The symptom of functional weakness: a controlled study of 107 patients

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Functional weakness describes weakness which is both internally inconsistent and incongruent with any recognizable neurological disease. It may be diagnosed as a manifestation of conversion disorder or dissociative motor disorder. Other names include psychogenic or ‘non-organic’ paralysis. We aimed to describe the incidence, demographic and clinical characteristics of cases with functional weakness of less than 2 years duration, and to compare these with controls with weakness attributable to neurological disease. Both cases and controls were recruited from consultant neurologists in South East Scotland. Participating patients underwent detailed assessments which included: physical examination, structured psychiatric interview (Structured Clinical Interview for the Diagnostic and Statistical Manual of Mental Disorders), measures of symptoms, disability and distress (Short Form (36) Health Survey, Hospital and Anxiety Depression Scale), and assessment of their illness beliefs using an augmented version of the Illness Perception Questionnaire. In total, 107 cases (79% female, mean age 39 years, median duration of illness 9 months) were recruited. This number suggests a minimum annual incidence of 3.9/100 000. Forty-six controls (83% female, median age 39 years, duration 11 months) were also recruited. Compared to controls, cases had similar levels of disability but more physical symptoms, especially pain. They had a higher frequency of psychiatric disorders, especially current major depression (32 versus 7%, P<0.0001), generalized anxiety disorder (21 versus 2%, P<0.005), panic disorder (36 versus 13%, P<0.001) and somatization disorder (27 versus 0%, P<0.0001). There was no difference in median self-rated anxiety and depression scores. Paradoxically, they were less likely than controls to agree that stress was a possible cause of their illness (24 versus 56%, P<0.001). Cases were twice as likely as controls to report that they were not working because of their symptoms (65 versus 33%, P<0.0005). Functional weakness is a commonly encountered clinical problem. Patients with this symptom are as disabled as patients with weakness of similar duration due to neurological disease. There is a paradox between the frequency of depression and anxiety diagnoses and the patient’s willingness to accept these as potentially relevant to their symptoms. We discuss the theoretical and practical implications of these findings for the concept of conversion disorder.

Keywords: conversion disorder; functional weakness; case–control study; psychogenic

Abbreviations: DSM = Diagnostic and Statistical Manual of Mental Disorders; HADS = Hospital and Anxiety Depression Scale; IPQ = Illness Perception Questionnaire; SCID = Structured Clinical Interview for DSM-IV—Axis 1 disorders; SF-36 = Short Form (36) Health Survey
Introduction

Weakness that is clinically inconsistent or incongruous with any recognized neurological disease is a relatively common clinical problem for neurologists. It is typically diagnosed when the weakness has an internally inconsistent quality (e.g. with a global distribution, give way quality, or with a positive Hoover’s sign) (Stone and Sharpe, 2001). A variety of terms have been used to describe this phenomenon, including psychogenic or non-organic weakness, motor conversion disorder and dissociative motor disorder. However, the diagnosis of conversion disorder encompasses diverse symptoms including non-epileptic attacks, movement disorders and sensory and visual disturbance. In this article we use the straightforward term ‘functional weakness’ to describe the specific symptom and to avoid making assumptions about its aetiology.

The limited evidence available indicates that functional weakness is relatively common. The estimated population incidence is 5/100,000 per annum (Binzer et al. 1997), the estimated frequency in new neurology outpatients is 1.5% (Binzer et al., 1997; Stone et al., 2009) and in neurology inpatients 2% (Parry et al., 2003).

Despite its frequency there have been only a small number of case series of functional weakness (Baker and Silver, 1987; Crimlisk et al., 1998; Heruti et al., 2002; Stone et al., 2003) and only one case-control study (of 30 patients) published (Binzer et al., 1997, 1998; Binzer and Eisemann, 1998). Furthermore, the generalizability of these studies to neurological services has been limited by their being based on samples of specific groups (e.g. neurological inpatients, patients referred to psychiatry and patients without somatization disorder) (Binzer et al., 1997, 1998; Binzer and Eisemann, 1998). It is also difficult to draw conclusions from studies of patients described as having conversion disorder (Barnett, 1971; Merskey and Trimble, 1979; Watson and Buranen 1979; Wilson-Barnett and Trimble, 1985; Spitzer et al., 1999; Roelofs et al., 2002) as these have included the diverse symptoms included under this diagnosis (e.g. weakness, blackouts and movement disorder) (Stone et al., 2004c). In summary, we need to know more about the frequency, clinical features and aetiology of functional weakness.

We aimed to determine the incidence, demographic and clinical characteristics of patients with recent onset functional weakness who had been recruited from inpatient and outpatient National Health Service (NHS) neurological services in South East Scotland. The variables assessed included: age of onset; socioeconomic deprivation; symptoms and clinical signs; disability (including use of aids and appliances); physical and mental health status [Short Form (36) Health Survey; SF-36], Diagnostic and Statistical Manual of Mental Disorders (DSM)-IV axis-1 psychiatric disorder; self-rated anxiety and depression; and illness beliefs and work status (including litigation and financial benefits).

We also aimed to test whether there were differences in these characteristics between cases and a control group of patients with recent onset weakness attributed to neurological disease (to control for the effect that experiencing weakness might have on these variables, as well as factors leading to hospital assessment).

Based on the available literature, we hypothesized that compared to controls, patients with functional weakness would have many other physical symptoms (Binzer et al., 1997; Crimlisk et al., 1998), more self-rated anxiety and depression, a higher frequency of interview-rated psychiatric disorder and be more commonly involved in litigation (Binzer et al., 1997). We did not expect to find a substantial difference in disability, illness beliefs, socioeconomic deprivation category and work status (Crimlisk et al., 1998; Stone et al., 2003, 2004a).

Materials and methods

Ethical approval was obtained from the Lothian Research Ethics Committee and all patients provided written consent to participate.

Recruitment and selection

Cases with functional weakness

Patients with functional weakness were recruited over a 28-month period (2000–2003) by referral from all of the nine consultant neurologists based in Edinburgh at the time. These neurologists provided the exclusive NHS neurology service to South East Scotland, a population of around one million where there is very little commercial practice. The study was promoted to clinicians by means of personal reminders and newsletters.

