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Motivation and Emotion (2025) 49:15–30
https://doi.org/10.1007/s11031-024-10101-1

ORIGINAL PAPER

Everything under control? Daily dynamics of self-control and emotion regulation

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Accepted: 2 December 2024 / Published online: 28 January 2025

Abstract

As emotions may hinder goal pursuit, regulating them is important. Although the relationship between self-control and emotion regulation has mainly been investigated on a dispositional level, the engagement in self-control and emotion regulation fluctuates across situations. Research on how and to what extent self-control and emotion regulation impact one another within individuals over time is scarce. In the present study, we investigated the within-person reciprocal relationships between momentary self-control and the emotion regulation strategies reappraisal and suppression. Ecological momentary assessment was employed to collect diary data five times a day over four days using repeated, short measures of emotions, self-control, reappraisal, and suppression. Using Dynamic Structural Equation Modeling (DSEM) of data from 1874 assessments provided by 111 participants, results showed that the relationship between self-control and the emotion regulation strategies reappraisal and suppression is reciprocal within persons over time. Momentary suppression related to lower levels of momentary self-control later on, and self-control, in turn, was positively associated with the employment of subsequent reappraisal. Findings are discussed in light of the importance of self-control in dealing with emotions that impede goal pursuit, and the contextual importance of this relationship. Overall, this study adds to the question how emotion regulation and self-control are intertwined on a within-person level and provides insight into how people could deal with their emotional experiences to achieve their long-term goals.

Keywords Self-control · Emotion regulation · Reappraisal · Suppression · Daily dynamics · Ecological momentary assessment

Introduction

Emotions are part and parcel of life, but often people want or need to change their emotions. This process, known as emotion regulation, involves self-control, but interestingly, emotions can also impede self-control (Chester et al., 2016). The complex dynamics between emotion regulation and self-control remain elusive and warrant further exploration. In general, it is believed that people who score high on self-control are good in regulating emotions too (e.g., Tangney et al., 2004). This would imply that individuals good in self-control stay away from strategies that are known to be maladaptive (e.g., suppression) and typically apply more adaptive emotion regulation strategies (e.g., reappraisal). It could also imply that individuals good in self-control are flexible in applying different emotion regulation strategies and thus regulate according to the requirements of a specific moment. Thus far, however, it has remained unclear how and to what extent self-control and emotion regulation

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impact one another within individuals over time. Emotions could hinder attempts of self-control, emotion regulation may get priority over other forms of self-control or engaging in self-control may hinder emotion regulation.

Self-control, the ability to override or change one's inner responses while refraining from acting on them to prioritize and achieve competing long-term goals (Muraven & Baumeister, 2000; Tangney et al., 2004) is typically needed when individuals experience a dilemma between their current state and a desired state. Emotion regulation, albeit related to changing inner responses as well, is focused on emotions specifically, and can be defined as how individuals influence which emotions they have, when they have them, and how they experience and express them (Gross, 1999). Importantly, people are not always carried away by their emotional impulses. For example, people can be motivated to up-regulate negative affect to promote performance (Tamir, 2009). This suggests that emotion regulation does not always involve self-control (Evers, 2018). An emotion regulation dilemma, however, can also relate to a self-control dilemma. Imagine, for example, someone with the long-term goal of earning a promotion, but feeling angry at their bullying manager. Like in a self-control dilemma, there is an impasse between a current and a desired state. People's strategies of dealing with such emotional situations can vary not only between individuals, but are also based on the context in which they occur (Kashdan & Rottenberg, 2010). Sometimes, individuals may suppress the feelings of angriness towards their manager to focus on work-related tasks and pursue the promotion. In other situations, they may want to redirect their anger by reappraising it, for example by considering the manager's behavior as a result of insecurity, to better control their emotional response.

Hereby, self-control may predict the emotion regulation strategies that are employed and vice versa, how people deal with their emotions may predict whether people can exert self-control in order to reach their goals (Carver & Scheier, 1998; Muraven & Baumeister, 2000; Richards & Gross, 2000; Wenzel et al., 2021). People who, for example, effectively regulate their emotions may feel more in control about the situation they encounter. This raises the question how self-control and emotion regulation exactly relate to one another within daily contexts where emotions may hinder one's goals over time.

In other words, self-control and emotion regulation seem to be dynamically interrelated, and this interplay may not only vary between people, but also within individuals across situations and over time. However, research on this reciprocal relationship as it occurs in the daily life of individuals is scarce. Following Matthews et al. (2021), in the present paper, we therefore take a situationally dynamic view on the process of emotion regulation, which occurs in an immediate situation (with specific demands) surrounded by a broader social-cultural setting, and depends on interrelated affective, cognitive, as well as motivational factors (see Fig. 1). Within this focus, we investigated the within-person reciprocal relationships between momentary self-control and two types of emotion regulation (reappraisal and suppression). Understanding these temporal dynamics is important to learn how people can effectively manage the emotional challenges they face during daily life.

The importance of self-control and emotion regulation

Self-control is an important skill contributing to a fruitful life. It encompasses multiple aspects such as mentally visualizing long-term goals, resisting or avoiding situational temptations and making wise decisions that may involve delaying gratification. To date, there is little doubt that the ability to exert self-control is associated with a wide range of positive outcomes, such as good physical and mental health, harmonious interpersonal relationships, and improved work and academic performance (Crescioni et al., 2011; Finkel & Campbell, 2001; Tangney et al., 2004). While past researchers mostly focused on the role of dispositional self-control as a relatively stable personality trait (e.g., some people are better self-controllers than others), we examine momentary self-control as varying within persons across situations and over time as this reflects other important features of this construct (e.g., self-control may be easier when the need is higher; Ridder et al., 2012).

Next to external distractions in one's environment, people often experience emotions that may conflict with their long-term goals. To achieve such goals, regulating these emotions by employing emotion regulation strategies is necessary, for instance, when sadness results in overeating or when anxiety for an exam impairs abilities to focus effectively. The process of emotion regulation, i.e., deciding whether or not and how to regulate one's emotions, is typically perceived as goal-oriented and motivated (Matthews et al., 2021; Thompson, 2011). Empirical work has shown that goals are involved in the elicitation of emotional states and in accounting for its behavioral consequences (e.g., Nelissen et al., 2007), and that emotions may hinder goal pursuit and achievement (in academic contexts, health domains, work contexts and personal relationships, e.g., Hennecke & Freund, 2016; Moeller et al., 2015; Pekrun, 2016; Tice & Bratslavsky, 2000; Trougakos et al., 2020; Webster & Hadwin, 2015; Wilkowski et al., 2016).

Individuals may employ various emotion regulation strategies. A dominant model of emotion regulation, the process model (Gross, 1998b), distinguishes two general ways people can deal with emotions, depending on the timing of

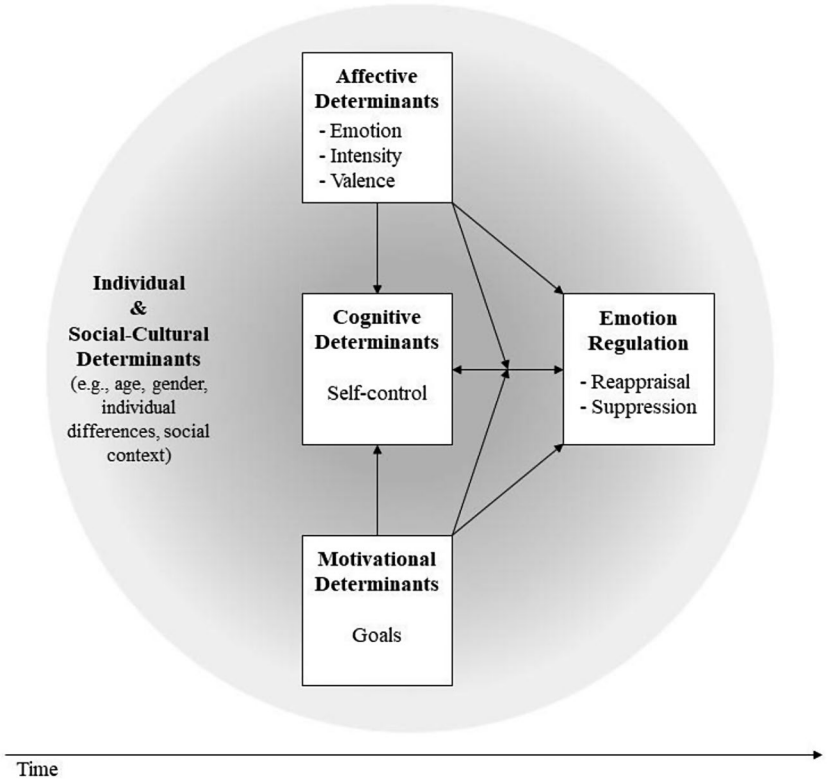

Fig. 1 Conceptual model of the interrelations between determinants of emotion regulation. Note. This conceptual model is based on the framework proposed by Matthews et al. (2021). It encompasses a simplified representation of the interrelations between various determinants of emotion regulation

the emotion-generative process. Antecedent-focused emotion regulation is employed *before* and response-focused emotion regulation is employed *after* emotions have become fully-blown present (Gross & Thompson, 2007). Antecedent-focused strategies are generally considered the most advantageous. They are more effective and less cognitively taxing because altering an emotional response relatively early, when the emotion is not fully present yet, is assumed to be easier as compared to regulating emotions relatively late when the intensity of an emotion might be higher (Sheppes & Gross, 2011). The most prominent antecedent-focused and response-focused emotion regulation strategies are cognitive reappraisal and suppression, which have been proposed to have 'adaptive' and 'maladaptive' natures respectively, based on their immediate effects on affect, behavior, and cognition (Gross, 1998a; Gross & John, 2003).

