The role of emotion dysregulation in Conversion Disorder

Lucía del Río-Casanova[1]
Ana Isabel González-Vázquez[2]
Ania Justo[3]
Vanessa Andrade[4]
Mario Páramo[5]
Julio Brenlla[6]
Andrés Blanco-Hortas[7]

[1] MD, Psychiatrist, Santiago de Compostela University Hospital, Spain
[2] PhD, Psychiatrist, A Coruña University Hospital. Spain
[3] MD, Psychiatrist, Clínica Assistens. Vigo. Spain
[4] MA, Psychologist, Clínica Assistens. A Coruña. Spain
[5] PhD, Psychiatrist, Santiago de Compostela University Hospital, Spain
[6] PhD, Psychiatrist, Santiago de Compostela University Hospital, Spain
[7] BS, Mathematic, Fundación Ramón Domínguez. Santiago - Lugo. Spain

Introduction. The role that emotion regulation plays in Conversion Disorders (CD) is not well known. This research deepens in this subject and describes the main differences between a group of conversion patients and a control group on different measures of emotion regulation and other clinical variables.

Methods. A case-control study was conducted including 43 patients suffering from CD and 42 healthy controls. Both groups went thought two psychiatric interviews and fulfilled 6 questionnaires assessing depression, anxiety, alexithymia, emotion dysregulation, affect intensity, psychoform and somatoform dissociation.

Results. Patients suffering from CD scored significantly higher on all the six questionnaires ($p<0.001$). Negative reactivity and negative intensity were also higher in patients ($p<0.01$), while cases and controls did not show any significant differences on positive affectivity and serenity. Anxiety, alexithymia and emotional dysregulation were the most relevant factors (OR=5.85/3.50/3.23 respectively). Anxiety and difficulties in emotion regulation were the most explicative variables for conversion in the regression analysis performed. Within the five factors assessing difficulties in emotion regulation, lack of emotional control and interference in goal directed behaviors were the most relevant. Positive and negative conversion where correlated to different emotional impairments.

Conclusions. People suffering from CD show several emotional impairments when compared to healthy controls. Emotion dysregulation can be considered a relevant aspect in CD. The existence of specific emotional patterns for different conversion manifestations is suspected.

Keywords: Risk factors, Emotion regulation, Conversion disorders, Disociative disorders

Actas Esp Psiquiatr 2018;46(3):92-103

El papel de la desregulación emocional en el Trastorno Conversivo

Introducción. El papel que juega la regulación de las emociones en la etiopatogénesis del Trastorno Conversivo (TC) es todavía poco conocido. Esta investigación pretende profundizar en este tema, buscando describir las diferencias principales que existen entre un grupo de pacientes con TC y un grupo control en lo que concierne a la forma de regular sus emociones así como a otras variables clínicas fundamentales.

Métodos. Se ha realizado un estudio de tipo casos (n=43) y controles (n=42). Ambos grupos se sometieron a dos entrevistas psiquiátricas y completaron 6 cuestionarios autoadministrados evaluando la depresión, ansiedad, alexitimia, desregulación emocional, intensidad efectiva, así como la disociación psicomorfa y somatomorfa.

Resultados. Los pacientes con TC puntuaron significativamente más alto en las seis variables estudiadas a través de los cuestionarios ($p<0.001$). La reactividad y la intensidad emocional negativas fueron mayores en el grupo de pacientes ($p<0.01$) mientras que ambos grupos puntuaron de manera similar en afectividad positiva y serenidad. La ansiedad, la alexitimia y la desregulación emocional fueron los factores de riesgo más importantes identificados (OR=5.85/3.50/3.23 respectivamente). La ansiedad y las dificultades en la regulación de las emociones fueron las variables que mejor explicaron la pertenencia al grupo de pacientes en los modelos de regresión logística calculados. Entre los 5 factores que midieron diferentes dificultades en la regulación emocional

Correspondence:
Lucía del Río Casanova
Hospital Provincial, Complejo Hospitalario Universitario de Santiago de Compostela, Servicio de Psiquiatría
Rúa Ramón Baltar s/n.
15706, Santiago de Compostela. Spain
Tel.: +34 981 951 500
Fax: +34 981 531 627
E-mail: ludelriocasanova@gmail.com

los más relevantes fueron la falta de control emocional y la interferencia en conductas orientadas a una meta. La sintomatología conversiva positiva y la sintomatología conversiva negativa se correlacionaron con distintos patrones de regulación emocional.

Conclusiones. Los pacientes con TC sufrieron múltiples dificultades a la hora de regular sus emociones, comparados con el grupo control. La desregulación emocional puede ser considerada un factor de riesgo para padecer un TC. Se discute la posibilidad de que existan diferentes patrones de regulación emocional en pacientes con distintos tipos de sintomatología conversiva.

