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Background

Executive dysfunction after traumatic brain injury (TBI) can make problem-solving and emotional regulation challenging, especially in injuries affecting the prefrontal cortex and the medial temporal regions of the brain. Comorbid post-traumatic stress disorder (PTSD) can compound challenges with executive functioning.

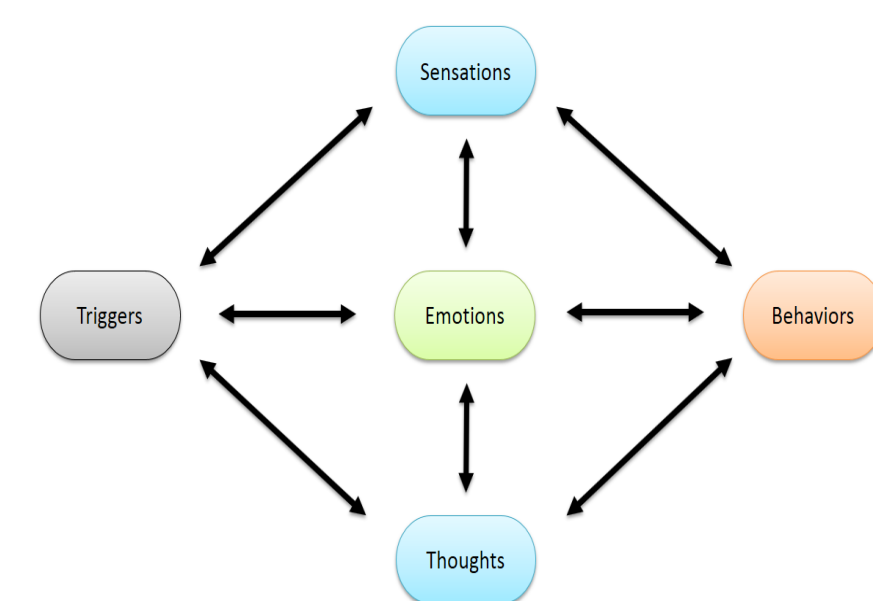
Short-term Executive Plus (STEP)

An evidence-based model incorporating meta-cognitive strategy instruction and formal problem-solving training to support problem-solving and emotion regulation. An RCT consisting of 12 weeks (9h/wk) of the STEP program (group training in problem solving & emotion regulation + individual training session focused on attention & strategy training) concluded that the STEP program is efficacious in improving self-reported post-TBI executive function and problem solving. (Cantor, et al. 2014).

Problem-Solving Model (SWAPS)

- S** – Stop!
- W** – What’s the problem?
- A** – Alternatives and Options
- P** – Pick and Prioritize
- S** – Satisfied?

Emotion Regulation Model (Emotion Cycle)



Problem

People who also experience difficulty with memory or post traumatic stress disorder (PTSD) report it is challenging to:

- Recall multiple steps in interventions
- Recall which strategies attempted
- Initiate use of strategies under stress

