Promoting Kindness and Gratitude with a Smartphone and Triggers
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Background And Objectives
- Gratitude positively affects psychological wellbeing (PWB), social interactions (Parks, 2014), cardiovascular and immune system, exercise frequency, and sleep (Post, 2005)
- Practicing gratitude has lasting effects (Carver, 2003)
- Pervasive technologies have not been fully explored to design behavioral intervention technologies that people actually use
- In the context of gratitude:
  - Use inspiring content
  - Utilize contextual data
    - for timing of delivery
  - Explore the interplay between mood and gratitude

Method
- We have used widely administered surveys to measure dispositional gratitude and PWB: GQ-6 (McCullough, 2002), GRAT (Thomas, 2003), Ryff's PWB (Ryff, 1989)
- We have developed Android apps to measure state gratitude and mood:
  - Kind and Grateful (Fig. 1):
    - Logs and quantifies gratitude expressions: frequency, intensity, span, density (Froh, 2011)
    - Gathers contextual data by monitoring smartphone sensor data
    - Provides inspiration to cultivate gratitude
  - Mood Tracker (Fig. 2):
    - Visually represents mood based on PAM (Desmet, 2012) and the two-factor mood model (Watson, 1985)
    - Unobtrusively gathers self-reported mood data from the phone lock-screen

Procedure
Control vs. intervention group: to cancel out environmental and temporal factors (Cunningham, 1979)
Intervention vs. reference weeks: to remove bias induced by personal differences

<table>
<thead>
<tr>
<th>Pilot RCT</th>
<th>Main RCT</th>
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<tbody>
<tr>
<td>N=15</td>
<td>N=27</td>
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<tr>
<td>2 weeks (1 w reference, 1 w intervention)</td>
<td>5 week (2 w reference, 3 w intervention)</td>
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<td>Recruited as groups</td>
<td>Recruited individually, more flexibility in social setting</td>
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<td>Control, Periodic, Contextual groups</td>
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Results
- Practicing gratitude (Fig. 3)
  - The contextual group expressed gratitude more. Specially, in the main study, in terms of freq.*, span**, density*, and intensity**
  - Example: main study, freq. change
    - Control: -90%
    - Contextual: +120%
- Dispositional gratitude and PWB (Fig. 4)
  - These measures improved more in the main study contextual group
- Contextual relevance (Fig. 5)
  - We found indications of relevance for inspiring gratitude in:
    - Social proximity
    - Location change
    - Physical activity
- Mood and momentary gratitude
  - Expressing gratitude might increase valence (Tab. 1)
  - Expressing gratitude might have a calming effect (Tab. 2)

Conclusions and Future Work
- Social proximity, location changes, and physical activity are relevant cues for inspiring gratitude
- Relevant inspiring content can fuel thankful behavior
- The intervention designed combining these elements resulted in improvements on:
  - GRAT, PWB, measures of practicing gratitude
- Gratitude expression might increase valence and have a calming effect
- Some future research directions:
  - Exploring alternative methods for measuring momentary gratitude
  - Applying machine learning techniques like reinforcement learning to adapt content and context of the notifications
  - Applying the learnt lessons to similar behavior change problems

Objectives
- Contextual groups
- Recruited as groups
- 3 w intervention
- Control and Periodic, Contextual groups
- 5 week (2 w reference, 3 w intervention)
- Control, Periodic, Contextual groups
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- N=15
- N=27
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