

Towards Self Expression Through Voice User Interfaces

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Self-expression through expressive writing yields positive health outcomes. However, people who have difficulty writing by traditional means may have difficulty accessing these benefits. This work proposes a study to investigate whether the positive effects of self-expression can be achieved through a voice user interface (VUI). The study compares traditional expression (writing) to expression using a VUI (voice). This work will extend the realm of expressive writing research to include voice user interfaces (VUIs) as a medium of expression. We expect expression through VUIs to yield results similar to traditional methods of expression such as writing. This finding would indicate that we may be able to make the benefits of expressive writing such as positive health outcomes available to people who cannot write by traditional means.

INTRODUCTION

Expressive writing is the process of writing about a traumatic event. Expressive writing results in positive health outcomes (Pennebaker & Beall, 1986). However, some people struggle with physically writing information down on paper using a pen or paper due to lack of literacy or physical, visual, and cognitive impairments. Voice user interfaces (VUIs) can make it possible for people to record their thoughts without having to use a pen and paper. It is possible that using a VUI for the purposes of expressive writing may make the benefits of expressive writing more accessible to more people.

In this study we investigate the benefits of expressive writing through a VUI. Our main hypotheses are as follows:

1. Expression will lead to increased satisfaction compared to the non-expression group (Pennebaker & Beall, 1986)
2. There will be no difference between written and VUI expression in terms of content (Lyubomirsky et al., 2006; Murray & Segal, 1994)

RELATED WORK

Expressive Writing. Expressive writing research is built on the premise that physical and mental health often improve when people transform their thoughts and feelings about personally upsetting experiences into language (James W Pennebaker & Chung, 2011). In 1986 Pennebaker first showed that writing about traumatic events could influence positive health outcomes with participants who did expressive writing having fewer visits to the health center (Pennebaker & Beall, 1986). Pennebaker and other researchers replicated these findings several times, showing that expressive writing has physical and mental health benefits (Lyubomirsky et al., 2006; Murray & Segal, 1994; Pennebaker & Beall, 1986; Pennebaker, 1997). In these studies participants are encouraged to write about traumatic events 15 or 20 minutes a day for 3 or 4 days. Participants had improved health and wellbeing following the expressive writing interventions.

Journal Writing. Journal writing, or journaling, is the practice of writing about personal experiences and events (Flood & Phillips, 2007). While the research on expressive

writing has grown tremendously over the last quarter century, research around the related phenomenon of journal writing is scarce. In journaling, the emphasis is placed on the person's reflections about events and the personal meaning assigned to them (Flood & Phillips, 2007). In contrast to the expressive writing research, journal writing revolves around continuous self-reflection through writing.

Some research investigates how journal writing helps older adults cope with aging (Flood & Phillips, 2007; Brady & Sky, 2003; Shepherd & Aagard, 2011). Journaling can help older adults cope with many of the issues of aging by helping them log thoughts and ideas to be preserved for themselves and future generations (Shepherd & Aagard, 2011). Journaling can help older adults make decisions and compensate for memory issues (Brady & Sky, 2003). Journaling also helps older adults nurture a sense of self and aids in discovery (Brady & Sky, 2003). Overall, creative activities like journaling help older adults improve problem-solving ability, self-esteem, coping skills, anxiety, and life satisfaction (Flood & Phillips, 2007).

Despite these benefits, some older adults have difficulty using existing tools to keep journals (Shepherd & Aagard, 2011). Existing journaling tools include paper journals, tablets, computers, and phones. Each of these media presents its own difficulties for people with motor disabilities and visual impairment. VUIs could address some of these difficulties.

Voice User Interfaces. Voice User Interfaces (VUI) are technologies that enable a person to communicate with a spoken language application. VUIs include prompts, grammars, and dialog logic that allow them to process and respond to users in spoken language (Cohen et al., 2004). Increasing visual, physical, and cognitive impairments associated with aging can make many interfaces difficult to use (Vacher et al., 2015). As a result, audio is a modality of choice for people without hearing impairments (Vacher et al., 2015). Given this preference for audio, some older adults and people from other groups who have difficulty using interfaces may be able to benefit from the added accessibility provided by VUIs (Stigall et al., 2019; Stigall & Caine, 2020; Vacher et al., 2015). VUIs can facilitate human to computer communication and make expression simpler, particularly

when engaging with internet technologies (Brewer & Piper, 2017).

