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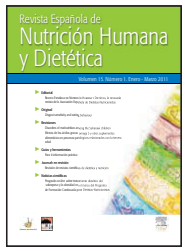

ORIGINAL

Disgust sensitivity and eating behaviour

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KEYWORDS
Disgust sensitivity;
Eating behaviour;
Eating disorders;
Functional dyspepsia;
Anxiet

Abstract
Background: The relation between emotions and food disorders has been studied in depth, although disgust sensitivity has been frequently avoided even though it has been suggested that it could play some role in these disorders.
Objective: To analyse the relation between eating-related variables and other psychopathological variables with disgust sensitivity.
Design: Descriptive, cross comparison of two samples (clinical and control).
Subjects and setting: 57 patients with eating disorders and 40 university students were studied. The presence of eating disorders in the latter was a reason for being excluded.
Measurements: Disgust sensitivity scale, visual analogue scales for dyspepsia, a state-trait anxiety inventory, a depression inventory, an eating disorder inventory, and a thought-shape fusion questionnaire.
Statistical analysis: The differences between groups were analysed using a variance analysis. Associations among variables were studied using Pearson's correlation coefficient and a multiple regression analysis was carried out to identify predictors (psychopathological, related with disgust sensitivity) of variables related with the eating behaviour.
Results: There were no significant differences between the groups neither in the total disgust sensitivity marking nor in its sub-scales. The drive to thinness was in correlation with core disgust ($r = 0.288$; $p < 0.01$), animal reminder ($r = 0.275$; $p < 0.05$), contamination ($r = 0.304$; $p < 0.01$) and disgust sensitivity ($r = 0.354$; $p < 0.01$), and the body dissatisfaction correlated with core disgust ($r = 0.25$; $p < 0.05$), contamination ($r = 0.371$; $p < 0.01$) and disgust sensitivity ($r = 0.323$; $p < 0.01$).
Conclusions: In spite of the absence of significant differences between groups, where it comes to disgust sensitivity, the relation between this sensitivity and other sensitivities specifically related with the eating behaviour, which are important in eating disorders, should be highlighted.

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PALABRAS CLAVE
Sensibilidad al asco;
Conducta alimentaria;
Trastornos alimentarios;
Dispepsia funcional;
Ansiedad

Sensibilidad al asco y conducta alimentaria

Resumen
Antecedentes: La relación entre emociones y trastornos alimentarios ha sido bien estudiada, aunque la sensibilidad al asco se ha obviado con frecuencia a pesar de haberse señalado que podría tener algún papel en dichos trastornos.
Objetivo: Analizar la relación de variables relacionadas con la ingesta y otras variables psicopatológicas con la sensibilidad al asco.
Diseño: Descriptivo, transversal, comparativo de dos muestras (clínica y de control).
Sujetos y escenario: Se estudió a 57 pacientes con trastornos alimentarios y 40 estudiantes universitarios. En estos, la presencia de alteraciones alimentarias fue motivo de exclusión.
Medidas: Escala de sensibilidad al asco, escalas analógico-visuales para dispepsia, inventario de ansiedad estado-rasgo, inventario de depresión, inventario de trastornos alimentarios y cuestionario de fusión pensamiento-forma.
Análisis estadístico: Las diferencias entre grupos se analizaron mediante análisis de varianza. Las asociaciones entre variables se estudiaron mediante el coeficiente de correlación de Pearson y se llevó a cabo un análisis de regresión múltiple para identificar predictores (psicopatológicos y relacionados con la sensibilidad al asco) de variables relacionadas con la conducta alimentaria.
Resultados: No hubo diferencias significativas entre grupos en la puntuación total de sensibilidad al asco ni en sus subescalas. La tendencia a la delgadez se correlacionó con asco esencial ($r = 0,288$; $p < 0,01$), recuerdo animal ($r = 0,275$; $p < 0,05$), contaminación ($r = 0,304$; $p < 0,01$) y sensibilidad al asco ($r = 0,354$; $p < 0,01$), y la insatisfacción corporal se correlacionó con asco esencial ($r = 0,25$; $p < 0,05$), contaminación ($r = 0,371$; $p < 0,01$) y sensibilidad al asco ($r = 0,323$; $p < 0,01$).
Conclusiones: A pesar de la ausencia de diferencias significativas entre grupos en la sensibilidad al asco, cabe destacar la relación entre dicha sensibilidad y otras específicamente relacionadas con la conducta alimentaria, que resultan relevantes en los trastornos alimentarios.