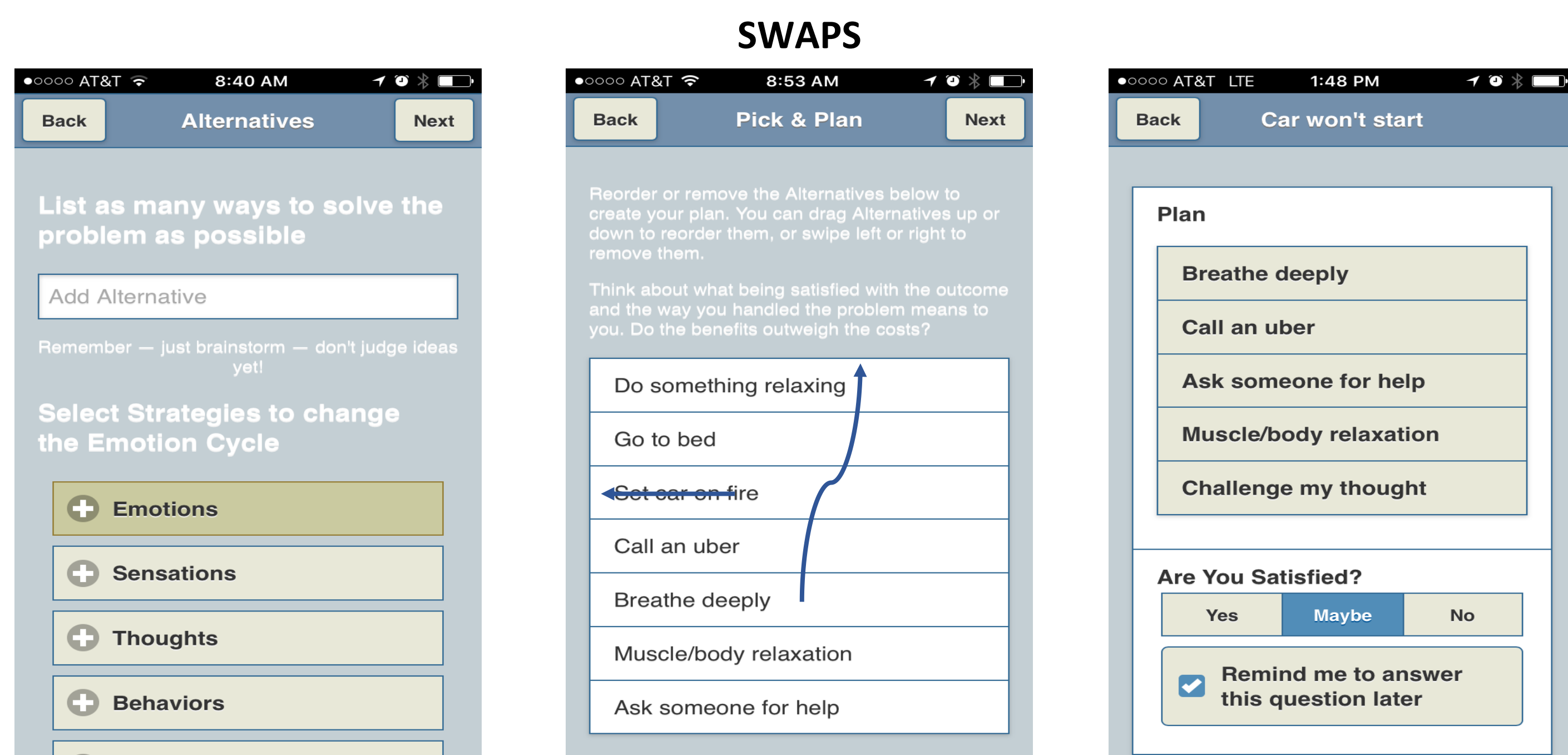