Palabras clave: Factores de riesgo, Regulación emocional, Trastorno conversivo, Trastorno disociativo

INTRODUCTION

The etiopathogenesis of Conversion Disorders (CD) is not well known, and different hypothesis have been postulated to explain its nature. Among other explanations, CD has been considered as (a) a result of the misinterpretation of physical experiences, (b) a phenomenon linked to disturbances on self-agency, (c) a physical posttraumatic manifestation or (d) the result of emotion regulation disturbances[1-4].

Main international classifications also differ while approaching this subject. DSM-5 classification considers CD as a type of Somatoform Disorder, while ICD-10 includes dissociation and conversion within the same section[5,6]. Nijenhuis was one of the authors who provided more evidence in favor of the consideration of conversion and dissociation as part of the same phenomenon. In this paper we embrace Nijenhuis´ perspective considering CD as a variant of dissociative disorders with predominant somatic presentation. He coined the term somatoform dissociation to name sensorimotor manifestations of dissociation (vs psychoform or psychological dissociation which refers to psychological symptoms)[1]. The author describe this way these concepts: "Somatoform dissociation designates dissociative symptoms that phenomenologically involve the body, and psychological dissociative symptoms are those that phenomenologically involve psychological variables. The descriptor 'somatoform' indicates that the physical symptoms resemble, but cannot be explained by a medical symptom or the direct effects of a substance. In the term somatoform dissociation, 'dissociation' describes the existence of a disruption of the normal integrative mental functions. Thus 'somatoform dissociation' denotes phenomena that are manifestations of a lack of integration of somatoform experiences, reactions, and functions".

On the other hand, Van der Kolk found that dissociation, somatoform manifestations and affect dysregulation were highly related conditions which were the result of the complexity of adaptation to trauma[7]. Our study intends to deepen into the emotional factors related to CD and tries to clarify the specific role of emotion regulation in this disorder. In this sense, the paper proposes two main questions: Which are the most relevant risk factors involved in CD? And concerning emotion regulation, which are the specific emotion dysregulation patterns appearing in this disorder? Concerning the first question and after a careful literature review[8-15] we considered psychoform dissociation, alexithymia, emotion dysregulation, anxiety and depression should be evaluated as they have been previously identified as risk factors for CD. To approach the second question, emotion dysregulation has been studied in depth, describing different patterns of emotion dysregulation and those differences that depend on the type of symptom patients manifest[4]. A broad variety of variables evaluating emotion regulation have been included.

Previous literature on emotion regulation in CD has described some particular findings that can be summarized in the next groups:

1. CD has been associated to the presence of increased alexithymia rates[10,16,17] and other emotion dysregulation disturbances[18,17]. Concerning alexithimia, Steffen et al. found that emotional adverse events and alexithymia increased the severity of conversion symptoms. The difficulty on interpreting one´s corporal states and feelings, especially in emotion-exigent contexts, could be the mechanism leading to the misinterpretation of physical symptoms appearing in CD according to some authors[10]. But alexithymia is not the only alteration on emotion regulation found in CD. Kozlowska described the presence of specific patterns of emotional-cognitive functioning in child conversion patients[19]. Brown and Uliaszek performed two independent studies and described the existence of a cluster of patients with non-epileptic characterized by higher levels of psychopathology, somatization, alexithymia and difficulties with most aspects of emotional regulation (including identifying, accepting and describing feelings, accessing adaptive regulatory strategies, performing goal-directed behaviors and controlling feelings and actions)[20,21].

2. Some impairments on the processing of different emotional stimuli have been found. In this sense, some authors have described that subjects suffering from CD are hyper-reactive to diverse kinds of negative stimuli[22] such as angry faces[23], or fearful and sad faces[24]. Others, have found that conversion patients were hyper-reactive to high arousing stimuli, regardless their valence[25,26]

and a more recent study has proposed that the reaction to neutral stimuli was augmented in CD[27].

3. There are at least two main emotion dysregulation patterns in CD patients, in relation with the presence of different types of symptoms. Some authors considered that conversion patients show two opposite patterns of managing their emotions. Some patients are unable to control overwhelming emotions and often feel hyper-reactive (what is called under-regulation of affect and is a result of excitatory experiences) while other patients are emotionally flattened and disconnected (over-regulation of affect which is a result of inhibitory experiences)[4,28,11,19]. While hyper-reactive patients were more likely to suffer positive conversion symptoms (as pseudo-seizures or involuntary movements), emotionally flattened patients usually suffered from negative symptoms (as paralysis, blindness or collapse reactions)[4,11,29,30]. Nevertheless, this field needs to be studied in further detail and validity of the categorization in positive vs negative symptoms is not well established for the moment. While some particular symptoms can be easily classified as positive or negative, there is incipient evidence that other symptoms could be the result of both excitatory and inhibitory experiences[4].

