SUPPLEMENTARY MATERIAL

IMPAIRED EMOTIONAL AND BEHAVIOURAL AWARENESS AND CONTROL IN PATIENTS WITH DISSOCIATIVE SEIZURES

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Methods: Emotional Go/No-go Task

The emotional go/no-go task broadly followed the setup described by Tottenham *et al.* (2011) Emotional (anxious, sad, happy) and neutral faces from the Karolinska Directed Emotional Faces (KDEF) dataset (Lundqvist *et al.* 1998) were used as stimuli. Briefly explained, the subjects were instructed to either react (press key in go trial) or withhold their reaction (no-go trial) depending on the presented stimulus. The stimulus was either an emotional face as "go" and a neutral face as "no-go" or vice-versa. The relevant condition (thus, which emotion was set as go/no-go stimulus) was changed in each block; see below. The task was programmed in OpenSesame 3.1.6. (Mathôt *et al.* 2012) using Psycho Backend with PsychoPy and was presented in a 1024 x 768px resolution on a 17,3'' screen which resulted in a visual angle of approximately 12.3°. OpenSesame run on a 64-bit Windows platform (Intel® Core™ i3 CPU M330 at 2.13 GHz with 4 GB RAM). Space key was set as reaction key. All measured aspects are listed in Table s1.

Task:

The task consisted of five blocks (40 trials each): One training and four experimental blocks:

- Training: *Anxious = go* vs. *neutral = no-go*.
- Experimental block: S*ad = go* vs. *neutral = no-go*.
- Experimental block: *Neutral = go* vs. *sad = no-go*.
- Experimental block: *Happy = go* vs. *neutral = no-go*.
- Experimental block: *Neutral= go* vs. *happy= no-go*.

Experimental blocks were presented in a randomized order.

Block:

Each block consisted of:

- Instructions (definition of go/no-go condition for upcoming block) in white font (size 24 pt) before start of each block. End of instructions/start of block at participants' wish (keypress).
- 40 Trials in random order with a 3:1 ratio of go:no-go trials to elicit a response bias.
- 10 sec. forced pause at the end of each block.

Trial:

Each trial consisted of:

- Preparation phase: Black screen (700ms ± 100ms jitter).
- Fixation dot: White dot 32 x 32px on black background (300ms), centre of screen.
- Presentation/reaction phase: Stimulus 307 x 409px enlarged by factor 1.3 on black background, presented at centre of screen for 500ms. Reactions could still be given in the first 500ms of the next preparation phase.

Stimuli

The stimuli were

- 40 randomly chosen pictures from the Karolinska Directed Emotional Faces (KDEF) dataset (Neutral, Afraid, Sad, Happy).
- 10 of each emotional condition.
- 5 female and 5 male faces per emotional condition.
- Only straight angle (person photographed frontally, no head tilt).
- Images were set to greyscale using irfanView batch converter (*[Batch] AdvResample=1 AdvResizeRatio=1 AdvBPP=2 AdvUseFSDither=1 AdvGray=1 AdvGamma=1 AdvBrightness=1 AdvSharpenVal=1 AdvGammaVal=1.00 AdvContrastVal=25 AdvBrightnessVal=40 AdvOverwrite=1 AdvAllPages=1 AdvBlurVal=1 AdvMedianVal=3 AddText=TextCoord=0;0;100;100; TranspText=1 FitColorW=1 FontColor=65280 TxtBgkr=16777215 FontParam=-13|0|0|0|400|0|0|0|0|1|2|1|49| Font=Courier [Effects] CanvL=10 CanvR=10 CanvT=10 CanvB=10 CanvInside=1 CanvW=1920 CanvH=1080 CanvCorner=4 [BatchWatermark] Coord=10;10; Image=no image Transp=33;* all other values = 0).
- Images were cropped to an oval form of 307 x 409px around the midpoint of the face (no hair, no neck/throat, no shirt visible) using a custom-made paint.NET mask.
- Fig. S1 shows stimuli AF14NES as used in the task exemplarily.

