Giuseppe Riva PHD
ATN-P Laboratory,
Istituto Auxologico
Italiano,
Milan, Italy

W:www.cybertherapy.info

Virtual reality in the treatment of eating disorders and obesity

Clinical data suggest that virtual reality can help to address two key features of eating disorders and obesity that are not always adequately addressed by existing approaches: body experience disturbances and self-efficacy

HIGHLIGHTS

- The experiential approach allowed by VR helps patients in discovering that difficulties can be defeated, so improving their cognitive and behavioural skills for coping with stress
- On the downside, the cost of this technology remains relatively high, its availability is still limited and some patients (1–2%) may experience simulation sickness

Resources
Cybertherapy
W:www.cybertherapy.info

CyberTherapy 2005 conference
W:www.e-therapy.info

Medicine Meets Virtual Reality Conference 2005
W:www.nextmed.com/mmvr_virtual_reality.html

VR hardware
W:vr.isdale.com/WhatIsVR/noframes/WhatIsVR4.1-VR.html

Worldviz
W:www.worldviz.com

Engineering Systems Technologies
W:www.it4tomorrow.de/shop/

Previ
W:www.previsl.com

VRHealth
W:www.vrhealth.com

Different new technologies have been introduced over the last few years that are increasingly finding application in healthcare delivery for patients with eating disorders (ED) and obesity. These include self-help (supervised and unsupervised), telemedicine, telephone therapy, email, the internet, computer software, CD-ROMs, portable computers and virtual reality (VR) techniques. One of the most promising technologies is VR, an advanced form of human-computer interface that allows the user to interact with and become immersed in a computer-generated environment (in a naturalistic fashion).

Therapists are using VR to provide a new human-computer interaction paradigm in which users are active participants within a computer-generated three-dimensional virtual world. Using VR in this way, the patient is more likely to gain an awareness of his/her need to do something to create change and also to experience a greater sense of personal efficacy.

This feature of VR has been extensively used in different clinical psychology treatments – from phobias to sexual disorders – and it is expected to increase in the future.[1] In particular, an area in which VR may offer a competitive advantage is the treatment of EDs and obesity.

Table 1. VR components

Hardware	Graphic Workstation with high-end graphic card
	Head-mounted display or 3D shutter glasses
	Tracking system (head and hands)
	VR gloves
Software	VR environment

Rationale and clinical data

Distorted body image, negative emotions and a lack of faith in the therapy are typical features of EDs and obsesity, and are the most difficult characteristics to change. One innovative approach to their treatment is to enhance traditional cognitive-behavioural therapy (CBT) with the use of a virtual environment.[2–5]

A first approach is offered by the Integrated Experiential Therapy (IET). Developed by Giuseppe Riva and his team inside the VREPAR and VEPSY Updated European funded projects, it is a relatively short-term, patient-oriented approach that focuses on individual discovery.[6–8] IET and CBT share the use of a combination of cognitive and behavioural procedures to help the patient identify and change the maintaining mechanisms. However, it differs from CBT in:

- Its use of VR: 10 VR sessions (as compared to none in CBT).
- Its focus on the negative emotions related to

the body, a major reason why patients want to lose weight.

- Its focus on supporting the empowerment process. VR has the right features to support the empowerment process since it is a special, sheltered setting where patients can start to explore and act without feeling threatened.

The VR session can approximate natural settings, providing an alternative to exposure and desensitisation exercises as well as a more general enhancement to therapy. Specifically, VR is believed to increase motivation by allowing individuals to (virtually) witness changes in their behaviour and shape and reach their own conclusions based on actual experience. During a typical VR session, patients are asked to wear a head-mounted VR display system. An approach similar to guided imagery is used to lead the subject through various zones over the course of 10 sessions. Stimuli that contribute to abnormal eating behaviours are identified and associated anxiety and body experiences are targeted for modification.

Subjects are also asked to identify figures that most closely resemble their current and ideal body sizes. They are also confronted with a photograph of their actual body.

This approach was validated through different case studies and trials.[9] In a first uncontrolled study, three groups of patients– with binge eating disorders (BED), with eating disorders not otherwise specified (EDNOS), and obese patients with a body mass index above 35 – were observed.[10] All patients participated in five biweekly sessions of the therapy. All groups showed improvements in overall body satisfaction, disordered eating and related social behaviours, although these changes were less noticeable in the EDNOS group.

