

Rating Scale for Psychogenic Movement Disorders: Scale Development and Clinimetric Testing

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Abstract: We developed and tested the clinimetric properties of a scale for psychogenic movement disorders (PMDs). PMDs are disabling but lack any generally accepted treatment strategies. To develop treatments, means of assessing disease severity must be provided. No scale to assess PMDs existed. The PMD scale developed here rates 10 phenomena (rest tremor, action tremor, dystonia, chorea, bradykinesia, myoclonus, tics, athetosis, ballism, cerebellar incoordination), 2 functions (gait, speech), and 14 body regions. To study interrater agreement, three movement disorder neurologists independently rated 88 videotapes of PMD patients. Data analysis was performed using a kappa coefficient of agreement, Kendall's coefficient of concordance, Spearman correlations, and intraclass correlation coefficients. Validity and scale responsiveness were tested as well. All phenomena and speech and gait dysfunction occurred

in the patient sample. A wide range of affected body regions, severity, and incapacitation was captured. Ratings showed excellent interrater reliability for presence or absence of each phenomenon (κ range, 0.63 to 0.86). Kendall's concordance coefficients for phenomenology, function, and total PMD scores were 0.92, 0.93, and 0.91. Spearman correlations between raters ranged from 0.86 to 0.90. The scale was responsive to changes that occurred as a result of a neuropsychiatric intervention. The PMD scale adequately captures the complex movements of PMDs and can be used to assess PMDs and test the efficacy of intervention strategies. © 2005 Movement Disorder Society

Key words: psychogenic movement disorders; rating scale; clinimetric testing

Abnormal movements are among the most frequent symptoms of psychogenic neurological disorders.¹ Psychogenic movement disorders (PMDs) are estimated to account for 2 to 3% of patients in movement disorder clinics.² The term psychogenic is used for those disorders that are not caused by known structural or neurochemical diseases, but the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders³ identifies three pertinent categories: somatoform disorders, factitious disorders, or malingering. PMDs often present with complex movements of various phenomenology, affecting

different body regions, and are a diagnostic and therapeutic challenge for the clinician. Symptoms can mimic the full spectrum of organic abnormal involuntary movements, affect gait and speech, or present as bizarre undifferentiated movements.⁴ PMDs are often disabling but lack any generally accepted treatment strategies. To develop treatments and to monitor the clinical course of these disorders, strategies for assessing disease severity must be developed. To date, no uniform scale is available to assess PMDs. A rating scale must be able to describe and quantify the complicated phenomenology of PMDs to reflect severity of impairment accurately. We developed and tested the clinimetric properties of a scale for PMDs that provides the following six types of information: movement phenomenology, anatomic distribution and severity of abnormal movements, duration of abnormal movements, assessment of two functions (gait and speech), impairment-based incapacitation by abnormal movement or function, and total severity score.

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MATERIALS AND METHODS

Scale Design

The PMD scale rates 10 phenomena (rest tremor, action tremor, dystonia, chorea, bradykinesia, myoclonus, tics, athetosis, ballism, cerebellar incoordination), 2 functions (gait, speech), and 14 body regions (Fig. 1). In part 1 of the scale, each phenomenon is first rated as present or absent. If present, the phenomenon is given a severity grade and duration factor 0 (lowest) to 4 (highest) for each body region. The duration factor rates for how long the phenomenon was present during the observation period and, thus, impacts the total points assigned to each phenomenon. Global Severity and Incapacitation are assessed for each phenomenon and also rated on a 0 to 4 scale. The Global Severity scores describe the predominant severity of a movement phenomenon, which is especially important if multiple different scores are assigned across the regions. Global Incapacitation refers to the question as to how functionally relevant the observed abnormal movement is. Part 2 of the PMD scale rates the presence, severity, duration, and incapacitation of two functions: gait and speech. These particular functions were selected because they are not being reflected by the localizable phenomena in the first part of the scale and yet routinely are assessed in clinical practice and are functionally very important. In an attempt to avoid redundancy, upper extremity functions such as handwriting were not incorporated here, as the first part of the scale already renders information about the upper extremities through phenomenological ratings in arms and shoulders. Total scores for phenomena, functions, and their sum are calculated and documented in part 3 of the scale. The Total Phenomenology Score is calculated as the sum of all severity, duration, and incapacitation ratings of all phenomena across the body regions. We chose to add ratings rather than multiply because multiplication could have led to negating of important findings in the case that one field has a zero value. The Total Function Score is the sum of severity, incapacitation, and duration ratings for the functions gait and speech. The Total Psychogenic Movement Disorder Score represents the sum of the Total Phenomenology Score and the Total Function Score. For reporting frequencies and mean scores, each of the three raters' scores was considered independently.