Reappraisal, a prototypical antecedent-focused emotion regulation strategy, involves changing one's interpretation by cognitively modifying the appraised meaning of an emotional stimulus (Gross & John, 2003). Anxiety for an exam, for example, can be reappraised by framing the situation as a challenge rather than a threat. Reappraisal is generally considered an adaptive emotion regulation strategy, since it has been associated with beneficial outcomes in daily life (e.g., Gross, 1998a; Nett et al., 2011; Ochsner et al., 2002). In contrary, the prototypical response-focused emotion regulation strategy suppression involves the inhibition of emotion-expressive behaviors (Gross & John, 2003). An example is a person holding back one's tears in front of colleagues when receiving bad news. Reducing emotional expression, however, does typically not reduce the actual emotional experience (Sorić et al., 2013), but is cognitively costly and has been associated with disadvantageous outcomes in daily life (e.g., Balzarotti et al., 2010; Jin-Kyoung et al., 2014; John & Gross, 2004; Srivastava et al., 2009). Therefore, suppression is generally considered a maladaptive emotion regulation strategy.

The link between self-control and emotion regulation

To understand why response-focused emotion regulation strategies like suppression may have maladaptive effects, self-control has been postulated as a likely underlying mechanism. According to the strength model of self-control (Muraven & Baumeister, 2000) exerting self-control is effortful, and reduces self-control resources. Consequently, one act of self-control reduces the resources available for subsequent self-control efforts. Likewise, overruling emotions once they have gathered force, as is the case for response-related emotion regulation strategies, seems to cost more self-control resources than interrupting an emotion that has not been fully evolved yet, like in the case of

antecedent-related emotion regulation (Carver & Scheier, 1998; Richards & Gross, 2000).

Research has indeed shown that emotion regulation can be effortful and may therefore lead to lower levels of momentary self-control (Wenzel et al., 2021), in line with findings on the varying costs of different emotion regulation strategies (Sheppes & Gross, 2011). For instance, research indicates that suppressing emotional responses (to both funny and sad video clips) leads to reduced performance at subsequently solving cognitive demanding tasks requiring self-control, such as anagrams (Baumeister et al., 1998) and Stroop tasks (Inzlicht & Gutsell, 2007). Specifically, response-focused emotion regulation (e.g., suppression) seems to be more cognitively costly by taxing higher amounts of self-control resources than antecedent-focused emotion regulation (e.g., reappraisal). Less self-control resources were available after individuals engaged in response-focused emotion regulation compared to antecedent-focused emotion regulation (e.g., Evers et al., 2010; Keng et al., 2017; Stiller et al., 2019; Wang & Yang, 2014). These findings indicate that emotion regulation can impact subsequent self-control. Self-control, in turn, may also impact subsequent emotion regulation. It has been demonstrated recently that higher levels of momentary self-control make it more likely to use more adaptive emotion regulation strategies, such as social sharing and reappraisal instead of maladaptive ones like suppression and rumination (Wenzel et al., 2021). Besides, different emotion regulation strategies may require different amounts of self-control resources. For example, acceptance based coping with negative emotions has been found to require fewer self-control resources than suppression (Alberts et al., 2021). Thus, people's momentary self-control capacity may determine subsequent emotion regulation strategy selection.

Taken together, whether people can effectively employ emotion regulation may depend on their self-control capacity and vice versa. A reciprocal relationship between both constructs, therefore, is likely grounded in goal-oriented contexts in which both regulatory processes are employed. This idea aligns with Matthews et al. (2021), who propose that the process of emotion regulation is determined by factors related to the individual and the emotion being regulated, and occurs in an immediate situation (with specific demands) embedded in a broader social-cultural setting. In their model, emotion regulation depends on affective, cognitive, as well as motivational factors. Based on their framework, we aimed to examine the interrelationship between self-control and the emotion regulation strategies reappraisal and suppression. As depicted in Fig. 1, the affective, cognitive, and motivational determinants displayed in squares represent the variables that are measured in the current study or were predetermined within the predefined context of the study. The circle shaded from dark to light grey in the background, represents the individual who employs the emotion regulation (e.g., age, gender, individual differences) and the social-cultural contextual determinants where it applied (e.g., the educational, studying context in the present study).

The situationally dynamic link between self-control and emotion regulation

The current study aimed to provide evidence for the dynamics of self-control and the emotion regulation strategies reappraisal and suppression at the within-person level. That is, traditionally, self-control and emotion regulation have been studied mostly separately. Empirical studies on the relationship between self-control and emotion regulation are scarce, and the existing evidence mainly involves the dispositional, between-person level. Such studies demonstrated that trait-level self-control positively correlates with habitual adaptive emotion regulation strategies, such as reappraisal (Paschke et al., 2016) and thinking about a solution (Opelt & Schwinger, 2020), whereas negative associations were found with maladaptive emotion regulation strategies, such as withdrawing (Opelt & Schwinger, 2020). Furthermore, people who score high on self-control are usually better at maintaining motivation (as for example indicated by maintained regulation of brain activity associated with negative emotions), which supports emotion regulation over time (Paschke et al., 2016).

The link between situated, momentary self-control and emotion regulation, however, remains relatively understudied. In light of Matthews et al.'s framework (2021), this is striking, since such regulatory processes may be dependent on the context and immediate situation in which they are employed, particularly when emotions are at play. As depicted in Fig. 1, both emotion regulation and self-control can be employed by an individual (with distinct demographic and dispositional characteristics) that needs to deal with the demands of a specific situation while interacting in a broader socio-cultural setting (Matthews et al., 2021; Thompson, 2011). In such situations, the process of whether and how an individual engages in self-control and emotion regulation can be interrelated, and be dependent on their motivations and emotions at play in that particular situation. Thus, both self-control and emotion regulation may be directed by the immediate or long-term goals of an individual in the context in which emotions are managed (Matthews et al., 2021; Thompson, 2011). Both momentary self-control and emotion regulation are susceptible to situational influences, such as previous attempts at self-control, affect and motivation (Ridder et al., 2012; Gross, 2002). Indeed, the capacity to engage in self-control or emotion regulation is characterized by daily fluctuations across situations and

time (Aldao, 2013; Ridder et al., 2012; Gross, 2002). This momentary aspect constitutes the focus of the current study.

As momentary measures capture experiential information close in time to its occurrence while dispositional measures capture general beliefs about the self (Robinson & Clore, 2002), investigating the link between self-control and emotion regulation at the momentary level adds to the current body of knowledge mainly based on dispositions. Since experience sampling studies appear to typically examine what strategies people use in daily life, scholars suggested to use such methods to investigate the strategies that individuals use in particular situations (e.g., Matthews et al., 2021). A focus on the momentary link is crucial for designing interventions at the within-person level and more in line with real-life situations, given the ever changing environments individuals encounter (Wenzel et al., 2021). However, to date it is unclear *whether* and *how* self-control and emotion regulation are exactly related and impact one another over time within individuals in specific (goal-directed) contexts.

The current study

To examine the situationally-grounded dynamics of emotion regulation, we investigated how momentary self-control and the emotion regulation strategies reappraisal and suppression are interrelated and impact one another, by assessing their dynamic relationship within individuals over hours and days using DSEM (Asparouhov et al., 2018). Gaining a deeper understanding of this relationship is crucial for advancing the current knowledge on how people can effectively manage emotional contexts in daily life. We used ecological momentary assessment and collected diary data five times per day over a period of four consecutive weekdays using repeated, short measures on emotions, self-control, reappraisal and suppression collected close in time. The present study was performed in a real-life context, that is, within an academic setting, focusing on emotions that hinder students' studying progress.

As reappraisal and suppression differ in their required cognitive effort, we hypothesized that momentary self-control positively predicts reappraisal and negatively predicts suppression. Additionally, we hypothesized that employing emotion regulation strategies negatively relates to momentary self-control capacity, with suppression taxing self-control resources relatively more than reappraisal.