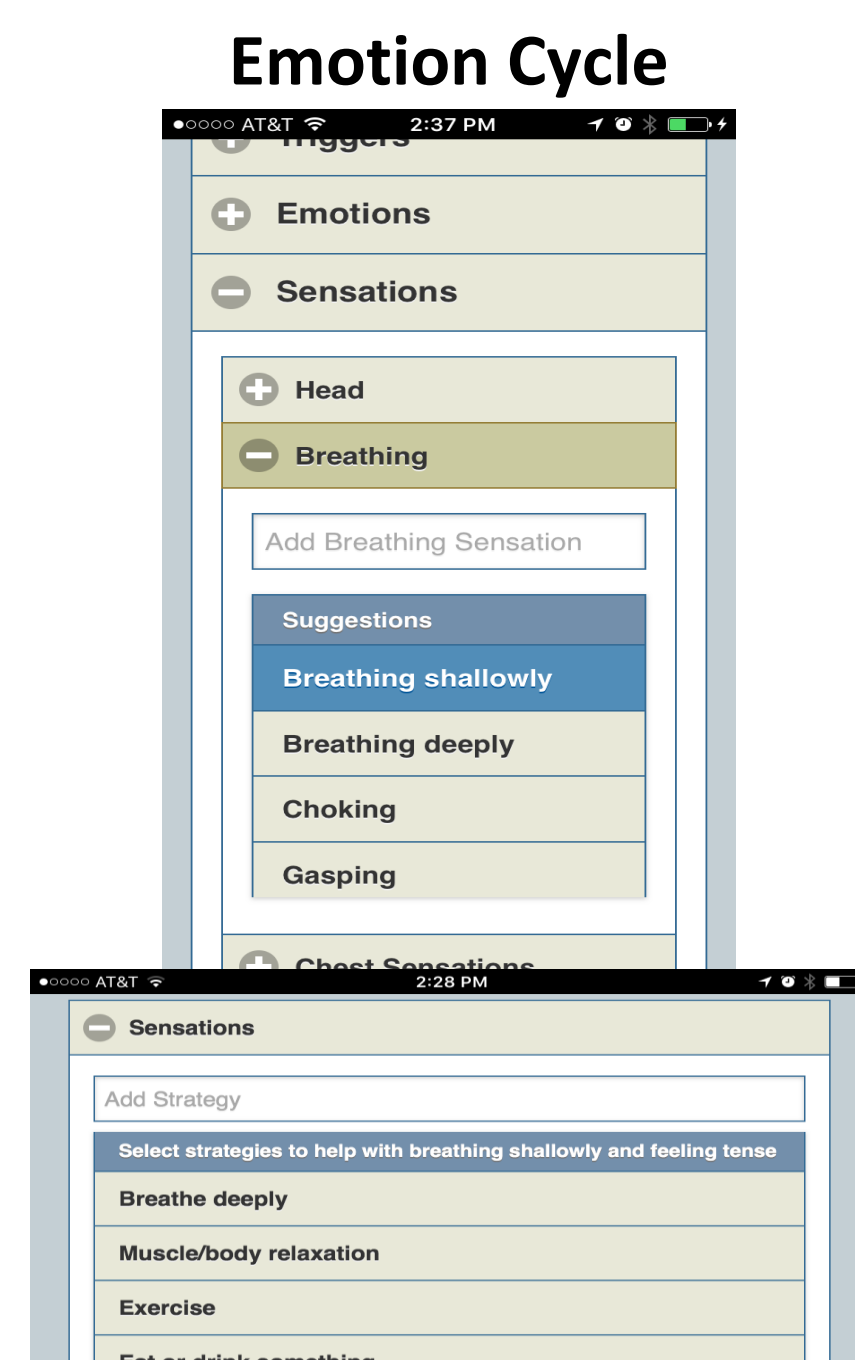
Solution & Design

