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Positive mood induction procedures for virtual environments designed for elderly people ☆

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ABSTRACT

Positive emotions have a significant influence on mental and physical health. Their role in the elderly's wellbeing has been established in numerous studies. It is therefore worthwhile to explore ways in which elderly people can increase the number of positive experiences in their daily lives. This paper describes two Virtual Environments (VEs) that were used as mood induction procedures (MIPs) for this population. In addition, the VEs' efficacy at increasing joy and relaxation in elderly users is analyzed. The VEs contain exercises for generating positive-autobiographic memories, mindfulness and slow breathing rhythms. The total sample comprised 18 participants over 55 years old who used the VEs on two occasions. Twelve of them used the joy environment, while 16 used the relaxation environment. Moods before and after each session were assessed using Visual Analogical Scales. After using both VEs, results indicated significant increases in joy and relaxation and significant decreases in sadness and anxiety. The participants also indicated low levels of difficulty of use and high levels of satisfaction and sense of presence. Hence, the VEs demonstrate their usefulness at promoting positive affects and enhancing the wellbeing of elderly people.

1. Introduction

In recent years, increasing life expectancies and decreasing birth rates have modified western countries' demographic distribution. This has intensified a multidisciplinary interest in improving the aging process by intervening in different contexts and lifestyles. Currently, the goal is not only to prevent disease in elderly people; but also to optimize their physical, social, recreational and mental health opportunities. This change of perspective in conceptualizing and addressing aging has led institutions such as the World Health Organization (1996) to promote concepts such as "active aging", this is defined as the process of optimizing health, social participation and security in order to enhance quality of life as people age. This concept highlights the need to enhance the continuity of social, economic, cultural, spiritual and civic activities of this population sector. In other words, our "elders" should continue to play active roles in society and should enjoy a satisfactory quality of life, while continuing to have new opportunities for independence and self-development.

The current demographic distribution contributes excessive strain on the health care system. Notably, several studies show a high prevalence of anxiety and depressive symptoms in the elderly population and demonstrate the relationship of these disorders to other illnesses (Barry et al., 2008; Ganguli et al., 2002; Katon et al., 2003; Yaffe et al., 1999). Therefore, it is necessary to design strategies that can help decrease emotional problems while fostering healthy emotions in this population group.

Recently, clinical psychologists have become more interested in positive psychology interventions (Rashid, 2009); they have designed and studied interventions that promote positive feelings, thoughts and emotions. These kinds of strategies can enhance and supplement clinical work, and can also help make non-clinical individuals' lives happier and more fulfilling (Seligman et al., 2006). As the field of positive psychology has matured, research on positive emotions has been increasing (Fredrickson, 1998, 2001). Fredrickson has proposed a theory for understanding positive emotions that has recently been empirically supported (Fredrickson, 2000; Fredrickson and Branigan, 2005; Fredrickson et al., 2000; Rowe et al., 2007; Wadlinger and Isaacowitz, 2006). This theory states that positive emotions have different adaptive advantages than negative ones. Negative emotions activate biological systems that guide people's actions and enable them to face danger, defend themselves or gain strength in the face of adversity. Positive emotions, on the other hand, amplify people's cognitive

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and behavioral resources. Whereas negative emotions narrow one's focus to facilitate immediate actions, positive emotions broaden one's focus to allow the system to process new information. Fredrickson et al. (2008, 2001) and Tugade et al. (2004) argues that when people are in a positive state, they are able to consider new ideas, look for alternative solutions to problems, reconsider situations and initiate new courses of action. Consequently, positive emotions enable new behaviors that simultaneously promote and foster healthier decisions and action plans. In sum, positive emotions temporarily broaden people's attention and thought processes, which allow them to make connections at a higher level and broaden their ideas and perception ranges. Significantly, new ideas, possibilities, approaches and initiatives result in lasting physical, intellectual, social and psychological resources. In other words, although the experience of a positive emotion is temporary, the resources strengthened as a result of broadened mental focus endure throughout one's lifetime; this is the main benefit of positive emotions.