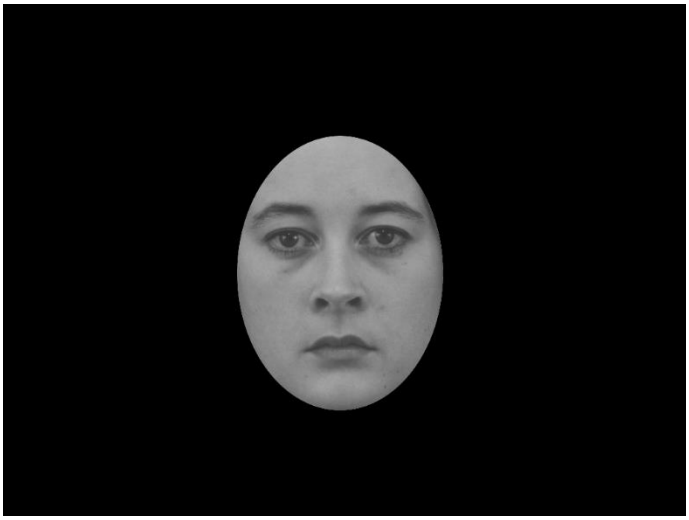

Fig. S1: AF14NES (female, neutral) as used in the task

Table s1: *Measures of the emotional go/no-go task.*

Measure	**Condition**	**Measured constructs**	**Definition**
Correct rate	All	Emotion recognition	"Go"-reaction when "go" was correct & "no-go"-reaction when "no-go" was correct
d'	All	Emotion recognition	z-transformed hit rate minus z-transformed false alarm rate
Error rate	*Emotion = go*	Emotion regulation	"Go"-reaction when "no-go" was correct or vice-versa
False alarm rate	*Emotion = go*	Emotion regulation	"Go"-reaction when "no-go" was correct
False alarm rate	All	Behavioural inhibition	"Go"-reaction when "no-go" was correct
Reaction time	All	Psychomotor speed, task engagement	Duration between onset of stimulus presentation and keypress in "go"-trials

Methods: Applied Questionnaires

Emotion regulation

Participants rated their subjective employment of emotion regulation strategies (“reappraisal” vs. “suppression”) by completing the Emotion Regulation Questionnaire (ERQ) (Gross & John 2003; Abler & Kessler 2009). The subjects evaluate their self-assessment with regard to different aspects of emotion regulation in 10 items using a 7-step Likert scale.

Alexithymia

Alexithymic traits were assessed using the Toronto Alexithymia Scale (TAS-20) (Taylor *et al.* 1991; Bach *et al.* 1996), a widely used self-report measure. The questionnaire consists of 20 items which are rated by self-assessment on a five-point scale (1 to 5; "not applicable at all" to "completely applicable"). In the evaluation, a sum scores as well as the expression of three subscales ("Difficulties identifying feelings", "Difficulties describing feelings", "Externally oriented thinking") are created.

Additionally, subjects completed the four item version of the Levels of Emotional Awareness Scale (LEAS) (Lane *et al.* 1990; Subic-Wrana *et al.* 2014). The LEAS is an ecologically valid indirect measure of the awareness and complexity of emotional content and perception. It consists of short descriptions of emotionally ambiguous situations; subjects are asked for a written projection of their understanding of emotional reactions in these situations (”How would you feel in this situation? How would the other person feel?”). The answers are rated by semantic aspects of emotional richness and complexity.

Dissociative traits

Dissociative traits and experiences were captured using two questionnaires. The FDS (Fragebogen zu Dissoziativen Symptomen) (Spitzer *et al.* 1998)) is based on the widely used Dissociative Experiences Skale II (DES-II) (Bernstein Carlson & Putnam 1993) and consists of 44 brief descriptions of potentially dissociative phenomena including the translated items from the DES-II. Participants are asked to rate the frequency of these experiences. A general score and individual subscores for five subscales (DES score, amnesia, absorption, derealisation, conversion) are computed. In this study, only the DES score was used.

The SDQ-20 (Somatoform Dissociation Questionnaire) (Nijenhuis *et al.* 1996; Mueller-Pfeiffer *et al.* 2010) captures aspects of somatoform dissociation, meaning medically unexplained physical symptoms and phenomena - this explicitly includes psychogenic non-epileptic seizures. The subjects indicate the presence of somatoform dissociative symptoms on a five-step Likert scale.

Psychological factors and psychiatric aspects

Further psychological factors and psychiatric aspects known to contribute to, perpetuate or accompany the emergence of dissociative seizures were considered. Symptoms of affective and anxiety disorders were captured using the Beck Depression Inventory II (BDI-II) and the Beck Anxiety Inventory (BAI), respectively.