The inclusion criteria for cases were: (i) a complaint of weakness that suggested a neurological disease; (ii) symptoms judged by a consultant neurologist to be definitely unexplained by organic disease; (iii) symptom onset within the previous 2 years (to provide a more homogenous sample); (iv) weakness not in part due to a known neurological disease. We did not apply or record the DSM-IV criteria for conversion disorder because of the practical difficulty in applying the criteria; we had no reliable way to exclude feigning and viewed the criterion requiring the association of psychological factors as too vague to apply. Rather we wished to focus on the symptom of functional weakness without selecting cases on the basis of any aetiological assumptions. In order to recruit patients representative of those diagnosed by consultant neurologists, no constraints were placed on the extent of the investigation that the patient had to undergo prior to diagnosis for them to be eligible for the study.

Controls with weakness attributable to neurological disease

These were selected by examining consecutive outpatient and inpatient letters written by three of the nine general adult consultant neurologists working in the same service. The same inclusion criteria used for the patients with functional weakness were applied, but for the controls the weakness had to be judged to be entirely explained by organic disease. We did not seek to match the age and sex of the control group.

Exclusions

The exclusion criteria for both groups were: (i) age less than 16 years; and (ii) unable to communicate with the researcher or complete questionnaires because of language difficulties, severe learning disability or dementia.
Assessment

All subjects were contacted by telephone. Following informed written consent, face-to-face interviews and neurological examinations of cases and controls were carried out by J.S. in the subjects’ homes (72%), in the hospital ward (17%) or in the outpatient clinic (11%). For patients seen at home, all questionnaires were given to the patient and returned by post after the assessment (apart from the Illness Perception Questionnaire (IPQ) which was completed before the interview). Patients interviewed in hospital completed the questionnaires in hospital. The assessment included interview and patient rated measures.

Interviewer rated measures

Semi-structured interview

This collected information on sex, age, marital status, ethnicity, presenting symptoms (using a checklist), current disability (including use of aids and appliances), work status, receipt of financial benefits, the presence of litigation and the patient’s beliefs about their illness. Postcode data were used to determine socioeconomic ‘deprivation category’, a measure of socioeconomic deprivation (McClore, 2004). We also recorded which investigations had been performed by the referring clinician.

Psychiatric diagnostic interview

This was the Structured Clinical Interview for DSM-IV-Axis 1 disorders (SCID), a semi-structured diagnostic interview of proven reliability for major mental disorders (excluding personality disorders) (First et al., 1996). Prior to the start of the study J.S. was trained in its use over 12 months by a senior psychiatrist (M.S.). All study interviews and ratings were also discussed with M.S. and re-rated if appropriate. Since there is no diagnostic interview for factitious disorder, we relied on the presence of marked inconsistency in the history, or evidence of lying to raise suspicion of this diagnosis. We supplemented the interview with a question on previous self-harm. We did not attempt to assess malingering. Nor did we diagnose dissociative disorders that are not covered by the standard SCID. Finally we did not record diagnoses of undifferentiated somatoform disorder, which we regarded as lacking specificity (Mayou et al., 2005).

Neurological examination

A neurological examination was performed. This paid particular attention to the presence or absence of the following ‘positive’ signs of functional disorder: collapsing weakness (of affected arm or leg); Hoover’s sign (weakness of hip extension returning to normal with contralateral hip flexion against resistance); midline splitting of sensory modalities (sharp demarcation of light touch, temperature at the midline); altered vibration sensation across the forehead (difference in vibration sensation across the forehead or sternum); and ‘la belle indifference’ (unconcern about disability) (Stone et al., 2002c).

Physical disability

This was assessed using the interviewer-rated Barthel scale, which has established validity and reliability across a wide range of physically disabling illnesses (Wade and Collin, 1988).

Patient rated measures

Physical disability and mental health status

The SF-36 questionnaire scales of health status are the most widely used self-report measures of physical and mental health status in medical research, and have undergone a large amount of testing for reliability, validity and responsiveness (McHorney et al., 1993).

Anxiety and depression

The Hospital and Anxiety Depression Scale (HADS) provides continuous measurements of anxiety and depression (Zigmond and Snaith, 1983). The scale has proven reliability and validity (Bjelland et al., 2002). The score can be analysed both as a continuous and categorical measure of anxiety and depression (Bjelland et al., 2002).

Illness beliefs

These were measured using the IPQ, which was developed to provide theoretically derived information about five major components of illness beliefs (Weinman et al., 1996). These are: (i) identity—the symptoms the patient associates with their illness; (ii) cause—the patient’s ideas about the aetiology of their illness; (iii) time line—the patient’s perceived duration of the illness; (iv) consequences—the patient’s perception of the seriousness and consequences of their illness; and (v) cure-control—how the patient feels they are able to control or recover from their illness. The IPQ presents 39 statements which patients rate on a five-point scale from ‘strongly agree’ to ‘strongly disagree’. It has good internal reliability and acceptable levels of stability in chronic disease (Weinman et al., 1996). Additional items were added to the ‘cause’ section of the IPQ to make it more relevant to patients with neurological weakness as follows: undiscovered physical cause, damage to the nervous system, inflammation in the brain, reversible changes within the nervous system, problems to do with the bones in the spine, something you experienced as a child.

Analysis

We estimated the incidence of functional weakness using the Scottish 2001 Census Online Website (http://www.scrol.gov.uk) to give population data from the referral catchment area of the study. We planned comparisons between cases and controls for age, sex, marital status, duration of symptoms, socioeconomic deprivation category, disability (Barthel and SF-36), physical and mental health status (SF-36), frequency of interview-rated psychiatric disorder (SCID), self-rated anxiety and depression (HADS), illness beliefs (IPQ) and work status data. Parametric and non-parametric tests were used as appropriate (Statsdirect; http://www.statsdirect.com). Simple post hoc exploratory correlation analysis of HADS data, IPQ (cause) and SF-36 disability were performed to explore potential mechanisms and confounders. Because of multiple statistical comparisons we suggest that P-values greater than 0.01 are regarded with particular caution.

