14%)	1.97(59%)	-.03	-.05*	-.08***	-.08***	.01	-.05*
PA	0.63(38%)	0.32(20%)	0.70(42%)	-.02	.03	-.09***	-.06**	.04	-.15***

Notes. Correlations coefficients computed with Pearson method, missing values handled with listwise deletion. *p<.05; **p<.01; ***p<.001

analyze the effect of dispositional mindfulness on the rate of change of affect because we were interested in momentary negative and positive affect and in their variability rather than in emotion trends over only six days. Finally, given the large number of emotion assessments, we centered the events variable on the mean of events for each person in each day. In this way, we measured the intra-individual and intra-day variation of negative and positive events to see how emotions changed when events occurred more than usual for a person in a given day. Before centering, we checked that events were unrelated to time, as we did in Study 3 and 4A (Curran & Bauer, 2011). Three-level multilevel regression analyses with the occurrence of negative and positive events as a function of time found no effect for either negative events (b = -0.002, p = .619) or positive events (b = -0.005, p = .318).

We modeled momentary negative (positive) affect as a function of each of the three mindfulness facets and the composite score, the variation and person-day mean of negative (positive) events, time as a discrete variable (taking integer values from 1 to 24, to indicate the beep order), and the interaction between the intra-individual and intra-day variation in events and the facet, controlling for age and gender. Due to the number and closeness of repeated measurements for each individual, we set an autoregressive (order 1) correlation structure to allow for temporal autocorrelation, and this addition substantially improved the model fit. Differently from the previous studies, the models were performed with the package, nlme (Pinheiro, Bates, DebRoy, Sarkar, & R Core Team, 2018), because it allows additional options useful for ESM data. Results are reported in Table 7 for negative affect and in Table 8 for positive affect.

All three facets and the composite index were negatively related to momentary negative affect, with *nonjudgment* showing a larger regression coefficient than the other facets, similar to Study 4A (Table 4).

Table 7. The effect of FFMQ facets on momentary negative affect: three-level linear mixed models (Study 5)

	Awareness			Nonjudgment			Nonreactivity			A+NR+NJ		
	B	*CI*	*p*	*B*	*CI*	*p*	*B*	*CI*	*p*	*B*	*CI*	*p*
Intercept	2.07	1.28 – 2.85	<.001	2.53	1.78 – 3.29	<.001	2.01	1.16 – 2.86	<.001	2.81	1.89 – 3.72	<.001
Age	-0.01	-0.02 – 0.01	.282	-0.01	-0.02 – 0.01	.359	-0.01	-0.02 – 0.01	.241	-0.00	-0.02 – 0.01	.530
Gender	0.22	-0.04 – 0.48	.094	0.16	-0.09 – 0.42	.204	0.21	-0.06 – 0.48	.128	0.15	-0.11 – 0.41	.249
PDM events	0.52	0.47 – 0.56	<.001	0.51	0.47 – 0.56	<.001	0.51	0.47 – 0.56	<.001	0.51	0.47 – 0.56	<.001
PDM-C events	0.25	0.15 – 0.36	<.001	0.31	0.22– 0.40	<.001	0.39	0.28 – 0.49	<.001	0.33	0.20 – 0.45	<.001
Beep order	-0.01	-0.01 – -0.00	.004	-0.01	-0.01 – -0.00	.004	-0.01	-0.01 – -0.00	.004	-0.01	-0.02 – -0.00	.004
FFMQ Facet	-0.20	-0.37 – -0.04	.018	-0.34	-0.50 – -0.18	<.001	-0.21	-0.44 – 0.01	.059	-0.16	-0.24 – -0.09	<.001
PDM-C events*F	0.01	-0.02 – 0.04	.576	-0.01	-0.04 – 0.02	.612	-0.04	-0.08 – 0.00	.043	-0.01	-0.02 – 0.01	.484
Individuals	132			132			132			132		
Observations	2441			2441			2441			2441		

Notes. PDM = Person and Day Mean. PDM-C = Person- and Day-Mean Centered. Events refer to negative events. A = Awareness. NR = Nonreactivity. NJ = Nonjudgment. F = FFMQ Facet. Models are fitted with ML. Autoregressive residuals. 95% Confidence Intervals and p-values stem from Wald tests.

Table 8. The effect of FFMQ facets on momentary positive affect: three-level linear mixed models (Study 5)