Table 1 Demographic information of the final sample ($N = 111$)

Characteristic	*n* (%)	*M*	*SD*
Age in years	111	19.94	1.80
Gender			
Female	92 (82.9)		
Male	18 (16.2)		
Other	1 (0.9)		
Nationality			
Dutch	104 (93.7)		
Turkish	2 (1.8)		
Other	5 (4.5)		
Study year			
First	59 (53.2)		
Second	33 (29.7)		
Third	15 (13.5)		
Fourth or higher	4 (3.6)		
Study			
Psychology	106 (95.5)		
Other	5 (4.5)		
Course			
A	6 (5.4)		
B	25 (22.5)		
C	9 (8.1)		
D	10 (9.0)		
E	61 (55.0)		
Weekly job hours	109 (98.2)	6.50	6.37
Weekly study hours per course	106 (95.5)	13.91	5.76

Note. Course names are presented as A-E for brevity and ethical reasons. In the university education system, a semester is divided into two blocks of two courses with an equal workload

Method

Participants

Participants were 111 undergraduate university students enrolled in five different psychology courses at a Dutch university. Demographic information of the sample is presented in Table 1. Participants had a mean age of 19.94 years ($SD = 1.80$) and were mainly female (82.9%, $n = 92$), Dutch (93.7%, $n = 104$), and in their first year of university (53.2%, $n = 59$).

Design and procedure

To examine the relationship between momentary self-control and momentary reappraisal and suppression within participants over time, we applied experience sampling to collect diary data five times per day over a period of four consecutive weekdays[1], combined with data obtained from an entry survey. At the start of an academic course, participants were recruited with a digital flyer containing a link. Via this link, participants received an online information letter about the purpose of the study. After giving their consent, they completed the entry survey[2]. Next, during the

[1] Other than the originally preregistered 5-day daily diary (for primary data collection), a 4-day daily diary was performed due to technical issues.

[2] For reasons of brevity, other variables that were assessed within the entry survey during primary data collection are not described in this

course a 4-day daily diary with five scheduled invitations to answer short items on self-control, emotion and the emotion regulation strategies reappraisal and suppression per day (i.e., five times from 10 am to 10 pm, resulting in a maximum of 20 measurements in total) was assessed (for an overview see Fig. 2). For each measurement occasion, participants received an email with a link to the online daily diary questions that had to be completed. Although the invitation to answer the questions was at set times, participants were flexible in answering within three hours, except for the measurements of 10 pm, which were left open during the night until the next measurement of 10 am the next day. After completing the study, participants received course credit or the chance to win a gift voucher (€10) as compensation for their participation. Ethical approval was provided by the university's Faculty Ethics Review Board (20–574). At AsPredicted, the primary data collection was preregistered on January 11th, 2021 (https://aspredicted.org/fr63-4jb7.pdf) and this study, using secondary data analyses, was preregistered on December 3rd, 2021 (https://aspredicted.org/vbc2-pj89.pdf).

Measures

Entry survey

Demographics Participants identified their gender (male, female, prefer not to answer, other; namely), nationality (Dutch, Turkish, Moroccan, Surinamese, Other; namely), education level (Undergraduate year 1, 2, 3, 4 or higher), and the course they were enrolled in (A, B, C, D, E). Through open-ended questions, participants reported their age, study program, average weekly study hours for a course, and average weekly working hours for a job.

Experience sampling method

Momentary self-control Momentary self-control was assessed with the adapted State Self-Control Capacity Scale (Johnson et al., 2014), consisting of five items (e.g., "My mind feels unfocused right now") that could be answered on a scale from 1 (*Very slightly or not at all*) to 5 (*Very much*). Momentary self-control was based on all five items per measurement occasion (Cronbach's α ranged from 0.89 to 0.95, with $M = 0.92$). For ease of interpretation, momentary self-control scores were reverse coded, such that higher scores were indicative of more momentary self-control.

Emotions, intensity and interference with study activities For each measurement, participants were asked whether they experienced an emotion that negatively affected their study progress in the past three hours, and if so, they selected from a predefined list of emotions the one that was perceived to be most negatively affecting their study-related activities. For that emotion, participants rated its intensity on a 7-point Likert scale from 0 (*Not at all*) to 6 (*Extremely*) and to what extent it negatively influenced their studying progress on a scale from 0 (*Very little effect*) to 6 (*Extremely negative effect*). The predefined emotions were adopted from the Achievement Emotions Questionnaire (Pekrun et al., 2011) and were complemented with epistemic emotions, emotions resulting from appraisals regarding the (mis)alignment between new information and existing beliefs, knowledge structures or recently processed information (Muis et al., 2018). This resulted in 19 available emotions for participants to choose from (i.e., Achievement emotions: anger, anxiety, boredom, enjoyment, hope, hopelessness, pride, relief and shame; Epistemic emotions: amusement, confusion, curiosity, disappointment, envy, fear, frustration, sadness, surprise and uncertainty). Emotions were presented in alphabetic order. The option to indicate that no emotion was experienced in the past three hours that impacted study progress was also provided.

Momentary emotion regulation If participants selected an emotion as negatively influencing studying progress, they were presented with items asking to what extent they engaged in reappraisal and suppression to regulate it. For this, a state version of the Emotion Regulation Questionnaire (ERQ: Gross & John, 2003) was used with a modified tense of the items. In line with previous experience sampling studies measuring momentary emotion regulation by modifying the ERQ (Elkjær et al., 2022; Silva et al., 2018), we only slightly rephrased some words of each item for the focus on the specific emotion experienced previously, while remaining its original structure. We used three reappraisal items ("I controlled *this emotion* by changing the way I was thinking about the situation I was in", "When I wanted to feel less of *this emotion*, I changed what I was thinking

paper as they were outside the scope of the present research.

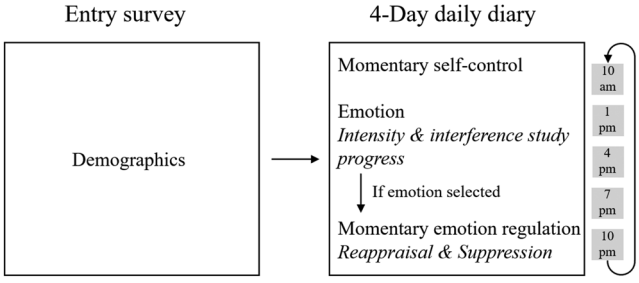

Fig. 2 Schematic overview of data collection and variables

about", and "When I wanted to feel less of *this emotion*, I changed the way I was thinking about the situation.") and three suppression items ("I controlled *this emotion* by not expressing it", "I kept *this emotion* to myself", and "When I felt *this emotion*, I made sure not to express it."). Items were answered on 5-point Likert scales ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*) and item scores were averaged into reappraisal and suppression scores. Cronbach's α ranged from 0.75 to 0.93 ($M=0.86$) for reappraisal and from 0.74 to 0.92 ($M=0.84$) for suppression.

Analysis

Data preparation

Data were prepared using the IBM SPSS Version 26.0 software statistical package and analyzed using Mplus Version 8.6 (Muthén & Muthén, 1998–2017). Prior to analysis, accuracy of data entry and missing values were examined. Eight completed measurements during the daily diary phase was chosen as a minimum to be included in the statistical analyses. Some participants ($n=8$) had submitted surveys within a three-hour timeframe belonging to a scheduled measurement moment twice, resulting in 17 extra responses. When double responses both targeted an emotion ($n=5$, 0.3%) or both pertained to experiencing no emotion at all ($n=4$, 0.2%), responses that deviated most from the originally scheduled measurement moment were excluded. When one of those double responses was targeted at an emotion, while the other response was pertaining to experiencing no emotion at all, responses that were targeting at no emotion were excluded ($n=8$, 0.4%). No univariate outliers ($-3<$z-score>3) or multivariate outliers (Mahalanobis distance with $p<.001$) were detected for the main study variables.

Analyses

Manifest scores for momentary self-control, reappraisal and suppression were used at the lowest level (the within-person level) for the main analyses using DSEM in Mplus. Latent aggregates were used at the between person level. To take irregular timings in student responses and longer lags overnight into account, the exact response time was included using the *tinterval* option. Two MCMC chains were used with 500,000 iterations each (using the Gibbs sampler), and a thinning of 100. Diffuse priors were used, as there was not enough information available to specify informative priors. The main interest of these DSEM analyses was the strength of the cross-lagged effects between self-control and the emotion regulation strategies reappraisal and suppression. 95% credible intervals were used to evaluate whether effects significantly differed from zero. Similar to other structural equation models, standardized estimates are presented (with effect sizes of 0.2 considered as 'small', 0.5 as 'medium' and 0.8 as 'large'; Cohen, 1988).

Because of the framing of the diary questions, the cross-lagged effect from the emotion regulation strategies to self-control was estimated using the answers from the same time point. That is, emotions experienced during the three-hour time period before the questionnaire were used as predictor of self-control as reported in the same questionnaire. Self-control was used as predictor of emotion regulation strategies employed in the three hour period after the self-report. We controlled for emotional valence (positive vs. negative) and time (day vs. night) in the model.

Results

Descriptive statistics

The final dataset included a total of 1874 reports of 111 participants. Most participants answered 18 questionnaires over the course of the four days (ranging from 8 to 20). Somewhat less than half of the questionnaires (737 or 39.3%) were answered at night (i.e., between 18.00 and 6.00). Self-control was always reported. At 984 moments (52.5% of the time), participants reported that they had experienced an emotion that negatively affected their study behavior and for these instances they reported to what degree reappraisal and suppression were used. In 418 of these cases (42.6%), they reported regulating positive emotions that had hindered their study behavior. Descriptive statistics and correlations are presented in Table 2.