Plan: Develop and test an iOS app to assist people with TBI and PTSD with problem solving and emotion regulation, thus creating an electronic mobile version of evidence-based tools that were previously only available in paper format. Then later develop for wearables and integrate the app with a stress detection biosensor.

SwapMyMood is available for free in the App Store. Target users have been included throughout the development process in accordance with user-centered participatory design principles. The initial design concept was led by a clinician with expertise in TBI cognitive rehabilitation in collaboration with a psychologist with expertise in PTSD treatment. Seven clinical specialists and 6 target users with TBI and PTSD contributed to the design through a combination of sit-by demonstrations and brief take-home testing.

Key Features of Mobile App:

- Guidance through the multiple steps involved in problem-solving and emotion regulation
- Links to strategy banks and other useful tips based on the Executive Plus/STEP written manual and the user’s previous entries
- Records and saves information input for future reference to assist with identifying effective strategy use

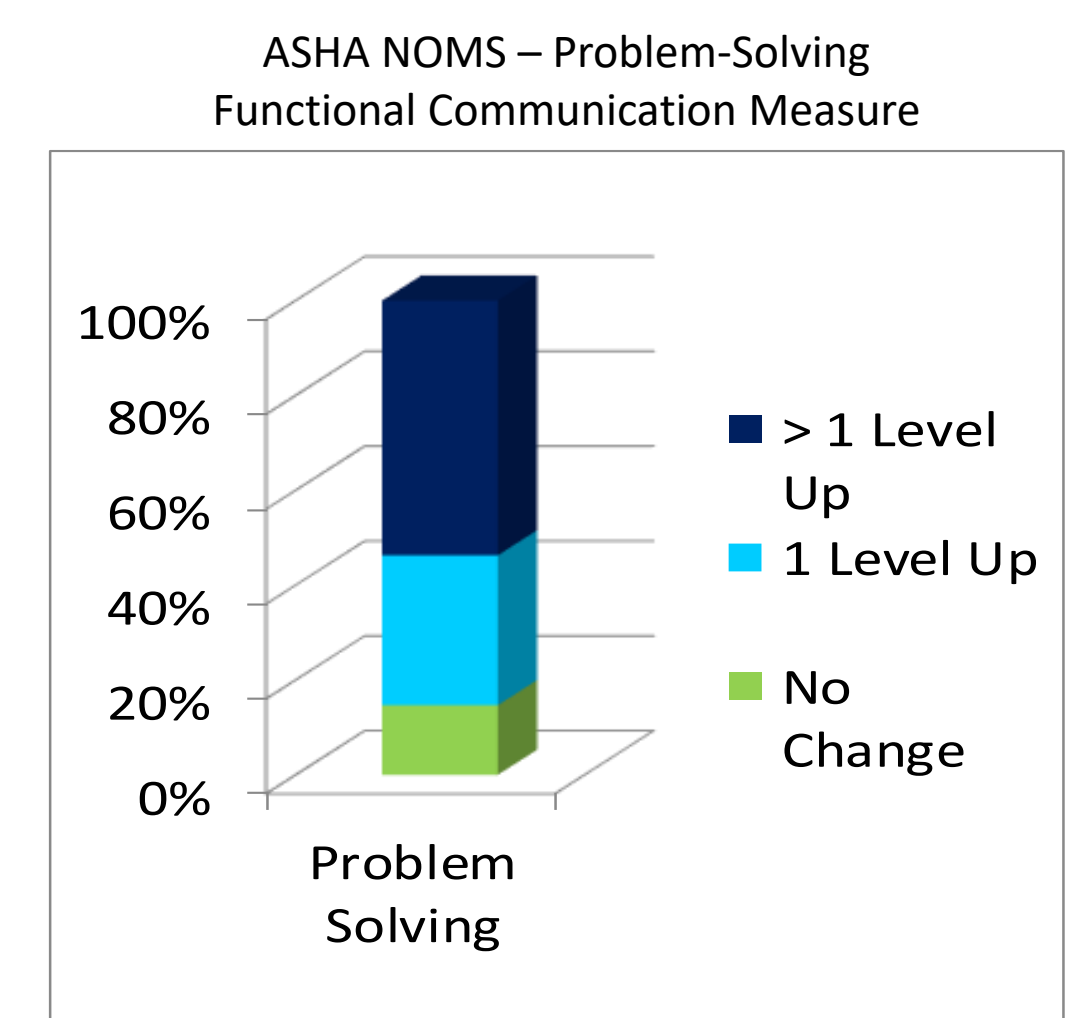


Adaptation and Application of STEP at Shepherd Center

The STEP program was adapted and applied within the SHARE Military Initiative at Shepherd Center, a comprehensive outpatient day rehabilitation program for post 9/11 military service members with mild-moderate TBI and PTSD.

Program Outcomes

- 95 total w/ BI, some w/ LOC and/or multiple blasts
- 93% were >12 months post onset
- 92% male in 20s, 30s or 40s
- Average LOS: 71 days



Results of User Testing

Feedback from Sit-by Demonstrations

Most gave positive feedback:

- “It looks great.”, “Really well-designed.”, “That’s really cool”, “I like it. It’s not as clunky as I thought it was going to be.”

What they liked most:

- Accessibility of digital mobile format
- Strategy prompting & recall of previously entered information
- Easy to use (5 of 6 reported it is “very easy” to use)
- Phone a friend is “crucial”
- Ability to review struggles, see what has worked and see how growth
- Using app during stress is “grounding”

Concerns:

- Can’t see all of the text when phone is vertical (design changed in response)
- There are a lot of dropdown boxes (dropdown boxes have since been reduced)
- Need more color choices
- Need to be able to edit entries (ability to edit and email plans has been added)

Take Home Testing – 2 weeks

Participant 1: 57-year old male veteran w/ TBI and PTSD; 13 years post onset
Participant 2: 46-year old female veteran w/ TBI and PTSD, 7 years post onset

How well do you know how to use SWOPS to support problem-solving and planning?

Participant 1: pre = “I know a little” / post = “I know it well”
Participant 2: pre = “I know it well” / post = “I know it well”

How well do you know how to use the emotion cycle to support emotion regulation?

Participant 1: pre = “I know a little” / post = “I know it well”
Participant 2: pre = “I know it well” / post = “I know it well”

How often do you use your SWOPS and Emotion Regulation workbooks and worksheets (asked pre) or the app (asked post)?

Participant 1: pre = “I use the worksheets less than half of the times when I use SWAPS and the emotion cycle” / post = “I use the app most of the times when I use SWAPS and the emotion cycle”
Participant 2: pre = “less than half” / post = “less than half”

Future Directions

- Refined collection of impact data, including clinical testing
- Add ecological momentary assessment to query about the need to initiate the strategy
- Explore integration with stress detecting biosensor
- Add context awareness (time/location) and machine learning
- Design a version for Apple Watch
- Design a version for Android and Android Wear

References

American Speech-Language-Hearing Association (2003). National Outcomes Measurement System (NOMS): Adult Speech-Language Pathology User’s Guide. Rockville, MD: American Speech-Language-Hearing Association.

Cantor J, Ashman T, Dams-O’Connor K, Dijkers MP, Gordon W, et al. (2014) Evaluation of the STEP intervention for executive dysfunction after traumatic brain injury: a randomized controlled trial with minimization. Arch Phys Med Rehabilitation; 95: 1-9.

SwapMyMood app published in the App Store at:
<https://apps.apple.com/us/app/swapmymood/id1457858738>

