Evaluating methods for teaching psychological skills through smartphones: A randomized controlled trial of the revised ACT Daily mobile app

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Prevalence of Mental Health Issues in College Populations

- **Challenges:**
  - 50% of US college students have a diagnosable psychological disorder in a given year (Blanco et al., 2008)
  - 32% report feeling so depressed that it is difficult to function (ACHA, 2014)
  - >50% overwhelming anxiety (ACHA, 2014)
  - 86% felt overwhelmed (ACHA, 2014)

- **Costs:**
  - Academic performance issues
  - Decreased retention & graduation rates (Kitzrow, 2003)
  - Suicide - 2nd leading cause of death (Suicide Prevention Resource Center, 2014)
  - Self-injury & violence (ACHA, 2014)
Support for US colleges students: College Counseling Centers (CCC)

- **Current issues**
  - Funding & staffing limitations
  - Increasing demand for services and rates of severe psychological problems (Beamish, 2005; Gallagher, 2014).
  - 69% of CCC directors reported resources have failed to expand appropriately (Gallagher, 2014)
    - Ratio = 1 counselor to ever 2,081 students (500 student increase per year)

- **Costs:**
  - Escalating rates of counselor workload, counselor burnout, & swelling waitlists (Gallagher, 2014).
  - Long waitlists = client dropout (Levy et al., 2005).
Cost-effective, innovative solution

• 91% global mobile penetration (Source: Digit, 2012)

• 71.6% smartphone penetration in the US (ComScore, 2014)

• Acceptability of mHealth
  • 76% of general public (Proudfoot et al., 2010)
  • 90% of therapists (Whitfield & Williams, 2004)
Mobile App benefits (cont.)

• Available throughout the day (increased intervention accessibility)
• Monitor & prompt skill use
• Mobility and adaptability of use
• Tailored content (contextualized)
• Supportive accountability
• Adherence to treatment
• Target specific processes
Preliminary research

- Created a custom-built app with outside developer.
- Small open-pilot studies tested app:
  - Adjunctively with face-to-face ACT therapy and...
  - As a standalone app intervention for students on a CCC waitlist.
- EMI
  - Random prompts tracking:
    - Emotional distress
    - ACT processes (acceptance, defusion, present moment awareness, connection with values).
  - Triggers brief tailored intervention:
    - Quick skills (1 minute)
    - Browse Skills (5 minute audio, interactive exercise).
Design – Quick Skills

When you are doing something meaningful, savor it like you might savor a delicious meal. Slow down. Notice what is important about what you are doing and how it matters to you. Appreciate the details of the experience, fully engaging in what you see, hear and feel.

You might even take a picture on your phone you can use as a reminder of this meaningful moment.
Values Quick Skills (cont.)

One Tiny Step

What small, easy thing can you do right now that would move you even just a little more towards your values and what is important to you?

Avoid setting a big goal. Really think of some little, tiny thing you could do right this moment that would be connected to living your values. Then do it!

Examples

- Text or email a friend if you value connecting with others.
- Take a walk outside if you value living in the moment.
- Stop by the gym and play in a pickup game if you value competing.
- Eat a piece of fruit instead of a candy bar if you value caring for your health.
Browse Skills Option

How much are you...

- Feeling depressed: 75
- Feeling anxious: 39
- Fighting your feelings: 49
- Stuck in thoughts: 56
- On autopilot: 96
- Disconnected from values: 75

Quick Skills: Connecting with values
- 1 min

Values brainstorming
- 3 mins

Goal setting
- 5 mins

Connecting With Your Values
We encourage you to really work on this goal. We can’t save your goal on the app, but consider writing it down or saving a picture of this screen on your phone.

**Area:**
Recreation/Fun

**Values to work on:**
Creativity

**Goal for today:**
Paint for 1 hour this afternoon

 ioutil.Don’t forget the post assessment!

Try to set a goal that is very detailed and specific. One that says exactly what you will do, when you will do it, and for how long.
Preliminary Research Findings

- Improvement across most outcome measures (DASS) and process measures.
- Unique effects for each treatment component on related pathological processes (e.g., defusion skills reduced fusion greater than other PI processes).