Introduction

People may respond with anger, fear or disgust to different kinds of threats. Anger may be an appropriate and effective response to threats to one's rights or one's property if these threats can be faced. Fear is an adequate response to threats that cannot be faced, and which people can then run away from. However, there are also threats that people cannot run away from or fight off. Some of these are associated with human bodily experience (i.e. oral contamination), while others may be related to meaninglessness stimuli but have developed within a cultural context. For this type of threat, disgust might be the appropriate emotional response[1]. Disgust is a process whereby different elicitors produce an initial evaluation, which generates a sense of offensiveness and revulsion and leads to thoughts of contamination. These thoughts refer to the feeling or belief that when something offensive touches something else, the offensiveness is immediately transferred to the contacted object[2]. For example, when a sterilised cockroach is dipped into a glass of juice, the juice becomes offensive even though the cockroach was previously sterilised. In this case disgust is followed by specific responses such as avoiding the juice, nausea, etc. From a cultural perspective, one can see that human beings have extended the threat evaluation system beyond the presence of an actual threat to stimuli such as a bitter taste or the smell of something rotten. Hence, this system also includes complex stimuli, which are not only biological but culturally developed. Obviously, the evaluation system has a clear adaptive objective, which is to avoid danger.

As regards the relationship between emotions and eating disorders (ED), relatively little attention has been paid to the role of disgust, although anger and fear have been studied[3,4]. However, it has been suggested that disgust might also play a role in ED. In fact, disgust has been studied in other mental disorders such as depression, social phobias and other specific phobias[5-9]. Disgust is one of the earliest emotions to develop, by as early as three years of age, and it is associated with distaste and adaptive mechanisms for avoiding dangers such as poisonous foods[10]. However, disgust is not restricted to the context of food. Disgust with oneself or shame, as well as disgust over one's actions or guilt, constitute more complex derivatives of the basic emotion of disgust. Such derivatives form part of the spectrum of disgust-based emotions usually found in

ED[11-13]. Examples here might be body-related disgust, food-related disgust, fatness-related shame, after-eating guilt, etc.[14-16]. A pioneering study on disgust[17] and its possible relationship with eating disorders found that disgust was related to eating disorder symptoms in female (but not male) students, especially as regards disgust sensitivity to foodstuffs of animal origin and to sexual practices. The same authors found that a small sample of adolescents, with anorexia nervosa, showed greater disgust sensitivity for foodstuffs of animal origin, the human body and its products (such as body odours and dandruff), and gastrointestinal products (such as vomit and faeces). A later study, however, failed to confirm that patients with ED showed higher levels of disgust sensitivity compared with other people, even though the tendency to experience disgust towards these body products was stronger among patients[18].

With regards to eating disorder symptoms, research has found that the drive for thinness and bulimia are related to disgust sensitivity for foods, death and contagion, although other psychopathological variables were not associated with disgust[18].

The aim of the present study was to analyse the relationship between eating disorder symptoms (and other psychopathological variables) and disgust in both a sample of patients with ED and a comparable group of students.