	Awareness			Nonjudgment			Nonreactivity			A+NR+NJ		
	B	CI	p	B	CI	p	B	CI	p	B	CI	p
Intercept	2.31	1.56 – 3.07	<.001	2.01	1.26 – 2.75	<.001	1.65	0.86 – 2.44	<.001	1.81	0.92 – 2.69	<.001
Age	0.00	-0.01 – 0.02	.551	-0.00	-0.01 – 0.02	.688	0.00	-0.01 – 0.01	.900	0.00	-0.01 – 0.01	.822
Gender	-0.09	-0.34 – 0.16	.485	-0.06	-0.31 – 0.19	.641	-0.03	-0.27 – 0.22	.843	-0.05	-0.30 – 0.21	.718
PDM events	0.42	0.38 – 0.47	<.001	0.42	0.38 – 0.47	<.001	0.42	0.38 – 0.47	<.001	0.42	0.38 – 0.47	<.001
PDM-C events	0.27	0.16 – 0.38	<.001	0.29	0.19 – 0.39	<.001	0.47	0.34 – 0.59	<.001	0.37	0.23 – 0.50	<.001
Beep order	-0.01	-0.01 – -0.00	.013	-0.01	-0.01 – -0.00	.013	-0.01	-0.01 – -0.00	.014	-0.01	-0.01 – -0.00	.013
FFMQ Facet	0.02	-0.14 – 0.17	.837	0.11	-0.05 – 0.26	.181	0.24	0.04 – 0.45	.020	0.06	-0.02 – 0.13	.123
PDM-C events*F	-0.01	-0.04 – 0.02	.593	-0.02	-0.05 – 0.01	.311	-0.08	-0.12 – -0.04	<.001	-0.01	-0.03 – 0.00	.064
Individuals		132			132			132			132	
Observations		2433			2433			2433			2433	

Notes. PDM = Person and Day Mean. PDM-C = Person- and Day-Mean Centered. Events refer to positive events. A = Awareness. NR = Nonreactivity. NJ = Nonjudgment. F = FFMQ Facet. Models are fitted with ML. Autoregressive residuals. 95% Confidence Intervals and p-values stem from Wald tests.

However, only *nonreactivity* buffered the effect of intra-individual and intra-day variation in negative events on momentary negative affect. This interaction is plotted in Figure 12, showing that when negative events occur more than the average level for a person in a given day, being high in *nonreactivity* is associated with lower momentary negative affect. *Nonreactivity* was also the only facet that was related, positively, to momentary positive affect, while interacting with intra-individual and intra-day variation in positive events. As shown in Figure 13, when positive events occurred more than the average level for a person in a given day, people high in *nonreactivity* was not related to positive affect, but when positive events occurred less than usual, people high in *nonreactivity* experienced more positive affect of those low in *nonreactivity*.

Figure 12. The effect of FFMQ nonreactivity on the effect of negative events on momentary negative affect (Study 5)
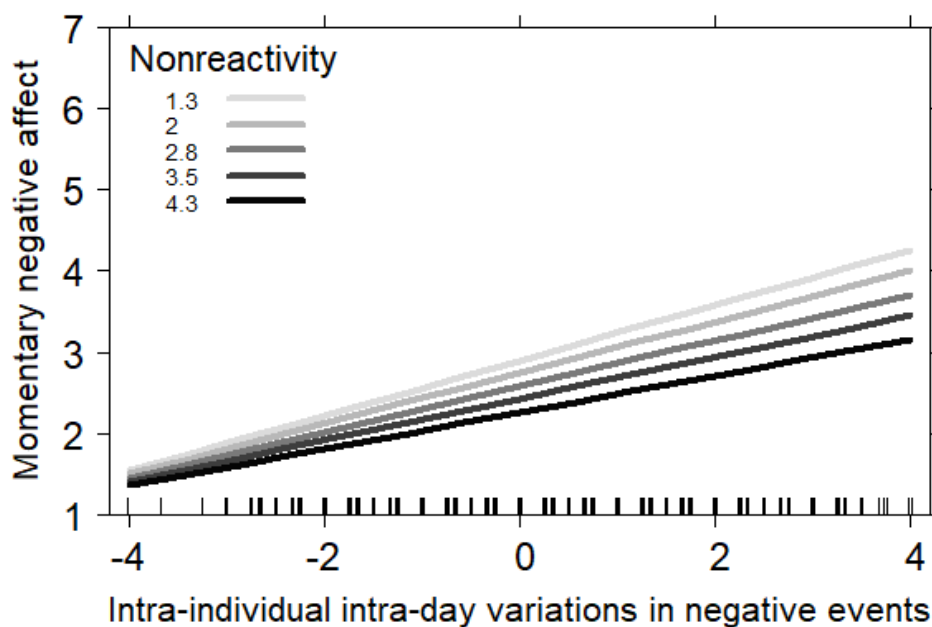
Figure 13. The effect of FFMQ nonreactivity on the effect of positive events on momentary positive affect (Study 5)
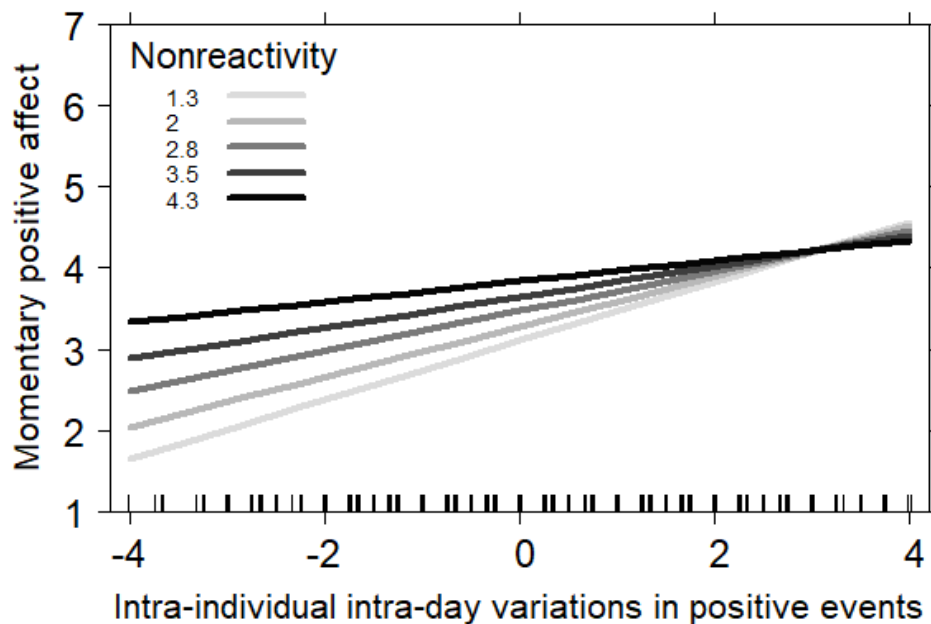
Additional analyses investigated the relationship between the three FFMQ facets and intraindividual variability of affect, assessed as variability around the within-person mean. To examine this, we replicated the models in Table 7 and 8, specifying the Level-1 (within-person) variance as a power function of the FFMQ facet involved in each model (Hoffman, 2007). The type of variance function was chosen based on fit indexes, and letting the variance depend on FFMQ facets left the size of the regression coefficients nearly unchanged. This additional specification – compared to the same model without the variance function – improved the fit in terms of AIC and BIC only in the models for momentary negative affect, and where the facet was *nonjudgment*, *nonreactivity*, or the composite. In these three models, the power estimate was, respectively, -0.23, -0.19, and -0.24, suggesting a negative relationship between the intra-individual variance of momentary negative affect and *nonjudgment*, *nonreactivity*, or the composite.

