# EMOTIONAL PROCESSING IN OBSESSIVE-COMPULSIVE DISORDER

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*Abstract*

The aim of the present study was to investigate whether there are differences in emotional processing among people with obsessive-compulsive disorder, using Lang's dimensional model of emotions. A total of 22 individuals with obsessive-compulsive disorder participated in the study and compared to a control group (n=25). All participants assessed a set of photographs with emotional content (pleasant, neutral, unpleasant, and with obsessive-compulsive content) using the Self-Assessment Manikin pictorial scales for rating emotional valence, arousal, and dominance. The results show significant differences in the processing of emotional images among individuals with obsessive-compulsive disorder and the high predictive value of dominance for diagnosis.

*Key words:* Obsessive-compulsive disorder, Emotion, Affective picture processing, Emotional dominance.

## 1. Introduction

Cognitive theories of anxiety disorders have suggested that one of the most important factors underlying this kind of disorder is a deficit in information processing (Beck, Emery & Greenberg, 1985; Eysenck, 1992; Mathews & Mackintosh, 2000; Mathews & MacLeod, 1994; Mogg & Bradley, 1998; Wells & Mathews, 1994; Williams, Watts, MacLeod & Mathews, 1988). In this regard, interest in the cognitive aspects of individuals with anxiety disorders has a long tradition (Rachman, 1980; Tuma & Maser, 1985). However, interest in the emotional processing of individuals with obsessive-compulsive disorder (OCD) is more recent (Vallejo y Berros, 2006) and empirical studies are scarce.

More recent research has shown that patients with OCD present deficits in tasks designed to measure cognitive bias and distortion (e.g., the Stroop test, Dichotic Listening, Dot Probe Task) (Steketee, frost, Rhéaume y Wilhelm, 2001). Studies on emotionally relevant information processing indicate that OCD patients could have increased sensitivity toward stimuli related to their fears (e.g., information relating to contamination) (Foa, Illai, McCarthy, Shoyer y Murdock, 1993; Foa & McNally, 1986; Lavy, van Oppen y Van Den Hout, 1994; Tata, Leibowitz, Prunty, Cameron y Pickering, 1996), although some studies suggest the opposite (Cohen, Lachenmeyer y Springer, 2003; Unoki, Kasuga, Matsushima y Ohta, 1999).

An important issue to take into account in research into emotional processing and OCD is the kind of emotional stimuli used. In general, lexical input with a single word is used to determine whether the patients with OCD exhibit biased responses to specific stimuli (Foa et al., 1993; Lavy et al., 1994; Tata et al., 1996). Such lexical input cannot be equated with

experiences from the real world, and therefore their capacity to induce emotional reactions is expected to be limited (Cohen et al., 2003).

An alternative with greater ecological validity is the use of affective images. Lang and colleagues have used affective images to test their Bioinformational Theory, showing that the emotional reactions induced by these images are similar to those that occur with real stimuli (Lang, Greenwald, Bradley & Hamm, 1993). This model states that emotions can be described within an emotional space having three dimensions: emotional valence, arousal and dominance (Bradley & Lang, 1994; Lang, 2000; Lang et al., 1993). In this context, Lang's group developed a set of assessment instruments for use in experimental research. These instruments consist in the perception of visual and auditory affective stimuli and their evaluation using pictorial scales (the Self-Assessment Manikin). The two most widely used instruments are the International Affective Picture System (IAPS; Lang, Bradley & Cuthbert, 1999) and the International Affective Digitized Sounds (IADS; Bradley & Lang, 1999). Both instruments have been adapted to the Spanish population (Fernández-Abascal et al., 2008; Moltó et al., 1999; Vila et al., 2001).

On the other hand, it is also known that the emotional response is modulated by the image presented (Bradley, Cuthbert & Lang, 1990, 1991, 1996; Cobos, Sánchez, García, Vera, & Vila, 2002, 2004; Greenwald, Bradley, Cuthbert & Lang, 1990; Lang et al., 1993; Moltó et al., 1999; Vila et al., 2001; Vrana, Spence & Lang, 1988) and that in OCD patients there is a tendency to overestimate threat, thereby increasing the likelihood of neutral-content stimuli being processed as threatening (Carr, 1971, 1974; Butler & Mathews, 1983; Kozak, Foa, & McCarthy, 1987; McFall & Wollersheim, 1979; Rhéaume, Ladouceur & Freeston, 1996; Steiner, 1972; Steketee & Frost, 1994).

