Well-Being Strategies from Recording and Reflecting: A Field Trial

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Abstract

Many systems have been developed to facilitate recording of events and emotions, as well as reflection on these at a later time. Despite their growing popularity, few studies have actually measured the effects of system usage and their influence on well-being. We present data on 64 participants who generated over 3200 recordings and reflections over 28 days. We compare the effects of simply recording experiences versus reflecting on those experiences at a later time. Both recording and reflecting on everyday events have well-being benefits. While recorders and reflectors benefited equally, they did so through different strategies.

Author Keywords

Reflection, recording, memory, emotion regulation, mobile technology, well-being

ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Introduction

Psychological theory describes two important skills for engendering memory related well-being benefits. The first is **recording**, which involves savoring and disclosing emotional events as they happen. The

second is **reflection**, which involves revisiting past events for perspective, personal growth, and distancing from traumas. While these processes are supported by new recording and reflecting technologies, very little research has systematically explored if and how such systems benefit well-being. We describe an empirical study to measure how **Technology-Mediated Recording** (TM-Recording) and **Technology-Mediated Reflecting** (TM-Reflecting) influence well-being. We also investigate potential **mechanisms** of benefit and uncover interesting new system and therapeutic directions to harness these adaptive mechanisms.

Related Work

Recording. Recording that is unmediated by technology involves **registering** and **evaluating** events in the present. Recording everyday experiences has psychological benefits [6]. There are two possible reasons for this. Recording positive experiences increases subjective well-being because it enhances awareness and emotional intensity of positive aspects of life [5]. This strategy is called **savoring**. Recording negative experiences also increases subjective well-being by facilitating analysis of events and emotions [10]. This strategy is called **emotional disclosure,** which allows the event to be better understood and reduces its emotional intensity.

Reflection. Unmediated Reflecting involves mentally reviewing our memories of past experiences. Reflection is beneficial for both physical and psychological health. Reflecting on **positive** events such as friendships and past successes increases perceived enjoyment of life and positive affect [2]. Over 200 studies have shown that reflecting on **negative** events is also adaptive for well-being potentially because it allows people to

distance themselves from traumas [9], Additionally, memory theorists have identified three adaptive functions of unmediated reflection: Directive, social, and self-enhancement [11].

Directive functions help us plan and direct our future behavior. By reflecting on past successes, our future behaviors are guided by increased self-efficacy. **Social functions** involve remembering and disclosing our past to others to promote interpersonal relationships and bonding. **Self-enhancement functions** are the tendency for memory to protect and enhance our self-image. Psychological distancing is an example of self-enhancement where we view past traumas over time as being further in the past. (as evidenced by a reduction in first person pronoun usage) [3].

Recording Technology. Many systems afford recording of events in the moment. Lifelogging systems [12] capture rich records of everyday activities. Such systems improve memory and self-efficacy in Alzheimer's patients [1]. Email, text messaging, instant messaging, online journaling, and microblogging all provide ways to write about experiences and share them with others. Blogging events throughout the day is beneficial to subjective well-being because it facilitates self-disclosure [6].

Reflection Technology. Many commercial systems support review of digital recordings of our pasts. Some systems such as Timehop, Live Happy, MorningPics, 1 Second Everyday, and Everyday.me send back past records to reflect on after time has passed. Other tools such as PosiPost Me, Moodmill, MobiMood, CaraClock, and eMoto add a social component to TM-Reflection by sharing emotional data with friends. Facebook has also explored TM-Reflection on past posts with Year in

Review, Timeline Moviemaker, Lookback videos and Say Thanks. With the exception of [8], there is very little data of how these systems might influence well-being.

Echo Technology. To understand the nature of TM-Recording and TM-Reflecting, we designed a mobile smartphone application called "Echo." Echo allows participants to record events of their choosing. A record consists of a label and short description of the event, and an emotional reaction to that event (ranging from '1' for a highly negative event, to '9' for a highly positive experience). A full description of the system is provided in [4].

TM-Recording vs. TM-Reflecting Study

To assess how recording and reflective technologies affect well-being and understand potential mechanisms, we conducted a controlled deployment of different versions of the Echo system. We randomly assigned participants to 4 different system conditions. We contrasted the two treatments (TM-Recording and TM-Reflecting) with two controls. The first was a *do-nothing* control group where participants had no access to technology records. The second *technology-control* group aimed to eliminate the effects of subject expectations about using technology to register emotions. We asked these participants to use Echo to record emotionally-neutral events. We compared these 4 groups by assessing changes in subjective well-being across four different psychological survey measures over a period of 28 days. We predicted that both treatment groups would improve on the well-being measures as compared to controls since recording and reflecting have demonstrated benefits [2, 5, 9, 10]. However, we also predicted that there would be greater improvement for TM-Reflection than TM-Recording

because only this group could benefit from the three adaptive memory functions (directive, social, self-enhancement).

Participants

We recruited 64 participants (36 female), aged 18 to 63 (*M*= 25.44, *SD*= 9.82) randomized across the four groups. There were 17 TM-recorders, 16 TM-reflectors, 16 in the technology control group, and 15 in the do-nothing control.

Materials

Participants were assessed using four validated standard well-being scales at pretest and posttest.