Several conclusions can be drawn from Study 5. First, consistent with the preceding studies, dispositional mindfulness was more strongly related to negative than to positive emotions, when considering both their levels and variability. Second, *nonjudgment*, *nonreactivity*, and a mix of these two facets with *awareness*, were related to higher emotional stability. Third, consistent with the correlational results on emotional variability and instability, and to some extent with Study 4A, *nonreactivity* was shown to be an important buffer of events during the day.

GENERAL DISCUSSION

Everyone's emotions fluctuate as they go through their daily lives, but r some

people's emotions fluctuate more, more often, and more rapidly. According to research on

emotion dynamics, resilience, and reactivity to daily hassles, functional emotion dynamics

involve small fluctuations in emotional states, attenuated reactivity to minor life stressors,

and quick return to baseline emotions after emotional change. Dispositional mindfulness has

been shown associated with lower reactivity to stress and lower emotional variability, and

theoretically linked to equanimity, which involves having a balanced reaction toward all

experiences or objects, regardless of their pleasant or unpleasant valence. We hypothesized

that dispositional mindfulness would be associated with more stable emotions (as reflected by

lower emotional reactivity to self-relevant events), flatter emotion trajectories, smaller effects

of negative and positive events on negative and positive affect respectively, and lower

emotional variability and instability. We studied the relationship between dispositional

mindfulness and emotional stability by employing different operationalizations of stability

and examining how this relationship varies depending on the aspect of mindfulness

considered, and on the valence of affect and events. We focused on eight research questions

in five studies, which provided cumulative evidence that largely supported our hypotheses.

Answering the Research Questions

Q1: Dispositional mindfulness and reactivity to self-relevant recalled events.

Dispositional present-moment awareness, assessed by the MAAS, was associated with lower

negative and positive emotions related to the most impactful, self-relevant recent negative

event, and to lower negative emotions related to the most impactful, self-relevant recent

positive event, with stronger effects for negative than positive emotions (Studies 1 and 2).

When dispositional mindfulness was measured by the CAMS-R, which combines present-

moment attention and awareness with an accepting and nonjudgmental attitude towards thoughts and feelings, the negative effect of dispositional mindfulness on emotional reactivity held only for negative emotions (Study 1). The lack of a negative relationship with positive emotional reactivity is consistent with research showing that CAMS-R scores are more strongly related to well-being than other measures of mindfulness (Bergomi et al., 2013).

These results suggest that people higher in dispositional mindfulness experience less negative emotional reactivity when recalling self-relevant events of any valence. This effect is consistent with research showing that dispositional mindfulness is related to a more pleasant perception and evaluation of events, even stressful ones (Nezlek et al., 2016; Weinstein et al., 2009, Study 3), and to a higher ability to recognize and regulate emotions (Hill & Updegraff, 2012). These capacities are likely to facilitate the management of unexpected situations, both negative and positive ones, hence smoothing out the negative emotional consequences of such situations, whether present or recalled. Although recalling positive emotions during stressful situations is a beneficial ability connected to resilience (Tugade & Fredrickson, 2004), once the event has occurred, having a more detached and unflustered perspective on the negative event might be equally functional.

