

## Relaxation Island: virtual, and really relaxing

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### Abstract

*To investigate the relationship between presence and mood change, subjective measures of presence and mood were taken in relation to participants' experiences of a therapeutic narrative presented either alone (i.e. audio of narrative only) or embedded within an audio-visual VE of a tropical island. The study explored the influence on mood and presence of the narrative and the VE, interrelationships between mood and presence, and any effects of mental imagery ability. The narrative was associated with decreases in negative and increases in positive discrete emotion ratings. Presence and increases in relaxation were rated more highly when the narrative was presented within the full VE than on its own. Participants' engagement with the media presentation was positively related to reductions in reported negative affect. Mood change also correlated with mental imagery ability; however, separate analyses show that mental imagery ability only correlated with the target mood change for the narrative only condition (i.e., where no visual display was provided - where mental imagery skills are most useful).*

*Keywords---* **presence, ITC-SOPI, 3 dimensions, emotion, sense, physical, space, engagement, ecological validity, mood change, visual analogue scales, positive, negative, affect, mental imagery**

### 1. Introduction

We define presence as a participant's sense of being there in a mediated environment, arising from a perceptual illusion of non-mediation; a hybrid of Barfield, Zeltzer, Sheridan and Slater [1] and Lombard and Ditton's [2] definitions. The majority of presence research to date has focused on evaluating the effects on presence of manipulating aspects of media form e.g., Freeman et al. [3]; Freeman et al. [4]; Welch et al. [5] Slater and Usoh [6]; Slater Usoh, and Chrysanthou, [7] – such as 3D presentation, the inclusion of shadows in VEs, screen size, and interactivity. Given that the recent study of presence has its roots in advances in computing, telecommunications and broadcast technologies, it is perhaps not surprising that technical aspects related to media form were initial research foci.

The study of viewers' experiences of audio-visual media such as film and TV has also at times focused on evaluating the impact of technical developments. However,

viewers' of linear media (and participants in interactive media) do not usually spend time using the media just to experience the technology. Rather, they use media to fulfil specific functions – be they related to communication, entertainment, education, relaxation, or as a means of passing the time.

As reported by Freeman [8] [9] several recent studies from a range of theoretical and methodological starting points – including semiotic, phenomenological, qualitative depth interviews, and quantitative factor analytic studies - converge on a three dimensional structure of presence.

The three dimensions have been labelled as:

- (1) Sense of Physical Space: a participant's sense of being located in a contiguous spatial environment, *determined primarily by aspects of media form*;
- (2) Ecological Validity (naturalness): a participant's sense of the believability and realism of the content – that it is real; *determined by aspects of media form and content*; and
- (3) Engagement: a participant's sense of engagement and interest in the content of the mediated environment; *determined primarily by content*.

To understand people's experiences of mediated environments, an understanding of the effects of content is required. To date, relatively little research effort has been devoted to obtaining an understanding of the effects of content variations on presence. However, in psychological research on mood induction and emotion a prime focus has been on the effects of content variation.

According to the three dimensional model of presence outlined above, variations in both media form and media content can influence presence. That content can affect both presence and emotion suggested a need for research to understand the relation between the two. Previous research has provided some evidence for this relation – through experimental research on presence and arousal [10] [11] and in a clinical context using virtual reality environments as therapeutic tools [12] [13].

Emotions are transient states of feeling, of relatively short duration, having a rapid onset and are usually caused by specific events. They result from appraisals of the significance of what has happened for personal well-being: the more relevant an event, the more emotive it is. Psychologists have found that a wide range of emotive stimuli can induce short term mood changes. These include films/stories [14], music [15] and emotive sentences [16].

The study reported here aims to determine whether a novel virtual environment (VE), conceptualized, designed

and specified by i2 media research ltd and Goldsmiths College and coded by project partners at the Interactive Institute (Sweden) as part of the EC funded project, Engaging Media for Mental Health Applications (EMMA), is effective in ameliorating (negative) mood states of stress and anxiety and promoting positive mood states (of happiness and relaxation). The VE, called 'Relaxation Island', is described in detail elsewhere [17]. In brief, it comprises several *zones* ('waterfall', 'beach 1' 'beach 2', and 'cloud'). Each zone has been developed to facilitate the delivery of *instructions* based on one of two theoretical approaches to modifying negative thinking and anxious mood state: standard 'controlled' breathing techniques (SBT) and narratives based on acceptance and commitment therapy (ACT; which promotes the idea of 'just noticing', 'accepting' and 'experiencing' bodily sensations rather than trying to control them). Both the ACT and SBT techniques are usually 'eyes closed' (audio-only) techniques, where participants listen to an instructional narrative and have the freedom to imagine any visual (or other sensory) element required.

