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Attention and postural control in patients with conversion paresis

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ABSTRACT

Objective: Current theories of conversion disorder (CD) propose that motor symptoms are related to heightened self-monitoring and excessive cognitive control of movements. We tested this hypothesis using quantification of performance on a continuous perceptuo-motor task involving quiet standing.
Methods: Twelve CD patients and matched controls maintained static balance on a force platform under various attention conditions: (1) with eyes open; (2) with eyes closed (requiring enhanced attention to proprioceptive information to regulate posture); and (3) while performing an attention demanding cognitive task.
Results: Compared to controls, CD patients displayed a greater decrease in postural stability in the 'eyes-closed' versus 'eyes-open' condition. In contrast, cognitive distraction led to a normalization of balance in CD. Moreover, sensitivity to the balance interventions correlated significantly with trauma reports and dissociative symptoms.
Conclusion: These results indicate that attention plays a crucial role in postural control in CD. More specifically, patients seem to inadvertently use deliberate control of posture (i.e., cognitive investment) of an otherwise nearly automatized perceptuo-motor task. Attentional distraction resulted in a temporary normalization of balance, which may be used to train individuals with CD to guide their attention in a more effective way.

Introduction

Conversion disorder (CD) is a psychiatric syndrome, characterized by neurologic symptoms such as partial loss of voluntary motor control and altered bodily sensations, in the absence of any identifiable neurological or organic causes [1]. The onset and exacerbation of CD symptoms have been linked to psychological factors like trauma or stress, suggesting that psychological mechanisms play an important role [2,3]. Despite a long history of speculations about the causes of CD, the mechanisms behind the syndrome are not well understood [4–6]. Against this background, there is disagreement as to whether the name 'conversion disorder' is appropriate in the first place, since the term already implies a (as of yet unproven) specific psychological etiology [7].

Various studies have investigated abnormal motor performance in CD, and the contributing role of attentional factors. The currently prevailing view is that intentional (self-initiated) motor functioning is impaired, whereas automatic motor functioning seems to be intact [8]. In a recent study [9] motor-evoked potentials (MEPs) were evaluated using transcranial magnetic stimulation (TMS) in a group of conversion patients. The authors found reduced cortical excitability during imagining of own body movements, but not during action observation, suggesting that the voluntary movement initiation system is compromised in these patients. However, a more recent study by the same group [10] showed that some healthy subjects were able to down-regulate motor excitability when instructed to intentionally disobey the instruction to engage in a certain type of motor imagery. Thus, MEPs may not always be able to successfully differentiate 'true' motor conversion from malingering. There is also evidence for the role of heightened action-monitoring and self-focused attention, as evidenced by event-related potential (ERP) studies [11] and functional magnetic resonance imaging (fMRI) studies [12,13]. Recent accounts of medically unexplained symptoms, including conversion symptoms, attribute the sensory and motor symptoms to a set of erroneous beliefs (expectations) about specific perceptual sensations and movements, combined with an excessive attentional focus on bodily symptoms and signs [4,14]. Especially this excessive attentional focus seems to form one of the major maintaining factors in CD.

Studies that examined actual motor performance in CD have tended to employ one of two paradigms. On the one hand, studies have looked at motor preparation and execution of discrete movements, such as button presses [11,12]. Other studies, in contrast, have looked at characteristics of spontaneous bodily tremor [6,15]. Interestingly, both types of paradigms have yielded evidence for the modulating role of attention with regard to motor symptoms, which underscores the role of psychogenic mechanisms. To our knowledge only one recent study [16; (see below)] has examined performance on a motor task involving

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continuous perceptuo-motor control. Many everyday activities such as standing and walking are coordinated using the continuous pick-up of relevant perceptual quantities and the subsequent adjustment of movement parameters, which in itself is attention demanding. Attentional fluctuations have a direct impact on successful control of such activities, but it is unknown to what extent attentional interventions in conversion disorder impact on the execution of such tasks.

We examined maintenance of quiet standing in a group of individuals with CD and a group of controls. Quiet stance involves the integration of visual, somatosensory, and vestibular inputs, as is required to maintain stable and upright stance [17]. This seemingly simple task involves continuous monitoring of the body orientation with respect to the gravity vector, and performing minute postural adjustments in the face of external and internal perturbations. The resulting spontaneous postural excursions or 'body sway', as evidenced in the body center-of-mass (COM) or center-of-pressure (COP) trajectories, displays surprisingly complex dynamics, which may provide insight into the underlying motor control processes. Dual-tasking studies [18] have found that maintenance of balance is highly automatized, but at the same time subject to cognitive and attentional factors. Thus, balance control is neither fully intentional nor fully automatized, but occupies an intermediate position on the automaticity continuum [19]. A prevailing insight is that focusing attention on one's own stance disrupts the automatic balance processes [20,21] and results in decreased postural stability. Relatedly, closing the eyes while maintaining quiet stance also causes reduced postural stability, which is in part related to the fact that actors need to adopt an inward focus of attention towards internal sensory signals (joint proprioception and the vestibular sense) to regulate their balance [22]. Conversely, diverting attention from balance, e.g., by focussing on the external effects of one's own bodily movement [23] or by performing mental arithmetic [24] leads to more stable and more automatized balance.