Results

Recruitment

Cases with functional weakness

Totally 192 patients were referred by consultant neurologists during the 28-month study recruitment period. Out of them 67 were excluded for the following reasons: weakness of more than 2 years duration (n = 48); referred erroneously as they never had the symptom of weakness (n = 16); comorbid organic disease (n = 12); and deaf mute (n = 1). A further eight eligible patients were not included for the following reasons: uncontactable (n = 5); refused to take part (n = 2); and did not complete the interview (n = 1). The final sample was therefore 107 cases.
Controls with weakness attributable to neurological disease

Forty-six eligible patients were approached to participate in the study. All were contactable, took part and completed the assessment. None were excluded because of symptom duration or communication difficulties. Their diagnoses were: multiple sclerosis (n = 27); Guillain–Barre´ syndrome (n = 4); first episode of demyelination (n = 3); sensory ganglionopathy (in all cases leading to disabling ataxia) (n = 3); transverse myelitis (n = 3); and other (n = 6) (cervical cord lesion, foot drop, malignant cord syndrome, motor neuron disease, myasthenia gravis and ulnar neuropathy).

Completeness of data

There were complete data for all participating patients from the semi-structured interview and SCID. The proportions completing the self-rated questionnaires were as follows: SF-36: cases n = 101 (94%), controls n = 43 (93%); HADS: cases n = 96 (90%), controls n = 40 (87%); IPQ: cases n = 102 (95%), controls n = 43 (93%). Missing data were not imputed.

Estimate of incidence

The incidence of functional weakness was calculated for adults over the age of 16 to be 3.9 /100 000/year [based on 116 eligible cases from a referral population of 1 261 191 in 28 months (including the deaf mute patient)]. This figure is bound to be an underestimate (or minimum incidence) as it does not include patients who were not referred to the study, those referred to other specialties and those aged less than 16 years.

Demographic and social characteristics

Table 1 shows the age, sex, marital status and socioeconomic deprivation category for cases and controls.

The mean age and the sex distribution of cases and controls were similar. The median duration of symptoms (this was not normally distributed) was also similar (9 versus 11 months). Some patients no longer had weakness by the time of the interview (functional weakness n = 8, neurological weakness n = 7) because it had improved since the time of referral. Apart from one neurological control, all patients were white/Caucasian.

The mean age of onset of weakness was 38 years for both groups. The age distribution is shown in Supplementary Fig. 1. There was no substantial difference in mean socioeconomic deprivation score between cases and controls (3.7 versus 3.5) (1 = least deprivation, 7 = most deprivation) (Table 1). These scores indicate average socioeconomic deprivation for South East Scotland.

Symptoms

Distribution of weakness and handedness

The distribution of weakness in cases and controls is shown in Table 1. Hemiparesis or monoparesis were the most common presentation in cases (79%, n = 84). There was no statistically significant preponderance of left sided symptoms. Four out of the five left-handed patients with unilateral functional weakness had left-sided symptoms. There were unusual cases of transient complete paralysis, but mild relative weakness of one side compared to the patient’s other side was the most common finding.
### Other symptoms

The semistructured interview assessed the frequency of symptoms other than weakness and these are presented in Table 2. Sleep symptoms, pain symptoms, gastrointestinal symptoms and other functional neurological symptoms (such as non-epileptic attacks \( n = 15 \), functional/psychogenic tremor \( n = 7 \) and functional/psychogenic dystonia \( n = 1 \)) were all significantly more common in the cases. Blackouts and tremor (all ‘functional’ in the cases) looked the most promising in terms of differentially predicting cases. Fatigue and concentration difficulties were common in both groups and only moderately more common in the cases. Similarly an analysis of symptom ratings from the SF-36 questionnaire revealed more pain in the cases but similar low ‘energy’ in both groups (Table 3).

### Physical examination findings and investigation

Table 4 shows the frequency of some putative ‘positive’ physical signs of functional weakness on examination in cases and controls.

### Routinely tested signs

- **La belle indifference**: many of the cases could be said to have had *la belle indifference* in that they initially appeared unusually cheerful despite their symptoms. However, in nearly all of these cases, during the course of the interview, the patient admitted that they had initially been trying to appear cheerful so that they weren’t thought by the examiner to be depressed or ‘mentally ill’. In three cases however *la belle indifference* was maintained. In these three cases there was a strong suspicion of factitious disorder (symptoms fabricated consciously in order to obtain care). *La belle indifference* was also seen in one control with multiple sclerosis (in the absence of cognitive impairment).
- **Hoover’s sign**: Hoover’s sign was found in 60 cases (56%). There were reasons why it could not be found in a further 41% of cases: no weakness (7%); weakness too mild (13%); bilateral weakness (12%); arm weakness only (5%); weak leg but no hip extension weakness (2%); and distal leg weakness only (2%). In the other 3% of patients with functional weakness it was absent. In the controls, only seven patients had unilateral hip extension weakness of a degree that Hoover’s might be found and one had a positive Hoover’s sign.
- **Dragging monoplegic gait**: a striking ‘dragging gait’ in which one leg is dragged with the knee extended and hip rotated externally or internally (Fig. 1) was not seen often in the cases (nine patients) and not at all in controls.
- **Collapsing weakness**: this was common in cases, although it is a sign particularly prone to error in patients with pain or who have difficulty following instructions.
Other so-called ‘signs’: of a functional disorder such as large dark glasses or furry slippers would not be worth mentioning had they not already been suggested (Hawkes, 1997). They were observed only rarely (twice each in the cases and once in the controls).

Other observations on the clinical examination in cases with functional weakness

Some further qualitative observations were made.

- **Diminished ticklishness**: cases often mentioned spontaneously (and were found to have) diminished ‘ticklishness’ of the affected foot. This is not proposed as a discriminatory sign but is of theoretical interest.
- **Arm protection**: some cases tended to ‘protect their arm’ in a flexed position in the absence of pain, either laying it across their lap or holding it in a flexed position when walking for reasons that they could not explain.

