Towards Systems that Elicit Spontaneous Self-Affirmation

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Abstract
Health applications increasingly focus on improving well-being and mental health. However, these applications have not explored the importance of self-affirmation in mental health. We examine a study of a life-logging application called Echo that offers a new perspective on spontaneous self-affirmation. We identify 3 facets of self-affirmation: positivity, generalizability, and explicitness; we also identify common domains and values users affirm. We find that our system design influenced how often people self-affirm. In addition, we build a computational model of self-affirmation. Finally, we use these results to suggest how new systems targeting improved well-being could be created that elicit spontaneous self-affirmation in order to improve mental health.

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Well-being; self-affirmation; Echo; technology-mediated reflection; mood; emotional writing.

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

Introduction
Applications to promote well-being have exploded in recent years, including systems that: infer mood [12],

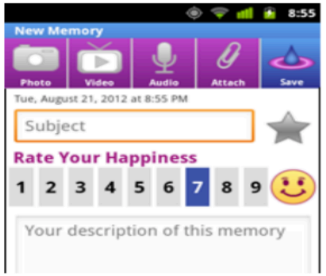

Figure 1 & 2: The interface of the Echo application. (Top) is the screen for logging a new memory, (Bottom) is the screen for logging a reflection.

passively track and improve behavior patterns [11], present correlations of physical and mental well-being indices, and even predict future mood [4,8]. These applications allow users to examine daily actions and events, promoting new insights about remedial behaviors and coping mechanisms to increase wellbeing [7,9].

However, there has been less exploration of self-affirmation in the context of well-being. Self-affirmation (SA) is a process by which people actively reflect on values held as a core part of their identity [16], e.g. they might reflect on reasons they value their family and describe a situation where they acted in accordance with this value. Self-affirmation is a highly successful intervention method: encouraging people to self-affirm increases both hedonic and eudaimonic well-being [13], reduces smoking [2], improves fruit and vegetable consumption [6], increases educational achievement in non-dominant groups [3], reduces consumption of alcohol [1], etc. However, prior work has primarily focused on controlled laboratory settings. While some work has begun to transition SA interventions into internet and mobile realms [6] these online interventions have met with mixed success [15], in part because lab-based elicitation techniques may be less effective in the wild [15]. This paper explores an alternate approach to SA by exploring how we might design programs that evoke *spontaneous* SA. To our knowledge, no work has allowed users to record spontaneous SA *in vitro* as they went about their daily lives.

Using a diary-like reflective mobile application called Echo [9], we examine spontaneous SA in everyday life. Although Echo was not explicitly designed to elicit SA, we informally observed multiple instances of spontaneous SA in the application. We therefore analyze Echo data to identify key characteristics of spontaneous SA and use naturalistic data to explore the design of novel systems to elicit SA, in order to create meaningful and health improving experiences for users. We have 3 specific research questions:

- What are the key properties of spontaneous SA?
- What system properties may promote spontaneous SA?
- How might we design systems to effectively elicit SA in the future?

Methods

We analyzed posts and reflections generated through the mobile lifelogging application Echo. Echo [9,10] supports manual text entry concerning an everyday experience. Creating an Echo post involves entering a subject line, a happiness ranking, a description and optionally adding photos, videos, and audio (Figure 1). The application elicits usage via reminder notifications; encouraging participants to generate posts and reflections. Users are later presented with prior posts and prompted to reflect on these memories in a similar fashion to the original post (Figure 2), with the ability to update their happiness about the event, add a new reaction/description, and attach more media. Each day the system presents users with up to three past posts, ranging from one day ago to years ago, encouraging them to reflect. Users are also able to browse prior posts and reflect on any memory at any time. The

3: Clear Spontaneous Self-Affirmation – *"It's always great to see my friends, so I feel positively about this memory. It was a good time.* ***Close friendships are important to me****."* – P83

2: Indefinite Spontaneous Self-Affirmation - *"What a relief. I often feel anxious about jd but he is being very nice lately and* ***i enjoy being here a bit****, esp since* ***it feels good*** *to get work done"* – P66

1: Ambiguous Spontaneous Self-Affirmation - *"It is a beautiful warm day, so I took a good run in the beach.* ***It was nice*** *to run for the first time in a long time!"* – P71

0: No Spontaneous Self-Affirmation – *"I didn't get that much sleep but at least I finished. I need to start doing my work earlier."* – P89

study involved 132 participants: 86 women and 46 men aged 18 to 60 (M= 23.9, SD= 6.8).

Self-Affirmation Coding

We developed a codebook using past spontaneous SA studies as a base and then iterating on it for our data. Previous studies assume long essays written specifically for SA whereas we have shorter diary-like entries, thus the codebooks were iterated on by coding first 500 random entries, then 1000 random entries and revising the codebook. Our final codebook consisted of 3 facets of spontaneous SA: positivity/negativity [17], generalized or situation specific [5], and whether the value was affirmed implicitly or explicitly. These facets were coded separately and used to calculate the final spontaneous SA score. There were 4 final categories of spontaneous SA:

- **Clear** - Explicitly affirming a value or belief in a way that is positive, generalized, and reflective.
- **Indefinite** - Implicitly affirms a positive value or belief. Usually generalized, and reflective.
- **Ambiguous** - Alludes to a positive value or belief but uses hedged language; often more specific to a certain memory than generalized.
- **None** - Specific to a single event, uncommitted language or an overall negative reflection.

