Are there benefits to using fixed versus random or 2 versus 4 smartphone-based ecological momentary assessments?

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Background

- Affective experiences change dynamically within an individual from moment to moment.[1]
- Ecological momentary assessment (EMA) enables researchers to examine moment-to-moment changes in affect.[2-3]
- There is a lack of clarity regarding how EMA design features (e.g., number of daily assessments, slider-type vs. Likert-type questions, fixed vs. random assessments) impact the assessment of affect.
- Accurate assessment of affect variability may enhance future interventions.[4]

Objective

- To evaluate how EMA design features relate to measured affect variability.
- To examine which affect variables are affected by EMA design features.

Study Design

- Nationwide randomized controlled trial (***N*=459**)
- Smartphone-based EMAs prompted over a 28-day study period
- 2x2x2x2x2 design:
  1. Random vs. fixed EMAs
  2. 2 vs. 4 EMAs/day
  3. 1st 2 weeks slider type vs. Likert-type questions
  4. 15 vs. 25 items/EMA
  5. Paid for each EMA vs. % portion of EMAs
- For 28 days, participants reported daily mood and health behaviors via Insight smartphone app.

Table 1. *Demographics*

Variable	Total n (%) or M (SD)
Sex	
Male	105 (23%)
Female	354 (77%)
Age (years), mean (SD)	48.4 (12.2)
Race/Ethnicity	
White	329 (71.7%)
Black	85 (18.5%)
Asian	13 (2.8%)
American Indian/Alaska Native	7 (1.5%)
More than one race	25 (5.4%)

Study Design (Cont.)

Measures

- EMA items assessed current affect (e.g., happiness, stress, anger, fear, and relaxation).
- Each item was presented with Likert-type (14 days) and slider-type (14 days) response scales. **Table 2** depicts the two types of response scales.

Table 2. *Question Response Types*

Scale Type	Question	Scale
Likert	Right now, I feel happy.	1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree
Slider	Right now, I feel happy.	0----------10 None High

Analyses

- Examined effects of 3 design factors on affect variability:
  - 2 vs. 4 EMAs/day
  - Random vs. fixed EMA schedules
  - First 2 weeks of slider type vs. Likert-type questions
- Multilevel models assessed the within-person variability in affect by design condition.
  - Outcome was evaluated as the **within-person standard deviation** of happiness, stress, anger, fear, and relaxation.

Results

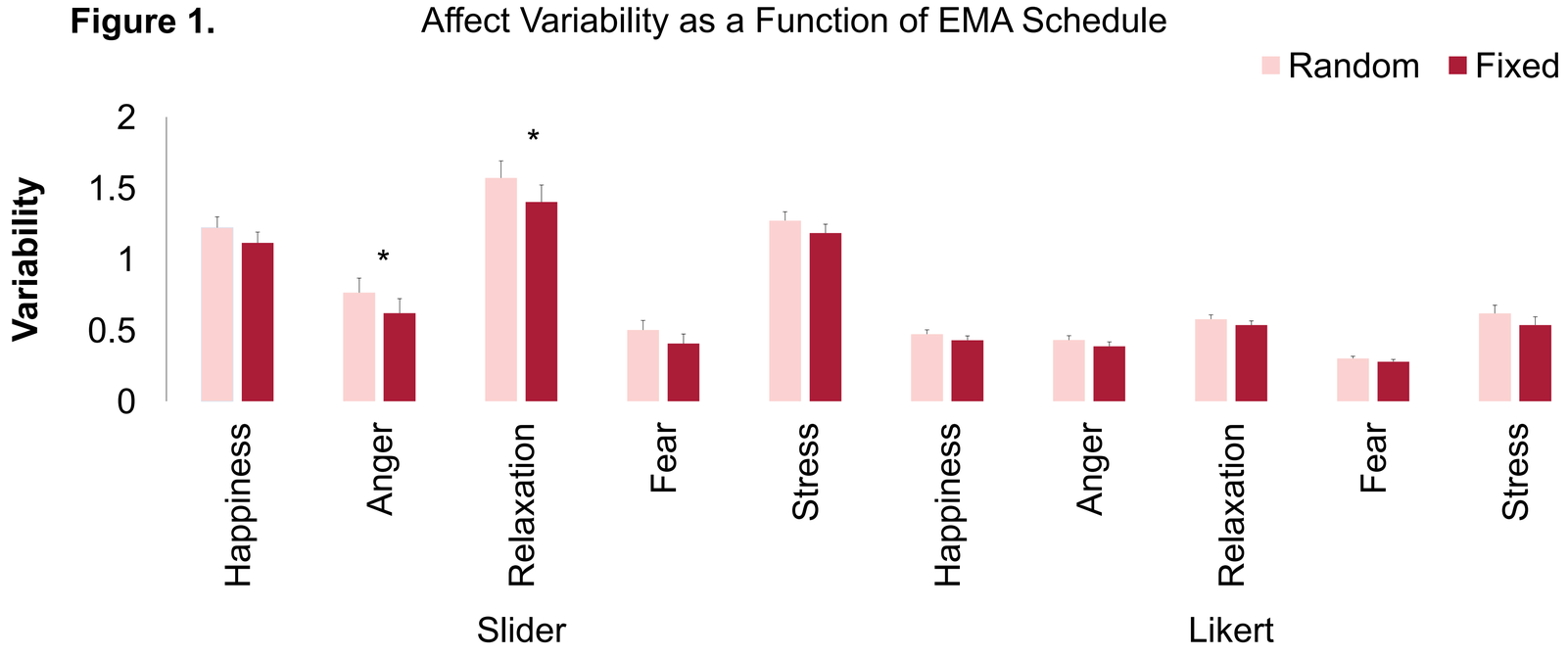
Multilevel Modeling

- Random EMAs demonstrated greater variability compared with Fixed EMAs for 2 slider-type questions (see **Figure 1**).
  - Slider-Anger (t = -2.32, p = *0.021*)
  - Slider-Relaxation (t = -2.29, p = *0.023*)
- Four (vs. two) daily EMAs were associated with increased variability of:
  - Likert-Stress (t = -2.38, p = *0.017*)
  - Likert-Anger (t = -2.91, p < 0.01)
- Participants assigned to complete slider-type before Likert-type questions for the first 14 study days, had greater variability in:
  - Likert-Stress (t = 2.28, p = *0.02*)
  - Likert-Anger (t = 4.35, p < 0.01)
  - Likert-Fear (t = 2.35 , p = *0.02*)
  - Likert-Relaxation (t = 2.82, p < *0*.01)

Summary

- Variability in EMA questions about feeling angry and relaxed were different for fixed vs. random EMAs.
- Variability in EMA questions about feeling angry and stressed were different for 2 vs. 4 EMAs per day.
- Variability in EMA questions about feeling stressed, angry, afraid, and relaxed were different for those that received slider-type vs. Likert-type questions first.

Figure 1. Affect Variability as a Function of EMA Schedule



*$p \leq 0.05$

Conclusions

- The use of slider-type questions can result in greater variability in affect reporting when a random EMA schedule is used versus a fixed EMA schedule.
- As expected, completing 4 versus 2 EMAs per day can result in higher variability in reported affect.
- Altogether, findings indicate that the variance in reported affect may be related to EMA design features.
- Future studies should further investigate the impacts of Likert-type (vs. slider-type) questions, number of daily EMAs, and fixed (vs. random) EMAs on affect.

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