In this study, the effects of a narrative focusing on a breathing technique scripted from an Acceptance and Commitment Therapy (ACT) perspective was explored under two conditions: eyes-closed, narrative-only vs. narrative plus the visual and background audio stimuli of Relaxation Island. This study was novel in that visual representations of imagery that might facilitate relaxation and acceptance techniques were tested here (e.g., calming sea waves, sounds of a tropical island).

This study was conducted to answer the following research questions:

- (a) Does presentation of the ACT narrative result in any mood change?
- (b) Is any such mood change enhanced by the presentation of the narrative within a audio-visual VE? (Specifically, is Relaxation Island really relaxing?)
- (c) Is presence higher in the full VE presentation than in the narrative only version?
- (d) Are any differences in mood change elicited by the two presentation conditions correlated with differences in their respective presence ratings?
- (e) Are individual differences in mental imagery ability correlated with any observed effects?

## 2. Method

### 2.1. Participants

Twenty participants (10 male, 10 female) aged between 20 and 56 years (mean age: 30.2 years, SD: 8.5) took part in this study. All were students or staff of Goldsmiths College, University of London. Each participant received an incentive of £10 for taking part in the study.

### 2.2. Design

The study used an independent (between) groups design with two levels of one factor: presentation or not of an audio-visual virtual environment to accompany a therapeutic narrative. For clarity, note that both groups experienced the therapeutic narrative. One group was merely exposed to the therapeutic narrative. The other was presented the therapeutic narrative along with the visuals of relaxation island environment and corresponding background environmental audio (e.g., sounds of the sea, tropical birds).

### 2.3. Measures

#### Screening Measures

A range of screening measures were administered to participants to enable control of possible between group differences:

- Acceptance and Action Questionnaire (AAQ: Hayes et al., [18]). A relatively new measure comprising a 49-item scale to assess people's willingness to accept their undesirable thoughts and feelings, whilst acting in a way that is congruent with their values and goals. Rated on a 7-point Likert scale from 'Never True' (1) to 'Always True' (7). Higher scores indicate greater psychological acceptance);
- General Health Questionnaire-12 item (GHQ-12: Goldberg & Hillier [19]);
- Depression Anxiety Stress Scale-short form (SF-DASS: Lovibond & Lovibond, [20]: 21 items);

*Results from the above measures are not reported in this paper.*

#### Mental Imagery Measure

The Short Betts' Questionnaire on Mental Imagery (QMI: Sheehan [21] based on Betts [22] was administered prior to any media experience to obtain a measure of participants' mental imagery abilities. The 35-items measure imagery skills in a variety of sensory modalities.

#### Mood Measures

- Positive and Negative Affect Schedule (PANAS: Watson, Clark & Tellegen [23]: 20 items, 10 for each general affect scale);
- Visual Analogue Scales (VAS: a variation of Gross & Levenson's [14] measure) assessing seven discrete emotions: happiness, anger, disgust, relaxation, fear, sadness, surprise

#### Presence Measures

- ITC-Sense of Presence Inventory (ITC-SOPI: Lessiter, Freeman, Keogh & Davidoff [24]: 44 items);
- UCL-Presence Questionnaire (UCL-PQ: Slater, Usoh & Steed, [25]: 3 items) - *results from the UCL PQ are not reported in this paper.*

## 2.4 Procedure

Prior to its commencement, this study received approval from Goldsmiths College Ethics Committee. Participants were randomly allocated to one of the two media experience conditions (instructional narrative only vs. instructional narrative presented within an audio-visual VE of a tropical island).

On arrival at the lab, participants were taken into an office space. They were told that the study involved questionnaire completion and having an ‘experience’ which could involve looking at something presented to them on a screen. They were first asked to complete an Ethics Form which requested them to agree that they satisfied a number of inclusion criteria. These were that they: (a) should not be taking any form of prescribed medication (except oral contraceptives), (b) should not be suffering any diagnosed emotional/psychological disorder, (c) were not currently receiving any form of psychological therapy/counseling, (d) had normal (or corrected to normal) vision, and (e) had a good grasp of the English language.

