Supplementary Information

State Self-Compassion Dynamics: Evidence for the Bipolar Continuum Hypothesis

Study 1

Descriptive Statistics

Baseline Measures

To exclude the possibility of emotional disorders or psychological conditions, we administered a series of validated psychological assessment questionnaires.

Depression Anxiety Stress Scale-21 (DASS-21). The DASS-21 (Lovibond & Lovibond, 1995) is a 21-item self-report questionnaire to assess depression (*i.e.*, "I felt down-hearted and blue"), anxiety (*i.e.*, "I felt I was close to panic") and stress (*i.e.*, "I found it difficult to relax") symptoms, over the past week. Items are rated on a 4-point Likert scale ranging from 0 ("It never happened to me") to 3 ("It happened to me almost always"). Both the original and its Italian version (Bottesi et al., 2015) demonstrate adequate reliability.

Rosenberg Self - Esteem Scale (RSES). The RSES (Rosenberg, 1965) assesses individual self-esteem levels through a 10-item scale (*e.g.,* "I feel that I'm a person of worth, at least on an equal basis with others"). Respondents rate each statement on a 4-point Likert scale, ranging from 4 (Strongly Agree) to 1 (Strongly Disagree). Higher total scores indicate higher self-esteem.

Self-Compassion Scale (SCS). The SCS (Neff, 2003), is a self-report questionnaire comprising 26 items designed to assess individuals' enduring Self-Compassion traits in their daily lives. The SCS encompasses six subscales: Self-Kindness, Common Humanity, Mindfulness, Self-Judgment, Isolation, and Over-Identification. Respondents were instructed to rate the frequency of their Self-Compassionate attitudes using a 5-point scale, ranging from 1 ("almost never") to 5 ("almost always"). To ensure consistency in scoring, negative items were reverse coded, with higher scores indicating a greater absence of negative Self-Compassion traits. The psychometric properties of the SCS have been found to be robust. For the total score, the Cronbach's alpha coefficient was reported as 0.96 in the original work by Neff (2003). Additionally, the test-retest reliability demonstrated adequate results, with a correlation coefficient (r) of 0.93 for the total score and ranging from 0.80 to 0.88 for the subscales.

Difficulties in Emotion Regulation Scale (DERS). The DERS is a 36-item self-report measure developed to assess the complexities in emotion regulation processes among individuals (Gratz & Roemer, 2004). This scale is divided into six subscales, each targeting a specific dimension of emotion regulation difficulties: Nonacceptance of Emotional Responses (NER), Difficulties Engaging in Goal-Directed Behavior (DEGB), Impulse Control Difficulties (ICD), Lack of Emotional Awareness (LEA), Limited Access to Emotion Regulation Strategies (LAERS), and Lack of Emotional Clarity (LEC). Respondents are asked to rate each item on a 5-point Likert scale that ranges from 0 ("Never") to 4 ("Always"), reflecting the frequency with which they experience each emotion regulation difficulty. The higher the score, the greater the difficulties in emotion regulation an individual is likely to have. Both the original version and its Italian adaptation (Sighinolfi et al., 2010), have demonstrated strong psychometric properties, including adequate reliability and validity.

The following table presents the descriptive statistics for all the aforementioned measures. It includes the estimated posterior mean (Estimate), Standard Error, and the 95% credibility interval, computed using a Bayesian model. Bayesian modeling was employed to account for deviations from Gaussianity.

Variable	Estimate	Std. Error	95% CI Lower	95% CI Upper
$DASS-21_{Stress}$	7.58	0.45	6.92	8.14
$DASS-21_{Anxiety}$	1.04	0.19	0.89	1.93
$DASS-21_{Depression}$	2.97	0.29	2.02	3.63
$RSES$	28.05	0.26	27.53	28.55
$SCS_{total-score}$	17.45	0.21	17.05	17.87
$SCS_{Self-Kindness}$	2.98	0.04	2.89	3.06
$SCS_{Common-Humanity}$	3.11	0.04	3.02	3.20
$SCS_{Mindfulness}$	3.11	0.04	3.03	3.20
$SCS_{Self-Judgment}$	2.74	0.04	2.65	2.82
$SCS_{Isolation}$	2.74	0.05	2.65	2.84
$SCS_{Over-Identification}$	2.78	0.05	2.68	2.88
$DERS_{totalscore}$	67.89	2.07	63.79	71.64
$DERS_{NER}$	6.23	0.43	5.95	7.02
$DERS_{DEGB}$	13.41	0.78	12.46	15.78
$DERS_{ICD}$	4.99	0.02	4.95	5.00
$DERS_{LEA}$	11.52	0.82	9.91	12.98
$DERS_{LAERS}$	13.01	0.67	11.52	14.11
$DERS_{LEC}$	9.91	0.65	8.36	11.14

There is no evidence of emotional disorders among participants. The obtained scores are consistent with those reported in other studies using the same measures within community samples (Bottesi et al., 2015; Neff et al., 2017; Sica et al., 2021; Sighinolfi et al., 2010).