Investigations carried out in the cases

In 14% of cases, the diagnosis had been made by the referring clinician without any brain or spine imaging. MRI brain scan, \( n = 58 \) (55%), CT brain scan, \( n = 38 \) (36%), lumbar puncture, \( n = 33 \) (31%) and neurophysiology, \( n = 15 \) (14%) were the most common investigations. The reason given by the referring neurologists for not investigating was their clinical confidence in the diagnosis.

Physical disability

There was no statistically significant difference in severity of physical disability between cases and controls either on the observer-rated Barthel score or on the self-rated SF-36 physical function scale (Table 3).

### Table 3 Disability, health status (SF-36), and anxiety and depression (HADS) data

<table>
<thead>
<tr>
<th>Examination findings</th>
<th>Cases (n = 107)</th>
<th>Controls (n = 46)</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Barthel Score (disability)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barthel Score (median out of 20, IQR)</td>
<td>20 (17–20)</td>
<td>20 (19–20)</td>
<td>NS</td>
</tr>
<tr>
<td>Barthel Score (n with score of ≤18 (%))</td>
<td>35 (33%)</td>
<td>10 (22%)</td>
<td>NS</td>
</tr>
<tr>
<td><strong>SF-36 (health status) (median, IQR)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical functioning</td>
<td>30 (14–55)</td>
<td>40 (18–70)</td>
<td>NS</td>
</tr>
<tr>
<td>Role physical</td>
<td>0 (0–0)</td>
<td>0 (0–50)</td>
<td>NS</td>
</tr>
<tr>
<td>Pain</td>
<td>33 (22–44)</td>
<td>56 (33–94)</td>
<td>( P &lt; 0.0001 )</td>
</tr>
<tr>
<td>Energy</td>
<td>30 (15–50)</td>
<td>40 (20–55)</td>
<td>NS</td>
</tr>
<tr>
<td>Social functioning</td>
<td>44 (22–67)</td>
<td>56 (28–78)</td>
<td>( P &lt; 0.05 )</td>
</tr>
<tr>
<td>General health perception</td>
<td>40 (30–56)</td>
<td>50 (35–75)</td>
<td>( P &lt; 0.05 )</td>
</tr>
<tr>
<td>Mental health</td>
<td>60 (44–84)</td>
<td>68 (52–80)</td>
<td>NS</td>
</tr>
<tr>
<td>Role emotional</td>
<td>33 (0–100)</td>
<td>67 (0–100)</td>
<td>NS</td>
</tr>
<tr>
<td><strong>HADS (anxiety and depression) (median, IQR)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anxiety score</td>
<td>8 (4–13)</td>
<td>6 (3–10)</td>
<td>NS</td>
</tr>
<tr>
<td>Depression score</td>
<td>7 (3–11)</td>
<td>5 (2–7)</td>
<td>NS</td>
</tr>
</tbody>
</table>

Cases had functional weakness, controls had weakness due to neurological disease. A lower score in the Barthel (range 0–20) or SF-36 (range 0–100) equals worse disability or distress or more pain; a higher score in the HADS indicates more anxiety or depression. IQR = interquartile range; NS = non-significant.

Table 4 Frequency of ‘positive physical signs’ of functional weakness

<table>
<thead>
<tr>
<th>Examination findings</th>
<th>Cases (n = 107)</th>
<th>Controls (n = 46)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>La belle indifference</strong></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Collapsing weakness</td>
<td>74</td>
<td>70</td>
</tr>
<tr>
<td>Hoover’s sign</td>
<td>60</td>
<td>56</td>
</tr>
<tr>
<td>Dragging monoplegic gait</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Hand strike</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Midline split</td>
<td>20</td>
<td>19</td>
</tr>
<tr>
<td>Increased vibration a</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Decreased vibration a</td>
<td>41</td>
<td>39</td>
</tr>
<tr>
<td>Decreased temperature sensation a</td>
<td>25</td>
<td>24</td>
</tr>
</tbody>
</table>

Cases had functional weakness, controls had weakness due to neurological disease. No statistical comparisons made.

- **Other so-called ‘signs’**: of a functional disorder such as large dark glasses or furry slippers would not be worth mentioning had they not already been suggested (Hawkes, 1997). They were observed only rarely (twice each in the cases and once in the controls).

- **‘Inverse pyramidal leg weakness’**: while many cases had a global rather than pyramidal pattern of weakness, they commonly had more difficulty with extension than flexion of the leg muscles. This was especially the case for ankle plantarflexion, which was often subjectively weaker than dorsiflexion.
more aids and appliances than controls. These were: wheelchair (10 versus 2%), bath chair (5 versus 3%); Zimmer frame (3 versus 0%); and a stair lift (2 versus 0%). Elbow crutches (9 versus 0%) were noticeably more common in cases compared to controls, who tended to use a stick (17 versus 11%) (Supplementary Table 1).

Self-rated anxiety and depression and interview-rated psychiatric disorder

Self-rated anxiety and depression
The HADS data (Table 4) indicated that self-reported anxiety and depressive symptom scores were relatively high in both groups, with no statistically significant difference between them. Analysis of HADS data according to cut off score, SF-36 ‘mental health’ category and individual items are presented in Supplementary Tables 2 and 3.

Interview rated psychiatric disorder
In contrast to the HADS data, the psychiatric diagnostic interview found a striking excess of many psychiatric disorders in cases compared to controls (Table 5). In addition to those cases who met criteria for current major depression (n = 34, 32%) a number had minor depression or cyclothymic disorder (n = 7, 7%) and a significant number had ‘suspected’ major depression (n = 16, 15%). These latter patients had all the somatic symptoms of depression and at interview appeared depressed but strongly denied low mood or anhedonia. Panic disorder (n = 38, 36%) and somatization disorder (n = 29, 27%) were also particularly common in cases. Four cases were suspected of having factitious disorder because of inconsistencies in their histories, although in none could this diagnosis be definitively confirmed. All were apparently seeking medical care and not monetary reward.