METHODS

Participants

A case-control study has been conducted. The range age for controls and cases was 18-70 years old. Inclusion criteria for cases was the presence of CD diagnosed by at least two psychiatrists or a psychiatrist and a neurologist by following DSM-5 diagnostic criteria[5]. Exclusion criteria for both groups were the existence of: 1) neurological or psychical disease that can course with neuro-psychiatric manifestations, 2) cognitive impairment, 3) alcohol or drug dependence excluding nicotine and caffeine, and 4) other severe mental disorders such as psychotic conditions and major affective disorders.

Procedure

The research protocol was approved by the Research Ethics Committee of the Hospital and was designed to meet Helsinki Declaration recommendations[31]. Patients were identified by a team composed of 2 neurologists and 5 psychiatrists working in outpatient services of the public healthcare system. Outpatients were identified in the same geographic area in Galicia (Spain) which included both rural and urban populations. Psychiatric and neurological outpatients were selected as they were consecutively identified during a two year period. As soon as the presence of CD was suspected in a patient, the subject was evaluated to check his suitability for the study. The diagnosis suspected was verified by the research team (a different psychiatrist confirmed it, based on DSM-5 criteria). By his hand, the control group was formed by healthy subjects who had no past psychiatric diagnosis or treatment and who had asked to a public request for volunteers. Patients and controls signed the informed consent and went through two psychiatric interviews. In the first interview inclusion and exclusion criteria were checked and socio-demographic and clinical variables were collected. In the second session all subjects completed six self-reported questionnaires.

Measures

1. Difficulties in Emotion Regulation Scale (DERS): It is a self-reported and Likert scale assessing difficulties in emotion regulation and developed by Graz and Roemmer[32]. The authors privileged the study of those emotion regulation disturbances that had shown to be clinically relevant in different disorders and developed this questionnaire to assess the difficulties on emotion regulation. It included most of the concepts that had previously been postulated as core phenomena to understand emotion regulation. In this sense, the questionnaire includes measures of emotional control (as a strategy to diminish the expression of negative emotions), emotional awareness (linked to emotional arousal and attention), impulse control (as a behavioral manifestation of emotional dysregulation), emotional clarity/confusion (a factor related to alexithymia), emotional acceptance/rejection (which involves appraisal and reappraisal processes) and interference in goal directed behaviors (a measure of disability and interference in daily life behaviors). While the original version included 36 items and 6 factors[33], its Spanish validation recommended to use 28 items organized around 5 factors: lack of emotional awareness (DERS1), lack of emotional clarity (DERS2), non-acceptance of emotional responses (DERS3), interference in goal directed behaviors (DERS4) and lack of emotional control (DERS5). For statistical treatment of data, the scale was also dichotomized and a cut-off point of 75 was considered corresponding to the mean +1SD taken from the sample of the Spanish validation study[33].

2. Affect Intensity Measurement Scale (AIM): Affect intensity refers to individual differences in the strength or intensity of emotional experiences, and was considered by Larsen as an individual differential characteristic. Subjects differ in the typical intensity or magnitude of their emotional responses and affect intensity is highly

stable over time and highly consistent across situations[34]. The AIM is a self-reported Likert scale with 40 items. Its factors are: positive affectivity (AIM1), negative intensity (AIM2), serenity (AIM3) and negative reactivity (AIM4)[35]. The Spanish validation study performed in general population, does not specify mean and SD values for the global scale, nevertheless these data are available for the four factors. The cut-off points considered (based on the mean score plus 1 SD) were the following: AIM1≥88, AIM2≥30, AIM3≥26 and AIM4≥38.

3. Toronto Alexithymia Scale (TAS-20): it is a 20 item Likert scale organized around 3 factors: difficulty identifying feelings (TAS1), difficulty describing feelings (TAS2) and externally oriented thinking (TAS3). Subjects with scores higher than 60 were considered alexithymic subjects[36,37].

4. Hospital Anxiety and Depression Scale (HADS): This broadly used scale was developed and found to be a reliable instrument for detecting states of depression and anxiety. It is a self-reported and multiple-choice questionnaire. A cut-off point of 8 has been considered to distinguish cases of anxiety or depression from healthy controls[38].

5. Somatoform Dissociation Questionnaire (SDQ-20): It is a 20 item Likert scale designed to assess somatoform dissociation. Subjects scoring higher than 35 are considered at high risk for suffering somatoform dissociation (Espirito Santo & Pio-Abreu 2007). Positive conversion (SDQ+) and negative conversion (SDQ-) were assessed by considering the items of the SDQ-20 that Van Dijke has proposed with this aim[11].

6. DES-II (Dissociative Experiences Scale-II): it is a 11 point Likert scale based on self-reported measures of psychoform dissociation [40]. It has 28 items and the subject has to evaluate the frequency of those symptoms from 0 to 100%. Scores higher than 20% have been considered suggestive of the existence of a Dissociative Disorder[41].

All the instruments have been validated in Spanish population[33,42-46].

