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# Convergent and divergent validity of the Gordon Diagnostic System in adults

Noelle E. Carlozzi [a,b,c,*], Michael David Horner [b,c]

[a] *Department of Psychological and Brain Sciences, Indiana University, 1101 East Tenth Street, Bloomington, IN 47405, United States*
[b] *Ralph H. Johnson Department of Veteran Affairs Medical Center, 109 Bee Street, Charleston, SC 29401, United States*
[c] *Medical University of South Carolina, Charleston, SC, United States*

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**Abstract**

The present study examined the convergent and divergent validity of the Gordon Diagnostic System (GDS) as a measure of attention in adults by examining correlations between GDS scores and scores on other attentional and non-attentional measures in 77 veterans (4 women and 73 men) referred for neuropsychological evaluation. Scores on the GDS were neither significantly correlated with scores on other attentional nor non-attentional measures. Participants were then divided into two groups, those who scored lower (<1S.D. below the published normative mean) and higher on the GDS for the Vigilance and Distractibility tasks separately. Participants with lower GDS scores on the Vigilance task performed more poorly on the Trailmaking Test, Part B than those with higher GDS scores. There were no other group differences on tests of attentional or non-attentional functions. These results do not provide strong support for the convergent and divergent validity of the GDS as a measure of attention in adults.


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The Gordon Diagnostic System (GDS; Gordon, 1983, 1987) is a computerized measure of sustained and focused attention that is often used in the assessment of children and adults. There are two adult tasks: Vigilance, in which participants respond by pushing a button only when a specified sequence of numbers appears on the screen, but not to distractor items; and Distractibility, which is identical except that extraneous numbers appear elsewhere on the screen during the task. While several studies have examined the reliability and validity of the GDS in pediatric samples (Aylward, Verhulst, & Bell, 1988; DuPaul, Anastopoulos, Shelton, Guevremont, & Metevia, 1992; El-Sayed et al., 1999; Gordon & Mettelman, 1988; Grant, Ilai, Nussbaum, & Bigler, 1990; Grodzinsky & Barkley, 1999; Mayes & Calhoun, 2002; Mayes, Calhoun, & Crowell, 2001; Rielly, Cunningham, Richards, Elbard, & Mahoney, 1999; Wherry et al., 1993), few have done so in adult samples (Burg, Burright, & Donovick, 1995; Horner, Teichner, Waite, & Harvey, 2000; Rasile, Burg, Burright, & Donovick, 1995).

The three studies that have examined the GDS in adult samples have demonstrated some preliminary support for its concurrent validity. Rasile et al. (1995) examined correlations among scores on the GDS (Standard Delay Correct: a

* Corresponding author. Tel.: +1 812 855 0318; fax: +1 812 856 3659.
*E-mail addresses:* ncarlozz@indiana.edu (N.E. Carlozzi), hornermd@musc.edu (M.D. Horner).

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measure of response inhibition; Vigilance Correct and Distractibility Correct) and other measures of attention including subtests from the WAIS-R (including Digit Span, Arithmetic and Digit Symbol), Kagan's Matching Familiar Figures (a measure of sustained attention), and the Stroop Color-Word Interference Task. Results provided some support for the convergent validity of the GDS (specifically Standard Delay Correct and Distractibility Correct) with other measures of attention, although correlations in this study were weak. The lack of significant relationships between GDS Vigilance Correct and other measures of attentional function was attributed to the restricted range of performance (or ceiling effect) on this task (e.g., most participants earn perfect or near-perfect scores on this task).

Burg et al. (1995) also examined the convergent validity of total correct and error commission scores from the GDS (Vigilance, Distractibility, and Standard Delay) with other measures of attentional function (Arithmetic subtest from the WAIS-R, Stroop, Digit Span Backwards from the WAIS-R, Paced Auditory Serial Addition Test, Digit Symbol from the WAIS-R, and the Recanti Time Estimation Task) in adults with traumatic brain injury and a non-injured control group. Results suggested moderate correlations of the GDS tasks with the other measures of attentional function, although patterns of correlations differed for brain-injured versus non-injured participants. Taken together these results provide support for the convergent and discriminant validity of the GDS.

Horner et al. (2000) found limited support for the convergent and divergent validity of the GDS in a sample of 42 male substance abuse outpatients. Pearson correlations demonstrated significant relationships between Vigilance Correct and Mental Control (WMS-R), Stroop Word, Stroop Interference, Trails A and B, and between Distractibility Correct and Trails A and B. Significant relationships were not found with other measures of attentional function including Digit Span, Stroop Color, and the Symbol Digit Modalities Test. There were also unexpected correlations with measures of memory and executive function.

The primary purpose of this paper was to examine the relationship between performance on the GDS and other measures of attentional function. We hypothesized significant relationships between scores on GDS Vigilance and Distractibility with scores on other measures of attentional function, but not with scores on measures of other domains of function (general intellectual functioning, executive functions, memory, language, and visuospatial functions). Relationships between scores on the GDS and measures of depression, anxiety, and other demographic variables were also examined to ensure that significant findings could not be solely attributed to such confounding variables. Thus, the purpose of the present study was to examine relationships among scores on the GDS and on other attentional and non-attentional measures. The utility of the GDS in diagnosing ADHD or other disorders was not addressed.

## 1. Method

### *1.1. Participants*

Eighty-three veterans referred for clinical neuropsychological assessment at a southeastern VA medical center were administered the GDS as part of their clinical evaluation. Six participants were eliminated due to insufficient effort during testing: three participants for failing the Test of Memory Malingering (Tombaugh, 1996), two for failing the Portland Digit Recognition Test (Binder, 1993) and one for questionable motivation as tasks became more demanding (determined by clinical judgment at the time of the assessment). Otherwise, all consecutively referred patients who had been administered the GDS (4 women and 73 men) were included in this study. One of these participants was administered only the Vigilance task only, while all others were administered both the Vigilance and Distractibility tasks from the GDS. All participants were referred, at least in part, for an evaluation of potential attention deficits. Primary referral sources were Primary Care, Neurology and Mental Health Services. Participants ranged in age from 21 to 67 years (mean = 40.6, S.D. = 12.1). The majority of participants were Caucasian (87.0%), with 6.5% African American and 5.2% of other racial groups (due to missing data, numbers do not sum to 100%). Participants' education ranged from 8 to 19 years (mean = 13.2 years, S.D. = 2.1). On the basis of this evaluation, and not previous assessments by other hospital personnel, patients received clinical diagnoses. While many participants in our study received cognitive diagnoses including ADHD (29.9%), learning disorder (13%) or cognitive disorder (5.2%) diagnoses, 16.9% did not receive a clinical diagnosis and 2.6% were inconclusive. Further, many participants did not exhibit objective attention difficulties and instead exhibited psychiatric problems including mood disorders (46.8%), substance use disorders (19.5%), anxiety disorders (19.5%), personality disorders (6.5%), and psychotic disorders (2.3%; percentages do not sum to 100 because some participants were given multiple diagnoses). Many participants were also characterized by