Comorbidity of psychiatric disorders
An additional analysis of psychiatric disorders in the cases shows how the DSM-IV axis 1 disorders overlapped with each other (Supplementary Fig. 3). Sixty-six of the cases were responsible for most of the major psychiatric disorders. Another 35 only had a history of one axis-1 disorder or more minor axis-1 disorder. One in twenty of cases had no current or previous axis-1 psychiatric disorder.

Illness beliefs

Illness perception questionnaire—main domains
The main domains of the IPO are shown in Table 6. In most of the domains cases and controls were similar. Both groups mostly agreed that their symptoms came and went in cycles, had major consequences on their life and that their illness made them feel depressed, angry or afraid. Endorsement of statements about the positive effects of potential treatment and the degree to which the illness could be influenced by the person themselves was low in both groups (but similar for cases and controls). There were however differences in two domains: first, cases were less likely to believe their illness was permanent than controls (timeline, P < 0.0001). This was despite tending to agree overall that their symptoms were likely to be long lasting. Second, cases were much more likely to believe that their illness was a mystery (illness coherence, P < 0.0001).

Illness perception questionnaire—cause
Table 7 shows frequency of endorsement of possible causes of symptoms listed in the questionnaire. Significance testing took into account the range of five responses from ‘strongly disagree’ to ‘strongly agree’. The striking findings were firstly that cases were less likely than controls to agree that stress was a cause
Secondly, cases had a tendency to endorse all causes to a lesser extent than controls. Even items such as chance or bad luck were endorsed less by cases. Cases and controls were also asked to name the three ‘most important causes of their illness’. The responses were grouped into four categories (Supplementary Table 4): physical, psychological, bad luck and ‘don’t know’. Only 12% of cases (compared to 19% of controls) chose a primary cause which could be seen as psychological (even though this encompassed concepts of external pressure such as ‘stress’ or ‘overwork’). Even when all three chosen ‘causes’ were taken in to consideration, only 25% of causes endorsed by cases fell into the ‘psychological’ category.

Work status, financial benefits and litigation

Table 8 shows work status, receipt of benefits and frequency of pending litigation. The cases were twice as likely as controls to have given up work as a result of ill health (n = 68 (65%) versus...
This is a meaningful comparison in the context of the same duration of symptoms, and similar severity of physical disability between cases and controls. Prior to the onset of symptoms, 20 cases (19%) were already off sick or retired because of ill health compared with only one (2%) of the controls. Of the cases, only one had a clear additional organic disease reason for this (systemic lupus erythematosus).

Despite the disparity in proportion working, a similar proportion of cases and controls were in receipt of disability benefits at the time of the interview (cases $n = 55$ (52%) versus controls $n = 19$).

### Table 7 Illness beliefs regarding cause

<table>
<thead>
<tr>
<th></th>
<th>Cases ($n = 102$)</th>
<th>Controls ($n = 43$)</th>
<th>Significance</th>
<th>Odds ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% agree</td>
<td>%</td>
<td>% agree</td>
<td>%</td>
</tr>
<tr>
<td>Stress or worry</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>56</td>
</tr>
<tr>
<td>Damage to the nervous system</td>
<td>34</td>
<td>33</td>
<td>32</td>
<td>74</td>
</tr>
<tr>
<td>Inflammation in the brain</td>
<td>10</td>
<td>10</td>
<td>20</td>
<td>47</td>
</tr>
<tr>
<td>Altered immunity</td>
<td>11</td>
<td>11</td>
<td>20</td>
<td>47</td>
</tr>
<tr>
<td>Chance or bad luck</td>
<td>30</td>
<td>29</td>
<td>28</td>
<td>65</td>
</tr>
<tr>
<td>Something I experienced as a child</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>My emotional state</td>
<td>17</td>
<td>17</td>
<td>10</td>
<td>23</td>
</tr>
<tr>
<td>Family problems or worries</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>23</td>
</tr>
<tr>
<td>Undiscovered physical cause</td>
<td>46</td>
<td>45</td>
<td>18</td>
<td>42</td>
</tr>
<tr>
<td>Reversible changes in the nervous system</td>
<td>25</td>
<td>25</td>
<td>16</td>
<td>37</td>
</tr>
<tr>
<td>Accident or injury</td>
<td>23</td>
<td>23</td>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td>Problems to do with the bones in the spine</td>
<td>18</td>
<td>18</td>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td>Overwork</td>
<td>17</td>
<td>17</td>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td>Poor medical care in my past</td>
<td>11</td>
<td>11</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>My mental attitude</td>
<td>8</td>
<td>8</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>My own behaviour</td>
<td>6</td>
<td>6</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>My personality</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Didn’t agree with any of the above</td>
<td>11</td>
<td>11</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Cases had functional weakness, controls had weakness due to neurological disease. Significance was determined by a Chi Square test of trend across all five responses (strongly disagree, disagree, neither, agree, strongly agree). For analysis of ‘first choice’ cause see Supplementary Table 4. Higher odds ratios correspond with beliefs more common in controls. NS = not significant.

### Table 8 Employment, receipt of benefits and litigation

<table>
<thead>
<tr>
<th></th>
<th>Cases ($n = 107$)</th>
<th>Controls ($n = 46$)</th>
<th>Significance (Fisher’s exact test)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$n$</td>
<td>%</td>
<td>$n$</td>
</tr>
<tr>
<td>Work status prior to symptom onset</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Working (including parenting)</td>
<td>82</td>
<td>78</td>
<td>41</td>
</tr>
<tr>
<td>Not working due to ill health</td>
<td>20</td>
<td>19</td>
<td>1</td>
</tr>
<tr>
<td>- off sick</td>
<td>8</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>- retired on ill health</td>
<td>12</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>Other reasons for not working</td>
<td>5</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Work Status at time of interview</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Working (inc parenting)</td>
<td>35</td>
<td>33</td>
<td>28</td>
</tr>
<tr>
<td>Not working due to ill health</td>
<td>68</td>
<td>65</td>
<td>15</td>
</tr>
<tr>
<td>- off sick</td>
<td>51</td>
<td>49</td>
<td>8</td>
</tr>
<tr>
<td>- retired on ill health</td>
<td>17</td>
<td>16</td>
<td>7</td>
</tr>
<tr>
<td>Other reasons for not working</td>
<td>4</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Pending litigation</td>
<td>9</td>
<td>9</td>
<td>3</td>
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<tr>
<td>Receiving state benefits</td>
<td>55</td>
<td>52</td>
<td>19</td>
</tr>
<tr>
<td>Disability living allowance</td>
<td>35</td>
<td>33</td>
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</tr>
<tr>
<td>Incapacity benefit</td>
<td>12</td>
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</tr>
<tr>
<td>Income support</td>
<td>8</td>
<td>8</td>
<td>2</td>
</tr>
</tbody>
</table>

Cases had functional weakness, controls had weakness due to neurological disease. NS = not significant.

