

# Interreality in the Management of Psychological Stress: a Clinical Scenario

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**Abstract.** The term “psychological stress” describes a situation in which a subject perceives that environmental demands tax or exceed his or her adaptive capacity. According to the *Cochrane Database of Systematic Reviews*, the best validated approach covering both stress management and stress treatment is the Cognitive Behavioral (CBT) approach. We aim to design, develop and test an advanced ICT based solution for the assessment and treatment of psychological stress that is able to improve the actual CBT approach. To reach this goal we will use the “interreality” paradigm integrating assessment and treatment within a hybrid environment, that creates a bridge between the physical and virtual worlds. Our claim is that bridging virtual experiences (fully controlled by the therapist, used to learn coping skills and emotional regulation) with real experiences (allowing both the identification of any critical stressors and the assessment of what has been learned) using advanced technologies (virtual worlds, advanced sensors and PDA/mobile phones) is the best way to address the above limitations. To illustrate the proposed concept, a clinical scenario is also presented and discussed: Paola, a 45 years old nurse, with a mother affected by progressive senile dementia.

**Keywords:** Interreality, Virtual Reality, Biosensors, Stress, Stress Management

## 1. Introduction

According to Cohen and colleagues [1] “Psychological Stress” occurs when an individual perceives that environmental demands tax or exceed his or her adaptive capacity. In this view, stressful experiences are conceptualized as person-environment transactions, whose result is dependent on the impact of the external stimulus .

The *Cochrane Database of Systematic Reviews* [2-3] identified in the Cognitive Behavioral (CBT) approach the best validated approach for stress management and stress treatment. Even if CBT is the treatment of choice for psychological stress, there is still room for improvement [42]. Specifically, there are three major issues to solve:

- *the therapist is less relevant than the specific protocol used;*
- *the protocol is not customized to the specific characteristics of the patient.*
- *the focus of the therapy is more on the top-down model of change (from cognitions to emotions) than on the bottom-up (from emotions to cognitions).*

## 2. The Interreality Approach

To overcome the above limitations, here we suggest a new paradigm for e-health – “*Interreality*” - that integrates assessment and treatment within *a hybrid environment, bridging physical and virtual world* [4-6].

By creating a bridge between virtual and real worlds, Interreality allows a full-time closed-loop approach actually missing in current approaches to the assessment and treatment of psychological stress:

- *the assessment is conducted continuously throughout the virtual and real experiences*: it enables tracking of the individual’s psychophysiological status over time in the context of a realistic task challenge.
- *the information is constantly used to improve both the appraisal and the coping skills of the patient*: it creates a conditioned association between effective performance state and task execution behaviors.

The potential advantages offered to stress treatments by this approach are: (a) *an extended sense of presence*: Interreality uses advanced simulations (virtual experiences) to transform health guidelines and provisions in experience; (b) *an extended sense of community*: Interreality provides social support in both real and virtual worlds; (c) *a real-time feedback between physical and virtual worlds*: Interreality uses bio and activity sensors and devices (PDAs, mobile phones, etc) both to track in real time the behavior and the health status of the user and to provide suggestions and guidelines.

To illustrate the proposed concept, a clinical scenario is also presented and discussed: Paola, a 45 years old nurse, with a mother affected by progressive senile dementia.

## 3. Interreality in Practice: PAOLA - A clinical scenario

*Paola is 45 years old*, and she works as a nurse in the hospital of her town. She has a son, Stefano, who moved three years ago to America where he works and lives with his wife and newborn baby. She doesn’t see them very often, generally only during Christmas holidays and summer time. Her husband died last year of a heart attack, and she has been living alone since then. She believes her main resource in coping with her husband’s loss has been her mother’s support, and she never imagined that her mother would also have gotten sick so soon.

*Indeed Paola is actually the primary home caregiver of her mother, who is affected by progressive senile dementia. Since the moment her mother received the diagnosis, providing her mother with home care has become Paola’s main activity after work.* Specifically, she spends an average of five hours per day in caregiving-related activities. Since Paola thought she had effectively coped with both her son’s departure and her husband’s death, she imagined she could also successfully cope with this new negative event; and now she is unable to accept its totally destabilizing effects on her.