Q2: Dispositional mindfulness and affect baseline and changes over time. When using either the MAAS and the FFMQ to measure dispositional mindfulness, all of the aspects of mindfulness except *observe* (the tendency to carefully notice stimuli and bodily sensations) were related to a lower baseline of negative affect and to a slightly higher baseline of positive affect (Studies 3 and 4A), consistent with numerous cross-sectional results on dispositional mindfulness and emotions (see the meta-analysis by Giluk, 2009).

As for changes in emotions across the 12 weeks of Study 3 and 4A, people higher in dispositional present-moment *awareness* and *nonjudgment* showed the flattest trajectories of negative affect, while no similar "stabilizing" effect was found for positive affect (Studies 3

and 4A). On the contrary, the trajectory of positive affect seemed slightly decreasing over the period of the study for people higher in *awareness*, and the plots suggested the possibility of regression to the mean affecting the results.

The flatter negative affect trajectories of people higher in dispositional present-moment awareness can be interpreted in the light of the negative relationship between emotional variability and trait mindfulness (Hill & Updegraff, 2012), but also considering that the decrease in negative affect during the studies shown by the samples on average may be due to habituation to the questionnaire. Therefore, dispositional present-moment awareness might be associated with more stable negative emotions over time, as well as with a lower response habituation bias.

Q3: Dispositional mindfulness and within-person variations in events. The negative affect of people higher in dispositional mindfulness was less affected by within-person variations in negative events, compared to people lower in dispositional mindfulness, both when measured over four weeks or in the moment (Studies 3, 4A, and 5). This buffering effect appeared for present-moment *awareness* and *nonreactivity* in particular (Study 4A), with the buffering effect of *nonreactivity* also observed for momentary negative affect (Study 5). People with low levels of either *awareness* or *nonreactivity* started with a higher baseline of negative affect and experienced larger increases in negative affect when negative events happened more than usual. On the other hand, *nonjudgment* was related to an attenuated effect of within-person variations in positive events on positive affect (Study 4A), and *nonreactivity* did the same for momentary positive affect (Study 5). In particular, higher scores in these two facets were associated with higher positive affect in the absence of positive events, while reaching the same level of positive affect experienced by people lower in *nonjudgment* or *nonreactivity* when positive events happened more than usual.

Research has shown that dispositional mindfulness buffers the effect of naturally-occurring and laboratory-induced stress on emotions (Brown, Weinstein, & Creswell, 2012; Ciesla et al., 2012; Dixon & Overall, 2016, Ford et al., 2017), even when controlling for emotion regulation and neuroticism (Dixon & Overall, 2016). The results of the present studies additionally suggest that, although each person might be accustomed to a certain level of usual stress, being more aware of the present moment and able to notice own emotions and thoughts without reacting to them helps people cope with increasing negative events. Moreover, the results suggest that people higher in *nonjudgment* or *nonreactivity* do not need a certain number or intensity of positive events to experience high levels of positive affect, which is barely affected unaffected when positive events occur more than usual. These processes might reflect a basis for equanimity: dispositional *awareness*, *nonjudgment*, and especially *nonreactivity* appear to be associated with having "a balanced reaction to joy and misery, which protects one from emotional agitation" (Bodhi, 2005, p. 154). These aspects of dispositional mindfulness seem to be central in facilitating an even-minded attitude toward all experiences, thereby fostering emotional stability.

The ability to see mental events as simply thoughts and feelings, without excessive involvement or identification with them, may key to emotional stability when facing emotionally relevant stimuli. In two experiments, Papies, Pronk, Keesman, and Barsalou (2015) showed that training participants to observe their reactions to pictures of appetitive stimuli – specifically attractive people and food – as passing mental events decoupled sexual motivation from viewing attractive others as potential partners, and hunger from unhealthy food choices. In both experiments, the mediator of this link was reduced attractiveness of the appetitive stimuli for participants in the training condition, compared to those in the control condition. Given that seeing thoughts as transient mental states helps people distance from self-relevant stimuli (Lebois et al., 2015), this feature of dispositional mindfulness, and

nonreactivity in particular, may help people distance from negative and positive events. This capacity is sometimes called "non-attachment", which is a tendency to experience life without excessive involvement (Sahdra et al., 2010).

Q4: How results change depending on the valence of events and emotions. Although one might expect that staying focused on the present moment enhances positive emotions, the results of these studies showed that, as in other research (e.g., Brown & Ryan, 2003; Ford et al., 2017), dispositional mindfulness was less strongly related to positive than to negative emotions (Studies 1 to 5), including both affect levels, emotional reactivity, and emotion stability. At least three processes might explain this asymmetry.

First, part of this asymmetry can be due to the set of emotions used; from Study 1 to Study 4b, we measured positive affect with relatively activated or high-arousal emotion items, compared to Study 5, and mindfulness may be more associated with low-arousal emotions (Chambers, Lo, & Allen, 2008). However, substantive evidence on the link between dispositional mindfulness and low-arousal emotions, compared to more activated emotions, is not available. Second, this asymmetry might be due to a weaker negativity bias in more mindful people: negative emotions and events are usually better processed and remembered than positive emotions and events (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001), but experimental manipulations of mindfulness reduce negativity bias in thoughts and attitude formation (Kiken & Shook, 2011, 2014). Third, and most important, dispositional mindfulness may be more strongly related to negative than positive emotions because its main mechanism of action is decentering (e.g., Shapiro et al., 2006; Brown et al., 2015), that is taking a detached perspective on situations and disengaging from one's own internal experience (Bernstein et al., 2015). A detached perspective helps in handling negative events and emotions (Lebois et al., 2015), but it may also hamper the unfolding of strong positive emotions.

