Can Daily Emotion Regulation Predict Changes in Depressive Symptoms over the Seasons? An Ambulatory Assessment Study

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Background

One of the core symptoms of depression, which affects over 300 million individuals worldwide [1], is dysregulated affect characterised by deficits in emotion processing and regulation. Depressed patients tend to ruminate more than healthy controls [2] while using reappraisal less frequently [3]. However, longitudinal studies remain scarce and the causality between emotion dysregulation and depressive symptoms, i.e. whether emotion regulation is a predictor of depressive symptoms, is still elusive.

Depressive symptoms appear to change over time, with a reported peak in severity in winter [4]. We use these occurring fluctuations in depressive symptomatology to investigate whether the use of rumination and reappraisal to regulate negative affect in summer could predict depressive symptoms in winter. The overall aim was to examine the causal relationship between emotion regulation and depressive symptoms, that is, whether the extent of use of rumination and reappraisal in summer could predict depressive symptoms in winter.

Methods

A German-speaking community sample (N = 136) with a mean age of 27.2 (SD = 5.77; age range = 18 − 44; 73.5% female) took part in this longitudinal online study. The current analyses includes two (summer T1 and winter T3) of the study's six assessments that overall spanned 12 months (see Figure 1).

Depressive symptoms were assessed with the German version of the Beck Depression Inventory-II [5], and the extent of reappraisal and rumination use were investigated for a week with ecological momentary assessment (EMA) using a smartphone app (*EmoTrack2*) developed by our research team (see Figure 2). Participants indicated the valence (using a 11-point Likert scale from 0 = "unwell" to 10 = "well") and type of the strongest emotion they had experienced (e.g. joy, anger) since the last assessment and the extent of reappraisal ("I have thought differently about the situation") and rumination use ("I have dwelled on the situation"). The extent of use for each emotion regulation strategy use was indicated with a sliding scale (0 = "not at all" to 10 = "very much"). EMA data from participants with a minimum of 10 EMA entries per assessment week was filtered to only include emotions of negative valence (valence <5). All suitable entries were averaged per participant per assessment.