The BDI II is the widely used revision in clinical practice of the self-evaluation questionnaire on depressive symptoms (Beck *et al.* 1961). Like the English original, the German translation of the BDI II (Hautzinger *et al.* 2009) consists of 21 items to assess the severity of a possible depressive symptomatology. An overall score is obtained, which serves as a five-level classification between "No depression" (0 to 8 points) and "Severe depression" (29 to 63 points).

With the Beck Anxiety Inventory (BAI) in the German version (Margraf & Ehlers 2007) a screening questionnaire was used to determine the severity of clinical anxiety. The BAI consists of 21 descriptive statements on anxiety symptoms, which are evaluated by the subjects on a four-level Likert scale (0 to 3) with regard to the extent to which they occurred in the last week. The sum value of all items is used to classify the subjects into four classes between "minimal anxiety" (0 to 7 points) and "clinically relevant anxiety" (26 to 63 points).

The experience of early traumatization (emotional, physical, or sexual abuse and neglect) was measured by the Childhood Trauma Questionnaire (CTQ) (Bernstein *et al.* 2003; Klinitzke *et al.* 2012). The CTQ is an internationally widely used instrument for retrospectively recording child abuse and early-life traumatization.The questionnaire consists of 28 items, each of which is answered on a five-level Likert scale (1 = “not at all” to 5 = “frequently”). There are controlling trivialisation items that record tendencies towards denial or trivialisation.

A comprehensive in-depth structured diagnostic interview (“Mini-DIPS”) (Margraf 1994)) was used to screen participants for current psychiatric disorders. The Mini-DIPS interview in the used version is based on DSM-IV and systematically screens for axis-I diagnoses.

Results: Characteristics of the healthy control group

Table s2 shows characteristics of the healthy controls concerning psychological and psychiatric factors and diagnoses.

Table s2: *Characteristics of healthy controls*

Diagnoses by Mini-DIPS	Depression by BDI-II*	Anxiety by BAI**
-	No (0)	No (0)
-	No (6)	No (6)
SPP	No (0)	No (0)
-	No (0)	No (3)
MD(rec)	No (1)	No (1)
-	No (0)	No (1)
-	No (3)	No (2)
MD(rec)	No (2)	No (0)
-	No (4)	No (4)
	No (4)	Yes (8)
MD(rec)	No (0)	No (1)
-	Yes (11)	No (3)
MD(rec)	No (1)	No (0)
-	Yes (19)	No (4)
-	Yes (11)	No (6)
-	No (2)	No (2)
SPP	No (2)	No (4)
-	No (4)	No (3)
-	No (2)	No (6)
-	No (1)	No (1)

* Beck Depression Inventory II (BDI-II) score exceeding clinical cut-off (8 points). Individual BDI-II score in brackets. ** Beck Anxiety Inventory (BAI) score exceeding clinical cut-off (7 points). Individual BAI score in brackets.
Abbreviations: SPP = Specific Phobia, MD = Major Depression, rec. = recurrent.

Results: Characteristics of the healthy control group

Table s3 shows results of measures of dissociation (SDQ, DES) and further psychiatric factors (depression, anxiety, trauma).

Table s3: *Measures of dissociation (SDQ, DES) and further psychiatric factors (depression, anxiety, trauma)*

	DS	**HC**	**p**
DES score	16.7±18.37	10.02±9.4	*.175*^{NP}
SDQ score	30.08±9.71	21.22±1.44	*<.001*^{NP}*
BDI-II score	14.5±10.73	3.65±4.86	*.001*^{NP}*
BAI score	20.2±11.5	2.75±2.38	*.001*^{NP}*
CTQ			
Total score	41.3±21.94	33.75±1.04	*.841*^{NP}
Emotional neglect	9.9±4.89	8.9±5.18	*.534*
Physical neglect	7.85±4.38	6.1±2	*.396*^{NP}
Emotional abuse	9.5±5.71	7.6±2.8	*.678*^{NP}
Physical abuse	7.3±5.54	5.8±1.67	*.925*^{NP}
Sexual abuse	6.75±5.09	5.35±.99	*.896*^{NP}

Mean ± SD as well as p-value of between-groups comparisons (MANOVA or Mann-Withney-U-Test, as applicable; NP indicated non-parametric group comparisons using Mann-Withney-U-Test). * indicate between-group differences that remain significant following REGWQ correction for multiple testing. Abbreviations: DES = Dissociative Experiences Scale, SDQ = Somatoform Dissociation Questionnaire, BDI-II = Beck Depression Inventory II, BAI = Beck Anxiety Inventory, CTQ = Childhood Trauma Questionnaire, DS = Dissociative seizures, HC = Healthy controls, NP = non-parametric Mann-Withney-U-Test.