Method

Participants

The total sample comprised 97 people (mean age, 22.2 ± 6.81 years; 86 women and 11 men). Of these, 57 were ED patients (52 women and 5 men; mean age, 22.67 ± 8.49 years) and 40 were university students (34 women and 6 men; mean age, 21.65 ± 3.98 years). Patients with ED fulfilled the relevant diagnostic criteria of DSM IV-RT[19], all were receiving outpatient treatment, and they had recovered their normal weight at the time of the study. In the case of the students, the current presence or a history of ED and other mental disorders was ruled out. Written informed consent was obtained from all subjects and the questionnaire data were collected both individually and anonymously. All the data were gathered by means of interviews conducted by a dietician and a physician.

Instruments

Disgust Scale-Revised-Spanish (DS-RS)[20-22]. This instrument is a 27-item, self-report scale which is divided into three sections: a "core disgust" section comprising twelve items (measuring food-related disgust, animal-related disgust, and disgust for body products), an "animal reminder" section comprising eight items (measuring disgust towards death and envelope violations), and a "contamination" section comprising five items (measuring concerns about interpersonal transmission of essences). All items are rated on 5-point scales (0-4), where 0 = Strongly disagree (very untrue about me), 1 = Mildly disagree (somewhat untrue about me), 2 = Neither agree nor disagree, 3 = Mildly agree (somewhat true about me), and 4 = Strongly agree (very true about me). The scale also includes two control-items (12 and 16): all participants who do not answer 3 or 4 on question 12 ("I would rather eat a piece of fruit than a piece of paper"), and who do not answer 0 or 1 on question 16 ("You see a person eating an apple with a knife and fork") are dropped.

Patient Symptom Questionnaire: visual analogue scales (VAS) for dyspepsia[23]. This self-report instrument gathers information about the following symptoms: postprandial fullness, early satiation, bloating, epigastric discomfort (an ache or discomfort after eating, poorly localised), epigastric pain (a sharp, easy-to-pinpoint pain after eating), postprandial nausea, belching after meals, and vomiting. Respondents mark the severity of each symptom on a 100-mm visual analogue scale, and the score on each of the eight subscales is then added to give a total score. Overall severity therefore ranges between 0 and 800 mm. Visual analogue scales have been shown to be sensitive to changes in symptom intensity and are a well-accepted instrument for evaluating such symptoms[23].

State-Trait Anxiety Inventory (STAI), Spanish version[24]. A 40-item, self-report questionnaire that measures state anxiety (STAI-S) and trait anxiety (STAI-T). Items are scored from 0 to 3, where 0 = not at all and 3 = a lot. As regards reliability and discriminant validity the STAI items show a sufficient ability to discriminate and differentiate (between age, sex, and anxiety levels) and have a good internal consistency (between 0.9 and 0.93 for the STAI-S and between 0.84 and 0.87 for the STAI-T).

Beck Depression Inventory (BDI), Spanish version[25]. This measures the intensity of depression and is used as a screening test in the general population. It is a self-report instrument comprising 21 items and four response levels (0 to 3 for each item). The scores obtained are linked to three categories: absence of depression (0-9), dysthymia or mild depression (10-15), and depression (over 15). The Beck Depression Inventory shows adequate reliability (0.93) and a convergent validity between 0.62 and 0.66.

Eating Disorders Inventory-2 (EDI-2), Spanish version[26]. The EDI-2 is a self-report questionnaire comprising eleven subscales (drive for thinness, bulimia, body dissatisfaction, ineffectiveness, perfectionism, interpersonal distrust, interoceptive awareness, maturity fears, asceticism, impulse regulation and social insecurity). For this study the Body Dissatisfaction (BD), Bulimia (B), and Drive for Thinness (DT) scales were administered. The BD subscale measures dissatisfaction with the overall shape and size of those parts of the body most related to eating disorders. The B subscale was designed to assess the tendency to think about and to engage in overeating episodes. The DT subscale measures excessive concern with dieting, preoccupation with weight, and fear of weight gain. The EDI-2 has been used to monitor psychological change during treatment of eating disorders, and the DT subscale has been used as a screening test. The internal consistency of the test, and its subscales, ranges

between 0.83 and 0.92 in patient samples, and between 0.65 and 0.93 for various non-clinical samples. Test-retest reliability ranges between 0.41 and 0.97 depending on the sample.