Data analyses

Statistical analyses were performed using a *R* statistical software[47] in its version 3.2.3. Normality tests were accomplished for all the variables in both groups. Descriptive statistics concerning sex, age, civil state and different questionnaire scores are compared in controls and cases by using a squared chi-test or a t-test depending on the distribution of the variable. Correlations were assessed thought a Spearman Rho method. Distribution comparisons between both groups were calculated with a U-test (Mann-Whitney test) for non-normal variables and a Student´s t-test was accomplished for normal variables. A bivariate analysis was conducted and risk estimations were obtained (*Odds-ratio*). Finally, three multivariate logistic regression models were calculated and are presented. To assess potential predictive factors of conversion disorder we adjusted a multivariate logistic regression model with all potential risk factors. Then, variables were removed in a stepwise backward elimination process to obtain the definitive model. Finally, another stepwise selection model was performed from the five factors of DERS to specific study of emotion dysregulation. The stepwise elimination process was based on Aikake Information Criterion (AIC) and *Nagelkerke's R-square was calculated* in order to evaluate the goodness of fit of the logistic regression model.

RESULTS

43 patients suffering from CD and 42 healthy controls satisfied the inclusion criteria and completed the protocol. No statistically significant differences were found between patients and controls concerning age and sex. Women were more represented in the sample than men. Age, sex and civil state distribution are shown in Table 1. The control group showed higher educational level with significantly more graduates than the case group ($p<0.01$). The case group did not differ from controls in the number of children they had nor in the number of years employed ($p=0.328$). Patients showed more antecedents of somatic diseases than controls and manifested affectation of more body systems ($p<0.001$). Figure 1 shows differences between the two groups respecting the antecedents of physical diseases. Concerning neurological manifestations we highlight that although subjects with neurological diseases that can course with symptoms that look like conversion manifestations were excluded of the study (such as patients suffering from epilepsy, demyelinating and/autoimmune diseases, dementia, movement disorders, or tumors and infections within the Central Nervous System), other neurological conditions such as chronic headache or migraine were not considered exclusion criteria and were highly frequent in the conversion sample.

Within the case group, mean age for the debut of conversion manifestations was 28.5 years (SD=12.9). Only 21% of the patients had a story of a single conversion manifestation, while 53% had suffered from two or three conversion symptoms and 26% more than three. Figure 2 shows the clinical characteristics of the sample (different types of conversion manifestations). On the other hand, 46.5% of cases had never be been admitted into a Psychiatry and/or Neurology Hospital Service, 37.2 % of patients had been admitted one, two or three times and 16.3% had been admitted

Table 1 Descriptive statistics concerning sex, age and civil state

Variables	Cases n=43		Controls n=42	
	Median/Absolute number	Range/ %	Median/Absolute number	Range/ %
Sex (Men)	5	11.6	6	14.2
Age (Years)	45	37-51	41.5	36-52
Civil state*				
Single	13	30.3	12	28.6
Married	19	44.2	18	66.6
Divorced	8	18.6	2	4.8
Widower	3	6.9	0	0

Median and and range are shown for continuous variables while absolute numbers and percentages are shown for categorical variables (civil state). p values (two tailed): *p <0.05, **p <0.01 and ***p<0.001

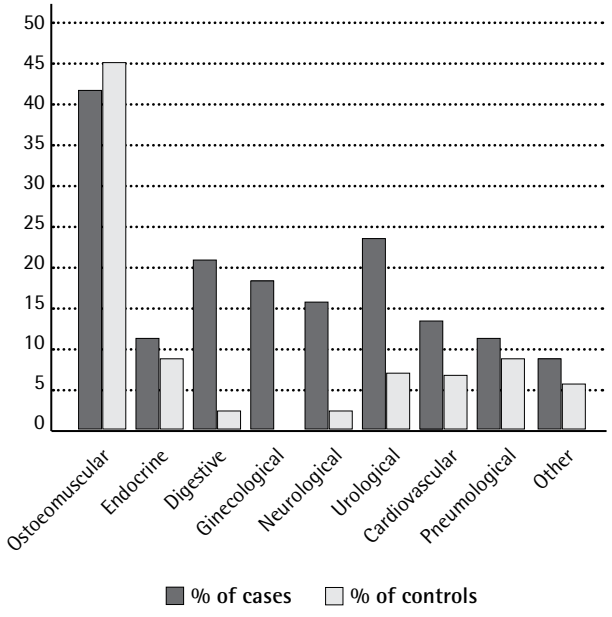


Figure 1 *Comparison between cases and controls concerning antecedents of physical diseases (the results are shown in %)*