Study of Interrater Agreement

An investigator (T.C.) otherwise unrelated to the study extracted from the Rush movement disorder videotape database 88 cases diagnosed as PMD by a Rush movement disorder neurologist. These tapes served as primary source material for ratings. Patients were filmed accord-

ing to a standardized video protocol (full-body view, close-up to head, hands, legs, speech, finger-to-nose testing, finger taps, hand movements, heel taps, standing/posture, walking, postural stability). Three movement disorder neurologists independently rated these videotapes using the PMD scale. Interrater reliability was assessed with a generalized kappa coefficient of agreement for PMDs, Kendall's coefficient of concordance, Spearman correlation, and intraclass correlation coefficients (ICC).

Construct Validity Testing

The relation between the PMD scale and an established but nonspecific scale (Clinical Global Impression scale [CGI])⁵ was examined. The CGI is a simple seven-point scale, with a score of 1 indicating "normal" and a score of 7 "extremely ill". The CGI is the most commonly used global impression scale and has been applied for decades in pharmacological trials. Two of the three raters who rated the 88 videotapes using the PMD scale also rated the same tapes using the CGI. Spearman correlations, a weighted kappa coefficient of agreement, and Kendall's coefficient of concordance were computed.

Scale Responsiveness

Scale responsiveness (an index of the scale's capacity to detect change) was demonstrated by ratings obtained by a blinded rater on videos of 9 PMD patients before and after a 3-month treatment intervention. The intervention consisted of psychodynamic psychotherapy and psychiatric medication adjustment and has been reported elsewhere.⁷

RESULTS

Demographics

Ratings were obtained on 63 females and 25 males. There were 74 Caucasian, 11 African-American, 2 Asian, and 1 Hispanic subjects. The mean age was 40.3 years (SD 13.5; range, 14–71 years).

Type of Movements Observed

All phenomena were identified by at least two raters in the patient sample. Action tremor (42%) was the most commonly observed phenomenon, followed by resting tremor (39%), dystonia (32%), bradykinesia (23%), myoclonus (19%), cerebellar incoordination (11%), tics (8%), chorea (7%), athetosis (3%), and ballism (2%). A total of 60% had a gait disorder and 28% had a speech dysfunction (Table 1). Seventy-four percent of subjects exhibited two or more phenomena (1 = 23 subjects; 2 =

Part 1: Phenomena

	Rest tremor	Action tremor	Dystonia	Chorea	Bradykinesia	Myoclonus	Cerebellar	Ballism	Athetosis	Tics
Upper face										
Lips/perioral										
Jaw										
Tongue										
Neck										
Head										
Left shoulder										
Right shoulder										
Left UE										
Right UE										
Left LE										
Right LE										
Trunk										
Other region										
Global severity										
Duration factor										
Global incapacitation										

Part 2: Functions

	Gait disorder	Speech disorder
Severity		
Duration factor		
Incapacitation		

Part 3: Total Scores

1. Total Phenomenology Score	
2. Total Function Score	
3. Total Psychogenic Movement Disorder Score (1+2)	

Severity

0 – none
 1 – minimal
 2 – mild
 3 – moderate
 4 – severe

Duration factor

0 – none
 1 < 25% of the time
 2 - 25-50% of the time
 3 - 50-75% of the time
 4 > 75% of the time

Incapacitation

0 - none
 1 - minimal
 2 - mild
 3 - moderate
 4 - severe

FIG. 1. Psychogenic movement disorders scale.

TABLE 1. *Distribution of phenomena, functions, and involved body regions across subjects*

Phenomenon	Subjects (n)	Body region	Subjects (n)
Action tremor	48	Face and lips	36
Resting tremor	44		
Dystonia	36	Jaw	9
Bradykinesia	26	Tongue	4
Myoclonus	21	Neck	33
Cerebellar	12	Head	27
Tic	9	R shoulder	20
Chorea	8	L shoulder	21
Athetosis	3	R upper extremity	64
Ballism	2	L upper extremity	64
Function		R lower extremity	46
		L lower extremity	44
Gait dysfunction	53	Trunk	33
Speech dysfunction	25	Other	7

30 subjects; 3 = 18 subjects; 4 = 13 subjects; 5 = 2 subjects; 6 = 2 subjects).