Thought-Shape Fusion Questionnaire (TSF-Q), Spanish version[27]. Thought-shape fusion is a cognitive distortion that has been found to be characteristic of eating disorders, and the TSF-Q measures this fusion between thought and body shape or image[28,29]. It is a 34-item, self-report questionnaire which is divided into two sections: *a)* a conceptual section (TSF-concept) comprising 17 items and which measures the importance attached to thoughts related to eating and the body, and *b)* an interpretation section (TSF-interpretation), also comprising 17 items and which evaluates how these thoughts are interpreted by participants. Each item is scored from 0 to 4 (where 0 = not at all and 4 = totally) according to how much the subject agrees with its content. The questionnaire has been shown to have high internal consistency (Cronbach's $\alpha = 0.95$ for the conceptual subscale and $\alpha = 0.97$ for the interpretative one) and discriminates between clinical and non-clinical samples. The internal consistency of the Spanish version of the TSF-Q and its subscales was determined by means of Cronbach's alpha, with values ranging between 0.93 and 0.96.

Table 1 Mean differences for all the variables considered

	ED patients	Students	p
Core disgust	30.32 ± 8.23	31.69 ± 7.8	0.457
Animal reminder	16.7 ± 7.08	17.46 ± 6.46	0.312
Contamination	7.89 ± 3.98	8.64 ± 3.8	0.659
Disgust sensitivity	54.20 ± 16.78	57.79 ± 15.47	0.256
STAI-S	21.98 ± 12.35	19.51 ± 11.35	0.473
STAI-T	26.6 ± 12.47	19.87 ± 9.39	0.205
BDI	12.7 ± 12.7	5.38 ± 4.55	< 0.0001
TSF-concept	14.62 ± 9.51	5.54 ± 4.95	< 0.0001
TSF-interpretation	17.08 ± 15.11	5.32 ± 4.53	< 0.0001
TSF-Total	31.58 ± 24.75	10.78 ± 9.62	< 0.0001
EDI-DT	7.19 ± 6.29	3.43 ± 2.05	< 0.0001
EDI-B	1.56 ± 0.97	0.43 ± 0.29	< 0.0001
EDI-BD	9.84 ± 8.64	5.05 ± 4.89	< 0.0001

BDI: Beck Depression Inventory; ED: eating disorders; EDI-B: Eating Disorders Inventory-Bulimia; EDI-BD: Eating Disorders Inventory-Body Dissatisfaction; EDI-DT: Eating Disorders Inventory-Drive for Thinness; STAI-S: State Trait Anxiety Inventory-State; STAI-T: State Trait Anxiety Inventory-Trait; TSF: Thought-Shape Fusion.
All data, mean ± standard deviation.

Statistical analyses

Data are expressed as means ± standard deviations. With regards to the different variables, between-groups differences were examined by analysis of variance (ANOVA). Associations between variables were studied by means of the Pearson correlation coefficient. Finally, a multiple regression analysis was carried out to identify any variables that might predict disgust sensitivity and its components. All the analyses were performed using the Statistical Package for the Social Sciences (SPSS, v. 18.0 for Windows, SPSS Inc., Chicago)[28] and significance was set at the 0.05 level.

Results

In relation to disgust sensitivity, no significant differences were found between the two groups (ED patients and students) in either the total score (disgust sensitivity) or on any of the subscales (core disgust, animal reminder and contamination) (table 1). With regard to symptoms of functional dyspepsia, ED patients scored higher on bloating (patients: 53.64 ± 34.58; students: 41.18 ± 27.06; $p < 0.05$) and epigastric pain (patients: 22.26 ± 20.52; students: 13.49 ± 11.26; $p < 0.01$). However, there were no significant differences for the other symptoms of functional dyspepsia.

For all the psychopathological variables considered, ED patients scored significantly higher, except on anxiety (table 1).