• *Subjective Happiness Scale* (SHS): 4 item survey that assesses happiness of self, and self relative to others.
• *Satisfaction with Life Scale* (SWLS): 5 item survey that assesses overall life satisfaction.
• *Psychological General Well-Being Index* (PGWBI): 22 item survey that measures self-representations of affective and emotional states.
• *Mindfulness Attention Awareness Scale* (MAAS): 15 item survey that measures attentiveness to what is occurring in the present.

Procedure

The TM-Recorders and TM-Reflectors were asked to make at least three recordings per day and to record a broad range of emotional events. Additionally, the TM-Reflection group was asked to reflect on previous recordings at least three times per day. A reflection involved revisiting a previously recorded event and re-evaluating it by writing a short textual description of how they now felt about that event along with a new emotional rating of their current feelings about that event. The TM-Recording group was not able to view or reflect on any previous recordings. The technology-

control group also recorded three events per day but their system version had no emotion ratings since they recorded neutral events. Following piloting, they were asked to either record a neutral description of a city street they were on, or a neutral description of a visual pattern they saw. The do-nothing control group was not given any tasks or technology to work with between pretest and posttest.

Results

TM-Recording and TM-Reflecting improve well-being.

We compared the scores of the control groups (technology and do-nothing) with the scores of the combined treatment groups (TM-Recording and TM-Reflecting). A MANOVA with one between factor (controls vs. treatments) and one within factor (pretest vs. posttest) revealed a significant interaction effect of time by group, $V = .18$, $F(4,59) = 3.24$, $p=.02$. Thus the combined TM-Recording and TM-Reflecting groups improved over time more than the combined controls.

TM-Recording and TM-Reflecting show equal well-being benefits.

To explore whether TM-Reflection influenced well-being differently from TM-Recording, we ran a separate MANOVA specifically comparing these two groups. The interaction effect of time by group on the well-being measures was not significant, $V = .11$, $F(4,28) = .90$, $p=.48$. We had expected TM-Reflectors to improve more but this result suggests that both TM-Recording and TM-Reflection experienced equivalent well-being benefits.

Mechanisms: How do TM-Recording and TM-Reflecting help well-being?

To better understand the mechanisms of these benefits, we ran LIWC, a text analysis program that calculates usage of word categories [7]. By examining how the language used in posts was correlated with changes in well-being, we hoped to gain insight into the adaptive strategies our participants used. We started by identifying words that are consistent with the *directive function*, where past experiences inform future behaviors, determining how these affected well-being. TM-Reflectors benefited from talking about **actions** (verbs: $r(10)=.61$, $p=.036$), and using words like 'should', 'can', 'will', 'ought' (auxiliary verbs: $r(10)=.59$, $p=.045$). They also benefited from discussing the **present** and the **future** ($r(10)=.79$, p=.002, and $r(10)=.60$, $p=.038$ respectively). This is evidence of a directive function in TM-Reflection.

Next we looked at *social functions* where people use past personal experiences to promote interpersonal relations. Echo was not being deployed in a social context as people were recording only for personal use. Nevertheless, we were still interested in the extent to which referencing the social would improve well-being. While social words did not correlate with well-being for the TM-Reflection group, we did find social functions in the TM-Recording group. Their increases in subjective happiness were positively correlated with use of **he/she**, $r(15)=.54$, $p=.026$, **talk about people,** $r(15)=.49$, $p=.048$ **sex**, $r(15)=.53$, $p=.028$, and using **quotes**, $r(15)=.48$, $p=.049$, suggesting that those who discussed relationships benefited more.

Lastly, we explored *self-enhancement functions* such as psychological distancing. We correlated **personal pronoun** usage in TM-Reflections with well-being and found a negative correlation, $r(10)=-.59$, $p=.04$. As predicted, use of personal pronouns signaled a failure to engage in adaptive distancing and led to decreases

in well-being. Those who used fewer personal pronouns in their reflections benefited the most.

Discussion

This study provides evidence for the benefits and adaptive strategies of TM-Recording and TM-Reflection. While both treatments received equivalent well-being benefits, a closer look suggests that these benefits are driven by **different mechanisms** which are consistent with functional theories of memory. Qualitative analyses of posts also support this [4].

This unexpected finding has practical therapeutic implications. The specific objective of the therapy might determine the type of technology the patient uses. If the goal of the intervention is to help the patient understand their habits for health-related behavior change, the level of detail provided by TM-Reflection might be a promising approach (directive functions). If the goal is to help the patient work-through relationship issues, or open up about these relationships, TM-Recording might be a preferable method (social functions). Lastly, if the objective is to raise the patient's general well-being, TM-Recording might be most efficient since it doesn't require the extra effort of TM-Reflection (which did not show additional well-being increases). This might improve patient compliance and cut down on therapist labor involved with reading and analyzing reflections.

Also, systems could be designed specifically with adaptive mechanisms in mind. There are many possibilities here. For example, prompts or structured templates might encourage users to use fewer personal pronouns or write in third person (distancing) in their reflections. Recording technologies could suggest to users that they write about relationships, while reflective systems could prompt recordings directed at future behavioral changes. Lastly, new systems might explore how to encourage users to record events that are emotionally salient (since this was more beneficial than neutral events). This could be accomplished by pushing phone alerts reminding users to record a positive or a negative event for that day.

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