The aim of the present study was to investigate whether there are differences in emotional processing among individuals with obsessive-compulsive disorder, using the bioinformational model of emotions (Lang, 1995). Based on the previous research findings outlined above, it was expected that people with OCD would assign lower scores on the dimensions of valence and dominance and higher scores on the dimension of arousal in response to emotional images.

## 2. Materials and Methods

### *2.1. Participants*

The sample consisted of 22 individuals with OCD (F42.8; 9 men and 13 women; mean age: 44.3 years) diagnosed by the Andalusian Health Service and private clinical psychology centres in Andalusia, Spain. In all cases, the diagnosis was confirmed using the structured clinical interview for DSM-IV Axis I disorders (SCID-I).

The control group consisted of 25 (6 men and 19 women) psychology students in their third and fourth year at the University of Malaga who had scored less than 10 on the Spanish version of the Padua Inventory of obsessive-compulsive-symptoms (Mataix-Cols, Sánchez-Turet, & Vallejo, 2002). None presented OCD symptoms when being assessed nor had they presented OCD in the past. This was confirmed using SCID-I.

### *2.2. Instruments*

*2.2.1. Emotional images related to obsessive-compulsive disorder* (IECO; Casado, Cobos, Godoy, Farias, & Vila, 2011).

A total of 100 photographs with obsessive-compulsive content were used which were based on the content of several OCD questionnaires (Yale-Brown Scale for Obsessive-Compulsive Disorder, Padua Inventory, Maudsley Obsessive-Compulsive Inventory. The images were divided into the following categories: Abuse, Blasphemy, Contamination-Washing, Checking, Untidiness, Order, Disease, Doing harm, Homosexuality, Repetition, Superstition and Others.

*2.2.2. International Affective Picture System* (Lang et al, 1999).

Sixty pictures were selected from the IAPS on the basis of their valence and arousal ratings according to Spanish norms (Moltó et al., 1999; Vila et al., 2001). They included 20 images with pleasant content and high-arousal, 20 images with neutral content and low-arousal, and 20 images with unpleasant content and high-arousal.

*2.2.3. Self-Assessment Manikin* (SAM; Lang, 1980).

The pictures were quantitatively assessed using the Self-Assessment Manikin. The SAM is a pictorial non-verbal assessment instrument that is easily and rapidly administered. It provides information on each image for the three affective bipolar dimensions: valence, arousal, and dominance. A computer-based version of SAM, created using E-prime software (Schneider, Eschman, Zuccolotto, 2002), was used in this study. In this version the scales are shown on screen immediately after the image has been presented. The participant indicated how he/she felt while watching the image by clicking on the appropriate dot for each scale.

*2.2.4. Padua Inventory* (PI; Sanavio, 1988)

The Padua Inventory is used to assess OCD symptoms. Studies using the original PI scale found high internal consistency (around 0.90) and test-retest reliability ranging from 0.57 to 0.77 (Sternberger & Burns, 1990; Van Oppen, 1992). We administered the Spanish version created by Mataix-Cols et al. (2002).The Spanish version of the PI has been validated using clinical and non-clinical samples, demonstrating an internal consistency of 0.93 and test-retest reliability of 0.71 (Mataix, *et al.,* 2002).

2.2.5. *Clinical interview*.

The structured clinical interview for DSM-IV Axis I disorders (SCID-I; First, Spitzer, Gibbon & Williams, 1999) was used to confirm the diagnosis of OCD in the clinical sample and its absence in the control group.

*2.3. Procedure*

Candidates were screened via the SCID-I and by completing the Padua Inventory and those selected were informed that the study involved assessing emotional photographs shown on a computer screen. The participants performed the experimental task individually in a psychology laboratory in subdued lighting seated 50 cm from a 17-inch computer monitor. The task consisted of 160 trials in which 100 IECO images and 60 IAPS images were presented randomly. Each image was shown for 6 seconds during each trial. Next, the three SAM scales appeared sequentially in the following order—valence, arousal and dominance—and the participant rated the image. Once the image had been rated a new trial commenced. E-prime software (Schneider et al., 2002) was used to sequence the experimental task, present the stimuli and record the responses.