Participants reported relatively high average levels of self-control and moderate levels for reappraisal and suppression. Intraclass correlations (ICC) indicated that about one third of the variability in the momentary assessments was due to stable differences between persons, reflecting more habitual self-control, reappraisal, and suppression. The remainder of the variance represented variation within a participant over time, including measurement error. Figure 3 illustrates this within- and between-person variability for three randomly selected participants. There are between-person differences in the stable between-person mean levels of self-control (i.e., the three horizontal lines), but there is also substantial within-person variation over time for the self-control levels around this personal mean. Participant 2 has the lowest mean scores, for example, but also has quite some relatively high scores for self-control.

Reappraisal and suppression were positively correlated, both at the between and the within-person level. Thus,

Table 2 Descriptive statistics and correlations for the main study variables

	Descriptives					Correlations[a]		
	M	*SD*	Min	Max	ICC	1	2	3
1 Self-control	3.37	1.18	1	5	0.31	-	0.02	−0.26*
2 Reappraisal	2.71	0.99	1	5	0.28	0.02	-	0.52*
3 Suppression	2.51	1.02	1	5	0.28	−0.08*	0.49*	-

[a] Values below the diagonal are within-person correlations, values above the diagonal are between-person correlations

* $p<.05$

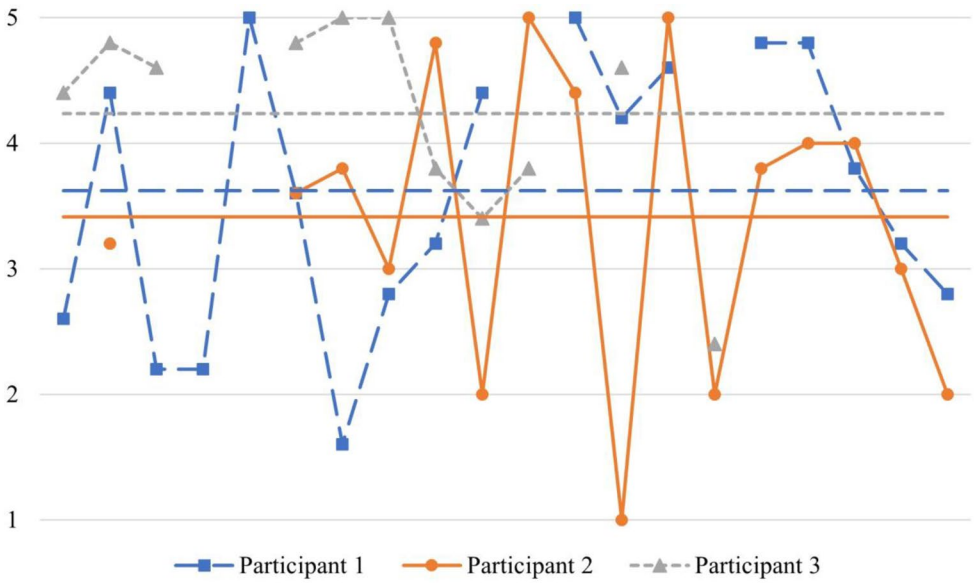

Fig. 3 Within-person self-control variation over time and stable between-person differences (horizontal lines) for three randomly selected participants

participants who used more reappraisal in general were more likely to use more suppression as well (r=.52). Also, within a moment, participants often indicated to use both strategies at the same time (r=.49). Self-control was negatively correlated with suppression, to some extent at the within-person level (r=−.08) and more pronounced at the between-person level (r=−.26). Self-control and reappraisal were not significantly associated at both levels.

Figure 4 presents the average levels of momentary self-control per day and time point. Participants' average momentary self-control was similarly distributed across the four days of the diary, with an overall trend to slightly decrease during the day.

Table 3 presents the prevalence, intensity, and negative influence on study activities of each emotion separately. The top five most prevalent emotions that were reported as negatively affecting study progress were amusement, boredom, enjoyment, frustration, and anxiety. Overall, emotions were experienced at moderate intensity (with means ranging from 3.16 to 4.00, except for anger, envy, and pride), and as having a moderate negative influence on study progress, with means ranging from 2.67 to 3.38, except for enjoyment, envy, hope, pride and relief which had a lower negative influence on study progress.

Within-person dynamics

The results of the dynamic structural equation model at the within-person level are presented in Fig. 5. The total explained variance (R^2) was 0.36 for self-control, 0.42 for reappraisal, and 0.36 for suppression, suggesting that self-control and these emotion regulation strategies are intertwined.

Significant autocorrelations were found for self-control, indicating stability, that is the degree of self-control was associated with self-control at the previous time point. Emotion regulation (both reappraisal and suppression) at the previous time point were not associated with respectively reappraisal and suppression at the next time point. Thus, although self-control and regulation had similar levels of variation within persons over time, only earlier self-control levels carried over, at least to some degree, to the next moment.

The model indicated a significant cross-lagged effect of suppression on self-control, but not vice versa, while controlling for the autocorrelations and scores at the previous time point. Higher suppression of emotions at one moment was thus associated with lower self-control at the next moment. There was no significant cross-lagged effect

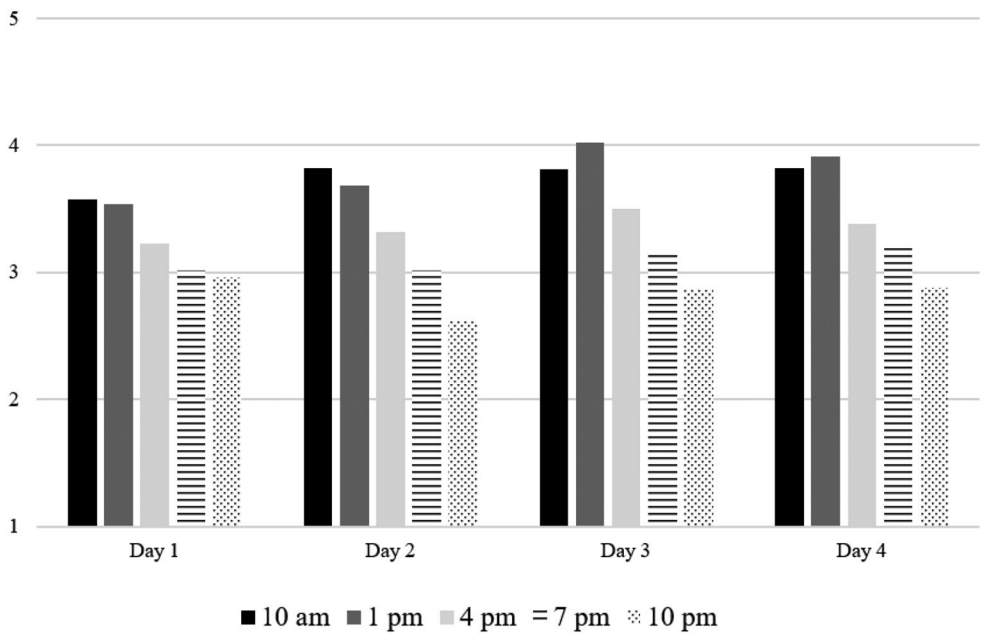

Fig. 4 Means of momentary self-control per day and time

Table 3 Emotions' prevalence, intensity and negative influence on study progress

		Prevalence		Intensity		Negative influence	
Emotion		*n*	%	*M*	*SD*	*M*	*SD*
1	Amsuement	227	23.0	3.96	1.52	3.05	1.97
2	Anger	6	0.6	4.67	0.82	2.67	2.34
3	Anxiety	78	7.9	3.37	1.15	2.85	1.42
4	Boredom	165	16.8	3.39	1.11	3.13	1.47
5	Confusion	25	2.5	3.16	1.11	3.08	1.15
6	Curiosity	25	2.5	3.84	1.31	2.68	1.84
7	Disappointment	24	2.4	3.75	1.19	3.38	1.71
8	Enjoyment	111	11.3	3.95	1.45	2.25	1.98
9	Envy	3	0.3	1.33	1.15	0.67	0.58
10	Fear	19	1.9	3.89	1.33	3.11	1.59
11	Frustration	102	10.4	3.68	1.15	3.30	1.62
12	Hope	12	1.2	3.92	1.00	1.42	1.83
13	Hopelessness	27	2.7	3.67	1.33	3.07	1.36
14	Pride	6	0.6	4.33	0.82	1.50	2.51
15	Relief	37	3.8	3.35	1.11	1.95	1.68
16	Sadness	53	5.4	3.87	1.16	3.08	1.57
17	Shame	5	0.5	4.00	1.22	3.00	1.41
18	Surprise	4	0.4	3.50	2.08	3.00	2.16
19	Uncertainty	56	5.7	3.32	1.29	2.86	1.43

Note. Percentages refer to the total number of times an emotion was selected during the study period

between reappraisal and later self-control, but self-control was positively associated with later reappraisal (see Fig. 5).