We performed paired-sample t-tests (two-tailed) to examine the a) differences in depressive symptoms and extent of rumination and reappraisal use between summer T1 and winter T3, and b) two separate hierarchical linear regressions to investigate whether the extent of rumination and reappraisal use at summer T1 could predict depressive symptoms at winter T3. For the regression model, depressive symptoms at T1 were included in the first step to control for depressive symptoms in summer and in the second step, rumination or reappraisal at T1 was included.
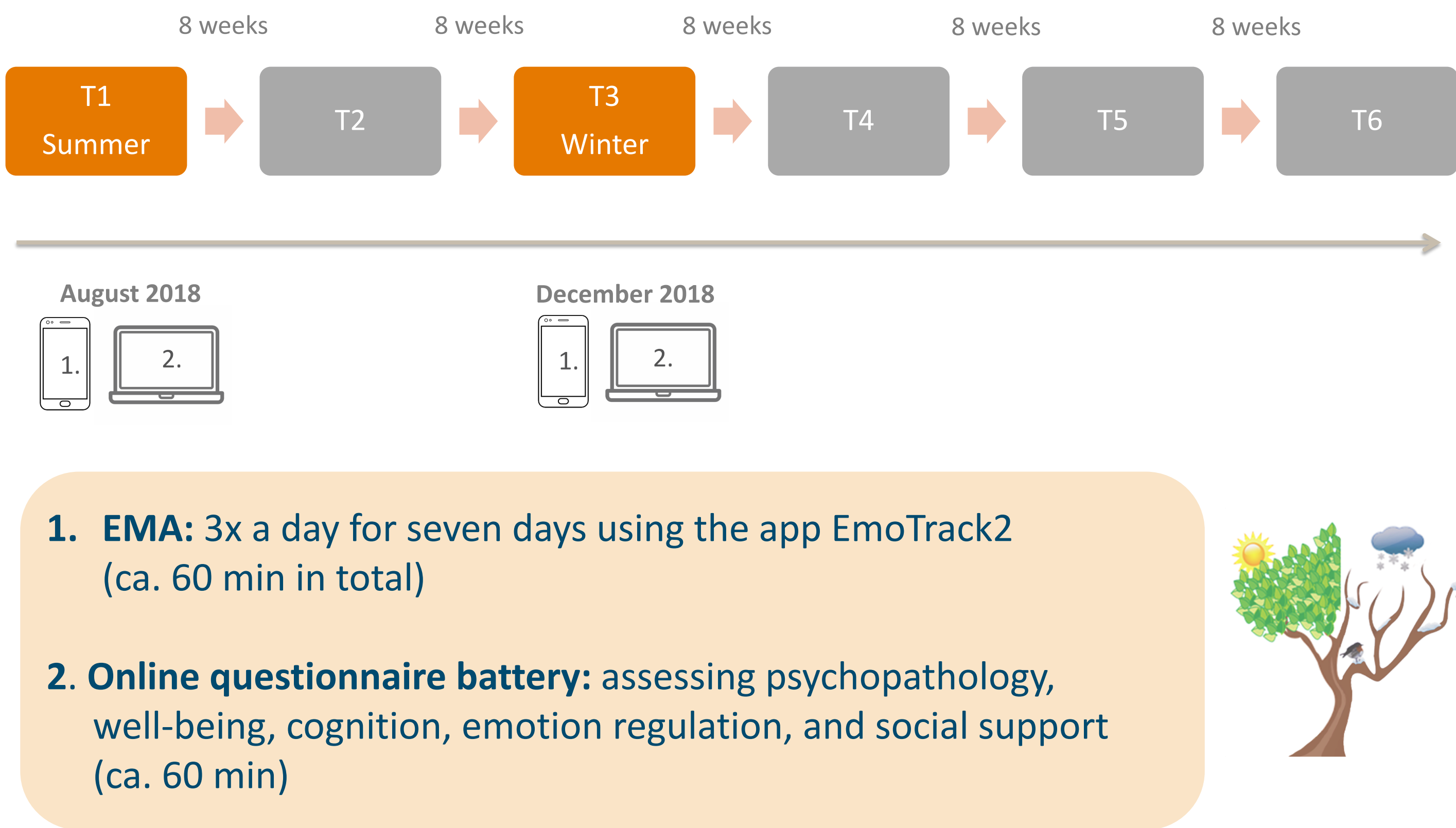
Study Overview