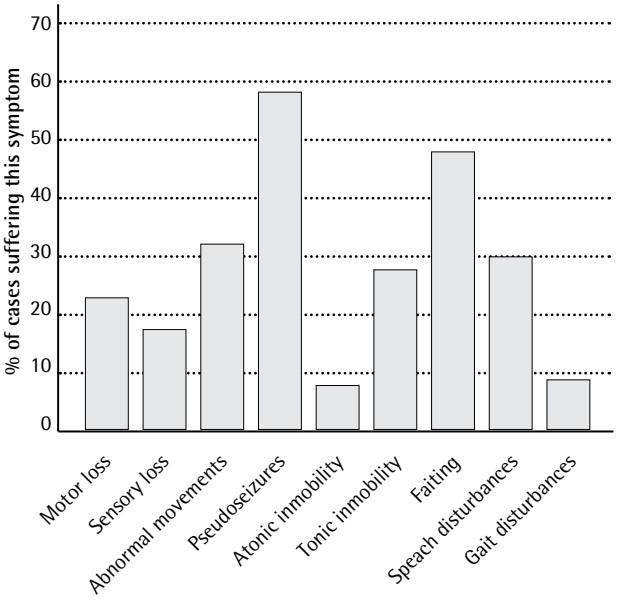


Figure 2 *Type of conversion clinical manifestations within the case group*

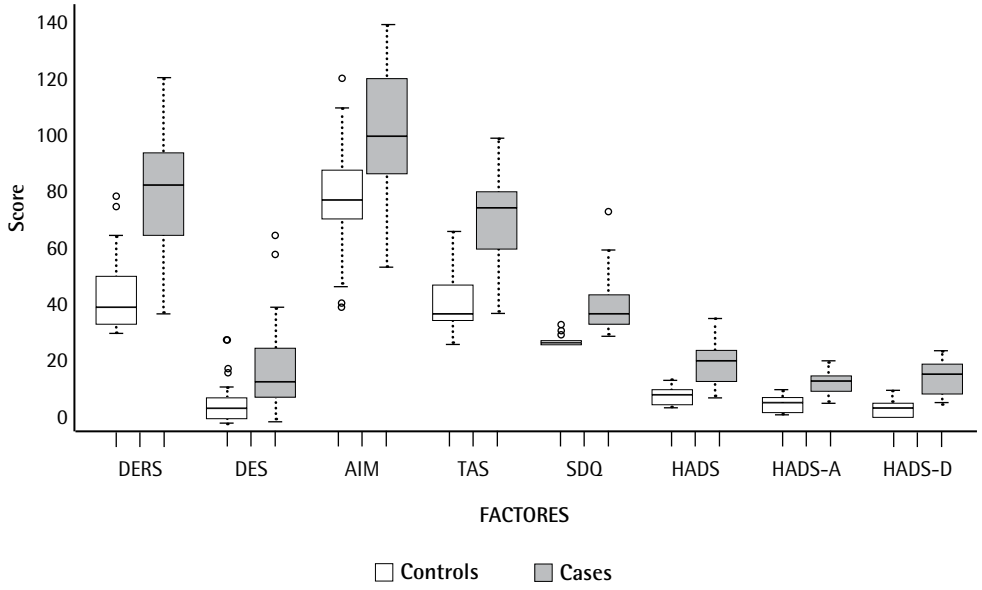
more than three times. It is salient that 83.7% of patients were taking psychiatric drugs.

Compared to controls, cases scored significantly higher at all the questionnaires which assessed: emotion dysregulation, psychoform dissociation, affect intensity, alexithymia, somatoform symptoms, anxiety and depression (p<0.001) (Table 2). Distributions on those variables for both groups are represented in Figure 3. Median scores and ranks for the factors of DERS, AIM and TAS were compared between

Table 2 Comparison of total scores between groups

	Cases n=43		Controls n=42	
	Median	Range	Median	Range
DERS ***	87	69-75	41	36-48
DES ***	13.2	8.4-24.45	3.75	1.5-6.1
AIM ***	99	87.5-117.5	78.5	71-89
HADS ***	22	15-26	7	3-9
HADS-A ***	12	9-14	4.5	2.25-6
HADS-D ***	10	5-13-5	2	0-3
TAS ***	72	58-78.5	40.5	35-47-2
SDQ ***	36	30-43.5	20	20-21