Random slopes: between person differences in momentary dynamics

To assess whether individuals differed in their associations between momentary self-control and the emotion regulation strategies reappraisal and suppression, we allowed for random slopes and residual variances at the between-person level. We explored whether stable between-person differences could explain variability in the moment-to-moment dynamics over time. There were only limited significant associations, thus differences in dynamics between persons could mostly not be explained by the variables in our model (see Supplementary file 1 for the full results). Higher mean levels of self-control or the emotion regulation strategies were, for example, not associated with differences between persons in momentary effects. That is, it was not the case that suppression had different associations (smaller

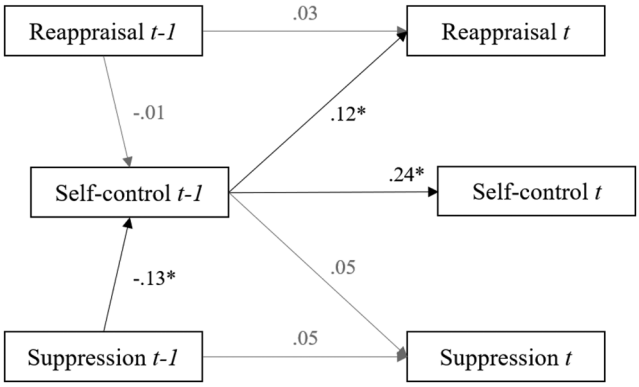

Fig. 5 Schematic overview of the autocorrelations and cross-lagged effects

or larger) with self-control for students with relatively high habituary levels of self-control. The few significant associations were as follows: participants with higher levels of self-control had less unexplained variance in self-control (β = −0.38), possibly because of a higher autocorrelation in self-control (β = −0.46). That is, participants with overall higher levels of self-control were more likely to continue relatively high levels of self-control over time. The cross-lagged effect from reappraisal to self-control was negatively associated with the cross-lagged effect from suppression to self-control (r=−.51), meaning that for participants who had a stronger association between reappraisal and self-control, the association between suppression and self-control was less strong. Participants' self-control thus tended to be affected by *either* reappraisal *or* suppression, and which one has a stronger influence differed between people. For the cross-lagged effects from self-control to reappraisal/suppression, the correlation between the random slopes was positive (r=.63), meaning that self-control was associated with both emotion regulation strategies in the same direction. Higher levels of self-control thus seem to result in using both more subsequent reappraisal and suppression. Finally, at the between-level, there was a positive correlation between reappraisal and suppression (r=.53) and between their variances (r=.49), meaning that individuals who tended to use reappraisal more also used suppression more often. In other words, some individuals reported to use both emotion regulation strategies on average more often than others.

To explore how sensitive the dynamics were to emotional valence and time of the day, we included both as dummy coded variables in the model (i.e., positive vs. negative, and day vs. night). The results showed that on occasions where positive emotions hindered studying, lower levels of emotion regulation, i.e., reappraisal (β = −0.47) and suppression (β = −0.39), were reported. During the evening/night, participants reported somewhat less use of suppression (β = −0.07) and less self-control (β = −0.27) as compared to during the day. There was no significant association with reappraisal.

Discussion

In the present study, we investigated the daily dynamics of self-control and the emotion regulation strategies reappraisal and suppression. Previous researchers addressing the between-person level concluded that emotion regulation is effortful and comes at the cost of successful self-control, with maladaptive forms of emotion regulation (such as suppression) taxing self-control to a higher extent (e.g., Baumeister et al., 1998; Evers et al., 2010; Inzlicht & Gutsell, 2007; Keng et al., 2017; Stiller et al., 2019; Wang & Yang, 2014). Vice versa, it has been found that self-control also affects subsequent emotion regulation (Alberts et al., 2021; Wenzel et al., 2021). It has remained unclear, however, how these phenomena are dynamically associated with each other over time at the within-person level. Also, thus far it has remained relatively unclear to what extent self-control is associated with the employment of antecedent- and response-focused emotion regulation strategies specifically. Based on a framework by Matthews et al. (2021), we viewed the process of emotion regulation as situationally dynamic, occurring in an immediate situation (with specific demands) surrounded by a broader social-cultural setting, and depending on interrelated affective, cognitive as well as motivational determinants. Within this focus, we investigated the within-person reciprocal relationships between momentary self-control and emotion regulation (i.e., reappraisal and suppression). We employed DSEM on diary data collected five times a day over four consecutive weekdays (N=1874 assessments), enabling a thorough inspection of the temporal dynamics between momentary self-control and the emotion regulation strategies reappraisal and suppression. The main findings demonstrate that self-control and reappraisal and suppression are reciprocally related and vary considerably within individuals over time. At the within-person level, momentary suppression was negatively associated with subsequent self-control. Self-control, in turn, was positively related to the employment of subsequent reappraisal.

The present results confirm the context-dependence of both self-control and the emotion regulation strategies reappraisal and suppression hence the importance of examining associations at the within-person level, because all constructs varied substantially within individuals over time. Only one third of the variability in self-control, reappraisal and suppression reflected stable between-person differences, whereas two thirds of the variability was due to variability within individuals over time (including measurement error). Thus, the use of self-control, reappraisal and

suppression seem to vary with situational and temporal factors (Aldao, 2013; Ridder et al., 2012; Gross, 2002), rather than being mainly determined by stable individual differences. Studying the within-person dynamics of momentary self-control and reappraisal and suppression will therefore add to the current body of knowledge that mainly addresses dispositional differences between individuals (e.g., Opelt & Schwinger, 2020; Paschke et al., 2016).

Further, the cross-lagged relationship between self-control and the emotion regulation strategies suppression and reappraisal differed. That is, suppression at a certain point in time was related to lower levels of self-control later on, while the employment of reappraisal did not have this disadvantageous effect. This in part confirms our hypothesis that employing emotion regulation strategies negatively relates to subsequent self-control, with suppression taxing self-control resources relatively more than reappraisal. In line with previous research, this may indicate that engaging in suppression comes at higher costs for self-control than employing reappraisal (Baumeister et al., 1998; Evers et al., 2010; Inzlicht & Gutsell, 2007; Keng et al., 2017; Stiller et al., 2019; Wang & Yang, 2014).

Additionally, our hypothesis that momentary self-control is positively associated with reappraisal and negatively with suppression was partly confirmed. While self-control indeed was positively associated with later reappraisal, no cross-lagged relationship was found between self-control and suppression. This indicates that, over time, self-control is more clearly and positively connected to later reappraisal than suppression. Suppression was to similar degrees likely to occur after either high or low self-control. Reappraisal is a highly cognitive emotion regulation strategy, including processes such as inhibiting prevalent appraisals, shifting one's attention away from the stimulus towards oneself, and maintaining the intention to detach (Dörfel et al., 2014; Staudinger et al., 2009), which may therefore be more clearly connected to self-control.

These findings provide evidence for the emotion regulation framework postulated by Matthew and colleagues (2021). This framework, indicating that individual, social-cultural, affective, cognitive and motivational determinants influence whether and how individual regulate their emotions, was based on a systematic review and meta-analysis of studies in the laboratory or that collected data online. By testing our hypotheses outside the lab, the framework is further confirmed under more ecologically valid circumstances, which is an innovative finding. Moreover, by taking a situationally dynamic view on the process of emotion regulation, and focusing on the within-person reciprocal relationships between momentary self-control and emotion regulation, the important role of cognitive determinants is further confirmed. Although it might be argued that self-control and emotion regulation are overlapping, related constructs (i.e., they both involve aspects of self-regulation), the present findings suggest that they encompass distinct constructs in terms of regulating response tendencies or emotional experiences. Besides being different on a conceptual level, this distinctiveness is also supported by our descriptive statistics, which show only small sized correlations between self-control and the emotion regulation strategies of reappraisal and suppression (both on within and between level).

These findings give novel insights for ways of improving goal performance or helping to prevent (emotional) distractions and desires that hinder goal achievement in specific situations. For example, studying can possibly be improved by promoting self-control or promoting adaptive emotion regulation (e.g., reappraisal), because reappraisal did not have a disadvantageous effect on subsequent self-control. In relation to emotion regulation, particularly suppression had a negative association with subsequent self-control. If self-control has to be maintained, the employment of suppression should be prevented. It might also be promising to promote a more automatic route towards emotion regulation, because automatic emotion regulation operates efficiently without the possible negative side effects of the more effortful emotion regulation strategy like suppression (e.g., Gallo et al., 2009; Sheeran et al., 2013). When an individual striving for a promotion wants to avoid becoming angry with one's manager that regularly bullies colleagues, for example, connecting one's emotion-regulation goals (e.g., "I will not get angry") to a response-focused implementation intention (e.g., "And if I see my manager bullying, then I will ignore it") can reduce arousal to achieve the emotion-regulation goal (Gallo et al., 2009). Stimulating such associations may help individuals to effectively regulate emotions that hinder goal pursuit.

