



Virtual Reality to reduce anxiety in healthy population: the Relaxation Island

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Stress and anxiety are the leading mental health problems of western societies and major illnesses are linked to stress (Flannery RB Jr., 2004; Shah et al, 2004).

Although it is being made a lot of research on VR and VR applications to psychological treatments field are increasingly developing (Wiederhold & Wiederhold, 2005; Botella et al, 2004, Riva 2003), many areas in the health field can be explored using this innovative technology. This is the case of RELAXATION.

As already experimented from Freeman (2004), VR could enhance the relaxation by visually presenting, and thereby enhancing, key images to facilitate relaxation and acceptance. The sense of presence experienced (Riva, 2005) could have multiple determinants, not only related to technological features of mean used.

The research questions



1. Can therapeutic narrative be enhanced using immersive VR?
2. Is there a relation between feeling of relaxation and sense of presence?

Hypothesis I: Efficacy within groups

- ◆ There is a significant anxiety reduction and emotional state modification between the beginning and the end of the therapy separately for VR and DVD

Hypothesis II: Efficacy between groups

- ◆ There is a significant difference between anxiety reduction and emotional state modification from beginning to end of whole treatment among the 3 groups (VR, DVD and Control). In RV these changes can be higher.

Hypothesis III: Presence

- ◆ There is a significant correlation between anxiety reduction and emotional state modification and sense of presence

A between subjects design with 3 experimental conditions

- immersive VR with therapeutic narrative
- DVD with therapeutic narrative
- control condition (CTR), with no treatment

and 2 repeated measures was used.

- pre-treatment
- post-treatment

The dependent variables tested were:

- the emotional and anxiety state dimensions
- the physiological parameters
- the sense of presence

Participants



38 subjects, university students (20 females and 18 males, between 20 and 25 years old) were randomly assigned to one of the three experimental groups: 14 in VR, 15 in DVD, 9 in CTR

Measures

- State Anxiety Inventory (**STAI**) (Spielberger, Gorsuch, Lushene, Vagg and Jacobs, 1983);
- Visual Analogue Scale (**VAS**) (Watson et al., 1988);
- Positive and Negative Affect Scale (**PANAS**) (Watson, Clark, & Tellegen, 1988b);
- **UCL** scale (Slater, Usoh, Steed, 1994);
- ITC-Sense of Presence Inventory (**ITC-SOPI**) (Lessiter, Freeman, Keogh, & Davidoff, 2001);
- Physiological parameters: Heart rate and amplitude (**HR, HA**), Galvanic Skin Response (**GSR**), Electro-miography (**EMG**), respiration rate and amplitude (**RR, RAM**)

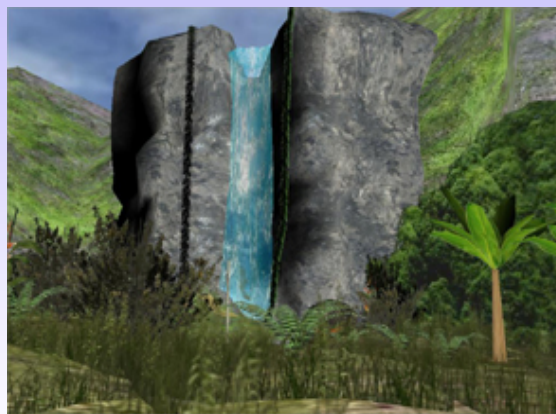
Hardware

- 2 Portable PC fujitsu siemens AMILO processor Pentium 4 and Sony Vaio Processor M, 512 Mb RAM
- Head-Mounted Display Sony Glastron PLM S-700
- Head-Tracker: Intersense Intertrax2
- "Procomp Infinity full" system, for the measurement of physiological indexes

Virtual Environment and DVD

- The virtual environment (VE) consists of a Relaxation Island developed with Virtools Player software within the EMMA project.
- The DVD is a commercial medium developed specifically to help subjects in achieving relaxation