Results: Correlation between subjective and objective measures of emotion recognition.

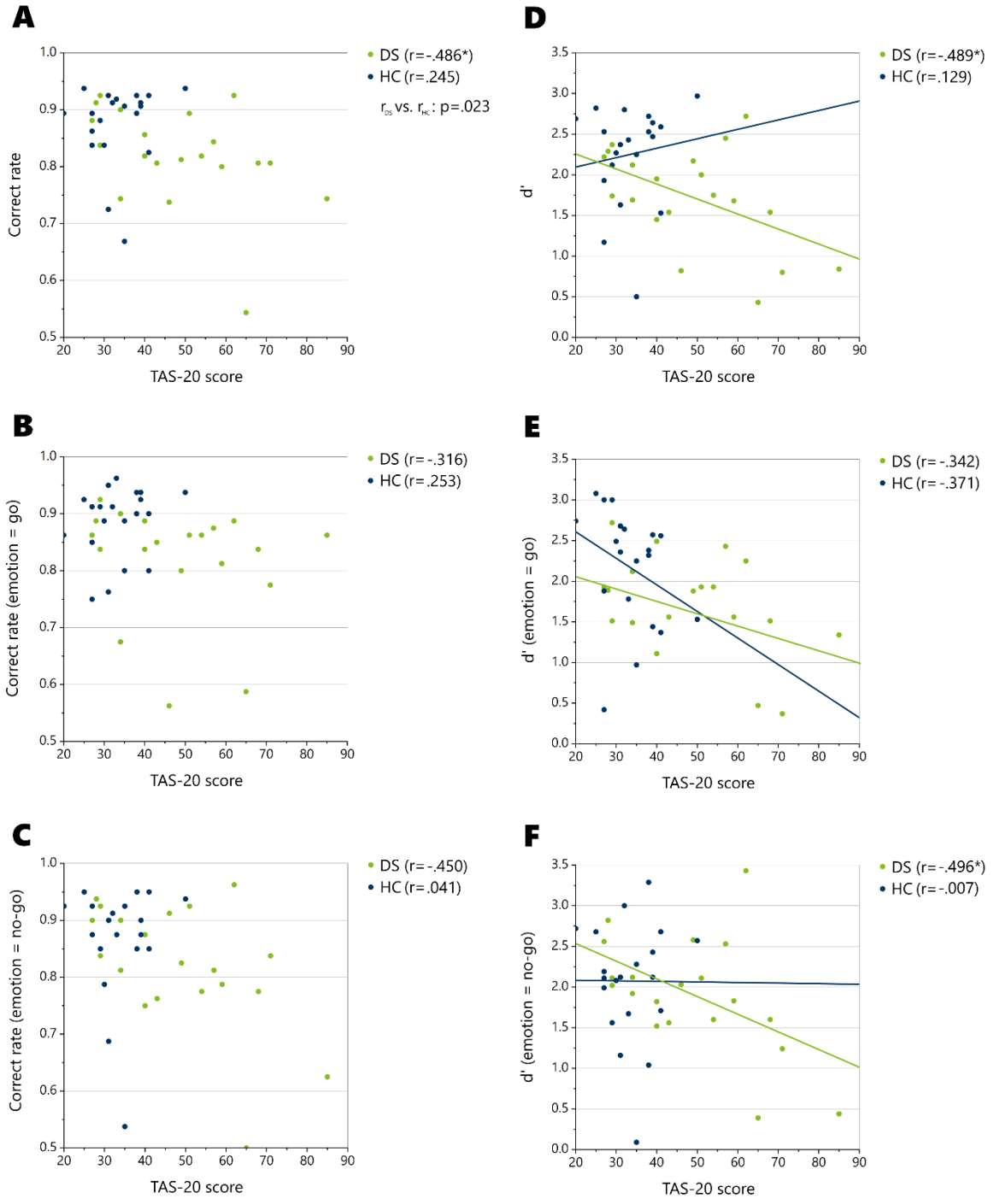

Fig. s2: Correlation between subjective and objective measures of emotion recognition. Individual dots represent individual participants. A: Spearman's correlation between TAS-20 score and correct rate (overall) in the emotional go/no-go task by groups. Correlations differed significantly between groups (p=.023). B: Spearman's correlation between TAS-20 score and correct rate (for emotion = go conditions) in the emotional go/no-go task by groups. C: Spearman's correlation between TAS-20 score and correct rate (for emotion = no-go conditions) in the emotional go/no-go task by groups. D: Pearson's correlation between TAS-20 score and d' (overall) in the emotional go/no-go task by groups. E: Pearson's correlation between TAS-20 score and d' (for emotion = go conditions) in the emotional go/no-go task by groups. F: Pearson's correlation between TAS-20 score and d' (for emotion = no-go conditions) in the emotional go/no-go task by groups.

* = significant correlation ($p < .05$).

Results: Correlation between subjective and objective measures of emotion regulation.