**Limitations:**

- Small open-trial design
- *Unclear if effects due to:*
  - tailoring of skill coaching
  - providing any skills
  - Completing EMA check-ins throughout the week.
What’s next?

• Tailoring may be key to the intervention
• ACT provides a model highlighting a key set of treatment components linked to corresponding pathological processes
• Impact of *tailoring* ACT skill coaching to such processes in the moment has not been tested.
Current Study

- **Goal:** to further examine impact of tailoring skill coaching based on in-the-moment client variables using ACT Daily mobile app.

- **Conditions:**
  - Tailored skill coaching
  - Random skill coaching
  - EMA check-ins only

- **Method of delivery change:**
  - Shifted to web-based version that optimized for mobile on Qualtrics.
  - Retained same design / functionality overall
  - Participants prompted via text 2x per day (included link to Qualtrics).
EMA check-in

ACT Daily

How much are you...

<table>
<thead>
<tr>
<th></th>
<th>None</th>
<th>Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feeling sad/depressed</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Feeling anxious/afraid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unable to do what matters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fighting your feelings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stuck in thoughts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Running on autopilot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disconnected from values</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What would you like to do?

- Quick Skill
- Depth Skill
- End session
Active conditions

- **Tailored:** Complete the same initial EMA check-in, and the app provided the participant with an ACT skill component based on their check-in results.

- **Random:** Complete EMA check-in, and provided with a randomly-selected ACT skill.

- **Both directed to a post-skill coaching assessment after completing a skill.**
  - Same as pre-check-in (allowed for assessment of change in psych flex.)
Procedures

**Online Screening & Informed Consent**

**Online Baseline Assessment**
- Automatically randomized to one of 3 app conditions
- Brief online training on assigned app

**Use app for assigned app for 2 weeks**

**Online Midpoint Assessment**

**Continue using app for 2 more weeks**

**Post Assessment**
Participants

• 69 adults, 68% female, age range = 18 – 46 y/o

• Baseline:
  • 62.3% moderate or higher rates of depression, anxiety, or stress at baseline (DASS cutoffs)
  • 29% displayed severe symptomology
  • 10.1% of entire sample reported seeing a mental health professional.
  • 18.8% reported taking psychotropic meds over last 4 weeks.
# Program Satisfaction

<table>
<thead>
<tr>
<th>Satisfaction Variable</th>
<th>Tailored App M (SD)</th>
<th>Random App M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Usability Scale – Total Score</td>
<td>83.13 (11.19)</td>
<td>87.88 (10.19)</td>
</tr>
<tr>
<td>Overall, I was satisfied with the quality of ACT Daily</td>
<td>4.69 (1.08)</td>
<td>5.00 (0.87)</td>
</tr>
<tr>
<td>ACT Daily was helpful to me</td>
<td>4.31 (1.49)</td>
<td>4.59 (1.28)</td>
</tr>
<tr>
<td>ACT Daily was easy to use</td>
<td>5.63 (0.62)</td>
<td>5.53 (0.87)</td>
</tr>
<tr>
<td>I felt ACT Daily was made for someone like me</td>
<td>4.19 (1.76)</td>
<td>4.29 (1.45)</td>
</tr>
<tr>
<td>I would like to use ACT Daily again in the future</td>
<td>3.56 (1.63)</td>
<td>4.06 (1.71)</td>
</tr>
<tr>
<td>I think ACT Daily would be helpful for people struggling with mental health problems</td>
<td>5.25 (0.68)</td>
<td>4.94 (0.97)</td>
</tr>
<tr>
<td>I would recommend ACT Daily to someone who was distress and/or struggling</td>
<td>4.88 (1.15)</td>
<td>5.00 (1.23)</td>
</tr>
<tr>
<td>The text message prompts to use ACT Daily were helpful</td>
<td>5.69 (0.60)</td>
<td>5.71 (0.47)</td>
</tr>
<tr>
<td>The ACT Daily check-in assessments were helpful</td>
<td>4.81 (1.47)</td>
<td>4.53 (1.28)</td>
</tr>
<tr>
<td>It is important that the ACT Daily check-in guides the specific skill coaching I received from the program</td>
<td>4.94 (1.00)</td>
<td>4.88 (0.93)</td>
</tr>
<tr>
<td>The initial online training on ACT Daily was helpful</td>
<td>5.00 (1.10)</td>
<td>4.71 (0.99)</td>
</tr>
<tr>
<td>The initial online training was enough for me to get started in using ACT Daily</td>
<td>5.44 (0.73)</td>
<td>5.35 (0.86)</td>
</tr>
</tbody>
</table>

