

Effect of the mood produced by virtual reality exposure on body image disturbances

Marta FERRER-GARCÍA^a, and José GUTIÉRREZ-MALDONADO^{a, 1}
^a*University of Barcelona, Spain*

Abstract. Previous research suggests that negative mood increases body image disturbances. The aim of this study was to examine whether the mood produced by virtual reality exposure had any influence on such disturbances. As expected, dysphoric mood increased body image disturbances in patients with eating disorders.

Key words. Body image, eating disorders, virtual reality, mood

Introduction

Previous research has provided evidence about the ability of virtual reality (VR) exposure to produce emotional responses (anxiety and depression) [1-2] and fluctuations in body image disturbances, especially as regards body image distortion and body image dissatisfaction in patients with eating disorders (ED) [3-4]. Furthermore, several studies have shown a strong relationship between dysphoric mood and increased body image disturbances [5-6].

The data reported here comes from a broader research project whose main objective is to study the instability of body image disturbances in ED patients by means of VR exposure. In the first stage of this research, VR was shown to be capable of eliciting different levels of anxiety and depressed mood [7]. Subsequently, the effect of VR on the level of body image distortion and body image dissatisfaction experienced by participants was also assessed [8]. The results showed that ED patients felt more anxiety, a more depressed mood, greater body image distortion and increased body image dissatisfaction when eating high-calorie food, both alone and with other people, than when eating low-calorie food. In contrast, controls showed similar responses in all situations.

Having demonstrated the ability of VR to produce changes in mood and body image disturbances in ED patients, the aim of the present study was to examine whether the anxiety and depressed mood produced by virtual reality exposure has any influence on body image distortion and body image dissatisfaction in patients with ED and in controls.

It was hypothesised that participants with ED would experience various virtual environments, especially those involving high-calorie food, as more stressful and depressing than would the control group, since these environments are emotionally significant for people with ED. In addition, as dysphoric mood is considered to be highly related with body image disturbances in ED patients but not in controls, only in the first group would anxiety and/or depression be good predictors of body image distortion and/or body image dissatisfaction.

1. Method

1.1. Participants

Eighty-five patients diagnosed with ED and 136 non-ED students from the University of Barcelona participated in the study. They were all female and their participation was voluntary.

Twenty-eight participants from the control group were excluded based on the following criteria: suffering or having previously suffered from an eating disorder or similar symptoms (assessed by self-report); being at risk of suffering from an ED (Eating Attitudes Test-26 > 20) [9]; and being overweight (body mass index

¹ Corresponding Author. Jose Gutierrez-Maldonado. University of Barcelona. Paseo Valle de Hebrón, 171, Barcelona., Spain 08035; E-mail: jgutierrezm@ub.edu

(BMI) > 25; WHO, 1998) [10] or underweight (BMI < 18; WHO, 1998) [10]. This yielded a final control group of 108 students.

1.2. Assessment measures

- Eating disorder symptomatology: *Eating Attitude Test-26* (EAT-26) [9]
- Anxiety: *State and Trait Anxiety Inventory* (STAI-S) [11]
- Depressed mood: *Barcelona Depression Questionnaire* (CDB: *Cuestionario de Depresión Barcelona*) [12]
- Body image disturbances: *Body Image Assessment Software* (BIAS) [13]

1.3. Procedure

First, all participants were measured and weighed in order to obtain their body mass index (BMI). They were then requested to complete the EAT-26.

In the next step, participants were exposed to four virtual environments (Figure 1) which were randomly displayed: the kitchen with low-calorie food (VE1), the kitchen with high-calorie food (VE2), the restaurant with low-calorie food (VE3), and the restaurant with high-calorie food (VE4). In the kitchen, participants were asked to eat either salad and fruit or pizza and ice-cream (depending on their experimental condition) while being alone. In the restaurant, participants were asked to eat either salad and fruit or pizza and ice-cream (depending on their experimental condition), but this time while being with other people who made comments about the food. Virtual reality environments were developed on the basis of the literature and using the information obtained from an ad hoc questionnaire; the latter was administered to 68 ED patients and compiled data about the situations and stimuli which produced the greatest discomfort in terms of body image.

Anxiety, depressed mood, body image distortion and body image dissatisfaction were assessed in the interval between the presentations of each virtual situation.

1.4. Statistical analysis

In order to study the strength of the relationship between mood and body image disturbances, several correlations were calculated. Standard multiple regression was also performed in order to determine which emotions were the best predictors of body image distortion and body image dissatisfaction.



Figure 1. Images of the low-calorie kitchen and the high-calorie restaurant

2. Results

Table 1 shows that correlations between anxiety or depressed mood and body image distortion were higher in ED patients than in controls, both when considering virtual environments separately and for the overall means.