*Looking for work, housewife (not parenting) or retired.

*b Includes two patients with learning disability who were unable to continue with normal day centre/college activities.

$n = 15$ (33%).
(41%). The interviews suggested that this may have been firstly because some of the patients with functional weakness had been unsuccessful or had not applied for benefits, and secondly because some of the controls were still working part time but also legitimately claiming benefits. There was no excess of ongoing litigation in the cases \( n = 9 \) (9%) compared with controls \( n = 3 \) (7%).

**Association between distress, disability and beliefs**

Exploratory analysis within the cases revealed an association between being more likely to believe stress was a cause of their illness and having more symptoms of anxiety and depression on the HADS \( r = 0.24; P = 0.02 \) and also with having less physical disability on the SF-36 \( r = 0.38; P = 0.001 \).

**Discussion**

This article reports the minimum incidence, demographic characteristics, age of onset, socioeconomic deprivation category, symptoms, clinical features, disability, self-rated anxiety and depression, frequency of interview-rated psychiatric disorder, illness beliefs and work status of 107 patients with functional weakness and compares these to those of patients with weakness attributed to neurological disease.

**Frequency of functional weakness**

The minimum annual incidence of 3.9/100 000/year in adults is comparable both to the only previous estimate for motor conversion disorder of 5/100 000 (Binzer et al., 1997), and to incidence figures for brain tumour and multiple sclerosis from population based studies (MacDonald et al., 2000). If, however, we had looked for patients with functional weakness among children, in primary care and in other specialties such as orthopaedics we would have found a much higher incidence.

**Gender**

We found a preponderance of females in the cases (79%) but also in the controls (83%). Since most studies of conversion disorder also reported this finding it is perhaps surprising that the literature on functional weakness has not previously reported any gender predominance. Our analysis of seven studies of a total of 272 patients with functional paralysis yielded a mean proportion of 53% females (Ljungberg, 1957; Baker and Silver, 1987; Apple Jr, 1989; Binzer et al., 1997; Cantello et al., 2001; Heruti et al., 2002; Nazir et al., 2005) One possible explanation is that some of the previous studies had been carried out in military institutions where males predominate.

**Age of onset**

The average age of onset in cases in this study was 39 years. Functional weakness has been reported to occur in a wide range of ages from children aged five (Grattan-Smith et al., 1988) to the mid-70s (Zhang et al., 1987). The average reported age of onset in previous studies clusters in the mid-30s (Ehrbar and Waespe, 1992; Binzer et al., 1997; Teasell and Shapiro, 1997; Ziv et al., 1998) in contrast to patients with dissociative seizures who characteristically develop attacks in their mid-20s (Stone et al., 2004c). Patients can also present at older ages; for example one series of patients presenting to an acute stroke unit had a mean age of 50 (Nazir et al., 2005). In our study, referral bias would almost certainly have prevented older patients reaching our neurology services.

**Socio-economic deprivation**

We did not find cases to be more socioeconomically deprived than the controls. The idea that patients with conversion symptoms have less ‘sophisticated’ symptoms and therefore may tend to come from lower socioeconomic groups, was previously reported by one controlled study (Folks et al., 1984) but not by two others (Roy, 1979; Ewald et al., 1994).

**Distribution of weakness**

In our study the most common presentation of functional weakness was hemiparesis (63%); there were fewer cases of monoparesis (16%) than reported in other case series. Pooling data from the 253 patients included in all the previous studies that reported distribution of weakness gives the following figures: 33% hemiparesis, 26% monoparesis, 12% tetraparesis, 28% paraparesis, <1% brachial diplegia and 1% triplegia. (Fallik and Sigal, 1971; Knutsson and Martensson, 1985; Apple Jr, 1989; Lempert et al., 1990; Ehrbar and Waespe, 1992; Binzer et al., 1997; Heruti et al., 2002). In keeping with our previously reported systematic review of laterality of functional weakness (Stone et al., 2002a), we found only a slight and non-significant excess of left-sided symptoms in this study.

**Physical signs**

The phenomenon of la belle indifference has been much discussed but was a rare finding in our study. We did come across patients who were said to have la belle indifference by nursing or medical staff. In these cases it was usual for the patient to report that they had been ‘putting on a brave face’, apparently to avoid the perceived stigma of being told the problem was ‘in their mind’. Further assessment suggested that they were distressed by their symptoms (rather than indiferent to them). This finding suggests that this is a sign with little discriminating value (Stone et al., 2006). Hoover’s sign did however appear to be discriminating, although—like any physical sign—it has a number of potential pitfalls (Stone and Sharpe, 2001). We propose that further empirical work on the value of these and the other physical signs described in this article is required (Ziv et al., 1998).

**Symptoms**

We found a high frequency of physical symptoms, especially pain symptoms and sleep disturbance, in the cases. Other functional neurological symptoms, such as non-epileptic attacks and functional tremor were present almost exclusively in cases suggesting they may be useful discriminators for diagnosis. The nature and frequency of other symptoms in patients with functional weakness has only been inconsistently reported. In previous studies of
patients with motor symptoms, pain (55–97%) (Knutsson and Martensson, 1985; Teasell and Shapiro, 1997; Birket-Smith and Mortensen, 2002; Stone et al., 2003) and sensory disturbance are commonly mentioned (30–48%) (Knutsson and Martensson, 1985; Crimlisk et al., 1998; Stone et al., 2003). Pseudoseizures (23%) (Crimlisk et al., 1998), bladder symptoms (25%) (Teasell and Shapiro, 1997), dysphonia (5%) (Crimlisk et al., 1998) and dysarthria (11%) (Teasell and Shapiro, 1997) are mentioned in some series, confirming that other functional neurological symptoms commonly co-occur with weakness.