In addition to these main findings, the dynamic structural equation model indicated some other noteworthy results. Only earlier self-control levels carried over at some degree to a next moment, whereas both emotion regulation strategies did not have these carry-over effects. This possibly indicates that the emotion regulation strategies reappraisal and suppression are more susceptible to situational influences, such as shifts in motivation or attention (Finley & Schmeichel, 2019) and differences between day- or nighttime (as indicated for suppression by the random slopes). Additionally, the employment of reappraisal and suppression were positively related (at both between- and within-persons level), which indicates that participants who more often employ one emotion regulation strategy also tend to use the other strategy more often. Investing in applying emotion regulation strategies in general might thus foster their (automatic) use across situations.

The current study was performed within an academic setting, focusing on emotions that hindered students' studying progress. Illustratively for this specific context, findings revealed that students experienced a variety of both positive and negative emotions that hindered their studying progress every day. This illustrates the importance of learning how one can effectively cope with such emotions to foster goal attainment. According to students themselves, in particular amusement, boredom, enjoyment, frustration and anxiety negatively impacted studying. This finding holds significant relevance as negative emotions, rather than positive ones, are often linked to adverse effects on performance (see these meta-analyses: Ergene, 2003; Seipp, 1991). Conversely, positive emotions are generally viewed as performance-enhancing (e.g., Pekrun, 2016). The current study, however, shows that positive emotions may hinder studying in approximately 40% of the time, suggesting a need to recognize the hindering role of positive emotions in educational settings (Fredrickson, 1998; Pekrun et al., 2002; Webster & Hadwin, 2015). It also highlights the importance for future research to consider the negative role of positive emotions in goal pursuit across various life domains.

This need for further research is also highlighted by more nuanced insights into emotion regulation: the random slope tests showed that when *positive emotions* hindered studying, individuals were more likely to report lower levels of reappraisal and suppression compared to situations involving negative emotions. This suggests that while students encountered positive emotions hindering their studying quite frequently, their employment of regulation strategies is notably lower for positive emotions than for negative ones. This discrepancy might indicate reduced motivation for and perceived importance of regulating these positive emotions. Especially when experiencing positive emotions, there may be pleasant social influences at play, such as receiving a funny message from a friend via social media or a roommate coming home who starts a chat. In such social situations, it may be that individuals change their momentary goals to temporarily enjoy the moment with its positive emotions. This suggests that even in a similar broader (studying) context, the immediate (social) situation may differ from time to time which stipulates varying demands and motivational determinants (e.g., immediate - versus long-term - goals and motives prevail). Such assumptions on the role of social situations on regulating positive (but also negative) emotions could be explored in future research, where (distractions in) the social context could be measured in depth and qualitatively.

Limitations and future directions

The current findings need to be considered in light of several limitations. Firstly, the parameters might be specific for the time-lag we focused on (i.e., approximately three hours). Findings might be different for other time intervals. Ideally, future studies could investigate even smaller intervals as emotions could substantially change within three hours, and it is therefore possible that different emotion regulation strategies are applied.

Additionally, although collecting repeated inputs of thoughts, feelings and behaviors close in time to the experience and in real-life contexts improves ecological validity, the sample was not representative for the general population, because mainly female university students participated. Albeit the DSEM model did include stable individual differences in the study variables (i.e., self-control, reappraisal and suppression), the current sample was not sufficient for testing the role of other individual determinants, while these are important in shaping the process of emotion regulation (see Fig. 1). For example, women employ reappraisal more often and suppression less often than men (Flynn et al., 2010; Nolen-Hoeksema, 2012). Additionally, educational level and other indicators of socio-economic status such as household income negatively relate to employing suppression (Wiltink et al., 2011). Relevant differences in dispositional affect and emotional intelligence may also influence emotion regulation ability (Mayer & Salovey, 1997). In addition, the reciprocal relationships between momentary self-control and the emotion regulation strategies reappraisal and suppression were assessed in the academic context, while this relationship could be different in other life domains, such as regarding one's health or social relationships. Thus, future work could test whether the current findings are context-specific, generalizable to other populations and life domains involving goal-directed behavior, as well as depended on other individual differences than the stable differences on the main variables examined in the current study.

Furthermore, albeit reappraisal and suppression are well-investigated emotion regulation strategies and prototypical reflections of the wider categories of adaptive antecedent-focused versus maladaptive response-focused emotion regulation, it may well be that other strategies are important for goal-directed behavior and these could be differently associated with momentary self-control. For instance, there is a wider range of emotion regulation strategies that differently impact goal attainment (e.g., Ackermans et al., 2023; Webb et al., 2018). Future research should help to clarify how other emotion regulation strategies that can be applied when experiencing hindering emotions relate to self-control in particular situations.

This study addressed the downregulation of emotions that hinder goal pursuit. However, as emotions can also stimulate goal pursuit and related behavior, people may benefit from strategies that help to increase or maintain desirable emotions in addition to strategies that help to decrease undesirable emotions (e.g., Giuliani et al., 2008; Harley et al., 2019; Livingstone et al., 2012). Therefore, future studies could elucidate situations in which the upregulation of emotions is likely or beneficial and whether this interrelates with momentary self-control among individuals over time.

Lastly, data was collected by means of a self-reported daily diary and involved a large number of systematic missing values. The latter was particularly for the measures of emotion regulation strategies, since these could not be assessed when no emotion was experienced as hindering study progress. Together these factors may have influenced the quality of our data (e.g., self-report bias; Podsakoff et al., 2024). To tackle this, scholars could try in future research to incorporate physiological measures as real-time monitoring of emotional arousal (e.g., heart rate, using digital watches; Donker et al., 2020) or emotion/self-regulation (e.g., heart rate variability). Nonetheless, the identification of specific, discrete emotions with such approaches remains a challenge (Kreibig, 2010).

Conclusion

In addressing the contextually-grounded temporal dynamics between self-control and the emotion regulation strategies reappraisal and suppression within individuals, the current study revealed that momentary suppression relates to subsequent lower levels of momentary self-control, and self-control, in turn, emerged as a correlate of the subsequent employment of reappraisal. These findings underscore the importance of self-control in regulating emotions that hinder goal pursuit. Notably, the relationship between self-control and the emotion regulation strategies reappraisal and suppression seems different at a within-person momentary level than at a between-person dispositional level. This discrepancy implies that the employment of self-regulatory attempts may be dependent on situational influences. Although this study addressed self-control and emotion regulation within the academic setting among higher education students, on a more general theoretical level this study importantly adds to the question how emotion regulation and self-control are intertwined on a within-person level. We suggest further exploration of this relationship across diverse populations and real-life settings, involving a variety of goal-directed behaviors and related emotions in future research. Such endeavors will not only enrich our theoretical understanding, but also pave the way for designing interventions aimed at helping individuals in effectively dealing with their emotional experiences and achieving reaching their long-term goals.

Acknowledgements Not applicable.

Author contributions All authors have substantially contributed to the study and the current article. LvdB, CE and MD conceptualized and designed the study. LvdB conducted data collection. MD, MT and LvdB planned and performed data analyses. All authors interpreted and discussed the findings. LvdB wrote the first draft of the manuscript. All other authors critically revised the manuscript. All authors approved the final manuscript.

Funding No grant was received from any funding agency for conducting this study, but credit is extended to the Center of Academic Teaching (CAT) at Utrecht University, particularly the last author's participation in CAT's Educational Training Program for University Teachers, which significantly contributed to the study's development.

Data availability The data and materials that support the findings of this study are available within the Open Science Framework, at https://osf.io/3fdzq/.

Declarations

Ethical approval All procedures performed in studies involving human participants were following the institutional research committee's ethical standards and the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Ethical approval was provided by the university's Faculty Ethics Review Board (20–574).

Informed consent Informed consent was obtained from all individual participants involved in the study. All authors consented to the submission of this manuscript.

Conflict of interest The authors report there are no competing interests to declare.