EMA Survey Questions

1. Think about the most notable event that has occurred since you last received a notification. If this is your first notification of the day, consider the most significant event from the start of the day. How would you evaluate this event?

   1) Very unpleasant
   2) Unpleasant
   3) Neither unpleasant nor pleasant
   4) Pleasant

    5) Very pleasant

2. At this moment I feel NERVOUS.

    1) Not at all
    2) A little
    3) Moderately
    4) Quite a bit
    5) Very much

3. At this moment I feel UPSET.

    1) Not at all
    2) A little
    3) Moderately
    4) Quite a bit
    5) Very much

4. At this moment I feel SATISFIED.

    1) Not at all
    2) A little
    3) Moderately
    4) Quite a bit
    5) Very much

5. At this moment I feel CHEERFUL.

    1) Not at all
    2) A little
    3) Moderately
    4) Quite a bit
    5) Very much

6. I'm giving myself the caring and tenderness I need.

    1) Completely false
    2) Moderately false
    3) Slightly false
    4) Slightly true
    5) Moderately true
    6) Completely true

7. I'm obsessing and fixating on everything that's wrong.

    1) Completely false
    2) Moderately false
    3) Slightly false

4) Slightly true
5) Moderately true
6) Completely true

8. I'm remembering that there are lots of others in the world feeling like I am.

   1) Completely false
   2) Moderately false
   3) Slightly false
   4) Slightly true
   5) Moderately true
   6) Completely true

9. I feel like I'm struggling more than others right now.

   1) Completely false
   2) Moderately false
   3) Slightly false
   4) Slightly true
   5) Moderately true
   6) Completely true

10. I feel intolerant and impatient toward myself.

    1) Completely false
    2) Moderately false
    3) Slightly false
    4) Slightly true
    5) Moderately true
    6) Completely true

11. I'm keeping things in perspective.

    1) Completely false
    2) Moderately false
    3) Slightly false
    4) Slightly true
    5) Moderately true
    6) Completely true

12. At this moment I am able to accept my flaws and weaknesses.

    1) Completely false
    2) Moderately false
    3) Slightly false
    4) Slightly true
    5) Moderately true

6) Completely true

13. At this moment I let myself be carried away by my emotions.

    1) Completely false
    2) Moderately false
    3) Slightly false
    4) Slightly true
    5) Moderately true
    6) Completely true

Model Convergence Diagnostics

To ensure that the model parameters accurately reflected participants' behavior in our task, we conducted posterior predictive checks, which were adequate for all examined models.

To confirm satisfactory convergence of the Markov chain Monte Carlo (MCMC) procedure for parameter estimation, we employed the convergence statistic $\hat{R}$ and monitored the number of divergent transitions during sampling. We verified that all population-level parameters had $\hat{R} < 1.01$. Additionally, posterior sampling of the models did not result in any divergent transitions.

Multilevel Correlations between CS and UCS components of State Self-Compassion

We conducted a multilevel analysis to compute the correlation between the CS and the UCS components of state self-compassion, and each of the six subscales of the Self-Compassion Scale (Neff, 2003).

These correlations are an average effect across participants, adjusted for the random intercepts attributable to individual differences among participants in our hierarchical model. For both components of state self-compassion, the correlation with the State Self-Compassion scale were modest. For CS, the largest multilevel correlation was with self-kindness, r = 0.24, 89% CI[0.15, 0.32]; for UCS, the largest multilevel correlation was with isolation, r = 0.21, 89% CI[0.10, 0.31].

CS Component of SSC

```
fit_cs <- brm(
  state_cs ~ self_kindness + common_humanity + mindfulness +
    self_judgment + isolation + over_identification +
    (1 | user_id),
  data = d,
  family = student(),
  backend = "cmdstanr",
  iter = 10000,
  chains = 4
)
```

Variable	Estimate	Std. Error	89% CI Lower	89% CI Upper
Intercept	0.06	0.04	0.00	0.12
Self-Kindness	0.23	0.06	0.13	0.32
Common Humanity	0.18	0.05	0.10	0.26
Mindfulness	0.06	0.05	-0.03	0.14
Self-Judgment	-0.04	0.05	-0.13	0.04
Isolation	-0.11	0.05	-0.19	-0.02
Over-Identification	-0.00	0.06	-0.10	0.09

UCS Component of SSC

```
fit_ucs <- brm(
  state_ucs ~ self_kindness + common_humanity + mindfulness +
    self_judgment + isolation + over_identification +
```

```
    (1 | user_id),
  data = d,
  family = student(),
  backend = "cmdstanr",
  iter = 10000,
  chains = 4
)
```

Variable	Estimate	Std. Error	95% CI Lower	95% CI Upper
Intercept	-0.02	0.04	-0.10	0.06
Self-Kindness	-0.14	0.06	-0.24	-0.02
Common Humanity	-0.03	0.05	-0.14	0.07
Mindfulness	-0.01	0.06	-0.13	0.10
Self-Judgment	0.10	0.06	-0.01	0.23
Isolation	0.21	0.05	0.10	0.31
Over-Identification	0.12	0.06	0.00	0.25

The Impact of Negative Affect and Event Unpleasantness on State Self-Compassion

In this section, we describe the statistical analysis used to assess the impact of contextual variables on state self-compassion. Our analysis specifically focuses on three key areas: differences across individuals, variations between days within the same individual, and fluctuations within a single day for each individual.