Existing evidence supports the importance of addressing positive emotions in order to enhance people's mental and physical health. Several studies (Fredrickson et al., 2001; Tugade et al., 2004; Gable et al., 2006; Stein et al., 1997) have found that people who experience positive emotions have increased optimism, calmness, resilience, mental health, and higher quality personal relationships. For instance, Tayyab's study (Tayyab, 2009) showed that experiencing positive emotions improves physical health and alleviates depressive states; Greenglass and Fiksenbaum (2009) found that individuals who had reported higher positive affect were less likely to be depressed or to miss work. Other studies have explored the role of positive emotions in the elderly population. For example, Collins et al. (2009) investigated the relationship between happiness and flow in older adults, and found a relationship between the quality of flow experiences and happiness. Regarding the relationship between positive emotions and health, Fredman et al. (2006) explored the influence of positive affect on functional recovery over a 2-year period in elderly persons who were hospitalized for hip fractures. Results showed that older people with high positive affect had a more rapid and complete recovery. Park-Lee et al. (2009) investigated whether positive affect was associated with a lower incidence of frailty in elderly female caregivers and non-caregivers. The study showed that elderly women with high positive affect had a lower risk of frailty and vulnerability than those with lower levels of positive affect. These data supported the theory that positive affect protects against health decline in older adults. Finally, there is evidence supporting the relationship between positive affect and longevity. For instance, the "Nun Study" by Danner et al. (2001) found a strong association between positive emotional content in early life autobiographies and longevity six decades later. Similarly, Xu and Roberts (2010) analyzed data from 28 years of the longitudinal Alameda County Study and found that subjective well-being and its components (positive feelings, global life satisfaction, domain life satisfaction and positive affect) predicted lowered risks of all-cause, natural-cause, and unnatural-cause mortality. Finally, Koopmans et al. (2010) found that the happiness–longevity association remained statistically significant after adjusting for sex, age, marital status, education and socioeconomic status, although chronic diseases and physical activity likely played a mediating role on the association between happiness and longevity.

All of these studies highlight the role that positive affect plays in improving health and well-being, they also demonstrate that positive emotions are linked to better coping ability, lower morbidity, and lower mortality (Fredrickson, 2001; Pressman and Cohen, 2005; Salovey et al., 2000). Evidently, late life is a period when happiness is particularly important to people's wellbeing. Recently, Fredrickson and Losada (2005) argued that optimal ratios of positive to negative emotions reside above 3:1 for optimal mental and physical health. Therefore, it is a worthwhile activity to explore ways in which elderly people can increase the number of positive experiences in their daily lives (Collins et al., 2009).

Different options are available in order to induce positive emotions and to increase their amount. One such option is training people through the use of positive mood induction procedures (MIPs). MIPs are strategies designed to produce a transient emotional state in a controlled manner (García-Palacios and Baños, 1999). The moods induced are intended to be specific and similar to those experienced in natural situations. MIPs have been used in numerous investigations with various purposes (Gilboa-Schechtman et al., 2000; Moore and Oasksford, 2002) but primarily in laboratory research, and mainly focused on the induction of negative emotions. Furthermore, MIPs have not been extensively used with older adults. Some studies by Fox and colleagues have used MIPs to investigate the effect of negative emotions on memory and attention in elderly people (Fox et al., 1998; Knight, 2005). Phillips et al. (2002) have analyzed the differences between older and younger adults in their reactivity to negative and neutral MIPs. Finally, Mammarella et al. (2007) have analyzed the ability of positive music (Vivaldi) to enhance cognitive performance (working memory). All these studies have used traditional MIPs (Velten's sentences, music, films, etc.). Our group have explored the utility of Virtual Reality (VR) technology to design ecological and efficacious MIPs, and we have developed Virtual Environments (VEs) which include Velten's induction procedure, Lang's pictures, music and films (Baños et al., 2006, 2008). The efficacy of these MIPs to induce negative and positive emotions has been tested on young adults. The present study describes a MIPs which use VR technology to induce positive emotions and to be used for elderly people who are not familiarized with new technologies. These MIPs offer visual and auditory stimuli that immerse the user in a positive emotional atmosphere. Our goal is to use these MIPs in both recreational and clinical contexts and not only in laboratory research. These emotional VEs are included in the "Butler System" platform developed by our group (Botella et al., 2009; Etchemendy et al., 2010). The "Butler System" is an e-health system specifically designed for elderly users and mental health professionals who work with this population. It is a computer program which includes several recreational and therapeutic activities designed to exercise several key elements of optimum aging, including social integration, communication, e-learning, social–emotional networks and positive emotion training. A more comprehensive description of the system is provided in Botella et al. (2009), Etchemendy et al. (2011).

The main objective of the present study is to offer data about the efficacy of these MIPs to induce positive emotions (joy and relaxation) in elderly people, and also to analyze the users' satisfaction and their sense of presence experienced in the VEs. Is important to highlight that these VEs are the first prototypes designed especially for elderly people that include positive MIPs and are self-applied. Our hypotheses are:

H1: Our MIPs with VR will be capable of increasing positive emotions and decreasing negative ones.
H2: The elderly people will show high levels of satisfaction and sense of presence in the VEs.

2. Method

2.1. Participants

A total of 18 participants (14 women and 4 men) comprised the sample; their ages ranged from 58 to 79 (mean 66.94; SD 5.52). All participants were volunteers and recruited from the Senior