Analysis of the association between variables revealed that core disgust was positively and significantly correlated ($p < 0.01$) with postprandial bloating ($r = 0.376$) and with the total dyspepsia score (0.378). A positive and significant correlation ($p < 0.05$) was also found with satiation ($r = 0.25$), epigastric pain ($r = 0.283$) and nausea ($r = 0.26$). Animal reminder was positively correlated ($p < 0.05$) with satiation ($r = 0.242$). Contamination was positively and significantly correlated ($p < 0.01$) with nausea ($r = 0.437$), vomit ($r = 0.313$) and the total dyspepsia score ($r = 0.441$). This subscale was also correlated ($p < 0.05$) with satiation ($r = 0.266$), bloating ($r = 0.223$), epigastric pain ($r = 0.269$) and belching ($r = 0.269$). Finally, the total score for disgust sensitivity showed a highly significant correlation ($p < 0.01$) with satiation ($r = 0.337$), nausea ($r = 0.302$) and the total dyspepsia score ($r = 0.38$). Disgust sensitivity was also correlated ($p < 0.05$) with bloating ($r = 0.281$) and epigastric pain ($r = 0.248$).

The various psychopathological variables considered were found to be significantly associated with disgust sensitivity (and its subscales). Regarding the non-eating variables, a positive and significant correlation ($p < 0.05$) was found between state anxiety (STAI-S) and core disgust ($r = 0.257$), animal reminder ($r = 0.222$) and disgust sensitivity ($r = 0.223$). Trait anxiety (STAI-T) showed a positive correlation ($p < 0.05$) with contamination ($r = 0.245$) and disgust sensitivity ($r = 0.233$). The symptoms of depression (BDI) were significantly associated ($p < 0.01$) with contamination ($r = 0.322$). As regards thought-shape fusion, scores for the TSF-interpretation section of the TSF-Q were correlated with contamination ($r = 0.25$; $p < 0.05$), as was the TSF-Total score ($r = 0.246$; $p < 0.05$). There were also correlations between the subscales of the EDI-2 and disgust sensitivity and its subscales. Specifically, drive for thinness (EDI-DT) was correlated with core disgust ($r = 0.288$; $p < 0.01$), animal reminder ($r = 0.275$; $p < 0.05$), contamination ($r = 0.304$;

$p < 0.01$) and disgust sensitivity ($r = 0.354$; $p < 0.01$). With respect to the body dissatisfaction subscale (EDI-BD), significant correlations were found with core disgust ($r = 0.25$; $p < 0.05$), contamination ($r = 0.371$; $p < 0.01$) and disgust sensitivity ($r = 0.323$; $p < 0.01$). By contrast, the bulimia subscale (EDI-B) did not show significant correlations with disgust sensitivity and its subscales.

A stepwise multiple regression analysis was then carried out in order to analyse which variables might be predictive of disgust sensitivity (and its subscales). The independent variables introduced were anxiety (STAI-S and STAI-T), depression (BDI), TSF and the subscale scores on the EDI-2. The analysis revealed state anxiety to be predictive of core disgust ($B = 0.229$; $SE = 0.088$; $\beta = 0.3$; $p < 0.05$). With regard to animal reminder, the drive for thinness (EDI-DT) was shown to be a predictor variable ($B = 0.486$; $SE = 0.146$; $\beta = 0.455$; $p < 0.01$), while the symptoms of depression (BDI) were predictive of contamination ($B = 0.148$; $SE = 0.046$; $\beta = 0.368$; $p < 0.01$). Finally, the drive for thinness (EDI-DT) was also a predictor of disgust sensitivity ($B = 1.359$; $SE = 0.351$; $\beta = 0.518$; $p < 0.001$), as well as body dissatisfaction (EDI-BD) ($B = 1.274$; $SE = 0.371$; $\beta = 0.507$; $p < 0.001$).