Prior to implementing the final Bayesian hierarchical models, we performed a model selection process for determining the most fitting structures for both random and fixed effects within our dataset. In the final models, we examined the CS and UCS aspects of SSC as a function of six predictors: negative affect and context evaluation. Each of these predictors was uniquely centered to distinctly capture and differentiate the three dimensions of variance we were interested in – namely, inter-individual differences, between-day variations within individuals, and within-day fluctuations for each individual.

We started by exploring the full fixed-effect structure and proceeded with a systematic comparison of models featuring varying degrees of random-effect complexity. Once we determined the optimal random-effect structure, we turned our attention to assessing models with different fixed-effects configurations. To facilitate model comparison, we used the Leave-One-Out (LOO) method, a robust Bayesian model selection technique implemented within Stan.

This technique evaluates out-of-sample prediction accuracy by sequentially excluding individual observations from the dataset and assessing the model's performance on these excluded points. Models demonstrating lower LOO values were interpreted as having superior fit and enhanced predictive accuracy. In our modeling process, we integrated regularizing priors, which served to mitigate overfitting by applying constraints that direct the model towards more plausible outcomes. Additionally, we employed partial pooling to boost the accuracy of estimations across various groups. We fitted the models using the cmdstan interface and with the brms package, which leverages the computational power of Stan for Bayesian inference.

CS Component

Random effects

Model	elpd_diff	se_diff	elpd_loo	se_elpd_loo	p_loo	se_p_loo	looic	se_looic
Model 1: Basic Model	0.00	0.00	-8383.79	114.38	2760.33	23.56	16767.57	228.77
Model 2: Add Random Effect user_id	-281.13	55.04	-8664.92	123.20	24642.01	87.90	17329.84	246.39
Model 3: Add Random Effects for user_id and user_id:day	-551.34	45.91	-8935.13	110.27	2312.90	19.53	17870.25	220.54
Model 4: Add Random Slopes for na_moment, na_day on user_id	-1666.63	71.51	-10050.41	105.37	369.61	3.49	20100.83	210.75

Model 5: Complex Random Effects Structure	-6024.44	114.52	-14408.22	85.91	9.62	0.16	28816.44	171.81

The model comparison, utilizing the LOO method, indicates that there is no valid justification for employing a random-effect structure more complex than participant-level clustering. In other words, the simpler approach of clustering at the participant level provides an adequate representation for our data, as evidenced by the minimal improvements gained from more intricate random-effect structures.

Fixed-Effects

Model	elpd_diff	se_diff	elpd_loo	se_elpd_loo	p_loo	se_p_loo	looic	se_looic
Model 1: Full Fixed Effects	0.00	0.00	-10050.04	105.34	368.99	3.49	20100.07	210.69
Model 2: Only na	-21.57	7.81	-10071.61	105.26	366.92	3.48	20143.21	210.52
Model 3: Only con	-1580.99	64.59	-11631.03	110.22	378.08	3.39	23262.05	220.43

Based on the model comparison using the LOO method, the best-fitting model is "Model 1: Full Fixed Effects." It exhibits the highest estimated log pointwise predictive density (elpd_loo) and the lowest Leave-One-Out Information Criterion (looic), suggesting superior predictive performance compared to the other models.

The final model for predicting the compassionate responding component of state self-compassion is as follows:

$$
\begin{aligned}
sc &\sim \text{Student-t}(\mu, \sigma, \nu) \\
\mu &= \beta_0 + \\
&\quad \beta_{\text{na\_moment}} \times \text{na\_moment} + \beta_{\text{na\_day}} \times \text{na\_day} + \beta_{\text{na\_person}} \times \text{na\_person} + \\
&\quad \beta_{\text{context\_moment}} \times \text{context\_moment} + \beta_{\text{context\_day}} \times \text{context\_day} + \\
&\ \beta_{\text{context\_person}} \times \text{context\_person} + \\
&\quad b_{\text{user\_id}}[j] + b_{\text{bysubj\_day}}[k] \\
b_{\text{user\_id}}[j] &\sim \mathcal{N}(0, \Sigma_{\text{user\_id}}) \\
b_{\text{bysubj\_day}}[k] &\sim \mathcal{N}(0, \sigma^2_{\text{bysubj\_day}}) \\
\beta &\sim \text{priors1} \\
\sigma &\sim \text{Half-Cauchy}(0, \text{scale}) \\
\nu &\sim \text{Exponential}(\text{rate})
\end{aligned}
$$

$$
\begin{aligned}
&\text{Where:} \\
\Sigma_{\text{user\_id}} &= \text{Full covariance matrix for random effects within user\_id} \\
\sigma^2_{\text{bysubj\_day}} &= \text{Var}(b_{\text{bysubj\_day}}[k])
\end{aligned}
$$

USC Component

In parallel with our analysis of the SC component, we conducted a model comparison for the USC component.