Disability and health status

Despite similar median duration of symptoms (and by chance, similar ages and sex distribution), we did not find a significant difference in either interview-rated or self-rated disability between cases and controls. There was, however, considerable heterogeneity in the severity of impairment and disability in the cases. We also cannot exclude the possibility that there may have been worse mobility in cases or controls despite similar scores. There is only one previous report measuring disability in patients with functional weakness. In this study of 30 inpatients, all patients had moderate or severe disability with 27% in the severe disability group compared to 17% of disease controls (Binzer et al., 1997).

It is also rare to find reports of disability in the literature on conversion disorder. In our 12-year follow-up study of patients with motor or sensory symptoms, 38% were limited in moderate activities and their SF-36 scores at follow-up were comparable to outpatients with multiple sclerosis (Stone et al., 2003). One third had taken medical retirement. In a Dutch study of 45 patients with conversion disorder receiving in patient treatment, 82% used wheelchairs or crutches, 15% used more than two devices and 24% had had their houses adapted (Moene et al., 2002). The existence of small local series of wheelchair users highlights how common this scenario can occur (Davison et al., 1999; Allanson et al., 2002).

Interview-rated psychiatric disorder and self-rated anxiety and depression

Patients with functional weakness had a significantly higher frequency of interview-rated Axis-1 psychiatric disorder (including current major depression, panic disorder and somatization disorder) than controls. However a third had only minor Axis-1 psychiatric disorder or no disorder. This is consistent with other studies that have found a frequency of depression of 27% in patients with functional weakness (Binzer et al., 1997) and 5–50% in patients diagnosed with conversion disorder (Purcell and Robins, 1951; Stephens and Kamp, 1962; Lewis and Berman, 1965; McKegney, 1967; Barnert, 1971; Guze et al., 1971; Stefansson et al., 1976; Bishop and Torch, 1979; Folks et al., 1984; Wilson-Barnett and Trimble, 1985; Marsden, 1986; Lecompte and Clara, 1987; Lempert et al., 1990; Tomasson et al., 1991; Ebel and Lohmann, 1995; Kapfhammer et al., 1998; Al-Habeb et al., 1999; Chand et al., 2001; Allanson et al., 2002; Birket-Smith and Mortensen, 2002; Roelofs et al., 2002; Kuloglu et al., 2003).

One important difference we found between cases and controls was in the frequency of panic disorder (36 versus 13%). This has been reported in only one previous study of conversion disorder (Roelofs et al., 2002). Our impression is that the panic disorder tended to present with predominantly somatic symptoms but not with anxiety, so called non-fearful panic (Chen et al., 2009). This may have led to the diagnosis being missed.

It was striking that whilst a great excess of depression and anxiety disorders were found at interview in the cases, the median self-rated anxiety and depression scores were similar in cases and controls. Why might this have occurred? First, interviewer non-blinding may possibly have led to an overestimate of psychiatric disorder in cases, although this is made less likely by all being re-rated. Second, perhaps as the illness belief data suggest, patients with functional weakness may have tended to play down the role of psychological factors, leading to artefactually low scoring on the self-rated HADS.

Illness beliefs

The concept that ‘hysterical’ paralysis may depend in large part on an ‘idea’ was probably first suggested by Reynolds as long ago as 1869 (Reynolds, 1869). Despite this, patients’ ideas and beliefs have been little studied. Strong beliefs about the presence of disease has previously been observed in small groups of patients with functional weakness (Binzer et al., 1998) and in patients with non-epileptic attacks (Stone et al., 2004a). In our study, only the ‘cause’, ‘illness coherence’ (‘my illness is a mystery’) and ‘timeline’ (‘my illness is permanent’) domains of the IPQ differed between cases and controls. The fact that patients with functional weakness were more often mystified by their symptoms than the controls is hardly surprising, given the nature of the diagnosis. Many doctors themselves report being mystified by functional symptoms (Kanaan et al., 2009). We did not specifically study what the doctors had said to the patients in this study, but this would undoubtedly have shaped their beliefs. For example, a patient who believes they have a physical disorder and is told they have a psychological problem may be especially mystified. The similarity of most of the domains suggests a group of patients experiencing symptoms as if they did actually have a neurological disease diagnosis. This is consistent with other studies comparing disease groups with ‘non-disease’ counterparts which have tended to find relatively little difference in health beliefs between patients with and without disease if they have the same symptoms (Trigwell et al., 1995; Stone et al., 2004a).

Regardless of their origins, illness beliefs appear to be important in this patient group. In our follow-up study of 718 neurological outpatients with symptoms unexplained by disease, illness beliefs (of permanence and that the condition was not psychological) as well as the receipt of disability benefits were the main independent predictor of poor 12-month outcome (Sharpe et al., 2010).

The cases’ illness beliefs do however give rise to some interesting and potentially paradoxical findings. Despite having a much higher frequency of interview-rated psychiatric disorder, cases were much less likely than controls to agree that stress was a cause of their symptoms. We propose several potential explanations for this finding.
(I) The presence of a diagnosis allows the patient to consider aetiological factors including ‘stress’. In other words, anyone in diagnostic ‘limbo’, whether they have a disease or not, may be reluctant to consider stress, or any other possible aetiological factor until they have a diagnosis. This is in keeping with the finding that cases tended to endorse all causes (even ‘damage’ and ‘bad luck’) to a lesser extent than controls.

(II) Patients with functional weakness tend to deny emotional symptoms. The conversion hypothesis, that distress is converted to a greater or lesser extent into physical symptoms, has held sway for nearly 100 years. The relative denial of stress as a causal factor observed in the cases in this study might be seen as consistent with this hypothesis. Additionally, the post hoc finding that patients with functional weakness with more physical disability were less likely to agree that stress is a factor could be seen to support it as well. However many cases endorsed symptoms of anxiety and depression on self-report. Furthermore, the correlation between more disability and less agreement with stress as a factor may alternatively be explained by stress being a less socially acceptable explanation for a totally paralysed limb or a mildly weak limb.