Due to the high perceived usability and usefulness of VUIs (Pyae & Joelsson, 2018), as well as the increased accessibility, research into how VUIs can assist older adults is growing. VUIs can facilitate health interventions such as exercising, preparing for doctor's visits, and telehealth (Constantin et al., 2019; Sin & Munteanu, 2019). Additionally, some research investigates the ability of a VUI to act as a companion for older adults (Nikitina et al., 2018; O'Brien et al., 2020; Sakai et al., 2012; C. Sidner et al., 2015; C. L. Sidner et al., 2018; Yamanaka et al., 2016).

VUI Journaling The researched benefits of expressive writing, and journal writing extend beyond written word. Murray et al. showed that written and spoken "expression" interventions have similar results (Murray & Segal, 1994). Expression has a positive effect regardless of the medium used to express (Murray & Segal, 1994). Lyubomirsky expanded upon this work by comparing talking, to writing, and thinking (Lyubomirsky et al., 2006). However, to our knowledge no work specifically investigates how a VUI can help facilitate expression. Prior expression research is dependent on researchers facilitating the expression exercise, and most of the expression being hand-written. Conversational systems like VUIs can augment expression by reminding participants to express and also by providing prompts (Kocielnik et al., 2018). We present a study to investigate how VUIs can help facilitate expression and achieve the same benefits through a more usable and accessible medium.

METHODS

We will conduct a study to evaluate perception and use of a VUI for self-expression. The study will consist of 3 parts: a pre-survey, expression phase, and post survey.

Study

Pre-survey. The first part of the study is a pre-survey. We used the short-form Computer Proficiency Questionnaire, CPQ-12 (Boot et al., 2015) to assess participant proficiency with computer technology. We also included a computer self-efficacy scale to measure how participants feel about their abilities to adapt to new technologies (Laver et al., 2012). We chose to include both measures because, while similar, they measure different things. The CPQ-12 asks participants how they feel about their ability to use existing technology such as keyboard/mouse, email, internet, calendars, etc. It is designed to be "a method for matching the initial skill level of the course participants (Czaja et al., 2006)." The self-efficacy scale asks questions about how a person feels about their ability to use a new technology under different circumstances. It is meant to help with "identifying older patients who may be more open to using new technologies (Laver et al., 2012)."

This was followed by a questionnaire assessing voice assistant use based on the Media and Technology Usage and Attitudes Scale (MTUAS) (Rosen et al., 2013). We included these three technology use scales in the pre-survey to help us ensure the participants assigned to experimental and control

groups had similar distributions of experience, efficacy, and proficiency.

The latter part of the survey is a life satisfaction instrument: the Satisfaction With Life Scale (SWLS) (Diener et al., 1985). This five question instrument asks participants to share how much they agree with 5 statements about their satisfaction with life such as "In most ways my life is close to my ideal" (Diener et al., 1985). The SWLS instrument measures how satisfied a person is with their life based on their own expectations of how their life should be. The simplicity of this scale makes it easy to administer to many groups of people.

We also included the Medical Outcomes Study (MOS) Short-Form-20 Health Survey (Stewart et al., 1988) to measure general health. This instrument contains six subscales assessing health perceptions (5 items); mental health (5 items); pain (1 item); and physical (6 items), role (2 items), and social functioning (1 item).

The SWLS and MOS are the primary instruments we will use for testing our hypotheses.

Expression Phase. The second part of the study is a 2 (modality of expression) x 2 (subject) experiment. The experiment is a replication of Pennebaker, Murphy, and Lyubomirsky's respective works, considering both the benefits of expression as well as the influence of modality on results (Lyubomirsky et al., 2006; Murray & Segal, 1994; Pennebaker & Beall, 1986). Participants will be assigned to either the expression or non-expression group. The traumatic group will be asked to write or speak about a traumatic event that occurred in their lives. The trivial group will be asked to write about trivial topics.

The only difference between the speaking and writing groups is being told to write or speak their particular expression prompt. There will be a general overview of the study given to all participants in the same manner. The overview will consist of instructing them they will be using paper and pen or a VUI to express their thoughts. Afterwards they will be instructed to use their respective technology express their thoughts. We differ from the methods of previous studies by having the prompt delivered via the medium the participants will use to express. We wanted the VUI to deliver the prompt, so we also moved the prompt to the paper participants write on instead of having a researcher present the prompt during the overview of the study.