Random-Effects

Model	elpd_diff	se_diff	elpd_loo	se_elpd_loo	p_loo	se_p_loo	looic	se_looic
Model 1: Basic Model	0.00	0.00	-8325.73	103.75	2507.22	22.25	16651.46	207.50
Model 2: Add Random Effect user_id	-393.72	36.24	-8719.45	101.44	2181.38	18.63	17438.91	202.89
Model 3: Add Random Effects for user_id and user_id:day	-539.99	93.24	-8865.73	140.28	37464.65	116.55	17731.46	280.56
Model 4: Add Random Slopes for na_moment, na_day on user_id	-1646.63	64.84	-9972.36	96.36	345.11	3.36	19944.72	192.72
Model 5: Complex Random Effects Structure	-5363.17	98.42	-13688.90	77.90	8.61	0.15	27377.80	155.79

Our evaluation of random-effect structures using the LOO method yielded results consistent with those observed for the SC component. The model comparison for USC indicates that there is no compelling justification for employing a random-effect structure more complex than clustering at the participant level. This echoes the findings from the SC component analysis, where participant-level clustering proved sufficient to adequately represent our data.

Fixed-Effects

Model	elpd_diff	se_diff	elpd_loo	se_elpd_loo	p_loo	se_p_loo	looic	se_looic
Model 1: Full Fixed Effects	0.00	0.00	-9973.73	96.34	346.60	3.37	19947.46	192.67
Model 2: Only na	-18.65	6.72	-9992.38	96.39	346.37	3.40	19984.75	192.79
Model 3: Only con	-1938.50	69.27	-11912.23	101.58	363.87	3.46	23824.47	203.15

When considering fixed-effect structures for the USC component, our analysis identified ‘Model 1: Full Fixed Effects’ as the best-fitting model. This model exhibited the highest estimated log pointwise predictive density (elpd_loo) and the lowest Leave-One-Out Information Criterion (looic) among the options. These results closely mirror the findings from the SC component analysis, where ‘Model 1: Full Fixed Effects’ also emerged as the preferred model.

The congruence in results between the SC and USC components underscores the consistency and reliability of our modeling approach. For both SC and USC, we have selected ‘Model 1: Full Fixed Effects’ as the optimal model, demonstrating superior predictive performance compared to more complex alternatives.

The final model for predicting the uncompassionate responding component of state self-compassion is as follows:

$$
\begin{aligned}
usc &\sim \text{Student-t}(\mu, \sigma, \nu) \\
\mu &= \beta_0 + \\
&\quad \beta_{\text{na\_moment}} \times \text{na\_moment} + \beta_{\text{na\_day}} \times \text{na\_day} + \beta_{\text{na\_person}} \times \text{na\_person} + \\
&\quad \beta_{\text{context\_moment}} \times \text{context\_moment} + \beta_{\text{context\_day}} \times \text{context\_day} + \\
&\; \beta_{\text{context\_person}} \times \text{context\_person} + \\
&\quad b_{\text{user\_id}}[j] + b_{\text{bysubj\_day}}[k] \\
b_{\text{user\_id}}[j] &\sim \mathcal{N}(0, \Sigma_{\text{user\_id}}) \\
b_{\text{bysubj\_day}}[k] &\sim \mathcal{N}(0, \sigma^2_{\text{bysubj\_day}}) \\
\beta &\sim \text{priors1} \\
\sigma &\sim \text{Half-Cauchy}(0, \text{scale}) \\
\nu &\sim \text{Exponential}(\text{rate})
\end{aligned}
$$

Where:

$$
\begin{aligned}
\Sigma_{\text{user\_id}} &= \text{Full covariance matrix for random effects within user\_id} \\
\sigma^2_{\text{bysubj\_day}} &= \text{Var}(b_{\text{bysubj\_day}}[k])
\end{aligned}
$$

The two models were estimated using a Student's t-distribution with identity links for the mean (μ), scale (σ), and degrees of freedom (ν). The analysis was based on 12621 observations, 326 participants, with the posterior distribution derived from 12000 post-warmup draws across four chains.

