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# Beam: A Mobile Application to Improve Happiness and Mental Health

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**Abstract**

In this paper, we present Beam, a mobile application that uses random acts of kindness to analyze and improve the mental health of its users. The concept was developed using an iterative, user-centered design process that included contextual inquiry, surveys, low and high-fidelity prototypes, and usability testing. Based on our initial research findings, we found that users tend to be pessimistic and focus on stress and negativity. We designed a mobile application that focuses on positive action and self-reflection to improve individual mental health. We used a combination of theory, design, and user research to influence users to become more optimistic – linking the use of the application with mental health and mood improvements.

**Author Keywords**

Mobile application, persuasive technology, user-centered design, contextual inquiry, behavior change,

**ACM Classification Keywords**

H.5.m. Information interfaces and presentation  
(e.g., HCI): Miscellaneous.



**Figure 1** - Building an affinity wall. We used contextual inquiry to find how users currently maintain their mental health.

## Introduction

Maintaining emotional balance is important to avoid future mental health problems. Researchers have found that the way people respond to seemingly minor arguments and stress may have long-term implications that can influence whether they suffer from psychological and mood disorders many years later. [1] Motivating people to do positive intentional activities and taking an active role in maintaining their mental health can increase long-term happiness and avoid more serious mental health problems. Random acts of kindness and positive self-reflection have been shown to be an effective way to amplify happiness and can have both short-term and long-term benefits. [8] Changes in intentional activity can affect happiness more than changes in life circumstances or genetics. [8] Positive outlook and engagement has also been shown to improve thought exploration and creativity. [6] Positive emotions and relationships contribute to reduced recovery time from sickness and injury as well as longer lifespan. [2][9][10] Those who self-reflect and create gratitude journals on a weekly basis have reported more progress toward important personal goals, positive states of alertness, and higher energy levels. [3]

Our team's goal was to design a product or application that would promote a positive life outlook and improve emotional well-being. Our design process included contextual inquiry, survey, persona and scenario creation, low-fidelity prototypes, high-fidelity prototypes, and usability testing. We used existing research to better understand effective ways to improve happiness and change behavior. Beam connects users with daily challenges to promote positive emotions and improve overall mental health.

## Preliminary Research and Survey

We began by gathering survey data from 78 college educated students and professionals. We targeted individuals who we believed incurred more stress on a daily basis and would most benefit from our application. Our primary goal was to uncover the types of activities individuals currently do to reduce stress and improve mental health.

We learned that individuals tended to talk to others in times of stress or act more passively by either listening to music or doing nothing at all. Very few interacted with social media or wrote about their feelings in either a blog or journal format to reduce stress. Many users did not want to share their private feelings and when they did, edited it to be acceptable for social media. They were often concerned of being judged by their social peers.

## Contextual Inquiry

We interviewed six individuals between the ages of 23 and 30. Our primary goal was to discover users' current outlook on life and what factors promote this outlook. Our team built an affinity wall diagram to analyze the data from our interviews. (See Figure 1) The findings that influenced the design of our application included:

- Individuals experience negative stress everyday
- Engaging in activities reduces stress
- Many are passive and do not do anything to improve their mood



**Figure 2** – Personas were developed to better understand our potential users.

## Initial Design

Based on our research findings, we brainstormed active ways to reduce negativity, promote a more positive outlook and improve overall mental health. Because our survey respondents and interviewees took a much more passive role in improving their mental health, our team narrowed our ideas and focused on a concept that would promote intentional activity and self-reflection. We chose a mobile application because the smartphone has become an omnipresent part of everyday life and could easily be incorporated into the daily habits of our users.

Our mobile application engages users by initiating random acts of kindness challenges and guides the user through self-reflection, journaling, and data analytics. Participants in our testing reported mood improvements after completing random acts of kindness. Our user testing substantiated our outside research finding and link random acts of kindness with improved optimism, increased levels of happiness and reduced stress levels. [6][8]

Our application features three main functions:

1. **Challenges:** Research studies have shown improved performance and motivation when specific goals and deadlines are established with feedback results [7]. The application allows the user to select and complete a random act of kindness challenge. Several challenges are randomly selected from a database for the user to choose from. Examples of the types of challenges include: buying a cup of coffee for a stranger, complimenting a co-worker, writing an appreciative note to a friend or loved one, or making lunch for a



