

## The question of symptom lateralization in conversion disorder

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### Abstract

**Objective:** The purpose of this study was to determine whether or not conversion symptoms are lateralized. Studies have shown a predominant left-oriented manifestation of symptoms for most somatoform disorders. The reports in the literature on the lateralization of conversion symptoms, however, are rather conflicting. They show left-sided, right-sided, or no symptom lateralization in conversion disorders. **Methods:** One hundred

fourteen patients with conversion disorder were screened for symptom lateralization. **Results:** Those patients with unilateral symptoms (32.5%) showed no significant bias toward left or right symptom presentation. **Conclusion:** Based on these results, and the conflicting findings from previous studies, we conclude that there is insufficient support for lateralization theories in conversion disorder. © 2000 Elsevier Science Inc. All rights reserved.

*Keywords:* Conversion disorder; Symptom lateralization

### Introduction

Are conversion symptoms lateralized? This question is often confronted in clinical practice and gave rise to numerous publications in the 1970s. A more recent publication by Min and Lee [1] has made it clear that a definitive answer is still lacking. Many studies show the symptoms of somatoform disorders other than conversion disorder to be mostly located on the left side of the body. This lateralization has been reported for pain symptoms [1–6] and hypochondriac symptoms [7]. The reports with regard to symptom lateralization in conversion disorders, however, are rather contradictory (for review, see Table 1). Left-sided lateralization of conversion symptoms has been found by Galin et al. [8] for females only, and by Pascuzzi [9] and by Stern [10]. Others have found a predominantly right-sided lateralization of conversion symptoms in both adults [11] and children and adolescents [12]. Three studies found no symptom lateralization in conversion disorder [13–15].

Three hypotheses have been put forth to explain the observed left-sided predominance of symptoms in somatoform disorder [2]. The hypotheses have been applied to

conversion symptoms as well [10]. The so-called *evaluative hypothesis* suggests that negative connotations are associated with the left side of the body and that somatoform symptoms are therefore left-lateralized. Little empirical support has been found for this hypothesis, however. As part of the so-called *convenience hypothesis*, Stern [10] tested the possibility of symptoms developing on that side of the body where they produce the least inconvenience. The finding that both right- and left-handed patients show the same predominance of left-sided conversion symptoms [8,10], however, disproved this hypothesis as well. Yet another hypothesis explains the left lateralization of somatoform symptoms in terms of the functional asymmetry of the cerebral hemispheres and is often therefore referred to as *hemispheric specialization theory*. According to this theory, the right cerebral hemisphere is more involved in emotional reactions and thus mediates the manifestation of affectively determined somatic symptoms on the left side of the body [10]. Although the hemispheric specialization theory is the predominant theory at present, the mechanism by which the right cerebral hemisphere transforms negative emotions into somatic symptoms on the left side of the body remains unclear [16]. Recent findings from two brain mapping studies, one case of left-sided paraesthesia [17] and one case of left-sided conversion paralysis [18], have suggested the involvement of higher level cognitive, attention systems from the right hemisphere in conversion

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Table 1  
Overview of studies examining lateralization of conversion symptoms<sup>b</sup>

Patient group	Symptoms studied	Number of patients: total (M/F)	Percentage of patients with unilateral symptoms	Number of patients with left/right/both-sided symptoms	Conclusion L/R lateralization (% patients)	Reference
Patients evaluated by neurology service (1986–1987)	Unilateral motor/sensory	31 (7/24)	—	26/5/—	L (84%)*	Pascuzzi [9]
Hysterical neurosis, conv. type		191 (51/140)				
	Motor conv	146 <sup>a</sup>	56% (81) <sup>a</sup>	52/29/65 <sup>a</sup>	L (64%) <sup>a,*</sup>	
	Sensory conv	155 <sup>a</sup>	74% (114) <sup>a</sup>	78/36/41 <sup>a</sup>	L (68%) <sup>a,*</sup>	Stern [10]
Psychiatric hospital patients	Conv.	40 (36/4)	83% (33)	8/25/7	R (76%)*	Fallik and Sigal [11]
Child and adolescent in-patients at psychiatric hospital	Conv.	15 (9/2) <sup>b</sup>	73% (11)	1/10/4	R (91%)**	Regan and LaBabera [12]
One or more of Engel's [25] criteria of conv. disorder	Unilateral conv.	22 (11/11)	—	12/10/—	L – R: NS (L: 55%)	Bishop et al. [13]
Conv. disorder according to Engel [25]	Unilateral conv.	52 (10/42)	—	33/19/—	L – R: NS (L: 63%) <sup>c</sup>	Galín et al. [8]
Patients with hysterical disorders	Gait disorders	60 (23/37)	7.8% (13)	9/4/—	L – R: NS (L: 69%)	Keane [14]
“Hysterical neurosis conv. type” + conv. prior to DSM-II	Conv.	64 (21/43) 205 <sup>a</sup>	15% (31) <sup>a</sup>	12/19/— <sup>a</sup>	L – R: NS (R: 61%) <sup>a</sup>	Stefansson et al. [15]

Conv., conversion; L, left; R, right; NS, nonsignificant.