*2.4. Data analysis*

The results were analysed by first calculating the mean and standard deviation of the ratings assigned by the clinical (OCD) and control groups to the pleasant, neutral, and unpleasant images and those with obsessive-compulsive content. Next, between-group differences in valence, arousal, and dominance in relation to the four types of images were analyzed using the Student *t*-test (adjusting the degrees of freedom when variances were not homogeneous). Since four comparisons were performed with the *t*-test for each emotional dimension, a minimum *p* value (alpha error) of at least 0.03 was required as well as a Cohen's δ of 0.50 (equivalent to a medium effect size).

## 3. Results

### *3.1. Valence*

Table 1 shows the mean (and standard deviations) ratings of the OCD and control groups on the valence scale. Significant between-group differences were found for pleasant images ($t$ (32.777) = 2.92, $p$ = .006) and IECO images ($t$ (45) = 2.24, $p$ = .030), with a moderate-high effect (Cohen's δ = 0.81 and 0.63, respectively). No significant differences were found for neutral and unpleasant images ($t$ (45) = -0.690, $p$ = .493).

The OCD group rated pleasant pictures and pictures with obsessive-compulsive content as more unpleasant than the control group.

### *3.2. Arousal*

Regarding the arousal scale (Table 1), no significant between-group differences were found for any of the images: pleasant ($t$ (45) = 1.35, $p$ = .183), neutral ($t$ (45) = -0.868, $p$ = .390), unpleasant ($t$ (45) = -1.074, $p$ = .288), and IECO ($t$ (45) = -0.975, $p$ = .335).

### *3.3. Dominance*

Finally, on the dominance scale (Table 1), significant between-group differences were found for pleasant images ($t$ (33.643) = 2.273, $p$ = .030), neutral ($t$ (34.108) = 3.178, $p$ = .003), and IECO images ($t$ (33.282) = 3.668, $p$= .001), with a moderate-high effect (δ = 0.65; 0.87 and 0.97, respectively).

No significant differences were found for unpleasant images ($t$ (45) = -1.651, $p$ = 0.106).

Compared to the control group, the OCD group rated the pleasant, neutral and IECO images as having a lower level of dominance.

## 4. Discussion

The aim of the present study was to investigate whether there are differences in emotional processing among people with obsessive-compulsive disorder by viewing affective images (Lang, 1995).

The results obtained reveal significant differences between the OCD and control groups in their rating of IAPS and IECO images. Pleasant images and those with obsessive-compulsive content were rated by members of the OCD group as less pleasant/more unpleasant compared to the ratings provided by the members of the control group. Moreover, compared to the participants with no OCD symptoms, the OCD participants rated pleasant, neutral and IECO images with less sense of control. This result is especially relevant since dominance has been less studied within the context of Lang's dimensional model of emotions. This dimension is found systematically in factorial studies on emotional stimuli (Osgood, Suci & Tannenbaum, 1957; Mehrabian & Russel, 1974). Different terms have been used for this dimension—power, control, dominance—and it is related to the

level of power or sense of control over emotions, ranging from emotions under the control of the person (feeling in control) to emotions that are dominated by the environment (feeling controlled). A recognised feature of individuals with OCD is their need to control all the aspects of their life (Steketee et al., 2001). Thus, our results are compatible with those reported by Rodríguez, Fernández, Cepeda-Benito and Vila (2005) and Rodríguez, Mata, Lameiras, Fernández and Vila (2007), who found that people who have problems in controlling their impulses rate images related to their problem as being less controllable, and describe their behaviour as involuntary and under the control of external factors. Our results are also compatible with those obtained by Moulding, Doron, Kyrios and Nedeljkovic (2008), who found that the sense of control is lower in people with checking OCD when presented with 4 hypotheical scenarios related to their problem.