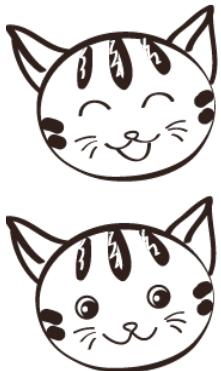
**Figure 3** – Storyboards were developed to better understand our users' motivations for using the application

roommate. The scope of the challenges should be simple enough to complete within the day, yet have a direct affect on another person. In the majority of the described challenges, the user receives immediate feedback from the recipient. (See Figure 6)

2. **Self-reflection:** Research findings from the experiment performed by Emmons and McCullough has found that positive reflection and journaling over time can improve happiness levels [3]. By having a user reflect after completing a random act of kindness, we can foster positive self-reflection. Overtime, the application tracks short-term and long-term mood improvement changes through self-reporting or a micro-expression capturing process.

The detailed graphical results present the user with data visualization and suggestions to evaluate the value of helping others and further improve the user's mood. (See Figure 6 & 7)

3. **Virtual Self-Modeling:** Research from Fox and Bailenson has found that users who were presented with a virtual representations of their physical-self were significantly more active than those who did not receive any vicarious reinforcement.[4] By incorporating an avatar, we hope to be able to promote the idea of virtual self-modeling in the user and improve the effectiveness of the application. (See Figure 4)



**Figure 4:** A Cat avatar is used as a virtual self-reflection of the user.



**Figure 5:** User testing through the use of paper prototypes

## Personas, Storyboards, and Scenarios

Based on our user studies, we developed personas of our typical users to help guide the design of our low-fidelity prototype. (See Figure 2) We used our personas to create storyboards to illustrate how our application would be used and help our persona improve his/her individual mental health. (See Figure 3)

## Low-Fidelity Prototype and User Testing

We conducted user testing to examine the effectiveness to:

- Assess clarity of design.
- Assess the application's effectiveness to perform basic tasks (ie. Select a challenge, set current mood, and complete self-reflection).
- Identify major obstacles and locate gaps between user expectations and current functions for refinement.

Ten users with various skill levels tested the paper prototype by performing a set of tasks. (See Figure 5) The tasks consisted of selecting a challenge, selecting a mood before and after the challenge, journaling, and reviewing sample data visualizations. We asked our participants to think aloud while responding to the interfaces. During the process, we observed their behaviors and recorded unrealized expectations and frustrations. The main findings were:

- Users enjoyed the cat avatar and seeing its different expressions.
- The interfaces were too complicated and confused the user.

- Users liked the ability to do a short self reflection responses as well as a longer manual entries if desired
- Users liked the data visualizations and the ability to see their progress over time and emphasized the need for diagram clarity.

We found that these findings guided us as we refined the interfaces. We re-analyzed the priority of the tasks and simplified the workflow so that the users would not be distracted or confused. We also made the analytics and journaling features more accessible, so users would be able to quickly return to those features. We expanded the role of the cat avatar and had it follow the user through the challenges, self-reflection, and reporting process as well as provide feedback to the user. By featuring the cat avatar more prominently throughout the application, we can improve the effectiveness of the virtual self-modeling.

## High Fidelity Prototype and User Testing

We conducted a second round of user testing to assess the usability of the application as well as its effectiveness in improving levels of happiness. To do this, we asked five users to perform three challenges throughout the week and another five users to perform five challenges over a week. Users were texted a challenge and asked to write a short self-reflection after the challenge. They were also asked to self assess their mood levels prior to the study as a baseline and to reassess after each challenge. From the user testing we discovered:

- Users felt good about themselves after completing the challenges given to them. They



**Figure 6:** Top image shows the challenge page. Users are able to select from randomly chosen challenges by swiping left to right

Below: Users can select their mood after a challenge. The self-reflection written by the user is analyzed using natural language processing to classify the emotion described by the user.

- felt that continuing with the challenges of random acts of kindness every week would bring a positive long-term impact.
- Users experienced higher levels of happiness after completing several challenges.
- Although users found the self-reflection process useful, they asked if it was tied into the analytics in some way.
- Users liked the graphical results and data visualizations to track their mood improvement.