*In particular, she has difficulty accepting the true reality of her mother under these conditions*, and it causes her to think she has lost her, making her feel totally alone. Moreover, *Paola feels like no one can help her*: her son is too far away and her friends cannot understand. She thinks: “those who have not directly experienced such a situation can never really understand that situation.” And since none of her friends have dealt with such a situation, then she feels they can never truly understand.

What makes the situation even more difficult is the fact that *Paola believes her coping efforts are ineffective*: she believes she has no control over the situation,

insufficient resources to cope with such a long-lasting event, and an inability to deal with the difficulties in changing identity and acquiring the social role of caregiver the current situation requires. *Paola is exposed to chronic stress* and is manifesting many of the difficulties associated with psychological stress: indeed she appears to have effectively dealt with previous stressors but not the current one.

Indeed, *the duration of a chronic stressor, the fact that it tends to be constantly rather than intermittently present and the changes in identity or social roles frequently associated with it* may contribute to the severity of the stressor in terms of both its psychological and physiological impact.

### 3.1. *The INTERSTRESS solution (10 biweekly sessions + 2/4 boosting sessions)*

Paola will first *need to accept what she is going through*. This will require a cognitive restructuring activity to allow for re-appraisal of the event. This should be followed by education and training regarding useful coping responses to the type of stressors she is dealing with. In general, she has the perception that her living conditions have become more and more stressful and she doesn't know how to deal with this increasing pressure: for this reason she has decided to go to a therapist.

When she arrives, the therapist welcomes her, and this gives Paola an immediate sense of being less alone and makes her begin to feel better.

After a short interview and some paper-and-pencil self-report questionnaires, the therapist decides to use the INTERSTRESS system. She asks Paola *to wear biosensors to monitor her physiological parameters*. The therapist places the non-invasive sensors on Paola and explains their value to her, beginning the education process.

Then the therapist introduces Paola to one of the virtual worlds – the *Experience Island* - where she is exposed to a virtual situation similar to the real life one. Within this virtual environment, Paola has to help her mother with daily activities. The data fusion system allows the therapist to directly index how the various stressors are impacting Paola's psychophysiology, thus providing an objective understanding of the different stressors and their importance and impact on Paola's well-being.

At the end of the clinical session, the therapist "prescribes" homework for Paola. This, she explains, will allow Paola to be an active participant in her own well-being. This will also allow Paola to begin to practice the skills she has started to learn, thus making them become more readily available to her during stressful situations. The homework: First Paola needs to expose herself to the recorded critical situation in the virtual world displayed on her PDA. Then she must expose herself to the real world situation. In real world situations, the biosensors will track her response and the Decisions Support System, according to the difference from her baseline profile, will provide positive feedback and/or warnings.

Finally the therapist tells *Paola that she can press a "stress" button in the PDA* if she feels more stressed: this will record her experiences and they can then speak about them in the next session, allowing the two as a team to problem solve between session difficulties and how to more effectively handle future situational stressors.

At the start of any new session, the therapist uses the compliance data and warning log to define the structure of the clinical work. Also, the Decision Support System will analyze the stressful situations indicated by Paola to understand more what happened and the context in which they occurred.

In our experience, often in the beginning of therapy, the patient is relatively "unaware" of which situations cause the most physiological arousal or stress. Their

self-report measures of stress are often different than their bodily responses due to denial and other defense mechanisms. By showing them what situations caused the most physiological arousal, they often develop a new awareness, which brings on added insight and allows for self-treatment to proceed more effectively. Utilizing new skills and coping mechanisms taught by the therapist, the patient is able to employ these skills prior to stress becoming overwhelming.