Contrary to expectations, no differences were found in arousal level. In this regard, previous studies on emotional processing in individuals with various anxiety disorders have found that the arousal is greater when participants are presented with threatening stimuli related to their fears (Cuthbert et al., 2003; Lang, McTeague & Cuthbert, 2005, 2007; McNeil, Vrana, Melamed, Cuthbert & Lang, 1993; McTeague, Lang, Laplante, Cuthbert, Strauss, & Bradley, 2009; Viedma, 2008). It has to be taken into account that the images with obsessive-compulsive content assessed in the study were not related exclusively to the specific symptoms of each participant, but referred to the different subtypes of OCD (rechecking, repetition, contamination, etc). Although it is rare in clinical practice to find people with OCD who present a single subtype of obsession-compulsion (Jenike, Baer & Minichiello, 2001), it is clear that not all the individuals with high obsessive-compulsive symptoms score high in all the subtypes of OCD. In fact, studies on emotional information

processing in patients with OCD suggest that there is increased sensitivity toward information related to their specific fears, (Foa et al., 1993; Foa & McNally, 1986; Lavy et al., 1994; Tata et al., 1996), although other studies suggest the opposite (Unoki et al., 1999; Cohen et al., 2003).

On the other hand, previous studies have shown that there is a tendency among participants with OCD to overestimate any kind of threat, thus increasing the likelihood of neutral-content stimuli being processed as threatening (Carr, 1971, 1974; Butler & Mathews, 1983; Kozak, Foa & McCarthy, 1987; McFall & Wollersheim, 1979; Rhéaume, Ladouceur & Freeston, 1996; Steiner, 1972; Steketee & Frost, 1994). In general, our results clarify the nature of this type of processing: people with OCD assess stimuli as more unpleasant and less controllable.

In addition, our study confirms the validity of using emotional images in the study of emotional processing in OCD.

The assessment of emotional processing through the visualization of emotional photographs has advantages compared to traditional procedures based on verbal scales and questionnaires. As mentioned, studies on emotional processing and OCD have generally presented emotional stimuli as lexical input (Tata et al., 1996; Foa et al., 1993; Lavy et al., 1994).These types of stimuli, being symbolic and abstract, do not resemble real-world experiences and are therefore limited in their ability to induce emotional reactions (Cohen et al., 2003).The emotional photographs (IAPS and IECO) have the advantage of being analog stimuli and represent important features of real life, acting as powerful generators of emotion (Lang, 1995). In addition, they have the advantage of being stimuli that can be

easily presented in clinical and laboratory settings, allowing complete control over their presentation and exposure time.

Some of the limitations of our study suggest the need to qualify any conclusions about emotional processing in people with OCD. Thus, the analysis did not differentiate between subtypes of obsessive-compulsive symptomatology, the number of men and women differed, and there were sociodemographic differences between the clinical sample and the control group. Although some studies report sex differences in OCD and a higher prevalence among women (Rasmussen & Tsunang, 1986; Karno & Golding, 1991), other authors (Yaryura & Neziroglu, 2001; Nathan, Gorman & Salkind, 2002) suggest that its distribution is less differentiated by sex. Regarding the sociodemographic characteristics of the sample, differences in age, sex, and level of education could have influenced the results. Nevertheless, our results are in line with those obtained by Casado et al. (2010), who studied a subclinical sample of groups which had been matched according to these characteristics.

Thus, this study reveals differences in emotional processing among individuals with OCD, especially in the dimensions of valence and dominance. Future research should confirm the present results by including psychophysiological registries, thereby advancing our understanding of OCD.

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Table 1.
Mean (SD) of the dimensions Valence, Arousal and Dominance in the Pleasant, Neutral, Unpleasant, and IECO images.

| | Pleasant | | Neutral | | Unpleasant | | IECO | |
|---|---|---|---|---|---|---|---|---|
| | OCD | Control | OCD | Control | OCD | Control | OCD | Control |
| Valence | 6.75 | 7.71 | 4.35 | 4.67 | 1.38 | 1.27 | 4.46 | 4.87 |
| | (1.35) | (0.78) | (0.87) | (0.52) | (0.60) | (0.42) | (0.73) | (0.53) |
| Arousal | 4.65 | 5.45 | 3.12 | 2.73 | 7.68 | 7.11 | 3.91 | 3.46 |
| | (2) | (2.03) | (1.59) | (1.45) | (1.74) | (1.90) | (1.51) | (1.59) |
| Dominance | 6.62 | 7.66 | 6.48 | 7.93 | 2.86 | 3.97 | 6.20 | 7.75 |
| | (1.86) | (1.12) | (1.85) | (1.14) | (2.40) | (2.19) | (1.73) | (1.02) |