In both cases, the model diagnostics indicate satisfactory convergence with Rhat values close to 1 for all parameters. The Bulk_ESS and Tail_ESS values suggest adequate effective sample sizes for reliable estimation and inference.

Direct Test of the BCH for State Self-Compassion

We employed a hierarchical Bayesian model to explore the relationship between state self-compassion components (CS and UCS) and their interactions with other covariates (negative affect, decentering, and context evaluation). By incorporating both fixed and random effects, our model aims to capture variability at the levels of individual participants, days, and measurements, providing a comprehensive understanding of the dynamics underlying the BCH.

In our model, the uncompassionate component (UCS) is represented using a t-distribution, which accommodates potential outliers and enhances the robustness of our analysis. This distribution is parameterized with a degree of freedom parameter (`nu`), an error term (`sigma_ucs`), and is influenced by both fixed and random effects.

The priors for the model parameters were selected to facilitate regularization:

$$
\begin{aligned}
\alpha_{ucs} &\sim \text{Normal}(0, 1) \\
\beta_{cs}, \beta_{covariates} &\sim \text{Normal}(0, 1) \\
z_{participant}, z_{day}, z_{measurement}, z_{participant\_slope\_cs} &\sim \text{Normal}(0, 1) \\
\sigma_{participant}, \sigma_{day}, \sigma_{measurement}, \sigma_{participant\_slope\_cs}, \sigma_{ucs} &\sim \text{Exponential}(1) \\
\nu &\sim \text{Gamma}(2, 0.1)
\end{aligned}
$$

The Stan implementation is provided below:

```
data {
  int<lower=0> N; // Total number of observations
  int<lower=0> P; // Number of participants
  int<lower=0> D; // Number of days
  int<lower=0> M; // Number of measurements per day per participant
  array[N] int<lower=1, upper=P> participant;
  // Participant index for each observation
  array[N] int<lower=1, upper=D> day; // Day index for each observation
  array[N] int<lower=1, upper=M> measurement;
  // Measurement index for each observation
  array[N] real CS; // Compassionate Self measures
  array[N] real UCS; // Uncompassionate Self measures
  array[N] real neg_affect; // Negative Affect measures
  array[N] real decentering; // Decentering measures
  array[N] real context_eval; // Context evaluation measures
}

parameters {
  real alpha_ucs; // Intercept for UCS
```

```
  real beta_cs; // Overall effect of CS on UCS
  array[3] real beta_covariates; // Coefficients for other covariates

  // Random intercepts
  vector[P] z_participant;
  vector[D] z_day;
  vector[M] z_measurement;

  // Random slopes for CS at the participant level
  vector[P] z_participant_slope_cs;

  real<lower=0> sigma_participant; // SD of participant intercepts
  real<lower=0> sigma_day; // SD of day intercepts
  real<lower=0> sigma_measurement; // SD of measurement intercepts
  real<lower=0> sigma_participant_slope_cs; // SD of participant slopes for CS
  real<lower=0> sigma_ucs; // Error term for UCS model
  real<lower=0> nu; // Degrees of freedom for t-distribution
}

model {
  // Priors
  alpha_ucs ~ normal(0, 1);
  beta_cs ~ normal(0, 1);
  beta_covariates ~ normal(0, 1);

  z_participant ~ normal(0, 1);
  z_day ~ normal(0, 1);
  z_measurement ~ normal(0, 1);
  z_participant_slope_cs ~ normal(0, 1);

  sigma_participant ~ exponential(1);
  sigma_day ~ exponential(1);
  sigma_measurement ~ exponential(1);
  sigma_participant_slope_cs ~ exponential(1);
  sigma_ucs ~ exponential(1);
  nu ~ gamma(2, 0.1);

  // Likelihood for UCS using t-distribution
  for (n in 1:N) {
    UCS[n] ~ student_t(
      nu,
      alpha_ucs +
```

```
      (beta_cs + sigma_participant_slope_cs *
        z_participant_slope_cs[participant[n]]) * CS[n] +
      beta_covariates[1] * neg_affect[n] +
      beta_covariates[2] * decentering[n] +
      beta_covariates[3] * context_eval[n] +
      sigma_participant * z_participant[participant[n]] +
      sigma_day * z_day[day[n]] +
      sigma_measurement * z_measurement[measurement[n]],
      sigma_ucs
    );
  }
}

generated quantities {
  array[N] real pred_UCS;
  array[N] real log_lik;

  for (n in 1:N) {
    pred_UCS[n] = student_t_rng(
      nu,
      alpha_ucs +
      (beta_cs + sigma_participant_slope_cs *
        z_participant_slope_cs[participant[n]]) * CS[n] +
      beta_covariates[1] * neg_affect[n] +
      beta_covariates[2] * decentering[n] +
      beta_covariates[3] * context_eval[n

] +
      sigma_participant * z_participant[participant[n]] +
      sigma_day * z_day[day[n]] +
      sigma_measurement * z_measurement[measurement[n]],
      sigma_ucs
    );

    log_lik[n] = student_t_lpdf(
      UCS[n] |
      nu,
      alpha_ucs +
      (beta_cs + sigma_participant_slope_cs *
        z_participant_slope_cs[participant[n]]) * CS[n] +
      beta_covariates[1] * neg_affect[n] +
      beta_covariates[2] * decentering[n] +
```

```
      beta_covariates[3] * context_eval[n] +
      sigma_participant * z_participant[participant[n]] +
      sigma_day * z_day[day[n]] +
      sigma_measurement * z_measurement[measurement[n]],
      sigma_ucs
    );
  }
}
```