Table 1. Correlations between mood and body image distortion

		VE1	VE2	VE3	VE4	Mean
Body image distortion	Anxiety					
	Control	.083	.189*	.265**	.226**	.224**
	ED	.430**	.468**	.464**	.517**	.511**
	Depressed mood					
	Control	.113	.176*	.267**	.139†	.175*
	ED	.405**	.467**	.496**	.516**	.511**

† $p < .10$ (marginally significant); * $p < .05$; ** $p < .01$

Similar results were obtained when the depressed mood and anxiety experienced in the virtual environments were correlated with body image dissatisfaction (Table 2). Correlations in the ED group were higher than those in the control group, both when considering virtual environments separately and for the combined means. The strongest relationship was that between mood and body image dissatisfaction.

Table 2. Correlations between mood and body image dissatisfaction

		VE1	VE2	VE3	VE4	Mean
Body image dissatisfaction	Anxiety					
	Control	-.099	-.344**	-.294**	-.205*	-.278**
	ED	-.593**	-.583**	-.549**	-.638**	-.672**
	Depressed mood					
	Control	-.179*	-.297**	-.338**	-.200*	-.235**
	ED	-.575**	-.606**	-.582**	-.653**	-.678**

† $p < .10$ (marginally significant); * $p < .05$; ** $p < .01$

Standard multiple regression was then performed to determine the best predictors of body image disturbance in both the control and ED groups. As Table 3 shows, neither anxiety nor depressed mood seems to be a good predictor of body image distortion, neither among controls nor for the ED group. It can also be seen that the interaction between anxiety and depression predicted higher levels of mean body image distortion in ED patients than in controls.

Table 3. Anxiety and depressed mood as predictors of body image distortion

		VE1	VE2	VE3	VE4	Mean
Body image distortion	Anxiety ^a					
	Control	.024	.131	.161	.213†	.185
	ED	.289†	.262†	.170	.286†	.279†
	Depressed mood ^a					
	Control	.098	.101	.167	.025	.064
	ED	.183	.259†	.355*	.280†	.280†
	Anxiety + Dep. Mood ^b					
	Control	.144	.206†	.295**	.228†	.229†
	ED	.445**	.493**	.505**	.541**	.535**

^a R; ^b Beta; † $p < .10$ (marginally significant); * $p < .05$; ** $p < .01$

Overall, depressed mood was the best predictor of body image dissatisfaction in ED patients. In contrast, neither anxiety nor depression alone had a significant influence on body image dissatisfaction among controls (Table 4). However, when anxiety and depressed mood were considered together, dysphoric mood was a good predictor of body image dissatisfaction in both the control and ED groups, the best results corresponding to the latter group.

Table 4. Anxiety and depressed mood as predictors of body image dissatisfaction

		VE1	VE2	VE3	VE4	Mean
Body image dissatisfaction	Anxiety ^a					
	Control	-.080	-.259*	-.138	-.137	-.214†
	ED	-.369**	-.275†	-.210	-.310*	-.351*
	Depressed mood ^a					
	Control	-.031	-.149	-.252*	-.127	-.106
	ED	-.292*	-.388**	-.408**	-.398**	-.386**
	Anxiety + Dep. Mood ^b					
	Control	.102	.365**	.355**	.231†	.291**
	ED	.621**	.629**	.594**	.667**	.706**

^a R; ^b Beta; † $p < .10$ (marginally significant); * $p < .05$; ** $p < .01$

3. Discussion

Both the depressed mood and anxiety produced by virtual reality exposure are highly related with body image disturbances in patients with ED. As previous research has shown^{5,6} the presence of a dysphoric mood is related with increased body image disturbances, especially body image dissatisfaction, in both controls and ED patients, although the relationship is much stronger in the latter group.

As expected, ED patients showed higher correlations between mood and body image disturbances in the virtual environments involving high-calorie food. These situations are experienced as highly stressful and depressing for people with ED, both in real life¹⁴ and in the virtual world^{2,7}. Furthermore, general dysphoric mood is considered to be strongly related with body image disturbances in ED patients^{5,6}. It was therefore expected that those virtual environments which elicited higher levels of anxiety and depression would be the ones that also produced greater body image disturbances. The results partially support this hypothesis. Depressed mood was indeed the best predictor of body image dissatisfaction in ED patients, although no good emotional predictor of body image distortion was found. It is interesting to note that anxiety and depression considered together did become a good predictor of both body image distortion and body image dissatisfaction for all participants, although the effect was stronger for the ED group.

Future research should focus on the relationship or interaction between anxiety and depression which enhances the power of mood as a predictor of body image disturbances. Likewise, it would be necessary to study which explanatory model best fits the relationship between the mood produced by VR and the body image distortion and body image dissatisfaction experienced by participants.

4. Conclusions

The mood experienced by ED patients in virtual environments, especially depressed mood, influences their body image disturbances (mainly body image dissatisfaction). In contrast, the body image of participants without ED is not influenced considerably by the mood experienced in virtual environments. This is probably due to the fact that the virtual situations used in this study are not emotionally significant for people without ED. The results support previous research conducted in this field.

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