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The modified gait abnormality rating scale in patients with a conversion disorder: A reliability and responsiveness study

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ABSTRACT

Individuals with conversion disorder have neurologic symptoms that are not identified by an underlying organic cause. Often the symptoms manifest as gait disturbances. The modified gait abnormality rating scale (GARS-M) may be useful for quantifying gait abnormalities in these individuals. The purpose of this study was to examine the reliability, responsiveness and concurrent validity of GARS-M scores in individuals with conversion disorder. Data from 27 individuals who completed a rehabilitation program were included in this study. Pre- and post-intervention videos were obtained and walking speed was measured. Five examiners independently evaluated gait performance according to the GARS-M criteria. Inter- and intrarater reliability of GARS-M scores were estimated with intraclass correlation coefficients (ICCs). Responsiveness was estimated with the minimum detectable change (MDC). Pre- to post-treatment changes in GARS-M scores were analyzed with a dependent *t*-test. The correlation between GARS-M scores and walking speed was analyzed to assess concurrent validity. GARS-M scores were quantified with good-to-excellent inter- (ICC = 0.878) and intrarater reliability (ICC = 0.989). The MDC was 2 points. Mean GARS-M scores decreased from 7 ± 5 at baseline to 1 ± 2 at discharge ($t_{26} = 7.411$, $p < 0.001$) and 85% of patients improved beyond the MDC. Furthermore, GARS-M scores and walking speed measurements were moderately correlated ($r = -0.582$, $p = 0.004$), indicating that the GARS-M has acceptable concurrent validity. Our findings provide evidence that the GARS-M scores are reliable, valid and responsive for quantifying gait abnormalities in patients with conversion disorder. GARS-M scores provide objective measures upon which treatment effects can be assessed.

1. Introduction

Conversion disorder, also known as functional neurological symptom disorder, is characterized by one or more symptoms of altered voluntary motor or sensory function in which clinical findings are incompatible with recognized neurologic conditions [1]. The annual incidence is estimated to be 2–5 cases per 100,000 [2,3]. Motor symptoms often include movement, limb posturing, and gait abnormalities. Individuals with a conversion disorder do not intentionally produce their symptoms, but the symptoms may be caused or exacerbated by psychological conflicts or stressors [4] and interfere with the individual's social, educational, and work activities. Given the effects of conversion disorders, for those who present with gait abnormalities, it is critical that objective measures be utilized to quantify the gait abnormalities so interventions can be directed at improving the symptoms.

Walking speed, for example, is a reliable and valid measure of gait that is touted as a vital sign for function [5]. Walking speed, however, examines only one aspect of gait whereas individuals with a conversion disorder often present with movement abnormalities that affect numerous aspects of gait [6]. Impaired walking speed, furthermore, provides little information to direct treatment for these individuals. Therefore, it is important to assess gait in affected individuals with an outcome measure that examines a variety of characteristics. One instrument that may serve that purpose is the modified gait abnormality rating scale (GARS-M) [7], adapted from Wolfson's gait abnormality rating scale [8], which was originally developed to predict risk of falling among older persons. The instrument incorporates evaluations of seven items, each scored by way of a 4-point ordinal scale, that

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mark characteristics of abnormal gait (Table 1). Those items include evaluations for variability, guardedness, staggering, foot contact, hip range of motion, shoulder extension and arm-heel strike synchrony. Scores from each item are summed to provide a total GARS-M score. GARS-M scores obtained by physical therapists are reported to have inter-rater reliability coefficients that exceed 0.90 with older adults [7] and that exceed 0.85 in persons with intellectual disabilities [9], though reliability and responsiveness indices in other populations have not been reported. The facets of gait abnormality included in the GARS-M may be appropriate to assess in persons with a conversion disorder in order to quantify their gait abnormalities, to direct treatment strategies and to use as an outcome measure to assess the effectiveness of intervention.

The purpose of this study was to evaluate clinimetric properties of GARS-M scores obtained by physical therapists in individuals with a conversion disorder. Specifically, we aimed to (1) estimate inter- and intrarater reliability coefficients of GARS-M scores, (2) quantify the minimum detectable change of GARS-M scores to establish an index of the instrument's responsiveness, (3) examine pre- to post-intervention changes in GARS-M scores among a sample of affected individuals who sought treatment at our institution and (4) assess concurrent validity by examining the association between GARS-M scores and walking speed measurements.

Table 1
Modified gait abnormality rating scale.

Variability – a measure of inconsistency and arrhythmicity of stepping and arm movements.
0 = fluid and predictably paced movements.
1 = occasional interruptions (change in velocity), <25% of time.
2 = unpredictability of rhythm 25%–75% of time.
3 = random timing of limb movements.