Several of our users asked if the self-reflection was integrated into the application. Because self-reflection is such an important part of improving ones outlook, we wanted to stress this feature and incorporate it further into the data visualizations. Strapparava and Mihalcea completed an experiment where they identified specific emotions in newspapers through text analysis. Using similar natural language processing algorithms that use Naïve Bayes classifiers trained on mood-labeled blog posts, we can classify the words written in the user's self-reflection that either directly or indirectly relate to certain emotions. (ie. sadness, joy, angry, frustration, surprise, etc.) When multiple emotions are extracted, an inter-annotator averages the scores of the mood to provide a suitable emotion match. The avatar then changes its expression based on the evaluations and gives a user a status report and potential areas of improvement.

### The Final Design

Users are presented with several challenges to choose from at the beginning of the day and are asked to complete the challenge before the day ends. (Figure 6) Users are asked to assess their mood before and after

each challenge to gauge short-term and long-term mental health improvement. A cat avatar walks the users through the challenges and self-reporting in order to increase user engagement. Self-reflection journaling is provided after each challenge to promote positive self-reflection and outlook while using text analysis to better understand potential subconscious feelings of the users. Data visualization is provided for users to see their mental health improvement over time. (See Figure 7)

### Benefits

By using Beam, users are able to see how helping others and positive self-reflection can improve their levels of happiness. By incorporating virtual self-modeling, we expect users to continue to use the application and become more motivated to actively improve their mental health.

Beam is a cost-effective solution. The application would be free after development. Users regularly download mobile applications to record and manage physical health, so it would be easy to get started with Beam.

Based on our user studies, we learned that users often take a passive role towards their mental health. Beam encourages awareness of the user's mental health and provides suggestions to reduce stress and improve happiness. The application asks users to actively think about activities they may already do naturally and see the positive benefits from interactions with others. It also encourages users play an active role in improving the lives of the people around them.



**Figure 7:** The cat avatar walks the users through the data and informs them of their progress.

## Conclusion

Our team has designed and tested a mobile application that has users complete random acts of kindness challenges, self-reflect, and assess their mood levels. People often use mobile applications to track physical health while neglecting to manage their mental health. We believe that through positive activities and self-reflection, we can encourage users to take active steps to reduce stress and improve overall happiness.

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## References

- [1] Charles, S. T., J. R. Piazza, J. Mogle, M. J. Sliwinski, and D. M. Almeida. "The Wear and Tear of Daily Stressors on Mental Health." *Psychological Science* 24.5 (2013): 733-41. Print.
- [2] Danner, Deborah D., David A. Snowdon, and Wallace V. Friesen. "Positive Emotions in Early Life and Longevity: Findings from the Nun Study." *Journal of Personality and Social Psychology* 80.5 (2001): 804-13. Print.
- [3] Emmons, Robert A., and Michael E. McCullough. "Counting Blessings versus Burdens: An Experimental Investigation of Gratitude and Subjective Well-being in Daily Life." *Journal of Personality & Social Psychology* 84.2 (2003): 377-89. Print.
- [4] Fox, Jesse, and Jeremy N. Bailenson. "Virtual Self-Modeling: The Effects of Vicarious Reinforcement and Identification on Exercise Behaviors." *Media Psychology* 12.1 (2009): 1-25. Print.
- [5] Fredrickson, Barbara L. *Positivity*. New York: Crown, 2009. Print.
- [6] Fredrickson, Barbara L. "The Role of Positive Emotions in Positive Psychology: The Broaden-and-build Theory of Positive Emotions." *American Psychologist* 56.3 (2001): 218-26. Print.
- [7] Lunenburg, Fred C. "Goal-Setting Theory of Motivation." *International Journal of Business, Management, and Administration*. 15.1 (2011): 1-6. Print.
- [8] Lyubomirsky, S., Tkach, C., & Sheldon, K. M. (2004). Pursuing sustained happiness through random acts of kindness and counting one's blessings: Tests of two six-week interventions. Unpublished data, Department of Psychology, University of California, Riverside.
- [9] Reich, John W., Alex Zautra, and John Stuart Hall. *Handbook of Adult Resilience*. New York: Guilford, 2010. Print.
- [10] Ryff, Carol D., and Burton Singer. "The Contours of Positive Human Health." *Psychological Inquiry* 9.1 (1998): 1-28. Print.