Figure 1. Overview of our multimethod longitudinal study that was conducted from August 2018 to August 2019 (summer T1 and winter T3 assessments used for this investigation in orange).
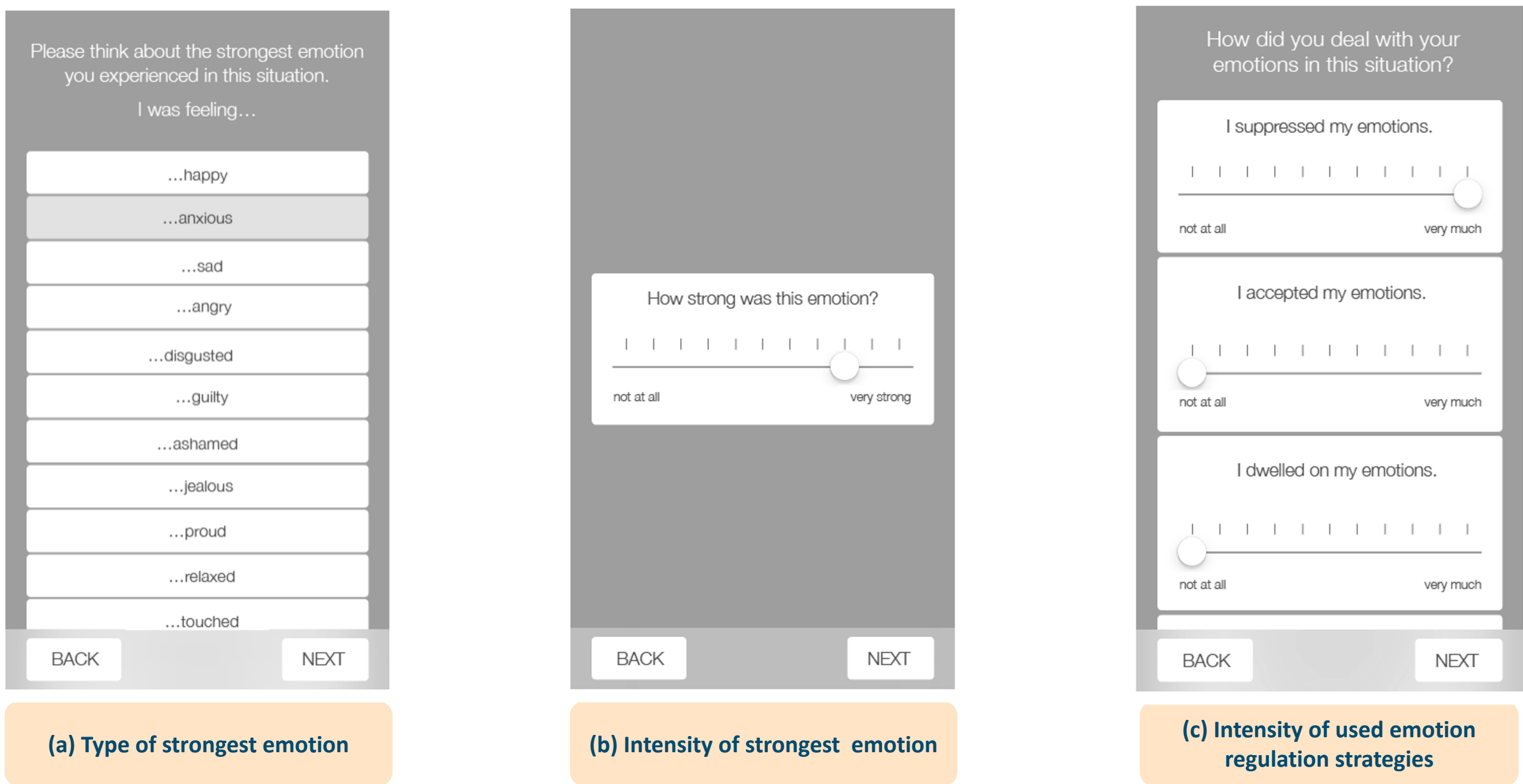
1. **EMA:** 3x a day for seven days using the app EmoTrack2 (ca. 60 min in total)

2. **Online questionnaire battery:** assessing psychopathology, well-being, cognition, emotion regulation, and social support (ca. 60 min)

Figure 2. Screenshot of the smartphone app *EmoTrack2* used for the EMA. Participants reported the strongest emotion they experienced since the last assessment (a) & (b) and indicated the intensity of use for a range of emotion regulation strategies such as rumination or reappraisal (c).

Results

In the investigated sample (N = 136), there was an increase in depressive symptoms, t(135) = -2.37, p = .02 from summer T1 to winter T3. No notable changes between summer T1 and summer T3 were observed for the extent of rumination and reappraisal use after experiencing negative emotions (see Table 1).

Descriptive Statistics and t Test Results for Study Variables

measurements	Mean (SD)		t - statistic	p - value
	summer T1	winter T3		
depressive symptoms (BDI-II)	8.16 (8.20)	9.79 (9.44)	-2.37	.02
rumination (EMA)	3.60 (1.81)	3.74 (2.17)	-.81	.42
reappraisal (EMA)	2.02 (1.64)	1.97 (1.64)	.34	.74

Table 1. Higher BDI-II scores indicate higher depressive symptomatology; higher numbers on the rumination and reappraisal measures indicate a greater extent of use of these emotion regulation strategies (scale ranging from 0 to 10). Standard deviations shown in parentheses. N = 136.

Preliminary hierarchical linear regression analyses (see Figure 3) showed that the extent of rumination used to regulate negative emotions at summer T1 significantly predicted depressive symptoms at winter T3 when controlling for depressive symptoms at summer T1 (β = .17, p = .02). A similar trend was observed for reappraisal (β = .16, p = .02). Rumination and reappraisal at summer T1 each explained 2.5% in variance in depressive symptoms at winter T3.