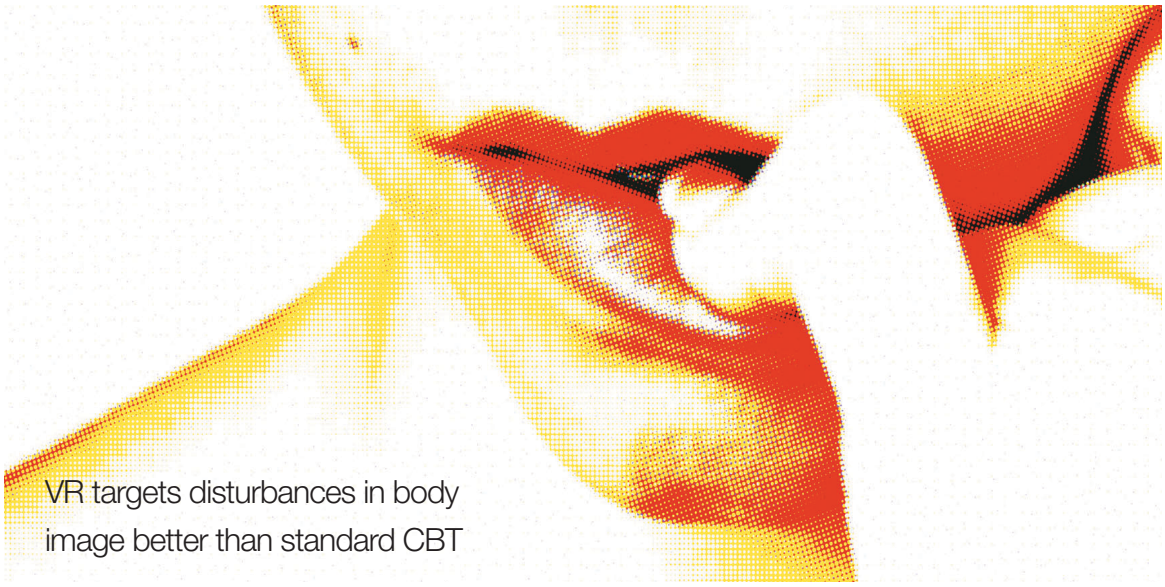
Recently, the approach was tested in different controlled studies. The first study involved 20 women with BED who were seeking residential treatment.[8] The sample was randomly assigned to IET- or CBT-based nutritional therapy. Both groups were prescribed a 1,200-calorie per day diet and minimal physical activity. Analyses revealed that although both groups were binge-free at one-month follow-up, IET was significantly better at increasing body satisfaction. In addition, IET participants were more likely to report increased self-efficacy and motivation to change.

In a second test, the same randomised approach was used with a sample of 36 women with BED.[6] The results showed that 77% of the ECT group quit binging after six months, against 56% for the CBT sample and 22% for the nutritional group sample. Moreover, the ECT sample reported better scores in most psychometric tests, including EDI-2 and body image scores.

In the final test, recently presented at the Medicine Meets Virtual Reality Conference 2005 (Long Beach, CA, USA), IET was compared with nutritional and cognitive-behavioural treatments, using a randomised controlled trial, in a sample of 211 obese female patients. Both IET and CBT produced a better weight loss than nutritional treatments after a six-month follow-up. However, IET significantly improved both body image satisfaction and self-efficacy. This change produced a reduction in the number of avoidance behaviours as well as an improvement in adaptive behaviours.

References

1. Botella C, Quero S, Banos RM, et al. Virtual reality and psychotherapy. *Stud Health Technol Inform* 2004;99:37-54.
2. Perpiña C, Botella C, Baños RM. Virtual reality in eating disorders. *Eur Eat Disord Rev* 2003;11:261-78.
3. Myers TC, Swan-Kremeier L, Wonderlich S, et al. The use of alternative delivery systems and new technologies in the treatment of patients with eating disorders. *Int J Eat Disord* 2004;36:123-43.
4. Riva G, Bacchetta M, Cesa G, et al. e-Health in eating disorders: Virtual Reality and telemedicine in assessment and treatment. *Stud Health Technol Inform* 2002;85:402-8.
5. Riva G, Bacchetta M, Cesa G, et al. The use of VR in the treatment of eating disorders. *Stud Health Technol Inform* 2004;99:121-63.
6. Riva G, Bacchetta M, Cesa G, et al. Six-month follow-up of in-patient Experiential-Cognitive Therapy for binge eating disorders. *CyberPsychol Behav* 2003;6:251-8.
7. Riva G, Bacchetta M, Baruffi M, Molinari E. Virtual reality-based multidimensional therapy for the treatment of body image disturbances in obesity: a controlled study. *CyberPsychol Behav* 2001;4:511-26.