After consent was obtained, participants were asked to complete a battery of pre-test questionnaires that were fixed in the following order: Randomised Short Betts Questionnaire on Mental Imagery, Acceptance and Action Questionnaire, Depression Anxiety Stress Scale – short form, General Health Questionnaire-12, (discrete emotion) Visual Analogue Scales, and the Positive and Negative Affect Schedule. The latter two (emotion) scales were intentionally presented immediately pre-test to account for any effects on mood of questionnaire completion and therefore to establish an accurate pre-test mood rating.

Participants were then taken into the laboratory. They were asked to sit on a sofa located at a distance of 1.9 meters from a projection screen and were handed an instruction sheet that explained: “You are about to take part in a short experience. You will either be asked to sit with your eyes open or with your eyes closed. During the experience you may or may not receive verbal instructions. If you are asked to sit with your eyes closed, please try to imagine a scene consistent with any instructions you may receive”. The lights were dimmed and they were then instructed whether or not to have their eyes open or closed.

Participants in the eyes open condition were handed a wireless keyboard and instructed that they could use the arrow keys to move around in the environment they were about to experience. They were asked to make their way to ‘beach 2’ which would be signposted in front of them when the environment was displayed. The experimenter then presented the environment which was a projected size of 96cm by 129cm (28.5 \* 37.5 degrees visual angle). Participants navigated their way to the beach zone (see Figure 1).

Participants in the eyes closed condition were instructed to close their eyes once the lights had been dimmed. In order that participants in both conditions took part in media experiences of approximately equal duration, and to trigger elements of the narrative (built into the VR program), for participants in the eyes closed condition, the experimenter navigated through the environment from the

same starting point (the signpost) and followed the same path (to ‘beach 2’) as for participants in the eyes open condition. In this condition, the VE was not projected (instead it was displayed only on the experimenter’s PC) and thus was not (even potentially) visible to the participant. This controlled for the possibility that participants might feel frustrated at being restricted from viewing something they knew was being presented.



**Figure 1: Beach Zone 2 (Relaxation Island)**

On arrival at the beach zone the navigator was ‘seated’ in a deck chair located near the sea shore with a view of the sea and a palm tree (swaying in the breeze) positioned on the right of the display. Once in the chair, the ‘eyes open’ participants’ navigation was restricted to panning left and right. The pre-recorded narrative then began. Those in the eyes open condition received the full audio-visual VE with the narrative, while those in the eyes closed condition simply listened to the narrative. The experimenter remained quiet (but in the room) for the duration of the experience.

There were four main sections of narrative each divided by long pauses to allow the participant to focus on the exercise. The narrative first welcomed the participant and commented on the presented environment (the ocean, waves, sun, breeze, golden shores). It was explained that the exercise would focus on a breathing technique. Participants were asked to just notice what their body and mind provided them with. In the second piece of narrative, participants were instructed to just notice their breathing. The act of taking a breath and exhaling was described and they were asked not to change their breathing but to simply notice it. The third section of narrative instructed that if their mind was drifting to other things, to gently bring it back to just noticing their breathing. And finally, the fourth narrative explained that they were coming to the end of the session. It was suggested that they could practice this breathing technique at any time and any place by visualizing the beach. The entire presentation in the beach zone lasted 7 minutes and 20 seconds. All participants were then instructed by the experimenter that the experience was over.

The experimenter then led the participant back to the office where the post-test battery of measures was completed. These were fixed in the following order: VAS, PANAS, ITC-SOPI, UCL-PQ. Participants finally completed the VAS and PANAS once again on reflection of their mood *during* the experience. They were then paid for their participation. The entire session lasted approximately one hour, including a short debrief.

### 3. Results

Mood state change scores (post-test minus pre-test) were calculated for each of the VAS (7 scales) and PANAS (2 scales) mood rating scores<sup>1</sup>. One-tailed significance is presented if the result obtained was predicted. T-tests and correlations were run to explore the aims of the study. Descriptives for the presence and mood state dependent variables in each condition are provided in Table 1.