<sup>a</sup> The numbers refer to symptoms instead of patients.

<sup>b</sup> Gender was not identified for all participants.

<sup>c</sup> In the female sample, 71% showed left-lateralized symptoms ( $p < 0.01$ ).

\*  $p < 0.05$ .

\*\*  $p < 0.01$ .

symptoms. Stern [10] and Sierra and Berrios [19] have attempted to explain left-sided symptom lateralization by drawing an analogy between anosognosia and the phenomenon of *la belle indifférence* in conversion disorder. Anosognosia is the denial of a (mostly left-localized) physical disorder associated with damage to the right parietal cortex and hypothesized to result from a failing attention function in the right hemisphere. As argued by Spence [16], however, this analogy is based on rather superficial phenomenological resemblances. Denying an organic impairment is not necessarily the same as going undisturbed by a psychogenic impairment, which is sometimes observed in conversion patients. Furthermore, pointing at the left hemispheric involvement in (equally lateralized) depressive symptomatology, Spence [16] criticized the simple localization of affect to one hemisphere.

As already pointed out, the reports on symptom lateralization in cases of conversion disorder have been less consistent and showed both left- and right-sided symptom lateralization. Additional hypotheses have therefore been developed to explain the predominantly right-sided localization sometimes observed in cases of conversion disorder [11,12].

The first hypothesis is more or less the opposite of the convenience hypothesis. According to the inconvenience hypothesis, the dominant limb is “chosen” because the resulting disorder will thereby offer greater inconvenience [11,12]. Studies have indeed shown 88% [10] and 100% [12] of patients with unilateral conver-

sion symptoms to display their symptoms on their dominant (mostly right) side. This observation alone does not provide support for the causal relation suggested by the inconvenience hypothesis, however.

The second lateralization hypothesis predicts a relation between *previous organic lesions* and current conversion complaints. Fallik and Sigal [11], for example, found the conversion symptom to occur most often in the area or limb where a previous injury or organic defect has occurred (65% of the 40 studied cases). They then suggested that conversion symptoms may more frequently appear on the dominant (mostly right) side of the body because injuries more frequently occur on the right side. A study by Axelrod et al. [2], however, showed no asymmetry in the bodily manifestation of organic damage.

In sum, the findings and theories on the lateralization of conversion symptoms are contradictory and tend to suggest either no, left-, or right-sided symptom lateralization. This fact alone demands further research. Furthermore, the aforementioned lateralization theories have found little empirical support for the proposed causal relations to date. Unfortunately, several of the preceding studies of the lateralization of conversion symptoms have also not been limited to cases of a full-blown conversion disorder [9,11–14]. Such heterogeneity prevents us from establishing whether conversion disorder is indeed an exception when compared with other somatoform disorders. In several studies [8,10,13–15], moreover, systema-

tic neurological screening was not performed for research purposes and the data on symptom lateralization were simply derived from the patients' medical charts.

In the present article, the results of a systematic investigation of symptom lateralization in 114 patients with conversion disorders according to the DSM-III-R [20] criteria are presented. The conflicting findings with regard to left- versus right-sided symptom lateralization in cases of conversion disorder, and the lack of empirical support for the causal relations put forth by the different lateralization theories, make the presence of symptom lateralization in conversion disorder questionable. We therefore hypothesized no significant symptom lateralization in cases of conversion disorder. Gender and handedness were also not expected to influence symptom lateralization in such cases.