The Relaxation Island



Procedure *two sessions conducted in two different days within the same week*

VR/DVD procedure

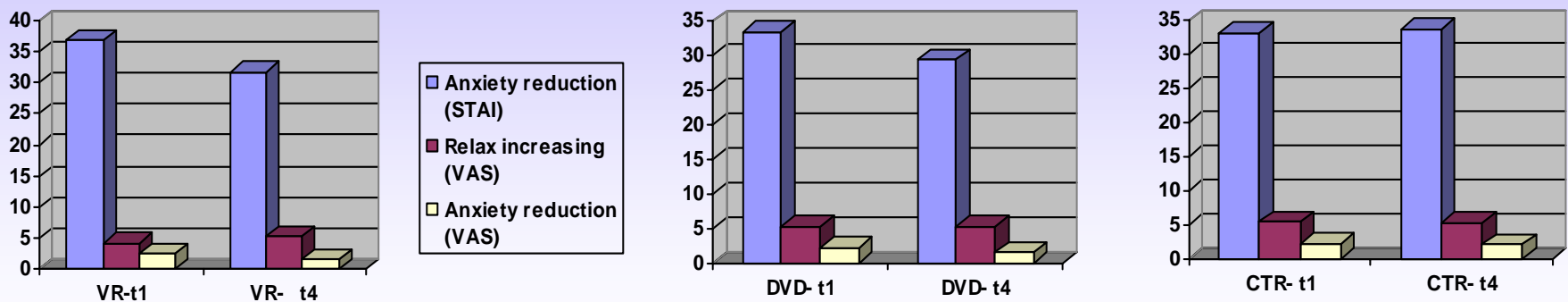
- Presentation of the study to the participant
- Baseline measurement of psycho-physiological parameters
- Self-report measurement of emotional and anxiety state before the VR/DVD experience (pre)
- Exploration of the VR Relaxation Island or DVD, listening to the therapeutic narrative
- Measurement of psycho-physiological parameters after the VR/DVD experience
- Self-report measurement of emotional and anxiety state after the VR/DVD experience (post)

Control group procedure

- Presentation of the study to the participant
- Baseline measurement of psycho-physiological parameters
- Self-report measurement of emotional and anxiety state
- Measurement of psycho-physiological parameters

Anxiety reduction and emotional state modification WITHIN groups

- A significant result was found concerning the anxiety reduction (STAI) after the whole treatment in VR condition ($Z=-1.678$; $p<.05$) and DVD condition ($Z= 2.111$; $p<.05$). No significant result was found in CTR group.
- A significant result was found concerning the emotional state modification (VAS) after the whole treatment:
 - in VR condition → anxiety reduction ($Z=-2.388$; $p<.05$) and relaxation increasing ($Z=-2.507$; $p<.01$)
 - in DVD condition → anxiety reduction ($Z=-1.998$; $p<.05$)



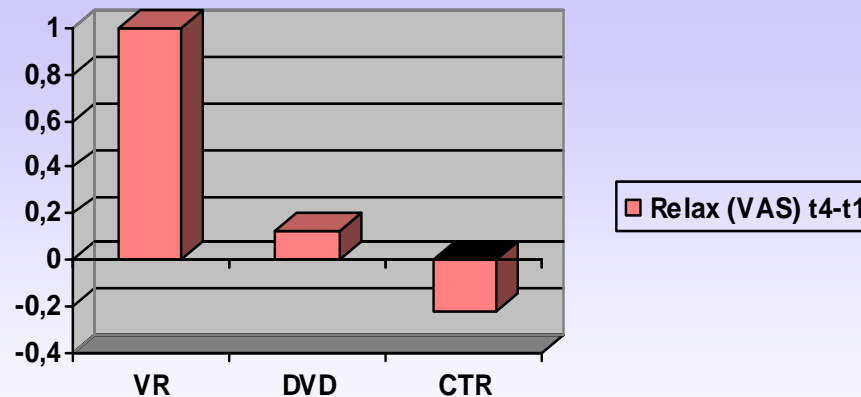
Anxiety reduction and emotional state modification WITHIN groups

- Pre-post comparison in VR condition showed a significant reduction of Galvanic Skin Response (GSR) mean ($Z=-2.197$; $p<.05$)
- No significant pre-post difference for the same parameter was found in the DVD condition

Anxiety reduction and emotional state modification BETWEEN groups

The level of relaxation (VAS) achieved after the treatment showed significant difference between the 3 groups ($Chi\ square=6.033$; $p<.05$).

Post hoc analysis showed that no difference existed between DVD and CONTROL group. In particular $VR>DVD>CTR$



Correlation between anxiety reduction and emotional state modification and sense of presence

- There is a significant correlation between changes in anxiety and emotional state on the one hand and several factors of presence on the other hand.
- This correlation is independent both by the use of VR or DVD and the type of subjective measurement used to evaluate anxiety and emotional change.

Summary of results



- ◆ There is a significant anxiety reduction and emotional state modification (in the sense of relax increasing) between the beginning and the end of the therapy separately for VR and DVD.
In VR these results are supported by subjective and objective measures.
- ◆ There is a significant difference between anxiety reduction and emotional state modification from the beginning to the end of the whole treatment among the 3 groups, showing that VR>DVD>CTR
- ◆ There is a significant correlation among anxiety reduction and emotional state modification and sense of presence. This correlation is independent from the technological medium used (VR or DVD)

Conclusions



Preliminary data support that:

- ◆ The **effects on relaxation** of a therapeutic narrative are evident with both media used (VR and DVD)
- ◆ **VR** mood induction procedures show significant advantages using both **self report questionnaires** and **physiological parameters**
- ◆ The relation between **presence and relaxation** is significant and independent from the medium used
- ◆ **Presence** is confirmed as a **multifactorial construct**, including both technological determinants and meaningful narrative context

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