#### 3.1 The instructional narrative media presentation affects mood

Presentation of the instructional narrative significantly raised VAS rated positive discrete mood ratings of relaxation ( $t_{19}=3.38, p<0.01$ ) and significantly decreased VAS rated negative discrete mood (sadness:  $t_{19}=-3.32, p<0.01$ ; disgust:  $t_{19}=-2.24, p<0.05$ ; fear:  $t_{19}=-2.15, p<0.05$ ; anger:  $t_{19}=-3.58, p<0.01$ ).

#### 3.2 Mood change is higher for the full VE than for the narrative only media presentation

As shown in Figure 2, there was a significant difference between the two conditions on relaxed mood change. The increase in VAS-rated relaxation was significantly higher when the narrative was presented within the VE than when it was presented on its own ( $t_{18}=2.18, p<0.05$ ).

There were no other significant differences between the two conditions for any of the other VAS or PANAS (positive affect [PA] or negative affect [NA]) mood change scores.

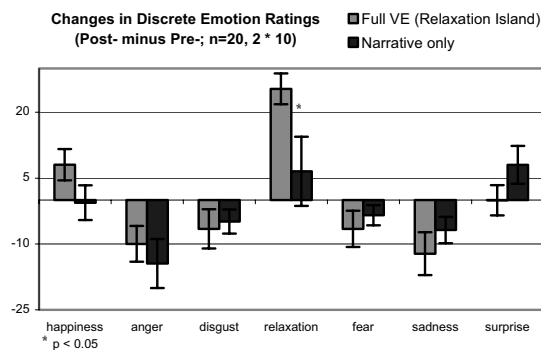


Figure 2: Changes in VAS ratings (post minus pre) comparing the two groups

#### 3.3 Presence ratings are higher for the full VE than for the narrative only media presentations

As shown in Figure 3, higher presence ratings were given to the full VE condition than to the narrative only

condition on all ITC-SOPI factors. Significant differences were as follows:

- Sense of Physical Space ( $t_{18}=2.66, p<0.05$ : two-tailed)
- Engagement ( $t_{18}=1.90, p<0.05$ : one-tailed)
- Ecological Validity ( $t_{18}=1.78, p<0.05$ : one-tailed)
- Negative Effects ( $t_{18}=2.66, p<0.05$ : two-tailed)

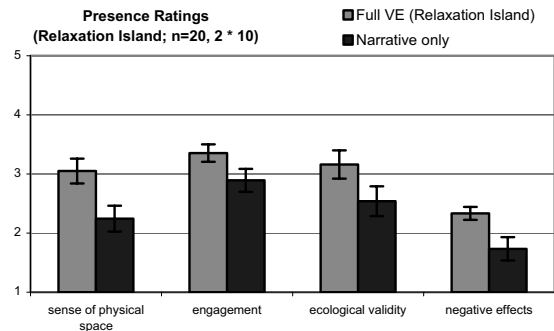


Figure 3: Presence ratings comparing the two groups

#### 3.4 Aspects of mood change and presence are related

There were significant correlations between the changes (post-pre) in VAS happiness and presence ratings (Sense of Physical Space:  $r=0.63$ ; Engagement:  $r=0.81$ ; Ecological Validity:  $r=0.64$ ;  $p<0.05$  and  $n=20$  for these correlations). No other VAS by presence dimension correlations were significant.

There was also a significant correlation for the sample as a whole between the (post- minus pre-) change in PANAS Negative Affect and ITC-SOPI Engagement scores. As (the) engagement (dimension of presence) ratings increased so did the reduction in negative affect ( $r=-0.48, n=20$ ).

When the different conditions were analyzed independently, however, an inconsistent pattern of correlations between VAS/PANAS and ITC-SOPI presence scores emerged.

#### 3.5 Mental Imagery ability is related to aspects of mood change

Overall, (post- minus pre-) change in VAS rated relaxation correlated with mental imagery ability ( $r=0.50, n=20, p<0.05$ ); however, separate analyses showed that mental imagery ability only correlated with increases in relaxation for the narrative only condition (i.e., where no visual display was provided; or in other words where mental imagery skills are most useful:  $r=0.58, n=10; p<0.05$ : one tailed).

<sup>1</sup> 'During' test mood state scores (VAS and PANAS) are not reported here.