Through the integration of multiple levels of random effects and the adoption of a robust likelihood function via the t-distribution, our hierarchical Bayesian model provides a nuanced analysis of the interaction between CS and UCS, shedding light on the dynamics underlying state self-compassion within a broader psychological context.

Study 2

Descriptive Statistics

Baseline Maesures

Variable	Estimate	Std. Error	95% CI Lower	95% CI Upper
$DASS-21_{Stress}$	7.24	0.73	6.10	9.37
$DASS-21_{Anxiety}$	3.43	1.55	0.95	6.32
$DASS-21_{Depression}$	3.00	0.36	2.17	3.92
$RSES$	22.88	0.52	21.84	23.86
$SCS_{total-score}$	17.00	0.42	16.19	17.84
$SCS_{Self-Kindness}$	2.88	0.10	2.70	3.07
$SCS_{Common-Humanity}$	3.00	0.09	2.83	3.17
$SCS_{Mindfulness}$	3.07	0.09	2.89	3.23
$SCS_{Self-Judgment}$	2.69	0.09	2.51	2.87
$SCS_{Isolation}$	2.69	0.09	2.50	2.87
$SCS_{Over-Identification}$	2.67	0.09	2.50	2.85

There is no evidence of emotional disorders among the participants. The obtained scores are consistent with those reported in other studies utilizing the same measures within community samples (Bottesi et al., 2015; Neff et al., 2017; Sica et al., 2021).

EMA Survey Questions

1. Think about the most notable event that has occurred since you last received a notification. If this is your first notification of the day, consider the most significant event from the start of the day. How would you evaluate this event?

    1) Very unpleasant
    2) Unpleasant
    3) Neither unpleasant nor pleasant
    4) Pleasant
    5) Very pleasant

2. At this moment I feel NERVOUS.

    1) Not at all
    2) A little
    3) Moderately
    4) Quite a bit
    5) Very much

3. At this moment I feel UPSET.

    1) Not at all
    2) A little
    3) Moderately
    4) Quite a bit
    5) Very much

4. At this moment I feel SATISFIED.

    1) Not at all
    2) A little
    3) Moderately
    4) Quite a bit
    5) Very much

5. At this moment I feel CHEERFUL.

    1) Not at all
    2) A little
    3) Moderately
    4) Quite a bit
    5) Very much

6. I'm giving myself the caring and tenderness I need.

    1) Completely false
    2) Moderately false

3) Slightly false
4) Slightly true
5) Moderately true
6) Completely true

7. I'm obsessing and fixating on everything that's wrong.

    1) Completely false
    2) Moderately false
    3) Slightly false
    4) Slightly true
    5) Moderately true
    6) Completely true

8. I'm remembering that there are lots of others in the world feeling like I am.

    1) Completely false
    2) Moderately false
    3) Slightly false
    4) Slightly true
    5) Moderately true
    6) Completely true

9. I feel like I'm struggling more than others right now.

    1) Completely false
    2) Moderately false
    3) Slightly false
    4) Slightly true
    5) Moderately true
    6) Completely true

10. I feel intolerant and impatient toward myself.

    1) Completely false
    2) Moderately false
    3) Slightly false
    4) Slightly true
    5) Moderately true
    6) Completely true

11. I'm keeping things in perspective.

    1) Completely false
    2) Moderately false
    3) Slightly false
    4) Slightly true

5) Moderately true
6) Completely true

12. At this moment I am able to accept my flaws and weaknesses.
    1) Completely false
    2) Moderately false
    3) Slightly false
    4) Slightly true
    5) Moderately true
    6) Completely true
13. At this moment I let myself be carried away by my emotions.
    1) Completely false
    2) Moderately false
    3) Slightly false
    4) Slightly true
    5) Moderately true
    6) Completely true
14. Recently, I have been able to observe my thoughts and feelings without being drawn in.
    1) Completely false
    2) Moderately false
    3) Slightly false
    4) Slightly true
    5) Moderately true
    6) Completely true
15. Recently, I have struggled with my thoughts and feelings.
    1) Completely false
    2) Moderately false
    3) Slightly false
    4) Slightly true
    5) Moderately true
    6) Completely true
16. Recently, I have experienced my thoughts and feelings as separate from myself.
    1) Completely false
    2) Moderately false
    3) Slightly false
    4) Slightly true
    5) Moderately true
    6) Completely true

17. Recently, I have been caught up in my thoughts.

    1) Completely false
    2) Moderately false
    3) Slightly false
    4) Slightly true
    5) Moderately true
    6) Completely true

Model Convergence Diagnostics

Models diagnostics produced similar results as in Study 1.