Discussion

This study explored the relationship between disgust sensitivity and eating behaviour. The first finding of note is that there were no significant differences between the clinical sample (ED patients) and the group of students as regards disgust sensitivity and its components. This confirms the results of a previous study[18], and shows again that the previous findings of Davey et al[17] are not corroborated.

However, beyond the absence of significant differences between the two samples it is necessary to highlight that there is a relationship between disgust sensitivity and specific eating-related variables, which are usually relevant in ED. The relationships are as follows: the cognitive bias of thought-shape fusion, which is characteristic of ED, was associated (TSF-interpretation) with the contamination subscale; drive for thinness (EDI-DT) was related to core disgust, animal reminder, contamination and disgust sensitivity; and, finally, body dissatisfaction was associated with core disgust, contamination and disgust sensitivity. By contrast, the bulimia subscale of the EDI-2 (EDI-B) did not show any significant association with disgust sensitivity and its components, a finding which differs from a previous report by Troop et al[18].

One difference between the present study and previous research[11-18] is that here the relationship between disgust sensitivity and symptoms of functional dyspepsia was analysed. Functional dyspepsia, which is closely related to ED, is often associated with disordered eating behaviour in the general population. In fact, functional dyspepsia has a complex physiopathology that also involves aspects such as stress, anxiety or depression[29,30]. Symptoms of functional dyspepsia are frequently observed in patients with ED, who in fact experience a wide variety of gastrointestinal manifestations[31-34]. Food intolerance, which is a common complaint among the general population, usually manifests in the form of abdominal pain, bloating and changes in intestinal regularity, and often meets the criteria for irritable bowel syndrome or dyspepsia, and sometimes for both. In patients with ED, the reporting of such intolerance and symptoms is related to one of the most clinically relevant aspects from a psychological point of view, namely interoceptive awareness[35].

The significant correlations observed between the different psychopathological variables, eating variables and disgust sensitivity confirm their association. These inter-relationships could determine disturbances related to functional dyspepsia, followed by the refusal to eat or restricted food choices, both of which are relevant in the course of ED. Indeed, of the variables analysed and shown to be predictive of disgust sensitivity, two of them are specifically related to ED (drive for thinness and body dissatisfaction). In addition, the relationship between the TSF-interpretation score and contamination would seem to be relevant, since this cognitive bias entails the individual's belief that thinking about eating fattening foods will result in weight gain[36]. In this case, thoughts about gaining weight could be linked with an idea of contamination. Moreover, this feeling of contamination is related to the TSF-Total score. It should be remembered that TSF is a cognitive bias which refers to: *a)* the fact that only thinking about eating could result in weight gain and/ or in changes in body shape; *b)* the belief that having such thoughts is as immoral as actually eating the food, and *c)* the belief that having such thoughts makes the person feel fat[37]. The relationship between TSF and the spectrum of obsessive disorders has been well studied, and within this spectrum feelings of contamination are usually relevant[38]. One might therefore hypothesise that this component of disgust sensitivity may influence the selection/rejection of certain foods as a result of the core psychopathology of ED patients.

The present study has several limitations. The sample of patients is somewhat smaller than that used previously by Troop et al[14], although the comparison group is larger. The size of the clinical sample means that it was not possible to analyse potential differences in disgust sensitivity according to diagnosis (anorexia nervosa, bulimia nervosa, and eating disorders not otherwise specified, where the latter includes binge eating disorder). The same can be said about the small proportion of male participants, which prevents any reliable analysis of gender differences. Regarding the psychopathological variables, the most relevant ones were chosen, despite the fact that no questionnaires of general psychopathology were used, as other authors did[18]. Interestingly, with the instrument used here, i.e. Derogatis' Symptom Checklist-Revised, these authors did not find any correlations between disgust sensitivity and the psychopathological variables included in the instrument. Finally, given the characteristics of the sample, it was not possible to determine the influence of the development of disgust sensitivity on the learning of eating habits. This would require the study of different ages, which should be an objective for future research.

Conflict of interest

The authors declare no conflict of interest.

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