Nevertheless, as the literature on affective stability has demonstrated, having stable – and medium to high – positive emotions is more beneficial for well-being than feeling intense but unstable positive emotions (Gruber et al., 2013; Houben et al., 2015). The present results show that the nonjudgment and nonreactivity components of mindfulness are associated with more stable positive emotions to some extent, especially in relation to within-persons variations in positive events. Therefore, despite a general positive-negative asymmetry in the effects, diverse elements of dispositional mindfulness contribute to the stability of both negative and positive affect, especially in relation to events.

Q5: Single aspects of dispositional mindfulness and emotional stability.

Consistent with past research (Haddock et al., 2017; López et al., 2016; Reese et al., 2015), the aspects of dispositional mindfulness that showed stronger relationships with emotions were awareness, a nonjudgmental and accepting attitude towards mental processes, and nonreactivity to emotions and thoughts (Studies 4A and 5). The same aspects were also more strongly related to emotional stability (Studies 4A and 5). One explanation is that these facets represent the pillars of mindfulness, according to most definitions (Bishop et al., 2004; Baer et al., 2006). Moreover, being able to stay in the "here and now" and to accept, without reaction, one's unpleasant emotions and thoughts, are likely to be the aspects of mindfulness that most strongly affect the appraisal of situations and events, compared to other aspects such as the ability to label emotions (FFMQ *describe*) or to notice sensations (FFMQ *observe*). In particular, *observe* could enhance sensitivity also to negative stimuli, or enhance controlling and judgmental tendencies (Bergomi et al., 2013). Not surprisingly, in the validation analysis of the FFMQ, the *observe* facet loaded on an overall mindfulness factor and was positively correlated with *nonjudgment* only in experienced meditators but not in non-meditators. In the same study, *observe* was positively associated with thought suppression, dissociation, absent-mindedness, and psychological symptoms (Baer et al.,

2006). These results may explain the positive – although weak – relationship between *observe* and baseline negative affect and the negative correlation between *observe* and *nonjudgment* shown in Study 4A. On the other hand, *awareness*, *nonjudgment*, and *nonreactivity* are likely to reduce immersion in negative thoughts and situations, hence producing greater emotional stability.

When comparing the FFMQ facets, *nonreactivity* seemed to be most strongly related to emotional stability, with a stabilizing effect regarding both reactivity to events and emotional variability and instability indexes. As mentioned earlier, a tendency to notice one's thoughts and feelings without reacting to them could prevent people from being swept up by momentary emotions.

Q6: Emotional variability as a mediator between mindfulness and well-being. Part of the relationship (from 7% to 9% of the total effect) between dispositional mindfulness and well-being was mediated by emotional variability, computed as the amplitude of emotion fluctuations around the within-person mean (Study 4B). The model did not include variations in emotions in relation to events, which could have been an additional basis of the relationship, hence strengthening the mediational role of emotional stability. Nonetheless, the partial mediations in Study 4B suggest that the stabilizing effects of *awareness*, *nonjudgment*, and *nonreactivity* on negative affect, together with the effect of *nonjudgment* on positive affect, are conducive to well-being, consistent with research showing that lower emotional variability is associated with better psychological health (Gruber et al., 2013).

Q7: Dispositional mindfulness and emotional variability, instability, and inertia. As two previous studies showed (Hill & Updegraff, 2012; Keng & Tong, 2016), dispositional mindfulness was correlated with lower emotional variability and instability, especially concerning negative emotions (Study 5). Our results complement their findings because we

assessed the FFMQ mindfulness facets separately instead of the total FFMQ score (Hill &

Updegraff, 2012) or MAAS score (Keng & Tong, 2016).

In particular, Study 5 showed that the facets most strongly related to emotional

variability and instability were *nonjudgment* and *nonreactivity*, although the strength of the

relationships was higher for negative emotions. *Awareness* had negative but weak

associations with negative emotional variability and instability, and with positive emotional

instability. *Nonreactivity* was also positively related to happiness inertia. As larger emotional

fluctuations and occasion-to-occasion variability are signals of mood-related dysfunction,

these findings support the role of dispositional mindfulness, in particular *nonjudgment* and

nonreactivity, in emotion regulation. Moreover, the happiness of people higher in

nonreactivity may last longer because their momentary affect is less influenced by negative

and positive events, as shown in Study 5.

Q8: Dispositional mindfulness and momentary affect levels and stability.

Surprisingly, the results regarding momentary affect were somewhat different from the

previous ones. In fact, although the FFMQ facets of *awareness*, *nonjudgment*, and

nonreactivity were all negatively related to momentary negative affect, only *nonreactivity*

was also positively related to momentary positive affect, besides moderating the effects of

both negative and positive events (Study 5). These results are somewhat different from the

those in Study 4A, in which all facets were positively related to the baseline of positive

affect, and both *awareness* and *nonjudgment* buffered effects of negative and positive events

respectively.