Involved Body Regions

The most frequently affected body region was the upper extremities (left and right each 73%), followed by lower extremities (right 52%, left 50%), neck (38%), trunk (38%), head (31%), left shoulder (24%), facial muscles (24%), right shoulder (23%), lips and perioral (17%), jaw (10%), tongue (5%), and other regions combined (8%). See Table 1.

Severity of Movements Observed

The examiner's ratings covered the full range of movement severity and incapacitation (Global Severity ratings: 0 = 24%, 1 = 9%, 2 = 33%, 3 = 29%, 4 = 4%; Global Incapacitation ratings: 0 = 32%, 1 = 13%, 2 = 29%, 3 = 20%, 4 = 6%). Table 2 shows the means for

TABLE 2. *Means for global severity and global incapacitation per phenomenon and function*

Phenomena/functions	Global severity, mean (SD)	Global incapacitation, mean (SD)
Phenomena		
Action tremor	2.33 (0.68)	2.08 (0.77)
Rest tremor	2.37 (2.37)	2.24 (0.93)
Dystonia	2.66 (0.78)	2.6 (0.92)
Bradykinesia	1.98 (0.71)	2.0 (0.75)
Myoclonus	2.32 (0.72)	2.15 (0.70)
Cerebellar incoordination	2.43 (0.93)	2.52 (0.98)
Tics	2.67 (0.84)	2.53 (0.74)
Chorea	2.09 (0.70)	2.0 (0.77)
Athetosis	2.00 (0)	1.67 (0.58)
Ballism	3.25 (0.5)	3.5 (0.58)
Functions		
Gait disorder	2.1 (0.97)	2.3 (1.03)
Speech disorder	1.6 (1.08)	1.6 (1.12)

TABLE 3. *Ratings for total phenomenology, function, and PMD scores and Kendall's concordance coefficient (W), and intraclass correlation coefficient (ICC)*

	Rater 1	Rater 2	Rater 3	Kendall's W	ICC
Total phenomenology score				0.91	0.87
Mean	22.88	22.45	26.59		
SD	15.96	15.89	16.91		
Range	0–72	0–81	0–80		
Total function score				0.93	0.89
Mean	9.87	8.71	10.31		
SD	4.9	2.21	4.32		
Range	0–23	0–19	0–80		
Total PMD score				0.92	0.88
Mean	29.05	27.9	33.03		
SD	19.77	18.56	19.93		
Range	0–92	0–87	0–91		

PMD, psychogenic movement disorder.

global severity and global incapacitation per phenomenon and function, considering only ratings that were greater than 0 (hence, phenomenon/function present).

Interrater Agreement

Physician ratings showed excellent interrater reliability for presence or absence of each phenomenon with perfect agreement among all three raters across all patients and phenomena in 89%. Generalized kappas for presence or absence of the most commonly encountered phenomena and functions were as follows: action tremor 0.86, rest tremor 0.84, gait disorder 0.80, dystonia 0.76, speech disorder 0.72, bradykinesia 0.63, and myoclonus 0.63. There was also a high rate of agreement between raters on ranking patients' overall PMD burden, as measured by the total phenomenology, function, and PMD scores (Table 3). Kendall's concordance coefficients for total phenomenology, function, and PMD scores were 0.91, 0.93, and 0.92, respectively. ICCs were 0.87, 0.89, and 0.88, respectively (Table 3). The ICCs demonstrate that most of the variation in the scores (87–89%) is associated with patient-to-patient variance and is independent of rater-to-rater variation. Spearman correlations for the total PMD scores between the three raters ranged from 0.86 to 0.90.

Construct Validity Testing

CGI ratings of the two raters showed a Spearman correlation of 0.81, compared to 0.90 for total PMD ratings of these two raters. The Spearman correlation of the mean CGI with the mean total PMD score was 0.79.