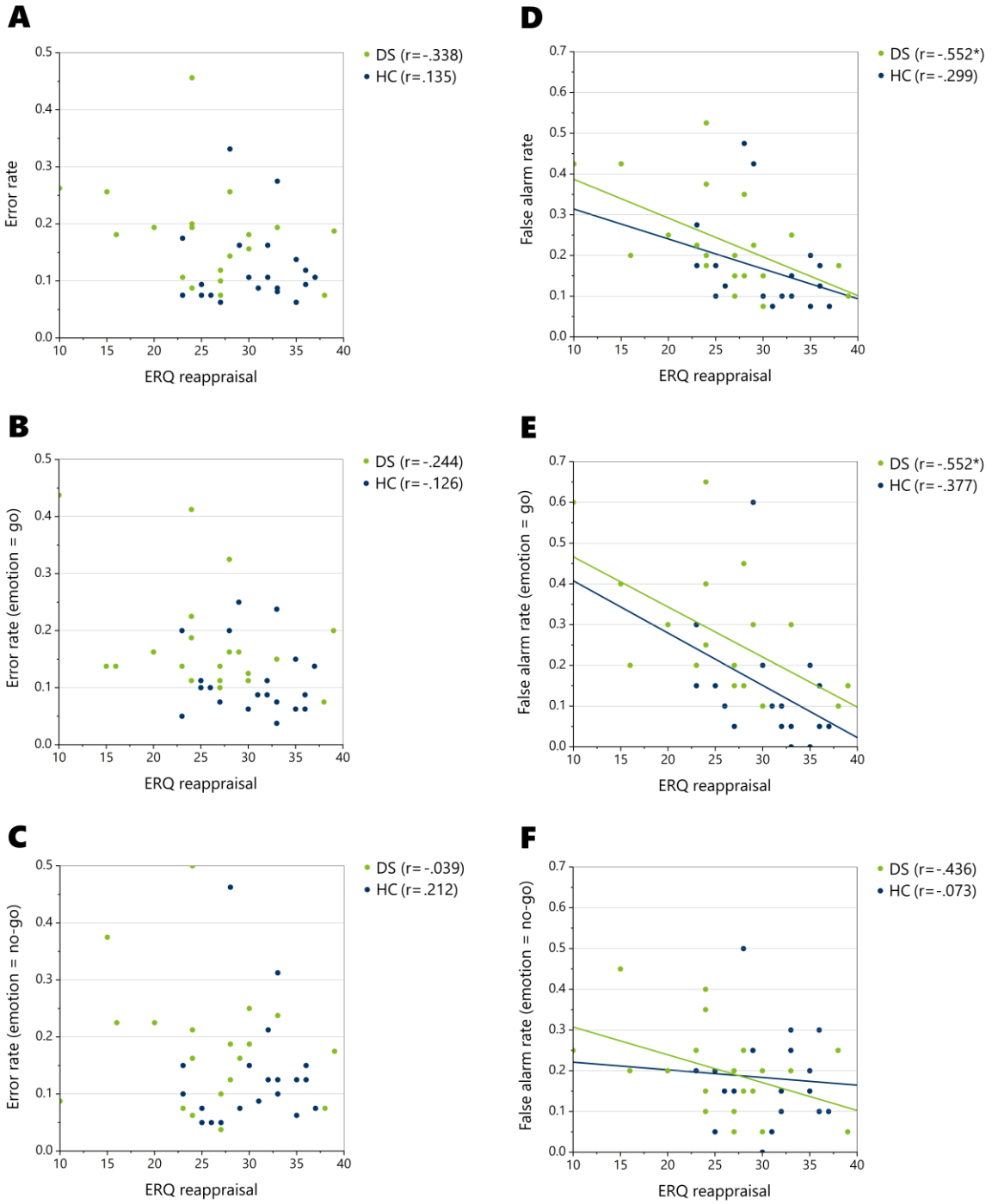

Fig. s3: Correlation between subjective and objective measures of emotion regulation. Individual dots represent values of individual participants. A: Spearman's correlation between ERQ reappraisal score and error rate (overall) in the emotional go/no-go task by groups. B: Spearman's correlation between ERQ reappraisal score and error rate (for emotion = go conditions) in the emotional go/no-go task by groups. C: Spearman's correlation between ERQ reappraisal score and error rate (for emotion = no-go conditions) in the emotional go/no-go task by groups. D: Pearson's correlation between ERQ reappraisal score and false alarm rate (overall) in the emotional go/no-go task by groups. E: Pearson's correlation between ERQ reappraisal score and false alarm rate (for emotion = go conditions) in the emotional go/no-go task by groups. F: Pearson's correlation between ERQ reappraisal score and false alarm rate (for emotion = no-go conditions) in the emotional go/no-go task by groups.

* = significant correlation ($p < .05$).

Results: Interoceptive awareness

Results of the Heart Beat Counting paradigm used to experimentally assess interoceptive awareness (quantified as interoceptive sensitivity) are shown Table s4. The table also shows results for possible confounding factors as blood pressure, pulse and the body mass index.

Table s4: *Results of the Heart Beat Counting Paradigm and associated factors*

	DS	**HC**	**p**
Interoceptive Sensitivity			
25 sec Interval	.59±.34	.66±.21	.478
35 sec Interval	.55±.32	.62±.28	.482
45 sec Interval	.54±.38	.64±.23	*.577*^{NP}