References

Ackermans, M., Jonker, N., & de Jong, P. (2023). Adaptive and maladaptive emotion regulation skills are associated with food intake following hunger-induced negative emotions. *Appetite*, *107148*. https://doi.org/10.1016/j.appet.2023.107148

Alberts, H. J., Schneider, F., & Martijn, C. (2021). Dealing efficiently with emotions: Acceptance-based coping with negative emotions

requires fewer resources than suppression. *Cognition & Emotion*, *26*(5), 863–870. https://doi.org/10.1080/02699931.2011.625402

Aldao, A. (2013). The future of emotion regulation research: Capturing context. *Perspectives on Psychological Science*, *8*(2), 155–172. https://doi.org/10.1177/1745691612459518

Asparouhov, T., Hamaker, E. L., & Muthén, B. (2018). Dynamic structural equation models. *Structural Equation Modeling: A Multidisciplinary Journal*, *25*(3), 359–388. https://doi.org/10.1080/10705511.2017.1406803

Balzarotti, S., John, O. P., & Gross, J. J. (2010). An Italian adaptation of the emotion regulation questionnaire. *Journal of Psychological Assessment*, *26*(1), 61–67. https://doi.org/10.1027/1015-5759/a000009

Baumeister, R. F., Bratslavsky, E., Muraven, M., & Tice, D. M. (1998). Ego depletion: Is the active self a limited resource? *Journal of Personality and Social Psychology*, *74*(5), 1252–1265. https://doi.org/10.1037/0022-3514.74.5.1252

Carver, C. S., & Scheier, M. F. (1998). *On the self-regulation of behavior*. Cambridge University Press. https://doi.org/10.1017/CBO9781139174794

Chester, D. S., Lynam, D. R., Milich, R., Powell, D. K., Andersen, A. H., & DeWall, C. N. (2016). How do negative emotions impair self-control? A neural model of negative urgency. *NeuroImage, 132*, 43–50. https://www.sciencedirect.com/science/article/abs/pii/S1053811916001312?via%3Dihub

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Routledge.https://doi.org/10.4324/9780203771587

Crescioni, A. W., Ehrlinger, J., Alquist, J. L., Conlon, K. E., Baumeister, R. F., Schatschneider, C., & Dutton, G. R. (2011). High trait self-control predicts positive health behaviors and success in weight loss. *Journal of Health Psychology*, *16*(5), 750–759. https://doi.org/10.1177/1359105310390247

De Ridder, D. T., Lensvelt-Mulders, G., Finkenauer, C., Stok, F. M., & Baumeister, R. F. (2012). Taking stock of self-control: A meta-analysis of how trait self-control relates to a wide range of behaviors. *Personality and Social Psychology Review*, *16*(1), 76–99. https://doi.org/10.1177/1088868311418749

Donker, M. H., van Gog, T., Goetz, T., Roos, A. L., & Mainhard, T. (2020). Associations between teachers' interpersonal behavior, physiological arousal, and lesson-focused emotions. *Contemporary Educational Psychology*, *63*, 101906. https://doi.org/10.1016/j.cedpsych.2020.101906

Dörfel, D., Lamke, J. P., Hummel, F., Wagner, U., Erk, S., & Walter, H. (2014). Common and differential neural networks of emotion regulation by detachment, reinterpretation, distraction, and expressive suppression: A comparative fMRI investigation. *Neuroimage*, *101*(1), 298–309. https://doi.org/10.1016/j.neuroimage.2014.06.051

Elkjær, E., Mikkelsen, M. B., & O'Toole, M. S. (2022). Emotion regulation patterns: Capturing variability and flexibility in emotion regulation in an experience sampling study. *Scandinavian Journal of Psychology*, *63*, 297–307. https://doi.org/10.1111/sjop.12808

Ergene, T. (2003). Effective interventions on test anxiety reduction: A meta-analysis. *School Psychology International*, *24*(3), 313–328. https://doi.org/10.1177/01430343030243004

Evers, C. (2018). Emotion regulation and self-control: Implications for health behaviors and wellbeing. In D. de Ridder, M. Adriaanse, & K. Fujita (Eds.), *The Routledge international handbook of self-control in health and well-being* (pp. 317–329). Routledge/Taylor & Francis Group. https://doi.org/10.4324/9781315648576-25

Evers, C., Stok, F. M., & De Ridder, D. T. D. (2010). Feeding your feelings: Emotion regulation strategies and emotional eating. *Personality and Social Psychology Bulletin*, *36*(6), 792–804. https://doi.org/10.1177/0146167210371383

Finkel, E. J., & Campbell, W. K. (2001). Self-control and accommodation in close relationships: An interdependence analysis. *Journal of Personality and Social Psychology*, *81*(2), 263–277. https://doi.org/10.1037/0022-3514.81.2.263

Finley, A. J., & Schmeichel, B. J. (2019). Aftereffects of self-control on positive emotional reactivity. *Personality and Social Psychology Bulletin*, *45*(7), 1011–1027. https://doi.org/10.1177/0146167218802836

Flynn, J. J., Hollenstein, T., & Mackey, A. (2010). The effect of suppressing and not accepting emotions on depressive symptoms: Is suppression different for men and women? *Personality and Individual Differences*, *49*(6), 582–586. https://doi.org/10.1016/j.paid.2010.05.022

Fredrickson, B. L. (1998). What good are positive emotions? *Review of General Psychology*, *2*(3), 300–319. https://doi.org/10.1037/1089-2680.2.3.300

Gallo, I. S., Keil, A., McCulloch, K. C., Rockstroh, B., & Gollwitzer, P. M. (2009). Strategic automation of emotion regulation. *Journal of Personality and Social Psychology*, *96*(1), 11–31. https://doi.org/10.1037/a0013460

Giuliani, N. R., McRae, K., & Gross, J. J. (2008). The up-and down-regulation of amusement: Experiential, behavioral, and autonomic consequences. *Emotion*, *8*(5), 714–719. https://doi.org/10.1037/a0013236

Gross, J. J. (1998a). Antecedent- and response-focused emotion regulation: Divergent consequences for experience, expression, and physiology. *Journal of Personality and Social Psychology*, *74*(1), 224–237. https://doi.org/10.1037/0022-3514.74.1.224

Gross, J. J. (1998b). The emerging field of emotion regulation: An integrative review. *Review of General Psychology*, *2*(3), 271–299. https://doi.org/10.1037/1089-2680.2.3.271

Gross, J. J. (1999). Emotion regulation: Past, present, future. *Cognition and Emotion*, *13*(5), 551–573. https://doi.org/10.1080/026999399379186

Gross, J. J. (2002). Emotion regulation: Affective, cognitive, and social consequences. *Psychophysiology*, *39*(3), 281–291. https://doi.org/10.1017/S0048577201393198

Gross, J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology*, *85*(2), 348–362. https://doi.org/10.1037/0022-3514.85.2.348

Gross, J. J., & Thompson, R. A. (2007). Emotion Regulation: Conceptual Foundations. In J. J. Gross (Ed.), *Handbook of emotion regulation* (2nd ed., pp. 3–24). Guilford. https://doi.org/10.1080/00140130600971135

Harley, J. M., Pekrun, R., Taxer, J. L., & Gross, J. J. (2019). Emotion regulation in achievement situations: An integrated model. *Educational Psychologist*, *54*(2), 106–126. https://doi.org/10.1080/00461520.2019.1587297

Hennecke, M., & Freund, A. M. (2016). Age, action orientation, and self-regulation during the pursuit of a dieting goal. *Applied Psychology: Health and Well-Being*, *8*(1), 19–43. https://doi.org/10.1111/aphw.12060

Inzlicht, M., & Gutsell, J. N. (2007). Running on empty: Neural signals for self-control failure. *Psychological Science*, *18*(11), 933–937.https://doi.org/10.1111/j.1467-9280.2007.02004.x

Jin-Kyoung, P., Jung-Im, K., & Do-Young, L. (2014). Stress response according to the ob stress of call center workers: Focused on the mediating effects of cognitive emotional regulation strategies. *International Journal of Applied Engineering Research*, *9*(22), 15081–15092.

John, O. P., & Gross, J. J. (2004). Healthy and unhealthy emotion regulation: Personality processes, individual differences, and life span development. *Journal of Personality*, *72*(6), 1301–1334. https://doi.org/10.1111/j.1467-6494.2004.00298.x

Johnson, R. E., Lanaj, K., & Barnes, C. M. (2014). The good and bad of being fair: Effects of procedural and interpersonal justice

behaviors on regulatory resources. *Journal of Applied Psychology*, *99*(4), 635–650. https://doi.org/10.1037/a0035647

Kashdan, T. B., & Rottenberg, J. (2010). Psychological flexibility as a fundamental aspect of health. *Clinical Psychology Review*, *30*(7), 865–878. https://doi.org/10.1016/j.cpr.2010.03.001

Keng, S. L., Tan, E. L. Y., Eisenlohr-Moul, T. A., & Smoski, M. J. (2017). Effects of mindfulness, reappraisal, and suppression on sad mood and cognitive resources. *Behaviour Research and Therapy*, *91*(1), 33–42. https://doi.org/10.1016/j.brat.2017.01.006

Kreibig, S. D. (2010). Autonomic nervous system activity in emotion: A review. *Biological Psychology*, *84*(3), 394–421. https://doi.org/10.1016/j.biopsycho.2010.03.010

Livingstone, K. M., & Srivastava, S. (2012). Up-regulating positive emotions in everyday life: Strategies, individual differences, and associations with positive emotion and well-being. *Journal of Research in Personality*, *46*(5), 504–516. https://doi.org/10.1016/j.jrp.2012.05.009

Matthews, M., Webb, T. L., Shafir, R., Snow, M., & Sheppes, G. (2021). Identifying the determinants of emotion regulation choice: A systematic review with meta-analysis. *Cognition and Emotion*, *35*(6), 1056–1084. https://doi.org/10.1080/02699931.2021.1945538

Mayer, J. D., & Salovey, P. (1997). What is emotional intelligence? In P. Salovey, & D. J. Sluyter (Eds.), *Emotional development and Emotional Intelligence: Educational implications* (pp. 3–31). Basic Books.