Guardedness – hesitancy, slowness, diminished propulsion or commitment to stepping and arm swing.
0 = good forward momentum and lack of apprehension in propulsion.
1 = COM of HAT projects only slightly in front of push-off, good arm-leg action.
2 = HAT held over anterior aspect of foot and some loss of smooth reciprocation.
3 = HAT held over rear aspect of stance phase foot and tentativeness in stepping.

Staggering – sudden and unexpected lateral partial losses of balance.
0 = no losses of balance to side.
1 = a single lurch to side.
2 = two lurches to side.
3 = three or more lurches to side.

Foot contact – degree to which heel strikes ground before forefoot.
0 = very obvious angle of impact of heel on ground.
1 = barely visible contact of heel before forefoot.
2 = entire foot lands flat on ground.
3 = anterior aspect of foot strikes ground before heel.

Hip range of motion – degree of loss of hip ROM seen during gait cycle.
0 = obvious angulation of thigh backward during double support (10°).
1 = just barely visible angulation backwards from vertical.
2 = thigh in line with vertical projection from ground.
3 = thigh angled forward from vertical at maximum posterior excursion.

Shoulder extension – measure of the decrease of shoulder ROM.
0 = clearly seen movement of upper arm anterior (15°) and posterior (20°).
1 = shoulder flexes slightly anterior to vertical axis.
2 = shoulder comes only to vertical axis, or slightly posterior to it during flexion.
3 = shoulder stays well behind vertical axis during entire excursion.

Arm-heel strike synchrony – extent to which the contralateral movements of an arm and leg are out of phase.
0 = good temporal conjunction of arm and contralateral leg.
1 = arm and leg slightly out of phase 25% of time.
2 = arm and leg moderately out of phase 25%–50% of time.
3 = little or no temporal coherence of arm and leg.

Source: adapted from Van Swearingen et al. (1996).

2. Methods

2.1. Participants

Establishing a clinically desirable reliability coefficient of 0.80 or greater relative to a minimally acceptable reliability coefficient of 0.50 requires 22 participants, assuming that each participant is measured twice, e.g., by two independent investigators or by a single investigator over two occasions [10]. We conservatively captured data from 27 participants to examine inter-rater and intrarater reliability of the GARS-M scores. Data were captured from a consecutive sample of patients who were treated in our clinic from May through December of 2013.

The following inclusion criteria determined eligibility: (1) age 18 or older, (2) diagnosis of a conversion disorder by a neurologist according to the criteria of Fahn and Williams [11], (3) completion of diagnostic testing deemed appropriate by physicians prior to being referred to the Physical Medicine & Rehabilitation (PM&R) Department at our institution, and (4) completion of a five-day multidisciplinary outpatient behavioral shaping therapy (BeST) program. Principles of the BeST program are described in detail elsewhere [6,12]. Briefly, once patients were referred to PM&R they were evaluated by a psychiatrist or psychologist and then participated in physical and occupational therapy twice-daily for five consecutive days. The physical therapy program focused on establishing normal movement patterns while ignoring abnormal movements. The motor reprogramming process began with establishing elementary movements in the affected limbs and was advanced by gradually introducing more complex movements. Positive gains were verbally reinforced and attention to abnormal movements was minimized. Participants were excluded from the study if their diagnosis was unclear or their episodes of care departed from the basic principles of the BeST protocol. There were no exclusion criteria for gender or minority populations for this study. Participants who met the inclusion criteria were sampled consecutively, thus the gender mix was determined by whoever participated in the BeST program prior to commencing this investigation.

All participants provided written informed consent. The research protocol was reviewed and approved by the Mayo Foundation Institutional Review Board to ensure the rights and well-being of the participants were adequately protected.

2.2. Raters

Five raters participated in this study. One was a licensed physical therapist with 6 years of experience who served as the institution's lead physical therapist in the outpatient neurologic practice and four raters were second-year physical therapy students. The lead physical therapist was experienced treating patients with conversion disorder according to the principles of the BeST program and was experienced with both quantitative and qualitative gait analyses, though he was not an experienced user of the GARS-M instrument prior to the study. The raters participated in a one-hour training session prior to assessing the videos used in the study under the guidance of the mentoring author, who was experienced with the GARS-M instrument. During the training session, the raters viewed pre-existing video from one patient who was not a participant in the study, used slow-action and stop-motion modes in the video player as necessary, and discussed the scoring of each item in the GARS-M until they came to mutual agreement on the score.