VR targets disturbances in body image better than standard CBT

A Spanish research group led by Cristina Botella has compared the effectiveness of VR with traditional CBT for body image (based on Cash[11]) and reported on a small controlled study with a clinical population.[12] Five patients – three with anorexia nervosa and two with bulimia nervosa – completed the traditional treatment and eight – four with anorexia nervosa and four with bulimia nervosa – completed the VR condition. Although both groups showed improvements in general ED measures, there were no significant between-group differences. However, the VR group showed greater improvement on measures of body image, dysphoria and anxiety, leading the authors to conclude that VR targets disturbances in body image better than standard CBT. Since then, this research team has also developed a VR simulator of food and eating, which is currently under evaluation with patients.[13]

Conclusions

Published data suggest that VR can help to address two key features of EDs and obesity that are not always adequately addressed by existing approaches: body experience disturbances and self-efficacy. VR technology offers an innovative approach to the treatment of body image disturbance, a difficult concept to address in therapy. Cognitive-behavioural and feminist approaches have previously been the standard interventions, although in our experience, it seems that many patients continue to struggle with negative body image post-treatment.

As emphasised by social cognitive theory, performance-based methods are the most effective in producing therapeutic change across behavioural, cognitive and affective modalities.[14] The proposed experiential approach could help patients discover that difficulties can be defeated, thus improving their cognitive and behavioural skills for coping with stressful situations.

On the downside, a limited number of patients (<2%) experienced simulator sickness, which consists of nausea, disorientation and eye strain or blurred vision, during and after use. In addition, the cost of this technology remains relatively high (see Table 1) and availability is still limited: a typical VR system, such as the one used in the studies discussed in this article, costs €15,000–25,000 (hardware €10,000–15,000; software €5,000–10,000).

Finally, communication networks have the potential to transform virtual environments into shared worlds in which individuals, objects and processes interact without regard to their location. In the next five years, such networks will probably merge VR and telemedicine applications, allowing us to use VR for distance learning, distributed training and e-therapy. ■

Five-year forecast

- VR systems for less than €5,000
- Clinical VR experiences on the web and on high-end cellular phones
- Bigger randomised controlled trials
- Integration of VR systems with biosensors: the features of the VR world are adapted to the biological responses of the patients

8. Riva G, Bacchetta M, Baruffi M, Molinari E. Virtual-reality-based multidimensional therapy for the treatment of body image disturbances in binge eating disorders: a preliminary controlled study. *IEEE Trans Inf Technol Biomed* 2002;6:224-34.

9. Riva G, Bacchetta M, Baruffi M, et al. Virtual reality based experiential cognitive treatment of anorexia nervosa. *J Behav Ther Exp Psy* 1999;30:221-30.

10. Riva G, Bacchetta M, Baruffi M, et al. Virtual reality based Experiential Cognitive Treatment of obesity and binge-eating disorders. *Clin Psychol Psychother* 2000;7:209-19.

11. Cash TF. The treatment of body image disturbances. In: Thompson JK, editor. Body image, eating disorders and obesity. Washington, DC: APA - American Psychological Association; 1996:83-107.

12. Perpiña C, Botella C, Baños RM, et al. Body image and virtual reality in eating disorders: Exposure by virtual reality is more effective than the classical body image treatment? *CyberPsychol Behav* 1999;3:149-59.

13. Lozano JA, Alcaniz M, Gil JA, et al. Virtual food in virtual environments for the treatment of eating disorders. *Stud Health Technol Inform* 2002;85:268-73.

14. Bandura A. Social foundation of thought and action: A social cognitive theory. Englewood Cliffs, NJ: Prentice-Hall; 1985.