The study of Wolfsegger et al. [16] examined postural fluctuations using accelerometers attached to the trunk in a group of individuals with suspected psychogenic gait and balance, and indeed found indications that distraction enhanced postural stability. However, the study failed to control for order effects. Furthermore the distractor involved physical contact (finger touch) which can directly interfere with postural control.

Because self-focussed attention has been suggested to play a major factor in CD [4,13,14,25], we decided to test our hypothesis by recording postural sway in patients with CD in three attention conditions: (1) standing with the eyes open (neutral); (2) standing with the eyes closed (enhanced attention to proprioceptive information) and (3) during cognitive distraction (reduced attention to proprioceptive information). We expected that standing with the eyes closed would lead to temporarily less stable balance in CD, whereas performing an attention-demanding cognitive task would result in more stable balance (cf. [16]), as exemplified by reduced postural excursions in CD compared to eyes open and eyes closed.

We additionally examined whether severity of dissociation and early trauma was correlated with postural abnormalities. Dissociative symptoms are often observed in conversion disorder [2,26]. Also, dissociative phenomena are associated with early childhood trauma [2,27]. Furthermore, a recent study [28] showed that number of aversive life events (in a non-clinical sample of students) was a predictor of postural freezing. Against this backdrop of findings, we examined whether dissociation and traumatic life events are associated with postural abnormalities.

Method

Participants

Twelve patients (46.0, SD = 8.5 years) diagnosed with conversion disorder on DSM-IV criteria [1] by a neurologist or a psychiatrist and 12 gender- and age-matched controls (45.0 y, SD = 9.3 years) participated. Table 1 shows demographic characteristics of the participants. All patients reported sensory-motor symptoms (especially paresis) in their lower body and/or gait disturbances. As part of the medical examination, all patients were screened for possible organic causes for their symptoms. Only cases were included where there were no signs of organic disturbances responsible for the symptoms. Patients were recruited by contacting health care professionals. None of the participants was a heavy smoker or user of alcohol or drugs. All the participants received 15 Euro cash for their participation. The study was approved by the Ethics Committee of Leiden University Medical Center and undertaken in accord with the Declaration of Helsinki. All participants signed an informed consent form.

Material

A custom-made stabilometric platform was used to assess body sway (1 m × 1 m; sampling frequency: 100 Hz; resolution: 0.28 N/bit; resonance frequency: 30 Hz); cf. [29]. The excursions of the center-of-pressure (COP) in the anterior–posterior and medio-lateral direction were recorded as a measure of postural (in)stability.

Dissociation was assessed using a set of 19 items adopted from the Clinician-Administered Dissociative States Scale (CADSS; [30]). The CADSS is a reliable and valid self-report instrument to assess state symptoms of dissociation. The full CADSS consists of two parts; a subject-rated part and an observer-rated part where dissociative behaviors are scored by a trained observer (8 items). For practical purposes only the first part was administered (cf. [31]), which is known as the Dissociative State Subscale (DSS; [32]). Each item consists of a symptom (e.g., do things seem to be moving in slow motion? Do you feel disconnected from your own body?), which is rated by the participant on a 0-to-4 scale. These scores were summed to obtain a total score.

Table 1
Participant characteristics.

CD	Age	Sex	Medication: AD	Medication: AN	Axis-I comorbidity	DSS	NLETQ
1	45	M	N	Y	Depressive disorder	33	10
2	55	F	Y	N	Depressive disorder	9	8
3	35	F	N	N		0	2
4	32	F	N	N		0	5
5	46	F	N	Y		0	4
6	53	F	N	N		15	6
7	55	M	N	N		4	6
8	42	M	N	Y		1	5
9	35	M	Y	N	PTSD	20	11
10	56	M	[a]	[a]		4	8
11	48	F	N	N	OCD	11	4
12	51	F	[a]	[a]	Social phobia, OCD, depressive disorder	4	2
Controls							
1	47	M	N	N		0	6
2	58	F	N	N		0	2
3	45	F	N	N		6	4
4	34	F	N	N		0	1
5	51	F	N	N		0	2
6	50	F	N	N		1	5
7	52	M	N	N		0	4
8	39	M	N	N		1	1
9	29	M	N	N		7	5
10	56	M	N	N		0	4
11	52	F	Y	N	Depressive disorder	0	4
12	46	F	N	N		1	1

AD = Anti-depressants; AN = anxiolytic; Y = Yes; N = No.
DSS = Dissociative State Subscale of the CADSS.
CADSS = Clinician-Administered Dissociative States Scale.
NLETQ = Negative Life Experiences and Trauma Questionnaire.
[a] Not registered.

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