One explanation of this inconsistency involves the different reference period of the

reported emotions, which was four weeks in Study 4A, and several hours in Study 5.

Secondly, the set of emotion items differed in the two studies. Nonetheless, the findings offer

support for the role of *nonreactivity* in within-day emotional stability. Assessing momentary

affect many times per day is somewhat like looking at emotional fluctuations with a magnifying glass, so that *nonreactivity* to emotions and thoughts, compared to other aspects of mindfulness, is associated with smaller fluctuations in emotional states in the short run. Given that the time interval between emotion assessments in the experience sampling of Study 5 could span from 90 minutes to around 5 hours, whereas the time interval between waves in Study 3 and 4A was four weeks, *nonreactivity* could be the component of dispositional mindfulness that produces the fastest recovery from unexpected negative and positive events.

Limitations and Future Directions

The present project has some limitations. First, we collected only self-reported reactions to naturally-occurring events. Experimental studies would be useful to assess emotional stability and variability in response to a controlled set of emotionally-evocative events, while measuring emotional reactions in other ways, particularly with psychophysiological measures. Second, Study 1 and Study 2 did not use a multifaceted measure of dispositional mindfulness, which lack prevented us from drawing conclusions about the effect of different aspects of dispositional mindfulness on affective reactivity to a recalled self-relevant event. Third, in Study 4B we calculated the within-person standard deviation of emotions based on only four data points. Although all participants had the same number of observations, which made the design balanced, four repeated assessments may not be enough to compute a reliable index of emotional variability. ESM studies typically utilize more than 10 data points.

Fourth, Study 5 had a large amount of missing data. Although missing data is very common in ESM studies, it may reduce the reliability of indexes of emotional variability, instability, and inertia, as well as the external validity of the models. Fifth, the effect of

dispositional mindfulness on the rate of change, especially of positive emotions, might be influenced by regression toward the mean. Finally, although most of our major findings replicate across studies, the replication is not perfect, due perhaps to the use of different study designs and measures of dispositional mindfulness and emotions across studies.

Future studies could use experimental designs to assess the link between dispositional mindfulness and emotional stability, and implement other intensive longitudinal (daily diary and ESM) data collections to explore the relationship between aspects of dispositional mindfulness and within-day emotional stability. Moreover, intensive longitudinal studies could be employed to understand the intra-individual mechanisms that mediate this link.

Conclusion

Across five studies that systematically examined the relationship between emotional stability and dispositional mindfulness in a variety of ways, mindfulness was clearly associated with a particular pattern of emotional responses. In addition to simply being related to lower negative and higher positive affect, as has been shown previously, trait mindfulness was associated with lower emotional reactivity to self-relevant events, flatter emotion trajectories, weaker effects of events, and overall less unstable emotions, and these effects primarily involved negative emotions. Analyses of specific facets of mindfulness revealed that these effects were due mostly to differences in *awareness*, *nonjudgment*, and *nonreactivity*.

These findings suggest that dispositional mindfulness may play a role in equanimity and resilience, leading highly mindful people to have milder reactions to events and smaller emotional fluctuations over situations and time. The life and daily events of people who are higher in dispositional mindfulness seem to be imbued with greater emotional stability, which is a fundamental aspect of mental health and functional well-being.

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APPENDIX

Table A1. Means, standard deviations, and Pearson correlations between Study 1 variables

	M(SD)	1.	2.	3.	4.	5.	6.	7.	8.
1. Dispositional mindfulness (MAAS score)	4.69(0.93)								
2. Frequency of negative events	3.69(1.77)	-0.16[*]							
3. Negativity of chosen negative event	6.33(2.42)	-0.11	0.49[***]						
4. Negative emotions, negative event	4.13(1.85)	-0.40[***]	0.33[***]	0.39[***]					
5. Positive emotions, negative event	1.31(1.54)	-0.24[***]	0.01	-0.09	0.13[*]				
6. Frequency of positive events	4.63(1.56)	0.05	-0.17[**]	-0.00	-0.00	0.00			
7. Positivity of chosen positive event	7.28(2.34)	-0.04	-0.09	0.15[*]	-0.03	-0.09	0.59[***]		
8. Positive emotions, positive event	5.29(1.81)	-0.18[**]	-0.04	0.16[**]	0.27[***]	0.14[*]	0.37[***]	0.61[***]	
9. Negative emotions, positive event	0.96(1.35)	-0.35[***]	0.06	-0.07	0.29[***]	0.55[***]	0.05	-0.17[**]	-0.02

Notes. Missing values handled with listwise deletion. [*]$p<.05$; [**]$p<.01$; [***]$p<.001$

Table A2. The effect of dispositional mindfulness (MAAS) and Big Five traits on emotional reactions to events: linear regressions (Study 1)