Overall	.56±.31	.64±.23	.386
Blood pressure			
Systolic	127.6±11.67	132.06±16.1	.379
Diastolic	75±9.26	82.28±9.04	.03
Mean Arterial Pressure	92.53±7.95	98.87±1.94	.071
Pulse			
25 sec Interval	8.32±1.34	76.93±7.29	.279
35 sec Interval	79.2±9.08	79.71±8.65	.869
45 sec Interval	78.22±9.16	75.56±9.52	.421
Overall	79.25±9.17	77.4±7.17	.521
Body Mass Index	25.61±6.29	25.35±6.5	.908

Mean ± SD as well as p-value of between-groups comparisons (MANOVA or Mann-Withney-U-Test, as applicable; NP indicated non-parametric group comparisons using Mann-Withney-U-Test). Abbreviations: sec = seconds, DS = Dissociative Seizures, HC = Healthy controls, NP = non-parametric Mann-Withney-U-Test.

Results: Correlations of measures of dissociation with interoceptive sensitivity and behavioural awareness

Table s5: *Spearman correlations of measures of dissociation with interoceptive sensitivity and behavioural awareness*

	DES		SDQ	
	DS	**HC**	**DS**	**HC**
Interoceptive Sensitivity				
25 sec Interval	-.048	.124	-.301	.06
35 sec Interval	.23	.076	-.008	-.108
45 sec Interval	.222	.209	.072	.066
Overall	.214	.183	-.075	.008
Libet experiment				
W-judgement block 1	-.046	.115	.356	-.085
W-judgement block 2	-.077	.23	.305	.126
W-judgement overall	.018	.151	.407	.016
M-judgement block 1	-.05	-.298	-.186	-.176
M-judgement block 2	-.251	-.401	-.203	-.126
M-judgement overall	-.219	-.329	-.22	-.238
W-M	.036	.186	.424	.105

Spearman correlations of measures of dissociation (DES, SDQ) with interoceptive sensitivity and behavioural awareness. All p>.099.

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