**Table 1. Descriptives for the presence and mood state dependent variables**

	NARRATIVE +VE Mean ( <i>SD</i> )	NARRATIVE ONLY Mean ( <i>SD</i> )
<b>Sense of Space</b>	3.05* (.67)	2.24 (.69)
<b>Engagement</b>	3.35* (.46)	2.89 (.61)
<b>Ecological Validity</b>	3.16* (.76)	2.54 (.79)
<b>Negative Effects</b>	2.33* (.34)	1.73 (.62)
<b>VAS-Happiness</b>	8.07 (11.23)	-.61 (12.50)
<b>VAS-Anger</b>	-9.98 (12.91)	-14.45 (17.70)
<b>VAS-Disgust</b>	-6.55 (14.11)	-4.90 (8.64)
<b>VAS-Relaxation</b>	25.36* (11.11)	6.56 (24.90)
<b>VAS-Fear</b>	-6.5480 (13.08)	-3.4500 (7.24)
<b>VAS-Sadness</b>	-12.2000 (15.47)	-6.8200 (9.51)
<b>VAS-Surprise</b>	-.05 (10.88)	8.03 (13.70)
<b>PANAS-PA</b>	-3.90 (4.33)	-2.70 (3.16)
<b>PANAS-NA</b>	-2.40 (4.62)	.10 (2.13)

\*  $p < 0.05$

#### 4. Discussion and Conclusions

The study described here was designed to explore whether the effects on mood of a therapeutic narrative were enhanced through its presentation within an audio visual virtual environment. This study is part of a larger factorial experiment that is currently in progress, on which a mediation analysis is planned. This particular study used a relatively small sample size ( $n = 10$  in each of the two

conditions), and thus the results are considered preliminary. Nevertheless, some interesting findings emerged.

The narrative itself was associated with significant mood change; reducing discrete negative emotion ratings, and increasing relaxation. Most importantly for our research questions, the presentation of the narrative within the audio visual virtual environment resulted in significantly greater increases in relaxation relative to presentation of the narrative alone, but there were no effects on the more global affect ratings (PANAS). It is an interesting and important finding that a VE can be developed to manipulate a specific target emotion. The current results suggest good potential for the use of virtual environments as devices to improve relaxation for the general population. It is envisaged that the effect measured here with relation to relaxation could generalize to other mood states. This is in addition to the already well documented clinical efficacy of VE based therapeutic applications such as the treatment of phobias.

As expected, presence ratings were higher for the condition that provided a visual representation of the media space (narrative presented within an audio-visual VE) than for the media presentation that did not (audio only presentation of the narrative). It is important to note that presence ratings for both conditions were with reference to the “mediated environment”. Clearly, taking presence measures in relation to an audio only stimulus could be described as problematic according to some theories of presence (e.g., Biocca, [26]; Waterworth & Waterworth, [27]) because by definition the experimental context required participants to ‘fill in the gaps’ from the minimal sensory cues provided by the narrative. Indeed, such an experience could be referred to as (at least partly) matching Waterworth and Waterworth’s [27] definition of absence. The current study was conducted as part of a much larger (ongoing) research programme, focusing both on testing theories of presence and on evaluating the applied potential of virtual environments as mood devices for a range of applications.

That presentation of the narrative within a full VE was associated with higher presence provides further evidence for the extensively documented effects of media form on presence. Correlations indicated some relationship between presence and mood change, though these were not consistent. It is possible that this instability is attributable to low power from the small sample size used in the study. Further analyses, and experiments, are planned to better understand the relationship between aspects of presence and emotion and the direction of the relationship(s). Within future experiments it is planned to manipulate presence and emotion independently, though care is required in the design of these studies given the theoretical starting point that both can be affected by content variations.

Finally, because there is a theoretical possibility that individual differences in mental imagery ability could have negated any difference in mood change between the two conditions used in this experiment, we explored whether mood change was related to mental imagery ability. That mental imagery ability only correlated with the increases in relaxation for the narrative only condition suggests that

whilst a relaxing virtual environment (such as Relaxation Island) promises applied potential for the general population, people with high imagery abilities may have less to gain from the presentation of a therapeutic narrative within a full audio-visual VE than people with lower imagery abilities.

### Acknowledgements

This research was conducted within the EMMA (Engaging Media for Mental Health Applications) project: IST-2001-39192- supported by the FET Presence Research Initiative.

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