System Usability Scale (SUS; Tullis & Alberts, 2008).
Program satisfaction items were rated on a 6-point scale with 4 “slightly agree” or higher indicating a positive response. There were no significant differences on satisfaction ratings between conditions (p > .10).
Program Engagement

Tailored condition:
- Skill type:
  - 11.74 quick skills
  - 1.83 depth skills
- 78% Completed ≥10 skill coaching sessions.
- 25.39 EMA check-ins

Random condition:
- Skill type:
  - 20.09 quick skills
  - 5.27 depth skills
- 77% completed ≥10 skill coaching sessions.
- 35.86 EMA check-ins

EMA-only condition:
- No skills provided in this condition
- 46.7 EMA check-ins**
## MRMM results with full ITT sample

<table>
<thead>
<tr>
<th>Measure</th>
<th>Time x Condition</th>
<th>Pre-Post Within Condition d [95% CI]</th>
<th>Between Condition Post d [95% CI]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Tailored</td>
<td>Random</td>
</tr>
<tr>
<td>Psychological Distress (DASS)</td>
<td>3.48*</td>
<td>.50</td>
<td>.55* [.08, 1.02]</td>
</tr>
<tr>
<td>Positive Mental Health (MHC-SF)</td>
<td>4.32*</td>
<td>.56</td>
<td>.73** [.26, 1.20]</td>
</tr>
<tr>
<td>Social Functioning (SSR)</td>
<td>2.58†</td>
<td>.42</td>
<td>.53* [.06, .99]</td>
</tr>
<tr>
<td>Psychological Inflexibility (AAQ-II)</td>
<td>3.00†</td>
<td>.45</td>
<td>.62* [.15, 1.08]</td>
</tr>
<tr>
<td>Psychological Inflexibility (CompACT)</td>
<td>4.14*</td>
<td>.54</td>
<td>.63** [.16, 1.09]</td>
</tr>
</tbody>
</table>

Notes: †p < .10; *p < .05; **p < .01; ***p < .001. Time by condition tests were conducted with baseline MHC-SF as a covariate except for the analysis on positive mental health. Negative effect size scores indicate effects opposite to predictions (i.e., worsening of outcomes within conditions, tailored app post scores < random app post scores < EMA-only post scores).
AAQ-II
DASS-stress
Positive Mental Health (MHC-SF)
Discussion

• Tailoring vs. random.
  • Tailored app condition improved more on psychological distress, positive mental health, social functioning, and psych. inflexibility over time relative to EMA-only and Random App condition.
  • Despite similar satisfaction ratings and higher engagement, Random app performed equivalently to EMA-only condition.

➢ Tailoring what ACT skills are provided based on in-the-moment assessment data may improve MH outcomes and ACT processes.

➢ Randomly providing ACT skills regardless of what processes are most relevant in the moment appears to be ineffective, and tailoring is needed.
  • Aligns with ideographic, present-focused approach of ACT.
Discussion (cont.)

- **Future directions for tailoring**
  - More sophisticated tailoring could be useful, such as tailoring algorithms based on:
    - Defined rules for subgroups of users
    - Additional assessment variables, including passive data such as GPS / biometric
    - Current study prompted participants semi-randomly (failing to prompt when to use ACT skills).
      - Could be improved via a full JITAI approach that tailors when and what skills to the user.