	Reference to self-relevant negative event						Reference to self-relevant positive event					
	Negative emotions			Positive emotions			Positive emotions			Negative emotions		
	b[CI]	β	p	b[CI]	β	p	b[CI]	β	p	b[CI]	β	p
Intercept	5.78[4.06, 7.50]		<.001	3.83[2.17, 5.50]		<.001	2.05[0.57, 3.52]		.007	4.37[3.09, 5.64]		<.001
Age	0.00[-0.02, 0.02]	.00	.968	0.00[-0.02, 0.02]	-.00	.965	0.00[-0.01, 0.02]	.03	.568	-0.01[-0.02, 0.01]	-.06	.278
Gender	0.30[-0.11, 0.72]	.08	.154	-0.46[-0.87, -0.06]	-.14	.024	-0.13[-0.50, 0.24]	-.03	.496	-0.32[-0.64, 0.00]	-.11	.050
Mindfulness	-0.59[-0.82, -0.36]	-.30	<.001	-0.43[-0.65, -0.20]	-.26	<.001	-0.35[-0.56, -0.14]	-.18	.001	-0.51[-0.70, -0.33]	-.36	<.001
Event intensity	0.23[0.14, 0.32]	.29	<.001	-0.08[-0.17, 0.01]	-.12	.071	0.47[0.38, 0.56]	.59	<.001	-0.20[-0.27, -0.12]	-.34	<.001
Frequency	0.12[-0.01, 0.25]	.11	.074	0.05[-0.08, 0.17]	.05	.464	0.01[-0.12, 0.15]	.01	.843	0.23[0.11, 0.35]	.26	<.001
Neuroticism	0.13[-0.02, 0.28]	.10	.091	-0.04[-0.19, 0.11]	-.03	.606	0.06[-0.08, 0.20]	.04	.412	0.00[-0.12, 0.12]	.00	.975
Conscientiousness	-0.01[-0.18, 0.16]	-.01	.912	-0.10[-0.26, 0.07]	-.07	.262	0.09[-0.07, 0.24]	.06	.261	-0.02[-0.15, 0.12]	-.02	.791
Extraversion	-0.08[-0.24, 0.07]	-.06	.289	0.16[0.01, 0.30]	.13	.039	0.05[-0.09, 0.18]	.03	.515	0.06[-0.06, 0.18]	.05	.359
Agreeableness	-0.05[-0.24, 0.13]	-.03	.576	0.16[-0.02, 0.34]	.12	.084	0.05[-0.12, 0.23]	.03	.534	0.10[-0.05, 0.25]	.08	.203
Openness	-0.03 [-0.21, 0.15]	-.02	.748	-0.12[-0.29, 0.05]	-.10	.159	0.17[0.01, 0.33]	.11	.038	-0.11[-0.25, 0.02]	-.10	.107
Observations	266			265			278			277		
R²	.33			.12			.42			.22		

Notes. CI = 95% Confidence Intervals. Event intensity refers to self-reported negativity of the self-relevant negative event in the first two columns, and to the self-reported positivity of the positive event in the last two columns. Similarly, Frequency refers to the frequency of recent negative events in the first two columns, and to the frequency of recent positive events in the last two columns.

Table A3. The effect of dispositional mindfulness (CAMS-R) on emotional reactions to events: linear regressions (Study 1)

| | Reference to self-relevant negative event | | | | | | Reference to self-relevant positive event | | | | | |
| | Negative emotions | | | Positive emotions | | | Positive emotions | | | Negative emotions | | |
	b[CI]	*β*	*p*	*b[CI]*	*β*	*p*	*b[CI]*	*β*	*p*	*b[CI]*	*β*	*p*
Intercept	3.99[2.38, 5.59]		<.001	2.07[0.54, 3.60]		.008	1.96[0.61, 3.32]		.005	2.94[1.73, 4.15]		<.001
Age	-0.01[-0.02, 0.01]	-.03	.558	-0.01[-0.02, 0.01]	-.05	.427	-0.01[-0.02, 0.01]	-.04	.476	-0.01[-0.03, 0.00]	-.10	.088
Gender	0.30[-0.11, 0.72]	.08	.153	-0.45[-0.85, -0.06]	-.14	.024	-0.11[-0.48, 0.25]	-.03	.534	-0.32[-0.64, 0.01]	-.11	.056
Mindfulness	-0.83[-1.26, -0.40]	-.22	<.001	0.14[-0.27, 0.55]	.04	.498	0.08[-0.31, 0.46]	.02	.695	-0.31[-0.65, 0.04]	-.11	.079
Event intensity	0.23[0.13, 0.32]	.30	<.001	-0.08[-0.17, 0.01]	-.12	.081	0.47[0.38, 0.57]	.61	<.001	-0.18[-0.26, -0.09]	-.30	<.001
Frequency	0.15[0.02, 0.28]	.14	.025	0.08[-0.05, 0.21]	.09	.212	0.00[-0.14, 0.14]	.00	.968	0.22[0.09, 0.35]	.25	<.001
Observations	266			265			278			277		
R²	.24			.04			.38			.10		

Notes. CI = 95% Confidence Intervals. Event intensity refers to self-reported negativity of the self-relevant negative event in the first two columns, and to the self-reported positivity of the positive event in the last two columns. Similarly, Frequency refers to the frequency of recent negative events in the first two columns, and to the frequency of recent positive events in the last two columns.