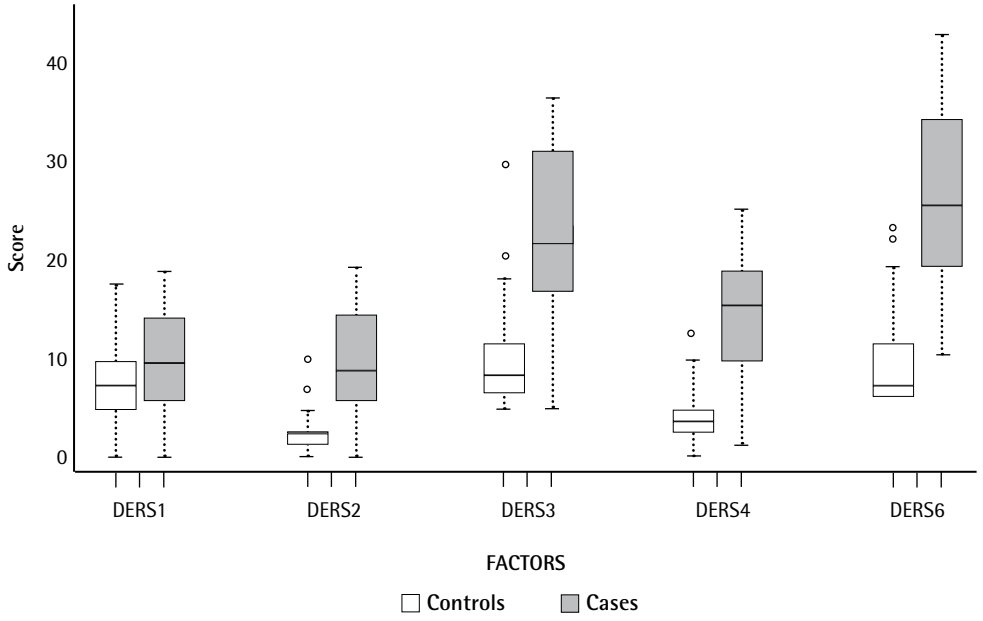
p-values achieved through a Mann-Whitney´s U-test: *p<0.05, **p<0.01 and ***p<0.001 (two tailed).
For variables following a normal distribution (AIM), a Student´s T-test was performed.



All box-plots included are uniform in their use of the box: the bottom and top of the box correspond to the first and third quartiles, and the band inside the box is always the second quartile (median)

Figure 3 *Box-plot showing the distributions on total scores in both groups*

groups. Cases showed significantly higher scores at all the five factors of DERS (Figure 4). The scores on the three factors of the TAS were significantly higher on the case group (p<0.001) (Figure 5). Concerning the AIM, negative reactivity and negative intensity were significantly higher in patients (p<0.001 and p=0.012 respectively) while differences on positive affectivity and serenity did not achieve statistical significance (p=0.16 and p=0.25 respectively) (Figure 6).



DERS1: lack of emotional awareness, DERS2: lack of emotional clarity, DERS3: non-acceptance of emotional responses, DERS4: interference in goal directed behaviors and DERS5: lack of emotional control.

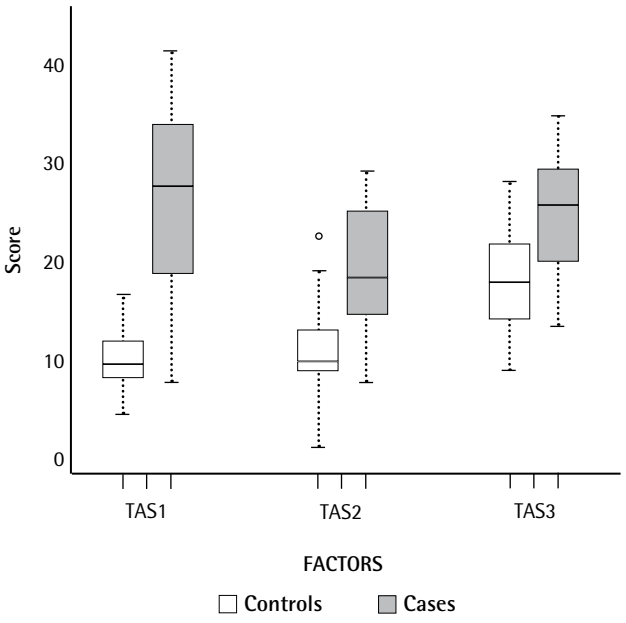
Figure 4 | *Box-plot showing the distribution of the DERS factors in cases and controls*

The presence of high anxiety rates (HAD-A≥8) was associated to an augmented risk for conversion (OR=5.85 with a CI-95%=2.96-11.56). Highly alexithymic subjects (TAS≥60) and highly emotion dysregulated subjects (DERS≥75) showed an increased risk for suffering CD with an OR of 3.49 (CI-95%=2.16-5.61) and 3.23 respectively (CI-95%=2.05-5.1). The presence of psychoform dissociation (DES scores≥20) was linked to a slightly increase on the risk for conversion with an OR of 1.59 (CI-95%=1.27-2.01). The presence of depression (HAD≥8) augmented the risk with an OR of 2.39 (CI-95%=1.68-3.40). Subjects with high negative emotional intensity (AIMS2≥30) and patients with high negative emotional reactivity (AIMS4≥38) also showed an augmented risk for conversion with OR of 1.79 and 2.05 respectively (CI-95%=1.37-2.34 and CI-95%=1.41-2.97).