Moeller, S. K., Troop-Gordon, W., & Robinson, M. D. (2015). When the going gets tough, the differentiated keep going: Cybernetic self-determination, daily obstacles, and persistent goal pursuit. *The Journal of Psychology*, *149*(5), 427–442. https://doi.org/10.1080/00223980.2013.837022

Muis, K. R., Chevrier, M., & Singh, C. A. (2018). The role of epistemic emotions in personal epistemology and self-regulated learning. *Educational Psychologist*, *53*(3), 165–184. https://doi.org/10.1080/00461520.2017.1421465

Muraven, M., & Baumeister, R. F. (2000). Self-regulation and depletion of limited resources: Does self-control resemble a muscle? *Psychological Bulletin*, *126*(2), 247–259. https://doi.org/10.1037/0033-2909.126.2.247

Muthén, L. K., & Muthén, B. O. (1998–2017). *Mplus User's Guide* (8th ed.). CA: Muthén & Muthén.

Nelissen, R. M., Dijker, A. J., & de Vries, N. K. (2007). Emotions and goals: Assessing relations between values and emotions. *Cognition and Emotion*, *21*(4), 902–911. https://doi.org/10.1080/02699930600861330

Nett, U. E., Goetz, T., & Hall, N. C. (2011). Coping with boredom in school: An experience sampling perspective. *Contemporary Educational Psychology*, *36*(1), 49–59. https://doi.org/10.1016/j.cedpsych.2010.10.003

Nolen-Hoeksema, S. (2012). Emotion regulation and psychopathology: The role of gender. *Annual Review of Clinical Psychology*, *8*(1), 161–187. https://doi.org/10.1146/annurev-clinpsy-032511-143109

Ochsner, K. N., Bunge, S., Gross, J. J., & Gabrieli, J. D. E. (2002). Rethinking feelings: An FMRI study of the cognitive regulation of emotion. *Journal of Cognitive Neuroscience*, *14*(8), 1215–1229. https://doi.org/10.1162/089892902760807212

Opelt, F., & Schwinger, M. (2020). Relationships between narrow personality traits and self-regulated learning strategies: Exploring the role of mindfulness, contingent self-esteem, and self-control. *AERA Open*, *6*(1), 1–15. https://doi.org/10.1177/2332858420949499

Paschke, L. M., Dörfel, D., Steimke, R., Trempler, I., Magrabi, A., Ludwig, V. U., Schubert, T., Stelzel, C., & Walter, H. (2016). Individual differences in self-reported self-control predict successful emotion regulation. *Social Cognitive and Affective Neuroscience*, *11*(8), 1193–1204. https://doi.org/10.1093/scan/nsw036

Pekrun, R. (2016). Academic emotions. In K. R. Wentzel, & D. B. Miele (Eds.), *Handbook of motivation at School* (2nd ed., pp. 120–144). Routledge.

Pekrun, R., Goetz, T., Titz, W., & Perry, R. P. (2002). Academic emotions in students' self-regulated learning and achievement: A program of qualitative and quantitative research. *Educational Psychologist*, *37*(2), 91–105. https://doi.org/10.1207/S15326985EP3702_4

Pekrun, R., Goetz, T., Frenzel, A. C., Barchfeld, P., & Perry, R. P. (2011). Measuring emotions in students' learning and performance: The achievement emotions Questionnaire (AEQ). *Contemporary Educational Psychology*, *36*(1), 36–48. https://doi.org/10.1016/j.cedpsych.2010.10.002

Podsakoff, P. M., Podsakoff, N. P., Williams, L. J., Huang, C., & Yang, J. (2024). Common method bias: It's bad, it's complex, it's widespread, and it's not easy to fix. *Annual Review of Organizational Psychology and Organizational Behavior*, *11*(1), 17–61. https://doi.org/10.1146/annurev-orgpsych-110721-040030

Richards, J. M., & Gross, J. J. (2000). Emotion regulation and memory: The cognitive costs of keeping one's cool. *Journal of Personality and Social Psychology*, *79*(3), 410–424. https://doi.org/10.1037/0022-3514.79.3.410

Robinson, M. D., & Clore, G. L. (2002). Belief and feeling: Evidence for an accessibility model of emotional self-report. *Psychological Bulletin*, *128*(6), 934–960. https://doi.org/10.1037/0033-2909.128.6.934

Seipp, B. (1991). Anxiety and academic performance: A meta-analysis of findings. *Anxiety Research*, *4*(1), 27–41. https://doi.org/10.1080/08917779108248762

Sheeran, P., Gollwitzer, P. M., & Bargh, J. A. (2013). Nonconscious processes and health. *Health Psychology*, *32*(5), 460–473. https://doi.org/10.1037/a0029203

Sheppes, G., & Gross, J. J. (2011). Is timing everything? Temporal considerations in emotion regulation. *Personality and Social Psychology Review*, *15*(4), 319–331. https://doi.org/10.1177/1088868310395778

Silva, E., Freire, T., & Faria, S. (2018). The emotion regulation strategies of adolescents and their parents: An experience sampling study. *Journal of Child and Family Studies*, *27*(6), 1774–1785. https://doi.org/10.1007/s10826-018-1015-6

Sorić, I., Penezić, Z., & Burić, I. (2013). Big five personality traits, cognitive appraisals and emotion regulation strategies as predictors of achievement emotions. *Psihologijske Teme*, *22*(2), 325–349. https://hrcak.srce.hr/108516

Srivastava, S., Tamir, M., McGonigal, K. M., John, O. P., & Gross, J. J. (2009). The social costs of emotional suppression: A prospective study of the transition to college. *Journal of Personality and Social Psychology*, *96*(4), 883–897. https://doi.org/10.1037/a0014755

Staudinger, M. R., Erk, S., Abler, B., & Walter, H. (2009). Cognitive reappraisal modulates expected value and prediction error encoding in the ventral striatum. *Neuroimage*, *47*(2), 713–721. https://doi.org/10.1016/j.neuroimage.2009.04.095

Stiller, A. K., Kattner, M. F., Gunzenhauser, C., & Schmitz, B. (2019). The effect of positive reappraisal on the availability of self-control resources and self-regulated learning. *Journal of Educational Psychology*, *39*(1), 86–111. https://doi.org/10.1080/01443410.2018.1524851

Tamir, M. (2009). What do people want to feel and why? Pleasure and utility in emotion regulation. *Current Directions in Psychological Science*, *18*, 101–105. https://doi.org/10.1111/j.1467-8721.2009.01617.x

Tangney, J. P., Baumeister, R. F., & Boone, A. L. (2004). High self-control predicts good adjustment, less pathology, better grades,

and interpersonal success. *Journal of Personality*, *72*(2), 271–324. https://doi.org/10.1111/j.0022-3506.2004.00263.x

Thompson, R. A. (2011). Emotion and emotion regulation: Two sides of the developing coin. *Emotion Review*, *3*(1), 53–61. https://doi.org/10.1177/1754073910380969

Tice, D. M., & Bratslavsky, E. (2000). Giving in to feel good: The place of emotion regulation in the context of general self-control. *Psychological Inquiry*, *11*(3), 149–159. https://doi.org/10.1207/S15327965PLI1103_03

Trougakos, J. P., Chawla, N., & McCarthy, J. M. (2020). Working in a pandemic: Exploring the impact of COVID-19 health anxiety on work, family, and health outcomes. *Journal of Applied Psychology*, *105*(11), 1234–1245. https://doi.org/10.1037/apl0000739

Wang, Y., & Yang, L. (2014). Suppression (but not reappraisal) impairs subsequent error detection: An ERP study of emotion regulation's resource-depleting effect. *PloS One*, *9*(4), e96339. https://doi.org/10.1371/journal.pone.0096339

Webb, T. L., Lindquist, K. A., Jones, K., Avishai, A., & Sheeran, P. (2018). Situation selection is a particularly effective emotion regulation strategy for people who need help regulating their emotions. *Cognition and Emotion*, *32*(2), 231–248. https://doi.org/10.1080/02699931.2017.1295922

Webster, E. A., & Hadwin, A. F. (2015). Emotions and emotion regulation in undergraduate studying: Examining students' reports from a self-regulated learning perspective. *Journal of Educational Psychology*, *35*(1), 794–818. https://doi.org/10.1080/01443410.2014.895292

Wenzel, M., Rowland, Z., & Kubiak, T. (2021). Examining five pathways on how self-control is associated with emotion regulation and affective well-being in daily life. *Journal of Personality*, *89*(3), 451–467. https://doi.org/10.1111/jopy.12590

Wilkowski, B. M., & Ferguson, E. L. (2016). The steps that can take us miles: Examining the short-term dynamics of long-term daily goal pursuit. *Journal of Experimental Psychology: General*, *145*(4), 516–529. https://doi.org/10.1037/xge0000150

Wiltink, J., Glaesmer, H., Canterino, M., Wölfling, K., Knebel, A., Kessler, H., & Beutel, M. E. (2011). Regulation of emotions in the community: Suppression and reappraisal strategies and its psychometric properties. *GMS Psycho-Social-Medicine*, *8*, 1–12.https://doi.org/10.3205/psm000078