(III) Societal stigma. Patients with functional weakness may avoid suggestions that the problem is stress-related because they have found that other people in general and doctors, in particular, tend not to believe their symptoms are ‘real’ if they do. Society tends to stigmatize physical symptoms which are thought to be ‘psychosomatic’ in nature (Peters et al., 1998; Stone et al., 2002b, 2004b). For patients with functional weakness, admitting a role for stress risks a diagnosis of mental illness. For the controls with disease, admitting a role for stress does not detract from the validity of an organic disease diagnosis.

It may not be possible to produce scientific data that can either prove or refute the conversion hypothesis. We do not present data on conflicts, dilemmas or ‘stress’ prior to symptom onset that might be useful in further testing this hypothesis more clearly. Also, our data on illness beliefs are cross sectional so inferring causality in relation to emotional disorder and the onset of weakness is not possible. However we suggest that a simpler and alternative hypothesis to the conversion hypothesis is that patients with functional weakness do not convert their emotional distress into physical symptoms and are not in denial about it—they just do not want to tell the doctor about their emotional state. Since doctors find explaining limb paralysis on the basis of emotional disorder a difficult theoretical leap, and society tends to accuse people seen as having a ‘psychosomatic’ weak limb of ‘faking it’, we should perhaps not be surprised if patients are reluctant to endorse emotional symptom and causes.

Work status, benefits and litigation

Cases were less likely to be working than controls. This also appeared to be the case before symptom onset. This finding has many possible explanations. They may have been more likely to be unable to work because they had more physical and emotional symptoms. Also work itself may have been perceived to be a causal factor in the production of the symptoms which may have led them to avoiding returning. It was interesting to note that despite the large difference between the proportions of patients in work (65 versus 33%) there was much less disparity between the groups in terms of who was in receipt of state benefits (52 versus 41%). This may reflect the difficulty obtaining benefits for a poorly defined illness compared to a well-known condition like multiple sclerosis. The lack of any excess litigation in the cases argues against the stereotype of the patient with functional weakness typically developing symptoms for ‘secondary gain’.

Limitations

Our study is the largest reported case-control study of patients with the symptom of functional weakness. The patients were representative of outpatient and inpatient neurological practice and were not selected on psychiatric or other criteria. The relatively short and homogenous duration of symptoms, similarity of age, sex distribution, social deprivation and severity of disability in the cases and controls, all reduce the risk that our findings are a result of confounding.

However, all case–control studies are subject to bias (Sackett, 1979). What might be the biases on our study? First did we obtain true and representative cases? We defined cases by a clinical diagnosis of functional weakness made by a consultant neurologist. Might some cases have been incorrectly diagnosed? We do not think this is likely to have been an important limitation as data from our own systematic review (Stone et al., 2005), local 12-year follow-up data (Stone et al., 2003) and Scottish National follow-up study (Stone et al., 2009) all suggest that misdiagnosis is uncommon (less than 4% of cases). Similar concerns may also be raised regarding contamination of our sample by patients who, unknown to us, may have been malingering or had factitious disorder (in addition to the four patients we suspected of having factitious disorder). Were our cases representative? They were not truly consecutive referrals to the neurology service even though they were consecutive referrals to the study. Also, cases of functional weakness may present to services other than neurology such as stroke units (Nazir et al., 2005), accident and emergency (Scott and Silbergliet, 2003) and orthopaedics (White et al., 1988). This ‘neurology’ selection bias may have led to us missing some patients, for example, those with a regional pain syndrome and comorbid functional weakness (Birklein et al., 2000), those with only mild weakness seen in primary care, and patients over 65. Furthermore, neurologists vary in their willingness to make a diagnosis of a functional disorder (Niemann, 1990; Perkin, 1990) and may have been especially reluctant to make the diagnosis in patients without obvious psychiatric comorbidity, men and older people. This bias could have inflated the frequency of interview-rated psychiatric disorders in the cases. Cases with very transient symptoms, for example after non-epileptic attacks may also have been disproportionately missed.

Second, was our choice of the controls appropriate? They were selected to control for the presence of the symptom of weakness and for the experience of being a patient. They were selected
from the same service but from only three of the nine consultants who referred cases. This could have introduced some bias, although their socioeconomic deprivation category was the same. The majority had inflammatory diseases of the nervous system, usually multiple sclerosis. Because of local service configuration, stroke patients were not included. Additionally, disease may have confounded some comparisons. For example, there is some evidence that multiple sclerosis, the commonest diagnosis in our controls, is associated with a high lifetime incidence of major depression (Sadovnick et al., 1996; Patten et al., 2003). We also did not control for possible differences in experience of the neurology service, for example inpatients versus outpatients. Furthermore, the controls had diseases such as multiple sclerosis, which may be associated with unusual disease specific illness beliefs.

Third, did we suffer from measurement bias? This may have arisen from non-blinding of the interviewer (J.S.) carrying out the structured psychiatric interviews, although these were all discussed and re-rated where necessary. There may have also been a tendency for cases to communicate their desire not to be seen as ‘mentally ill’ in their completion of self-rated questionnaires.

Fourth, were the differences we found between cases and controls reliable? We advised that results between $P<0.01$ and $P<0.05$ should be treated with caution because of the multiple statistical comparisons made. Alternatively, the relatively small sample size may also have led to type 2 false negative errors.

**Conclusion**

Functional weakness is a common presentation to neurologists, usually accompanied by many other symptoms, substantial physical disability, a high frequency of psychiatric disorders and illness related unemployment. Patients with functional weakness generally view their illness in a similar way to patients whose weakness is due to neurological disease, but despite having a more emotional disorder are much less likely to agree that this is a cause of their symptoms. These data are of clinical and potential theoretical relevance to understanding patients with the symptom of functional weakness.

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**Supplementary material**

Supplementary material is available at *Brain* online.

**References**


Reynolds JR. Paralysis and other disorders of motion and sensation dependent on idea. BMJ 1869; i: 483–5.