The prompt will be delivered on the paper or via the VUI depending on the participants' assigned group. The experimental prompt is adapted from (James W Pennebaker & Chung, 2011) as follows:

For the next three days, I would like for you to write about your deepest thoughts and feelings regarding the significant life experience you highlighted on the questionnaire. In your writing, I'd like you to really let go and explore your deepest emotions and thoughts. You might tie your topic to your relationships with others including parents, significant others, friends, or relatives, to your past, your present, or your future, or to who you have been, who you would like to be, or who you are now. You may write about the same general issues or experiences on all days of writing or on different things each

day. Not everyone has had a single trauma but all of us have had major conflicts or stressors—and you can write about these was well. All of your writing will be completely confidential. Don't worry about using complete sentences or being logical. Just write whatever comes to your mind about this experience.

The trivial group will have a prompt similar to the one above except they will be instructed to write about the following trivial topics: the shoes they were wearing, their bedroom, and how they planned their day. Participants will be asked to write or speak for 3 days about their respective topics.

Table 1. Study Design

	Traumatic	Trivial
Paper	Paper traumatic expression	Paper trivial expression
VUI	VUI traumatic expression	VUI trivial expression

Post Survey. After the experiment, participants will be thanked for their time and informed that they will receive a post survey in four weeks time. The post survey included the life satisfaction and health assessment instrument.

Participants

Participants in this study will be recruited from the university and surrounding community. The 60 participants will be equally distributed across age and gender.

RESULTS

We expect our results to replicate the findings of previous literature. Participants in the experimental group will have increased life satisfaction and health assessment scores. Additionally, we expect to see no significant differences between the VUI and paper groups.

DISCUSSION

We will investigate using VUIs for self-expression. Participants will be asked to either perform expressive writing on paper or perform expressive speaking using a VUI. We expect participants in the traumatic expressive group to have increased life satisfaction and health outcomes after 4 weeks, compared to the control group as measured by the SWLS and short form health survey. These findings will replicate the findings of Pennebaker and other researchers who have investigated expressive writing (Lyubomirsky et al., 2006; Murray & Segal, 1994; Pennebaker & Beall, 1986; Pennebaker, 1997).

Additionally, we expect to find no significant differences in life satisfaction between the VUI expressive and paper expressive groups. This will replicate Murray and Lyubomirsky's findings that voice expression yields the same benefits as traditional written expression (Lyubomirsky et al., 2006; Murray & Segal, 1994) and will support VUIs as facilitators of expression just as Kocielnik showed with conversational systems (Kocielnik et al., 2018). These findings will be particularly useful for work investigating

VUIs as social companions for older adults (Nikitina et al., 2018; O'Brien et al., 2020; Sakai et al., 2012; Sidner et al., 2015; Sidner et al., 2018; Yamanaka et al., 2016). Social companion VUIs can be equipped with a journal/expressive speaking component to elicit more positive benefits.

The findings of this study will be important particularly for researchers investigating how VUIs can help improve the lives of older adults. VUIs that act as social companions can be augmented with journal writing functionality. That companion can encourage older adults to express themselves via voice or writing to achieve positive outcomes. Expression is a costless intervention that has positive benefits (Krupan et al., 2013). Voice assistant enabled companions could potentially help to bring this therapy to more older adults or other people with limited access to therapeutic resources.

LIMITATIONS/FUTURE WORK

There are limitations to this study. We will only follow participants for four weeks in replication of previous literature (Lyubomirsky et al., 2006). The time period could potentially affect the results by reducing or magnifying the effect. Life satisfaction and health may change differently over differing lengths of time. Additionally, three weeks also may not be long enough to see the affect. Most other studies evaluated participants after longer periods such as three months (Pennebaker & Beall, 1986). Future work should measure life satisfaction and health at 4 weeks and 3 months to evaluate differences.

Additionally, the VUI will limit the ability of participants to look at the history of what they expressed. Future work could investigate if access to history affects the results.

Future work could also investigate how comfort with technology (self-efficacy, computer proficiency) affect the perceptions of using a VUI to express and if that also affects satisfaction and health.

CONCLUSION

We propose a study to evaluate if a VUI could elicit the benefits of expressive writings. If our results replicate the findings of previous literature, our work will support adding expression functionality to VUIs meant to be companions for people, particularly older adults and other people needing these interventions. Additionally, VUIs could be a cost-effective tool to bring the therapeutic benefits of expression to people. Finally, the VUIs may make expression – and its benefits - more accessible to more people.

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