Examples of these levels of SA reside in the left bar on this page. Domain of the value being self-affirmed was also coded. Domains were created from systematic bottom up coding and the final domains were: Pets/Animals, Art/Music, School, Friendships, Possessions, Nature, Family, Leisure, Productivity, Romance, Work, Spirituality, Lessons, Pride, Home, Health/Fitness, and Goals.

After discussing and agreeing on these definitions and creating a formal codebook with examples, 2 coders next coded 2868 entries and reflections on this four-point scale. After coding separately, differences in codes were mediated through discussion.

Results

We first examine whether spontaneous SA is related to the type of entry—either a reflection or original recording. A significant relationship was found, X^2 (2, N = 132) = 16.268, $p < 0.001$, indicating that reflections were more likely to contain spontaneous SA than original recordings.

Feature	Coefficient	p-value
Post Type	.040	.001
Happiness	.037	.01
Common Verbs	.005	.02
Future Tense	-.007	.02
…	…	…
Negations	-.003	.04
Past Tense	-.006	.006
Sentences	.031	.001
Sexual	.016	.001
Unique Words	-.002	.004

Table 1: Significant predictors of spontaneous SA. Non-significant predictors have been omitted.

Next, we characterize spontaneous SA computationally. We build a linear regression model of SA on a per post basis using: post type (reflection or recording), post

Further Examples of Clear Self-Affirmation

P128 – *"I should be more grateful for the love and stability Justin has brought to or lives together. He has truly been a trusted confidante and place of refuge for me."*

P117 - *"Just finished reading tattoos on the heart. A little worried about scheduling this weekend, but feel a deep warmth in my heart after finishing favorite book of all time. I am so grateful to be clean and have gods love all around me. I'm SO connected and feel this book is helping lift me and helping me love at a level I never knew existed."*

P47 – *"I feel like a fire has been sparked. I know my work is meaningful. It is great to hear how much people care about making this world a better place."*

P52 - *"I feel so lucky to have my job and I love the experiences that come along with it."*

happiness rating, user ID, and LIWC categories (see Table 1). LIWC is a tool that categorizes words into different linguistic categories, e.g. the words 'hate', 'fear', and 'rage', are all classified by LIWC as 'negative emotion' [14]. Therefore, each post is rated according to the percentage of words in the post that fall into each LIWC category. Overall, the model is slightly predictive of SA (adjusted $R^2 = .131$, $p < .0001$).

Discussion

First, we saw that in Echo, spontaneous SA occurs in applications that do not target it. One of the major Echo design decisions that seems to elicit SA is reflection. Prompting users to actively reflect on posts they had previously recorded led to more posts exhibiting SA. In addition, we find that SA can be described in our setting by Echo entry features and lexical features. Self-affirmation seems to be positive and reflective; this is predictable given our coding scheme. More interestingly, stronger SA seems to be focused on the present tense, verbs/actions, and sexual words. Looking at the examples in the left bar of page 4 exemplifies this. Many of these SAs start with a reflection on an event that happened in the past and then generalize it to the user's current state and values. Additionally, we see what LIWC classifies as the 'sexual' words because of the extensive use of 'love'. While some of these examples are specifically interpersonal love (P128), others such as P117 and P52 refer to broader uses of 'love' including in the context of religion and thankfulness.

Our results inform the design of systems to elicit naturalistic spontaneous SA. One straightforward modification of Echo system might be prompt users in a way that leads toward the discerning features our computational model identified. Changing the prompt to carefully guide users towards posts that are focused on the present tense, highly positive, and focused on what the user is currently enjoying could lead to more spontaneous self-affirmation. This change may result in more naturalistic SA than previous induced lab experiments—the equivalent of a flowing conversation compared to the intrusive interviewing of common induced SAs.

Other designs could passively determine *when* or *where* a good time to post an entry. For example, one of the primary domains of spontaneous SA we discovered is about being in nature; therefore, an application could detect when the user was in state or national park and prompt them to reflect on their visit. Similar means could be deployed to detect when the user is visiting family, a friend or significant other and non-intrusively prompt the user to reflect on the significance of this relationship afterwards. These modifications would mean that posts and reflections are more likely to elicit SA, thus reducing the number of posts that users have to make to incur well-being benefits, which in turn would likely increase posting compliance.

Finally, our SA based approach suggests it is important that mental health applications focus on deeper elements of well-being. It may be easy for applications to passively sense activity and location in order to estimate a user's mood or current state, but this may overlook deeper motivations and values that permeate a users' life. Self-affirmations are deeply meaningful interactions that our Echo system elicits from users and our work provides a design approach to prompting these beneficial interactions in naturalistic contexts.

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