Impact of Academic Exam on State Self-Compassion

We employ a hierarchical Bayesian model to compare the CS or UCS components of state self-compassion across two time points: the day before and the day after an academic exam. This model accounts for the hierarchical structure of the EMA data, which includes repeated measures across multiple days and times. Specifically, we compare 12 administration distributed over separate days, each containing 5 notifications at different times, against a single notification on the evening following the exam.

Our model incorporates random intercepts for subjects, days, and measurement times, as well as random slopes for the exam day effects:

$$sc_n \sim \mathrm{SkewNormal}\left(\mu_n, \sigma, \mathrm{skewness}\right),$$

where

$$\mu_n = \alpha + \alpha_j[\mathrm{subj}_n] + \alpha_d[\mathrm{day}_n] + \alpha_m[\mathrm{meas}_n] + (\beta_{\mathrm{pre}} + \beta_{j,\mathrm{pre}}[\mathrm{subj}_n]) \cdot \mathrm{exam\_day\_pre}_n + (\beta_{\mathrm{post}} + \beta_{j,\mathrm{post}}[\mathrm{subj}_n]) \cdot \mathrm{exam\_day\_post}_n.$$

For the model's parameters, we used regularization priors:

$$\begin{aligned}
\alpha &\sim \mathcal{N}(0, 2.5) \\
\alpha_j &\sim \mathcal{N}(0, \sigma_j) \\
\alpha_d &\sim \mathcal{N}(0, \sigma_d) \\
\alpha_m &\sim \mathcal{N}(0, \sigma_m) \\
\beta_{\mathrm{pre}} &\sim \mathcal{N}(0, 1) \\
\beta_{\mathrm{post}} &\sim \mathcal{N}(0, 1) \\
\beta_{j,\mathrm{pre}} &\sim \mathcal{N}(0, \sigma_{\beta_{j,\mathrm{pre}}}) \\
\beta_{j,\mathrm{post}} &\sim \mathcal{N}(0, \sigma_{\beta_{j,\mathrm{post}}}) \\
\sigma &\sim \mathrm{Exponential}(1) \\
\sigma_j &\sim \mathrm{Exponential}(1) \\
\sigma_d &\sim \mathrm{Exponential}(1) \\
\sigma_m &\sim \mathrm{Exponential}(1) \\
\sigma_{\beta_{j,\mathrm{pre}}} &\sim \mathrm{Exponential}(1) \\
\sigma_{\beta_{j,\mathrm{post}}} &\sim \mathrm{Exponential}(1) \\
\mathrm{skewness} &\sim \mathcal{N}(0, 1)
\end{aligned}$$