## Method

### Subjects

Subjects included 114 patients with conversion disorder according to the DSM-III-R criteria. Between 1991 and 1998, the patients had applied for either in- or out-patient treatment at a general psychiatric hospital specializing in the treatment of conversion disorders and involved in a study of the treatment of conversion disorders [21]. The psychiatric screening was performed by a psychiatrist using the DSM-III-R criteria. A neurologist was responsible for the somatic screening, which was performed on all patients, even those who had previously undergone neurological examination. When necessary, more precise diagnostic techniques, such as serial computed tomography (CT) and brain scans or magnetic resonance imaging (MRI) were also undertaken. The neurologist referred the patient to a specialist clinic for further diagnostic procedures when appropriate. The diagnosis of conversion disorder was made by the psychiatrist on the basis of multidisciplinary findings. A total of 86 women and 28 men were studied, with a mean age of 38.0 years ( $SD=12.5$ , range 17 to 67) and 40.8 years ( $SD=10.2$ , range 20 to 67), respectively, and a mean duration for the conversion complaints of 49 months ( $SD=61.7$ , range 1 to 324) and 41 months ( $SD=47.7$ , range 2 to 194), respectively. Of the 114 patients, 37 patients showed comorbidity on DSM-III-R Axis I. The following DSM-III-R criteria were met in (n) patients: depression (14); dissociative disorder NOS (13); dysthymic disorder (7); posttraumatic stress disorder (7); panic disorder (5); specific phobia (4); pain disorder (2); adjustment disorder (1); eating disorder (1); female sexual arousal disorder (1); unspecified mental disorder (1); dissociative amnesia (1); and generalized anxiety disorder (1). Note that patients could meet the criteria for more than one disorder.

### Procedure

The data on symptom lateralization were collected during the psychiatric screening. The presence and location of the following conversion symptoms were systematically checked using a standard intake list: paralyses; pareses; contractures; tremors; bizarre movements; coordination disorders; speech disorders; eye muscle disorders; hearing disorders; vision disorders; feeling disorder; pain; and pseudoepileptic seizures. The patients were then identified as having unilateral conversion symptoms when the symptoms occurred on only one side of the body.

Data on hand preference were collected using Annett's Handedness Questionnaire [22]. This questionnaire and a return envelope were sent to the patients, and handedness was scored using the method described by Lishman and McMeekan [23].

The percentage of patients with unilateral symptom presentation was calculated, and the numbers of patients with unilateral versus bilateral symptoms were then compared using binomial testing. To test for a predominance of symptom presentation on one body half, the numbers of patients with only left-sided versus only right-sided symptoms were also compared using binomial testing. The effects of gender, handedness, and the presence of Axis I comorbidity on symptom side were estimated using Pearson's chi-square tests of independence in  $2 \times 2$  cross-tabulations. When the expected frequency for any of the cells was  $<5$ , Fisher's exact test was used. Furthermore, symptom duration was compared for patients with left-sided and right-sided symptoms using a *t*-test for independent samples.

## Results

The incidence of the motor symptoms across patients was: paralyses ( $n=19$ ); pareses ( $n=61$ ); contractures ( $n=17$ ); tremors ( $n=19$ ); bizarre movements ( $n=14$ ); coordination disorders ( $n=39$ ); speech disorders (aphonia and dysphonia) ( $n=17$ ); and eye muscle disorder ( $n=9$ ). As far as the sensory symptoms, 6 patients had vision disorders. Disturbed feeling ( $n=53$ ) and pain ( $n=59$ ) were observed in concurrence with motor disturbances. A total of 17 patients had pseudoepileptic seizures. Vision disorders and bizarre movements occurred only bilaterally, and bilateral body symptoms were observed during pseudoepileptic seizures. In the category of speech disorders, only aphonia with dysfunction for both vocal cords was observed. All other symptoms occurred both unilaterally and bilaterally.

Of the 114 patients, 77 (67.5%) showed bilateral symptoms and 37 (32.5%) showed unilateral symptoms. Bilateral symptom presentation occurred significantly more frequently than unilateral symptom presentation (two-tailed binomial test; probability=0.5:  $p<0.001$ ). Of the 37 patients with unilateral symptoms, 23 showed left-lateralized symp-

toms and 14 showed right-lateralized symptoms. This distribution was chance-based (two-tailed binomial test; probability=0.5:  $p=0.19$ ). Of the 86 women in the study, 60 had bilateral symptoms, 18 had left-sided symptoms, and 8 had right-sided symptoms. Of the 28 men, 17 had bilateral symptoms, 5 had left-sided symptoms, and 6 had right-sided symptoms. There was no significant relation between gender (male, female) and symptom side (left, right) (two-tailed Fisher's exact test:  $\chi^2=1.86$ ,  $p=0.27$ ).

A total of 80 patients (70%) returned the handedness questionnaire. Of the 37 patients with unilateral symptoms, a total of 28 completed the handedness questionnaire. Of the 23 right-handed patients with unilateral symptom presentation, 15 had left-sided symptoms and 8 had right-sided symptoms. And, of the 5 left handed patients with unilateral symptoms, 4 had left-sided symptoms and 1 had right-sided symptoms. There was no significant relation between handedness (right, left/ambidextrous) and symptom lateralization (two-tailed Fisher's exact test:  $\chi^2=0.41$ ,  $p=1.0$ ). Furthermore, patients with left-sided symptoms did not significantly differ in symptom duration (months) (40.43,  $SD=45.0$ ) from patients with right-sided symptoms (36.70,  $SD=39.20$ ) [ $t(35)=0.27$ ,  $p=0.79$ ].