Scale Responsiveness

Scale responsiveness was demonstrated by blinded evaluation of videotapes of PMD patients before and after a treatment intervention. Nine patients were evaluated, and all nine subjects and their treating physicians had considered that they improved with treatment.⁷ Functional improvement in these patients was also demonstrated by improvement in their Global Assessment of Function (GAF)³ scores. The GAF scale is a clinician-rated instrument that assesses the patient's current and highest level of functioning. The mean total PMD score changed from 71.2 (SD 42.5) before treatment to 29 (SD 20.6) after treatment ($P = 0.020$). The mean PMD function score was 7.4 (SD 6.1) before and 2.1 (SD 3.3) after treatment ($P = 0.014$).

Scale Utility

The scale was easy to use, and scale administration time equaled the duration of each videotape (range, 4–7 minutes). Videos did not have to be watched repetitively to complete the scale.

DISCUSSION

The scale captured the broad phenomenological breadth, variable severities, and functional impairments due to psychogenic movement disorders. It reflects anatomic distribution, phenomenology, duration, and incapacitation. Although the patient sample was derived from a single movement disorder referral center, the case series covered the full range of phenomena, body regions, and severity ratings and, therefore, provided an excellent basis for clinimetric testing of the scale. Our patient sample also confirmed the necessity for the PMD scale to address a variety of movement phenomena, as 74% of subjects presented with a mixed phenomenology and all phenomena were seen in this sample. Abnormal movements were found in all the body regions addressed by the PMD scale across the 88 subjects. The proposed scale was found to be applicable to the demands of complex PMDs but also appropriate for single movement disorders, as ratings in that case would be reduced to marking only one column. The PMD scale, therefore, has the advantage over existing scales for isolated phenomena (such as a tremor rating scale) of being able to be used for the whole spectrum of PMDs encountered in clinical practice. As the underlying psychiatric diagnosis (somatoform disorder) is the same independent of the movement phenomenology, we believe that a single scale should be used to rate these patients. The scale proved easy to use and did not require repeated viewing of the videotapes.

To be clinically useful in the assessment and monitoring of patients, a scale must be both reliable and valid.⁶ Interrater reliability refers to the consistency between independent examiners to rate patients similarly and was high between the 3 independent raters in this study.

Validity testing is carried out to answer the question of whether a scale measures what it is intended to measure. Content validity testing, the examination of the rationale for the new measure,⁶ was carried out before designing the PMD scale through an examination of the literature on phenomenological presentation of PMDs and neurological rating scales. The literature search demonstrated that there is no scale to rate PMDs. Existing scales for abnormal involuntary movements such as the Abnormal Involuntary Movements Scale (AIMS)⁵ were reviewed but were found to be inadequate for rating PMD. The AIMS scale for example does not provide any information on the type of movement observed and also over-emphasizes the lingual–facial–buccal regions having been originally developed for rating tardive dyskinesias. The highly variable phenomenology and anatomic distribution of PMDs cannot be captured with any of the existing scales. Criterion-related validity, the degree to which a measure correlates with a gold standard, cannot be tested for the PMD scale, because there is no comparison scale. Therefore, construct validity testing was carried out, which refers to the relation between the PMD scale and a more nonspecific but established clinical measure: the CGI Scale. There are no clinimetric data available for the CGI scale, but it has been widely used since its description in 1976. It is used in nearly all antidepressant, antipsychotic, and anxiolytic medication trials. The CGI is a simple scale with minimal guidelines involved and has been used under the assumption that clinicians are able to make appropriate clinical inferences. Despite the more complex nature of the new PMD scale, the interrater agreement was higher using the PMD scale than the CGI (Spearman correlation PMD 0.90 versus Spearman correlation CGI 0.81). Because of the broader range in the scoring system (total PMD score range, 0–128; CGI score range, 0–7), the PMD scale is more sensitive to small changes than the CGI. A Spearman correlation of 0.79 between the two scales confirms that the PMD scale indeed quantifies the impact of the movements and is a valid measure of severity.

Another pivotal step for practical utilization of a scale is its responsiveness; an index of a scale's capacity to detect change, either over time or due to a therapeutic intervention. Scale responsiveness was excellent, as demonstrated by its ability to reflect change in our intervention study for PMDs.

We consider it useful to assess PMDs and to test the efficacy of intervention strategies. PMDs continue to be a therapeutic challenge, leaving both the disorder and its associated rating scale rich resources for future research.

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