Belows is shown the Stan implementation of the model:

```
data {
  int<lower=1> N; // Number of observations
  int<lower=1> J; // Number of subjects
  int<lower=1> D; // Number of days
  int<lower=1> M; // Number of measurements per day
  array[N] int<lower=1, upper=J> subj; // Subject index
  array[N] int<lower=1, upper=D> day; // Day index
  array[N] int<lower=1, upper=M> meas; // Moment index
  array[N] real sc; // Dependent variable
  array[N] real exam_day_pre; // 1 if exam day is 'pre', 0 otherwise
  array[N] real exam_day_post; // 1 if exam day is 'post', 0 otherwise
}

parameters {
  real alpha; // Global intercept
  array[J] real alpha_j; // Random intercepts for subjects
  array[D] real alpha_d; // Random intercepts for days
  array[M] real alpha_m; // Random intercepts for measurements
  real beta_pre; // Main effect of exam day 'pre'
  real beta_post; // Main effect of exam day 'post'
  array[J] real beta_j_pre; // Random slopes for exam_day_pre
  array[J] real beta_j_post; // Random slopes for exam_day_post
  real<lower=0> sigma; // Standard deviation for psc
  real<lower=0> sigma_j; // SD for subject random intercepts
  real<lower=0> sigma_d; // SD for day random intercepts
  real<lower=0> sigma_m; // SD for measurement random intercepts
  real<lower=0> sigma_beta_j_pre; // SD for random slopes (pre)
  real<lower=0> sigma_beta_j_post; // SD for random slopes (post)
  real skewness; // Skewness parameter for the skew normal distribution
}

model {
  // Priors
  alpha ~ normal(0, 2.5);
  alpha_j ~ normal(0, sigma_j);
  alpha_d ~ normal(0, sigma_d);
  alpha_m ~ normal(0, sigma_m);
  beta_pre ~ normal(0, 1);
  beta_post ~ normal(0, 1);
  beta_j_pre ~ normal(0, sigma_beta_j_pre);
  beta_j_post ~ normal(0, sigma_beta_j_post);
  sigma ~ exponential(1);
```

```
  sigma_j ~ exponential(1);
  sigma_d ~ exponential(1);
  sigma_m ~ exponential(1);
  sigma_beta_j_pre ~ exponential(1);
  sigma_beta_j_post ~ exponential(1);
  skewness ~ normal(0, 1);

  // Likelihood
  for (n in 1:N) {
    sc[n] ~ skew_normal(
      alpha + alpha_j[subj[n]] + alpha_d[day[n]] + alpha_m[meas[n]] +
      (beta_pre + beta_j_pre[subj[n]]) * exam_day_pre[n] +
      (beta_post + beta_j_post[subj[n]]) * exam_day_post[n],
      sigma, skewness
    );
  }
}

generated quantities {
  array[N] real y_rep;
  array[N] real log_lik;

  for (n in 1:N) {
    y_rep[n] = skew_normal_rng(
      alpha + alpha_j[subj[n]] + alpha_d[day[n]] + alpha_m[meas[n]] +
      (beta_pre + beta_j_pre[subj[n]]) * exam_day_pre[n] +
      (beta_post + beta_j_post[subj[n]]) * exam_day_post[n],
      sigma, skewness
    );

    log_lik[n] = skew_normal_lpdf(
      sc[n] |
      alpha + alpha_j[subj[n]] + alpha_d[day[n]] + alpha_m[meas[n]] +
      (beta_pre + beta_j_pre[subj[n]]) * exam_day_pre[n] +
      (beta_post + beta_j_post[subj[n]]) * exam_day_post[n],
      sigma, skewness
    );
  }
}
```

This hierarchical Bayesian model was also applied to the UCS component of state self-compassion, following the same structure and parameterization.

Impact of Academic Exam on Negative Affect

In a separate analysis, we found a large effect of academic examinations on students' negative affect. Specifically, we observed a pronounced decrease in negative affect from the day before to the day after the exams. This pattern was consistent across two separate examinations. For the first exam, we found a substantial standardized decrease in negative affect on the day following the exam, relative to the day prior. The magnitude of this decrease was -0.92 (Standard Error, $SE = 0.10$), translating to a Cohen's d value of -0.98, with an 89% CI of [-1.23, -0.78]. A parallel trend was observed for the second exam, where the standardized decrease in negative affect mirrored that of the first exam, being -0.39 ($SE = 0.08$). This yielded a Cohen's d value of -0.54, with the 89% CI of [-0.75, -0.36].

Testing the BCH Through Contextual Influences of the State Self-Compassion.

For our analyses, we employed the identical models utilized in Study 1.

Direct Test of the BCH for State Self-Compassion

For our analysis, we employed the identical Stan model utilized in Study 1.

Levels of Personal Concern

This section details the script used to test the hypothesis that the correlation between the SC and USC components of state self-compassion is influenced by the level of personal concern. The same statistical model was applied to three distinct datasets, each representing different time points relative to an examination period:

1. **Pre-Exam Dataset**: Data collected one day before the exam.
2. **Post-Exam Dataset**: Data collected one day after the exam.
3. **Baseline Dataset**: Data collected during a period unrelated to any exam.

```r
bform <-
  bf(mvbind(psc, nsc) ~ 1 + (1 | user_id)) +
  set_rescor(TRUE)

mod <- brm(
  bform,
  data = d,
  backend = "cmdstanr",
  chains = 4
)
```

Decentering and SC and USC Correlation

Decentering (Bennett et al., 2021; Bernstein et al., 2015) and self-compassion are related constructs. Both constructs contribute to psychological well-being through slightly different mechanisms. Decentering aids in diminishing identification with negative thoughts and feelings, enabling individuals to observe them without judgment or automatic reactions. This detachment can create space for self-compassion to emerge, as individuals can acknowledge their challenging experiences with greater kindness and understanding. Self-compassion, in turn, can facilitate the decentering process by offering a gentler and more welcoming approach to difficult emotions and thoughts. When individuals can treat themselves with compassion, they may find it easier to observe their internal experiences without being overwhelmed. Self-compassion allows individuals to confront failures, mistakes, and self-criticism with kindness and understanding rather than judgment or reproach. This approach can facilitate decentering, as individuals learn to view such experiences as common to all humans, rather than reflections of their personal worth. Both decentering and self-compassion contribute to psychological resilience. Decentering helps maintain a more balanced and objective perspective, while self-compassion provides emotional support and a more positive response to challenges. Mindfulness plays a key role in connecting decentering and self-compassion. Mindfulness practice encourages both decentering and self-compassion by promoting non-judgmental observation of internal experiences and greater self-kindness.

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