An overview of the total number of affected limbs per type of motor or sensory conversion symptom is shown in Table 2.

Table 2  
Total number of motor and sensory symptoms in 101 patients with conversion disorder

	Limbs	Left side	Right side
<b>Motor symptoms</b>			
Paralysis	Upper	4	5
	Lower	11	9
Paresis	Upper	23	27
	Lower	39	36
Contractures	Upper	8	6
	Lower	7	6
Tremors	Upper	10	11
	Lower	11	11
Bizarre movements	Upper	9	9
	Lower	5	5
Coordination disorder	Upper	16	14
	Lower	26	25
Eye muscle disorder		9	9
Total <sup>a</sup>		178	173
<b>Sensory symptoms</b>			
Hearing disorder		0	0
Vision disorder		6	6
Feeling disorder	Upper	20	17
	Lower	34	32
Pain	Upper	24	22
	Lower	34	21
Total <sup>a</sup>		118	98

The table excludes symptoms that are unlikely to show laterality and therefore excludes six patients with only a speech disorder and seven patients with only pseudoepileptic seizures.

<sup>a</sup> The number of left-sided vs. right-sided symptoms did not differ (two-tailed binomial test, probability=0.5:  $p=1.0$ ).

## Discussion

The objective of the present study was to determine whether patients with conversion disorder show symptom lateralization or not. A review of the relevant literature showed the previous findings to be rather conflicting: they show left-sided [8–10], right-sided [11,12], or no symptom lateralization [13–15]. The existing theories with regard to symptom lateralization were also found to lack empirical support. Our results are in agreement with the hypothesis that conversion disorder is not characterized by symptom lateralization. Most of the patients in the present study showed bilateral symptoms. Only 32.5% of the patients had lateralized symptoms and, within the subgroup of patients with unilateral conversion symptoms, a chance-based left–right distribution was found.

The lateralization rates reported in other studies of the lateralization of conversion symptoms vary between 83% [11] and 7.8% [14]. This extreme variability may be due to certain methodological differences. In some studies [11,15], it was not made clear how symptom lateralization was defined. A patient with bilateral symptom presentation but a difference between the body sides with regard to the number and/or severity of symptoms may be assigned to the group of patients with symptom lateralization, for example. Such categorization is likely to inflate lateralization rates, however. Furthermore, the relatively high lateralization rate of 73% observed by Regan and LaBabera [12] was based on a small sample of children and adolescents ( $N=15$ ). This makes generalization of the findings to the adult population questionable. Given these methodological differences, the lateralization rates across studies are difficult to compare.

Another finding of the present study was that no specific subgroups of patients with symptom lateralization could be identified. Neither gender nor handedness showed a significant effect on symptom lateralization. Lateralization also did not differ for symptom duration and symptom type (sensory, motor).

In order to localize conversion disorder in the brain, a parallel with the neurological syndrome of anosognosia has been made by some investigators [10,19]. Considering the broad manifestation of conversion symptoms, which covers the entire range of neurological symptoms, this analog does not appear to be very valid. Frequently occurring symptoms, such as tremors, unwilling excessive movement, or coordination problems are, for example, more reminiscent of neurological disorders, such as hyperkinesia, Huntington's disease, or Parkinson's disease than of hemineglect with anosognosia. The question that then arises is whether research should focus on localizing conversion disorder in one specific brain region. It may be more fruitful to study dysfunctional processes in the brain than to attempt to identify a specific "conversion" brain area [16]. One fruitful hypothesis emerging from recent neurophysiological studies suggests that higher cognitive processes, such as the atten-

tional awareness system, may be involved in paralysis and paraesthesia (a subgroup of conversion disorder) [17,18]. Of special interest is the observation by Marshall et al. [18] of the involvement of the anterior cingulate cortex and the orbitofrontal cortex in conversion paralysis. Both brain structures have been identified as so-called negative motor areas that can inhibit spontaneous movement of the contralateral side [24]. Because these brain structures are bilaterally present, however, the implications for symptom lateralization are not at all clear.

Based on the following arguments, we conclude that there is insufficient support for the presence of lateralization in conversion symptoms: (1) the majority of conversion patients do not show symptom lateralization; (2) many conversion symptoms are unlikely to show lateralization (pseudoepileptic seizures, aphonia, excessive movements attacks); and (3) the studies that have found a significant lateralization of conversion symptoms showed conflicting findings with respect to left- versus right- lateralization.

### Acknowledgments

The authors thank Pieter Sandijck and Muriel Hagenaars for their assistance during data collection and Paul Eling for his thoughtful comments.

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