Table A4. Means, standard deviations, and Pearson correlations between Study 2 variables (measured at first wave)

	M(SD)	1.	2.	3.	4.	5.	6.	7.	8.
1. Dispositional mindfulness (MAAS score)	4.68(0.99)								
2. Frequency of negative events	3.65(1.77)	-0.03							
3. Negativity of chosen negative event	5.77(2.32)	-0.07	0.63***						
4. Negative emotions, negative event	3.93(1.76)	-0.27***	0.36***	0.48***					
5. Positive emotions, negative event	1.08(1.17)	-0.11*	0.02	0.01	-0.00				
6. Frequency of positive events	4.72(1.58)	0.02	-0.19***	-0.12*	-0.11	0.15**			
7. Positivity of chosen positive event	7.37(1.92)	0.07	-0.09	0.03	0.02	0.06	0.62***		
8. Positive emotions, positive event	5.35(1.70)	-0.01	-0.16**	-0.05	0.10	0.12*	0.51***	0.60***	
9. Negative emotions, positive event	0.71(0.93)	-0.25***	0.12*	0.12*	0.24***	0.34***	0.01	0.00	-0.12*

Notes. Missing values handled with listwise deletion. *$p<.05$; **$p<.01$; ***$p<.001$

Table A5. The effect of dispositional mindfulness (MAAS) on trajectories of negative and positive affect: linear growth models (Study 3)

	Negative affect			Negative affect			Positive affect			Positive affect		
	b	*CI*	*p*	*b*	*CI*	*p*	*b*	*CI*	*p*	*b*	*CI*	*p*
Intercept	2.68	1.75 – 3.62	<.001	2.99	2.04 – 3.94	<.001	1.99	0.77 – 3.22	.002	1.83	0.59 – 3.06	.004
Age	-0.01	-0.02 – -0.01	<.001	-0.01	-0.02 – -0.01	<.001	0.00	-0.00 – 0.01	.470	0.00	-0.00 – 0.01	.474
Gender	0.05	-0.06 – 0.17	.362	0.06	-0.06 – 0.17	.339	-0.09	-0.21 – 0.02	.111	-0.09	-0.21 – 0.02	.109
PM events	0.33	0.09 – 0.57	.007	0.33	0.09 – 0.57	.008	0.27	0.01 – 0.52	.040	0.27	0.01 – 0.52	.041
PM-C events	0.23	0.12 – 0.34	<.001	0.22	0.11 – 0.34	<.001	0.14	0.03 – 0.26	.018	0.15	0.03 – 0.27	.013
MAAS	-0.18	-0.38 – 0.01	.062	-0.25	-0.45 – -0.05	.013	0.01	-0.24 – 0.26	.940	0.05	-0.21 – 0.30	.724
Time	-0.04	-0.06 – -0.01	.004	-0.24	-0.37 – -0.12	<.001	-0.08	-0.11 – -0.06	<.001	0.04	-0.08 – 0.15	.517
PM-C events*M	-0.02	-0.05 – -0.00	.046	-0.02	-0.05 – 0.00	.071	-0.01	-0.03 – 0.02	.632	-0.01	-0.03 – 0.02	.550
PM events*M	-0.01	-0.06 – 0.04	.611	-0.01	-0.06 – 0.04	.635	0.01	-0.04 – 0.06	.659	0.01	-0.04 – 0.06	.648
Time*M				0.04	0.02 – 0.07	<.001				-0.03	-0.05 – -0.00	.034
Within variance		0.240			0.235			0.202			0.201	
Between variance		0.207			0.208			0.207			0.207	
Individuals		318			318			318			318	
Observations		1206			1206			1217			1217	
BIC		2294			2290			2155			2157	

Notes. M=MAAS. PM = Person-Mean. PM-C = Person-Mean Centered (within-person deviations from the person mean). Events refer to negative events in the first two columns, and to positive events in the last two columns. P-values are computed through Kenward-Roger approximation. All models are fit with maximum likelihood.

Table A6. Means, standard deviations, and Pearson correlations between Study 4A variables (measured at first wave)

	M(SD)	1.	2.	3.	4.	5.	6.	7.	8.
1. FFMQ Aware	3.60(0.78)								
2. FFMQ Nonjudge	3.37(0.80)	0.41***							
3. FFMQ Nonreact	2.80(0.58)	0.02	0.14***						
4. FFMQ Observe	3.10(0.69)	-0.12**	-0.20***	0.19***					
5. FFMQ Describe	3.29(0.77)	0.27***	0.20***	0.21***	0.18***				
6. Log negative events	1.29(0.62)	-0.18***	-0.24***	-0.10*	0.07	-0.10*			
7. Positive events	6.28(2.14)	0.13**	0.16***	0.13**	0.11**	0.14***	-0.38***		
8. PANAS Negative affect	2.56(0.85)	-0.34***	-0.47***	-0.22***	0.12**	-0.17***	0.49***	-0.31***	
9. PANAS Positive affect	3.42(0.72)	0.30***	0.24***	0.15***	0.10**	0.24***	-0.28***	0.59***	-0.29***

Notes. Missing values handled with listwise deletion. * $p<.05$; ** $p<.01$; *** $p<.001$

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