- **Relevance to face-to-face therapy**
  - Lack of empirical guidance for more fine-grained clinical decision making with therapies such as ACT.
  - Apps still have limitations in bridging the gap, but this information could be useful in addressing clinical issues (e.g., when to use defusion vs. values skills).
Limitations

• Small sample size
• Qualtrics delivered non-native app.
  • Not able to disseminate via app store
• That said, Qualtrics + Text prompting methodology…
  • Displayed similar engagement / satisfaction ratings to native-app v1 of ACT Daily
  • Allowed for faster in-house iterative development
  • Cost-effective alternative.
Thank you to my colleagues

- Michael Levin, Ph.D. – chair
- Rick Cruz, Ph.D. – statistical analysis
- Ben Pierce, M.S. – analysis / content drafting
- Undergraduate RA’s: Melisa Reid & Serena Johnson for all of their hard work!
Questions?
Contact: 
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USU CBS website: www.usucbs.com
Additional Slides below...
## Between Group Effects on Treatment Outcomes

<table>
<thead>
<tr>
<th>Measure</th>
<th>Tailored Pre M (SE)</th>
<th>Tailored Post M (SE)</th>
<th>Random Pre M (SE)</th>
<th>Random Post M (SE)</th>
<th>EMA Only Pre M (SE)</th>
<th>EMA Only Post M (SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression</td>
<td>11.22 (2.0)</td>
<td>8.16 (2.33)**</td>
<td>12.18 (2.02)</td>
<td>12.73 (2.32)</td>
<td>9.42 (1.94)</td>
<td>11.39 (2.19)</td>
</tr>
<tr>
<td>Anxiety</td>
<td>10.26 (1.33)</td>
<td>6.83 (1.70)</td>
<td>6.55 (1.34)</td>
<td>6.75 (1.70)</td>
<td>6.75 (1.30)</td>
<td>7.49 (1.61)</td>
</tr>
<tr>
<td>Stress</td>
<td>14.44 (1.83)</td>
<td>12.06 (2.22)</td>
<td>14.27 (1.87)</td>
<td>15.88 (2.21)</td>
<td>12.92 (1.79)</td>
<td>13.61 (2.08)</td>
</tr>
<tr>
<td>Positive Mental Health</td>
<td>55.30 (2.65)</td>
<td>61.59 (3.44)**</td>
<td>60.32 (2.71)</td>
<td>60.02 (3.46)</td>
<td>63.00 (2.60)</td>
<td>61.73 (3.28)</td>
</tr>
<tr>
<td>Psychological Inflexibility</td>
<td>23.91 (2.06)</td>
<td>20.22 (2.08)**</td>
<td>21.73 (2.10)</td>
<td>22.21 (2.08)</td>
<td>19.83 (2.01)</td>
<td>20.07 (1.97)</td>
</tr>
</tbody>
</table>
Between group effects on treatment outcomes

- Time x Condition interactions found between tailored app condition and EMA condition on:
  - Anxiety $F(1, 38.1) = 6.85, p = .01$
  - Positive mental health $F(1, 38) = 7.29, p = .01$
  - Psychological Flexibility, $F(1, 38.9) = 4.28, p = .045$

- Time x Condition interactions found between tailored app condition and Random condition:
  - Anxiety $F(1, 35.08) = 5.17, p = .03$
  - Positive mental health $F(1, 35.07) = 5.89, p = .02$
  - Psychological Flexibility, $F(1, 38.01) = 3.12, p = .09$ (**trending)**

- **Tailored app condition improved more on outcomes relative to EMA-only and Random App condition in each case.**

- No time x condition interactions between EMA and random app conditions (equivalent on study outcomes)
Assessed for eligibility and completed informed consent (n=73)

Declined participation - did not start baseline assessment (n=4)

Completed baseline assessment and randomized (n=69)

Tailored app condition (n=23)
- Completed at least one app session (n=18, 78%)
- Used the app for 3 weeks or more (n=16, 70%)

Completed post assessment (n=18, 78%)

Random app condition (n=22)
- Completed at least one app session (n=22, 100%)
- Used the app for 3 weeks or more (n=17, 77%)

Completed post assessment (n=19, 86%)

EMA-only condition (n=24)
- Completed at least one app session (n=24, 100%)
- Used the app for 3 weeks or more (n=22, 92%)

Completed post assessment (n=22, 92%)