This is where Virtual Worlds have an immensely beneficial advantage. In the new sessions, the virtual world is not only used for assessment but also for training and education. Within the environment, Paola has the opportunity to practice different *coping mechanisms: relaxation techniques, emotional/relational management and general decision-making and problem-solving skills*. For example, if Paola's real world outcome is poor (e.g., she can't do a task without feeling irritable and impatient when with her mother) she will experience again a similar experience in the virtual environment and will be helped in developing specific strategies for coping with it. Later, in the relaxation areas she will enjoy a relaxing environment and learn some relaxation procedures. As with any new skill, as Paola has the opportunity to practice the coping skills, they become second nature, and these new behaviours replace the older, outdated behavior patterns which caused the initial overwhelming stress.

The therapist now prompts Paola to also visit another virtual world – the *Learning Island*. Within this world, Paola learns *how to improve her stress management skills* and in particular she learns about the main causes of stress and how to recognize its symptoms, learn stress-management skills such as better planning, learn stress relieving exercises such as relaxation training and get the information needed to succeed.

After some sessions, the therapist invites Paola to *participate in a virtual community* (under therapist supervision initially) where she will meet other individuals who are stressed like her. Within this virtual world - *Community Island* - Paola has the opportunity to discuss and share her experience with other users.

However, *in some cases Paola experience new critical situations that may raise her level of stress*. For example, she had to discuss with her boss in the morning and this left her feeling very upset during the rest of the day.

At the end of the work day, when she returned home to care for her mother, she felt very excited/stressed and nervous and the *Decision Support System alerted Paola twice about this*. Both the signals were sent also to the therapist who appeared on her PDA display as an avatar *suggesting to Paola some relaxation techniques*.

Paola is scheduled to see the therapist the next day. The therapist asks her if the avatar was helpful. Her answer is yes: the avatar gave her an emotional boost appearing in the exact moment she needed it and suggesting helpful relaxation techniques she had previously learned. Then the therapist asks Paola about her difficulty. In particular, the therapist wants to get information about where Paola was: what she was doing and thinking, and what her reactions were.

Paola relates all the information to the therapist: she was in the hospital and was quarrelling with a colleague, causing her stress level to become higher. The information provided by Paola is compared by the therapist with the information provided by the Decision Support System. Any difference is explored and interpreted.

By working as a team, Paola is taught a new skill of interpretation, and her therapist is more able to understand any differences in Paola's self-perception of stress and the objective measurements shown by the DSS. This will help to more effectively individualize and guide future training and therapy sessions.

In the following sessions, Paola tells the therapist that *she feels better thanks to being able to frequently experience stressful situations within safe virtual environments*. She also says that meeting other people in the community has helped her to find much-needed support and to discover new strategies to manage her emotions. With regard to this, she says also the community experience has helped her with seeing the stressor in a new perspective. Moreover, by listening to other's experiences, she was facilitated in adopting new coping skills.

Indeed, Paola has developed the ability to help her mother more effectively and to find time to do other things. The therapist helps Paola to cognitively restructure the critical situation, which now she is more able to deal with through the strategies she has learned. The last session ends with *advice on the prevention of relapse*.

#### 4. Conclusions

The clinical use of Interreality is based on a closed-loop concept that involves the use of technology for assessing, adjusting and/or modulating the emotional regulation of the patient, his/her coping skills and appraisal of the environment (both virtual, under the control of a clinician, and real, facing actual stimuli) based upon a comparison of that patient's behavioural and physiological responses with a training or performance criterion. Although CBT focuses on directly modifying the content of dysfunctional thoughts through a rational and deliberate process, Interreality focuses on modifying an individual's relationship with his or her thinking through more contextualized experiential processes. To discuss and evaluate the clinical use of the proposed approach we presented and detailed a possible clinical scenario: Rosa, a 55 years old nurse, involved in a major car accident.

Obviously, any new paradigm requires a lot of effort and time to be assessed and properly used. Without a real clinical trial, the Interreality paradigm will remain an interesting, but untested concept. However, a recently funded European project, "INTERSTRESS – Interreality in the management and treatment of stress-related disorders (FP7-247685) - will offer the right context to test and tune these ideas.

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