The group of cases was studied in further detail. Spearman Rho coefficient of correlation was calculated for the scores at DERS, DES, AIMS, TAS, HAD, SDQ, HAD-A, and HAD-D. Affect intensity wasn´t correlated to any other measure. Psychoform dissociation was only significantly correlated to emotion dysregulation while somatoform dissoci-

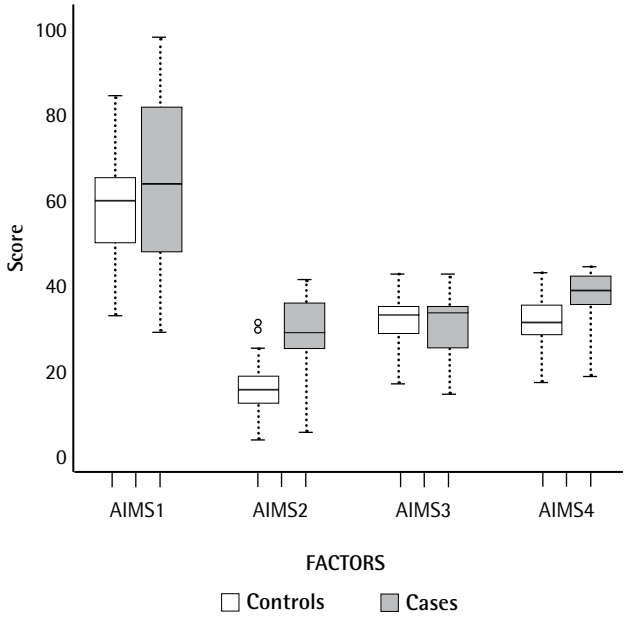
Table 3 | **Spearman Rho coefficients of correlation within the case group. Only significant correlations are shown (p<0.05)**

	DERS	DES	AIMS	HADS-A	HADS-D	TAS	SDQ
DERS		0.309		0.322	0.657	0.578	0.324
DES	0.309						
AIMS							
HADS-A	0.322				0.490	0.484	0.301
HADS-D	0.657			0.490		0.647	
TAS	0.578			0.484	0.647		
SDQ	0.324			0.301			



TAS1: difficulty identifying feelings, TAS2: difficulty describing feelings and TAS3: externally oriented thinking.

Figure 5 | *Box-plot showing the distribution of the three TAS factors in both groups*



AIM1: positive affectivity, AIM2: negative intensity, AIM3: serenity and AIM4: negative reactivity.

Figure 6 | *Box-plot showing the distribution of the four AIMS factors in both groups*

ation was correlated to emotion dysregulation and anxiety. Depression, anxiety, alexithymia and emotion dysregulation showed several correlations among them (Table 3).

A multivariate logistic regression model was calculated including all the variables assessed through the questionnaires with the exception of somatoform dissociation (SDQ-20) because this variable measures the severity of conversion and somatoform symptoms, which overlaps with conversion definition. Emotion dysregulation, alexithymia, affect intensity, anxiety, depression and psychoform dissociation were included in the model. As we can see in Table 4, the model obtained after stepwise selection variables procedure considers only these three variables: anxiety, emotional dysregulation and psychoform dissociation (Model 1). It obtained good predictive properties achieving an R^2 of Nagelkerke =0.905 and being able to classify 92.9% of controls and 93.1% of cases. Psychoform dissociation was included in the model, but it didn´t reach statistical significance. In a second step, to explore if there was any specific emotion dysregulation pattern in conversion patients, we tested a second multivariate logistic regression model including the five factors of DERS (Model 2). After a stepwise elimination process, only "interference in goal directed behaviors" (DERS4) and "lack of emotional control" (DERS5) were significant for the model. This model was able to predict 86% of cases and 90.5% of controls (R^2 of Nagelkerke =0.80).

Positive somatoform dissociation (SDQ+) was significantly correlated to diverse emotional impairments such as emotional rejection, interference, decontrol in emotions, difficulty on identifying and describing feelings and negative emotional reactivity ($p<0.05$). By his hand, negative somatoform disociation (SDQ -) was only significantly correlated to emotional rejection and to the difficulty on describing feelings ($p<0.05$). While positive symptoms were significantly correlated to depression, negative symptoms were correlated to anxiety.

CONCLUSIONS AND DISCUSSION

Previous studies have found that when compared to healthy population conversion patients show more psycho-

Table 4 Multivariate logistic regression models

Models	Variables	Coef.	Sig.	OR	CI 95%	R-square
Exploratory model	TAS	-0.061	0.403	0.940	0.814-1.086	0.916
	HADS-D	0.715	0.209	2.044	0.670-6.237	
	HADS-A	0.937	0.042	2.552	1.035-6.293	
	DES	0.187	0.078	1.206	0.979-1.486	
	DERS	0.139	0.039	1.149	1.007-1.312	
	AIMS	0.014	0.674	1.014	0.951-1.082	
Model 1	DES	0.160	0.122	1.174	0.975-1.502	0.905
	DERS	0.110	0.017	1.116	1.035-1.254	
	HADS-A	1.128	0.014	3.092	1.543-9.983	
Model 2	DERS4	0.334	0.008	1.396	1.089-1.790	0.803
	DERS5	0.301	0.001	1.351	1.130-1.615	

R-square: Nagelkerke's R-square.

form and somatoform dissociative symptoms[2,13], more anxiety and depression[12,20,15], higher alexithymia rates and are emotionally dysregulated[16,17,20]. Our study was successful when replicating all these findings.

