Moderated Association of Momentary mindfulness and self-regulation with momentary affect and cognition: An Ecological Momentary Assessment (EMA) Study

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Background

- Problem: College students witness multi-faceted stressors and are vulnerable to the onset of mental and behavioral health problems.
- Potential Strategies: Mindfulness and self-regulation have demonstrated beneficial effects in promoting mental health.
- Literature Gap: The existing studies mostly applied cross-sectional surveys or pre-post intervention design to study the role of mindfulness and self-regulation.
- Study Aim: This study uses Ecological Momentary Assessment (EMA) to test temporal associations of mindfulness and self-regulation levels with emotional and cognitive outcomes within college students’ natural environments.

Methods

- Data was collected using Expiwell from 44 college students (Mean age=20.5, SD=1.38) during Fall 2021 semester, 6 random times per day for 7 consecutive days.
- Prompts were sent every 2 hours in the participants’ self-selected time window (for e.g., BAM-SBM), and randomly at any time within every 2-hour window.
- Participants had 20 minutes to complete 18 survey items after the prompt was delivered, and a reminder was sent after 5 minutes from the first prompt.

Expiwell data-collection process

Three Multi-level Models in R

Level-1:
Negative Affect/Positive Affect/Perceived Cognition = \( \beta_0 + \beta_1 (\text{Time of the Day}) + \beta_2 (\text{Weekend}) + \beta_3 (\text{Day of Week}) + \beta_4 (\text{Energy Expenditure}) + \beta_5 (\text{Location}) + \beta_6 (\text{Social Engagement}) + \beta_7 (\text{Momentary Autonomy}) + \beta_8 (\text{Momentary Self-regulation}) + \beta_{9i} (\text{Momentary Mindfulness}) + \beta_{10i} (\text{Momentary Self-regulation} \times \text{Momentary Mindfulness} \times \text{Intercept variance}) + e_{ij} \)

Level-2
\( \beta_{0i} = \gamma_{00} + \gamma_{01} (\text{Age}) + \gamma_{02} (\text{BMI}) + \gamma_{03} (\text{Gender}) + \gamma_{04} (\text{On-campus}) + \gamma_{05} (\text{Race}) + \gamma_{06} (\text{Major}) + \gamma_{07} (\text{Usual Self-regulation}) + \gamma_{08} (\text{Usual Mindfulness}) + \gamma_{09} (\text{Usual Autonomy}) + u_{0i} \)
\( \beta_{11,7,10i} = \gamma_{1-7,10} + u_{11,7,10i} \)
\( \beta_{8,9i} = \gamma_{8,9} + u_{8,9i} \)

Results

<table>
<thead>
<tr>
<th>N=1104 EMA Observations</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Perceived Cognition</td>
<td>Positive Affect</td>
<td>Negative Affect</td>
</tr>
<tr>
<td></td>
<td>Coefficient</td>
<td>SE</td>
<td>Coefficient</td>
</tr>
<tr>
<td>Fixed Effect</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Usual mindfulness</td>
<td>1.205***</td>
<td>.293</td>
<td>- .30</td>
</tr>
<tr>
<td>Momentary mindfulness</td>
<td>.521***</td>
<td>.06</td>
<td>.211***</td>
</tr>
<tr>
<td>Usual self-regulation</td>
<td>-.351</td>
<td>.296</td>
<td>.54</td>
</tr>
<tr>
<td>Momentary self-regulation</td>
<td>.206***</td>
<td>.048</td>
<td>.078**</td>
</tr>
<tr>
<td>Momentary mindfulness x self-regulation</td>
<td>.01</td>
<td>.031</td>
<td>-.047</td>
</tr>
<tr>
<td>Random Effect</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept variance</td>
<td>.039</td>
<td>.150</td>
<td>.134</td>
</tr>
<tr>
<td>Residual variance</td>
<td>.147</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: This model was controlled for Age, BMI, Gender, On-campus or Off-campus, Stay, Race, Major, Day of week, Weekend, Time of the day, Energy Expenditure, Outdoor or Indoor Location, Alone or with someone, and Momentary and Usual Autonomy. * p<.05, ** p<.01, *** p<.001, *p<.1

Interpretations:
- Higher levels of momentary mindfulness and self-regulation were associated with higher levels of momentary perceived cognition and positive affect and lower levels of momentary negative affect.
- At any moments when students had both lower mindfulness state and self-regulation than their usual levels, they reported the highest negative affect (see interaction plot on the right).

Conclusion and Discussion

- Our EMA study revealed the time-sensitive associations that students’ momentary affect and cognition were each predicted by their momentary mindfulness and self-regulation levels.
  ✓ Positive affect and perceived cognition can be improved by targeting momentary mindfulness or/and self-regulation.
  ✓ Negative affect can be decreased significantly by target momentary mindfulness and self-regulation simultaneously.
- To improve momentary positive affect and cognition, health interventions may need to target more frequent practice of mindfulness and/or self-regulations skills in students’ typical day-to-day life.
- To decrease negative affect, health interventions may need to target more frequent practice of mindfulness and self-regulation skills simultaneously in students’ typical day-to-day life to relatively attain more benefits.
- For example, brief mindfulness and self-regulation practices can be integrated in classroom settings before the lecture to promote better momentary cognition and well-being.
- Future studies can test the mediating role of self-regulation between mindfulness and positive affect/cognitive outcome across diverse populations, while accounting for different cultural factors.

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