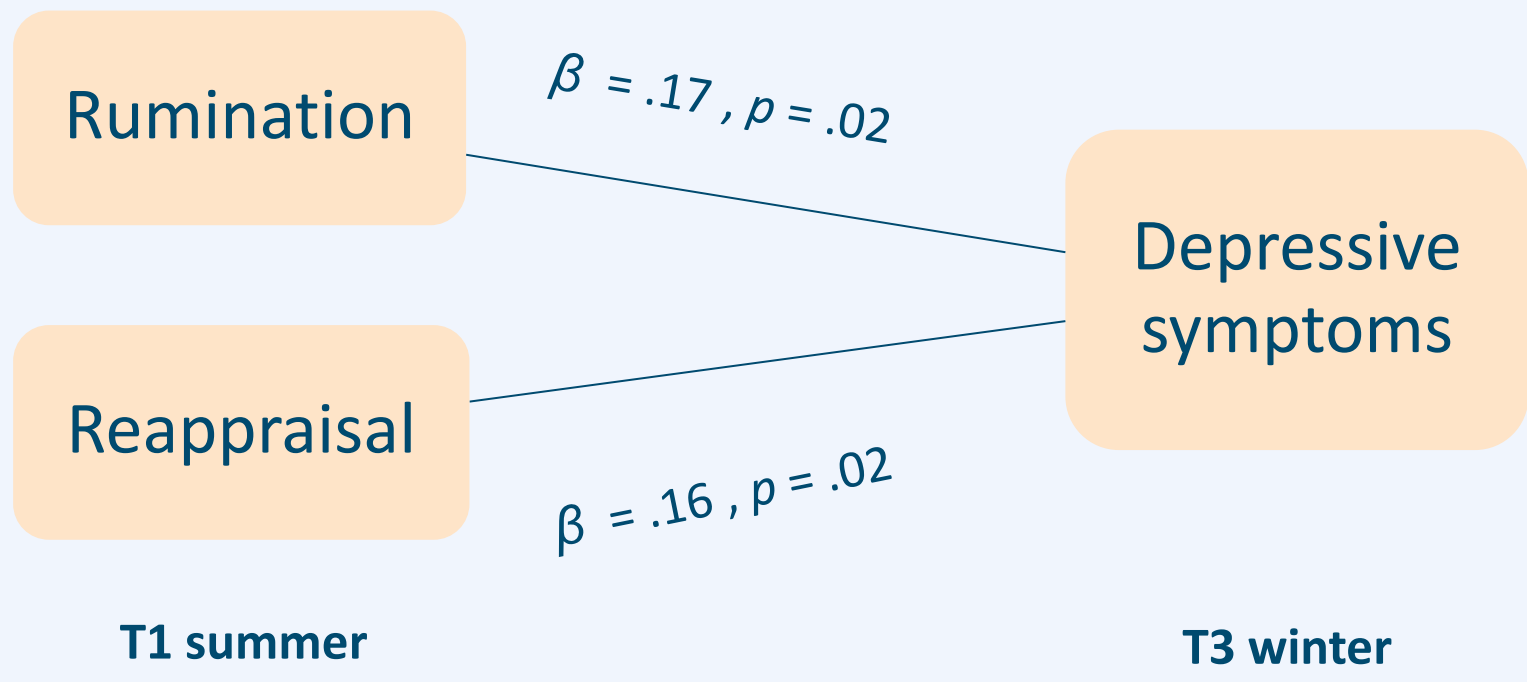**Rumination and Reappraisal as Predictors of Depressive Symptoms**

Figure 3. Linear regression results of rumination and reappraisal extent at summer T1 predicting depressive symptoms at winter T3.

Discussion

A higher extent of rumination and reappraisal after experiencing negative emotions at summer T1 predicted an increase in depressive symptoms at T3 winter. Our results support previous findings on the role of rumination in depression [6]. In contrast to most studies [7], reappraisal was positively associated with depressive symptoms and used to a lesser extent after experiencing negative emotions. This could be attributed to the phrasing used in our assessment, which is different compared to other studies. Some research suggests that the adaptivity of reappraisal could depend on contextual factors such as controllability (where reappraisal of controllable stressful situations was linked to decreased psychological well-being [8]). Overall, our findings highlight the relevance of emotion regulation in understanding how depressive symptoms might develop or change over time.

References
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