On the other hand, the main findings around emotion regulation in CD we have summarized in the introduction were also congruent with our results. Patients were significantly more alexithymic, including the three factors of alexithymia evaluated and they showed stronger emotion dysregulation with higher difficulties levels on lack on emotional awareness, lack of emotional clarity, non-acceptance of emotional responses, interference in goal directed behaviors and lack of emotional control. It is interesting to highlight that in our sample "interference in goal directed behaviors" and "lack of emotional control" were the most useful factors, within the five DERS factors included in the regression model, when we tried to predict conversion. The assessing of only 13 items of the DERS (those who compose these two factors) was enough to predict the belonging of the subject to the case group in 86% of subjects and the membership to the control group in 90.5% of the subjects. It would be interesting to study in further detail which emotional disturbances are more specific for CD and which can be considered generic findings that are common to other psychiatric disorders.

Our results also confirm the relationship between negative affectivity and conversion that previous authors have proposed[22-24], but no differences were found between cases and controls in positive affect measures as Voon and Seignourel had proposed by using different paradigms[25,26].

Finally, we considered the severity of positive vs negative symptoms in the sample through the assessing of SDQ-20 scores and we looked for its correlation with emotion regulation deficits. Our results around this issue, support the idea that positive and negative conversion symptoms might be related to different emotion regulation impairments as it has been previously proposed[11,19,4]. Our study has limitations around this issue because of the variety of conversion manifestations that patients suffered and because of the sample size. These limitations are shared with most studies on this issue. Further study is needed and the inclusion of samples of patients who had suffered only one type of symptom would be useful in order to check if some concrete manifestations are linked to specific emotion regulation impairments. Our results suggest that Conversion Disorder is not a homogeneous disorder, not only when considering clinical manifestations but also when considering emotion regulation. The study of phenotypes is a blooming area in the neurosciences that, in our opinion, should be also approached when studying CD. We consider that the establishment of phenotypes in CD should include clinical and neurobiological features but also emotion regulation measures.

On the other hand, when evaluating which were the strongest factors related to CD, anxiety achieved the highest OR, followed by alexithymia and emotion dysregulation. The logistic regression models presented were successful to

identify anxiety and emotion dysregulation as most predictive variables, It is interesting to note that psychoform dissociation was a very mild risk factor for being in the conversion group. In our sample all the emotional disturbances assessed (emotional dysregulation, alexithymia, negative affect intensity and negative affect reactivity) were stronger risk factors than dissociation.

High levels of anxiety and depression have been detected in various samples of patients suffering from CD[15,48,49], as we have found in ours. But it is also true that anxiety and depression are a frequent comorbidity in several psychiatric disorders and its presence can´t be considered specific of the disorder. In fact, the presence of anxiety and depression can be also related to other factors in conversion samples such as the presence of high levels of dissociation or emotional distress[50,51] which can make the results more difficult to interpret. Some authors even outline the difficulty on identifying whether some dissociative and conversion symptoms (such as confusion, amnesia, depersonalization and some particular somatic manifestations) have a dissociative nature or whether they are part of anxiety or depression, the result of health anxiety, or over-estimated normal manifestations[52]. As we can see, the role of anxiety and depression in the development of CD remains unclear. Our study was not designed to clarify this issue but it was successful when replicating the finding that patients are more depressed and more anxious than controls. We found a stronger association of CD to anxiety than to depression as a previous study has described[49]. Anxiety and emotion dysregulation were the main factors explaining the presence of CD in the regression model and although both variables are correlated, anxiety can´t be considered only a confusing factor nor a mediating factor between CD and emotion dysregulation impairments. When controlling anxiety and depression, the correlations between conversion and emotion dysregulation remained significant which suggests that both factors (anxiety and emotion dysregulation) contribute separately to the presence of CD.

All those findings, together with the growing evidence respecting the neurobiological basis of conversion[29,53,54], are giving support for a positive definition of this disorder beyond the classical definition of conversion as "a lack of a physical explanation for a neurologic symptom". The results also confirm that emotion dysregulation is a core phenomenon in CD and that some specific emotional patterns are frequent in this disorder.

As main strengths of this study we emphasize the demanding exclusion criteria considered (which allowed us to study a sample of patients who had never suffered from any neurological or systemic disease concerning the central nervous system which could interfere with the diagnosis of CD) and the existence of a control group to carry out comparisons and risk estimations. Some limitations have also been detected. The cross-sectional design of the study does not allow establishment of causal relationships. On the other hand, although the sample size was similar to previous studies, it was too small to accomplish cluster analyses on different subgroups of patients. Finally, men were scarcely represented in the sample so the results presented are consistent for women but more studies are needed in order to check if men show similar behaviors.

ACKNOWLEDGMENTS

To Fundación Ramón Domínguez, because of the statistical and methodological support.

No founding has been received.

The authors do not declare any conflicts of interest concerning the present article.

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