

Leadership Education in Neurodevelopmental Disabilities (LEND) Program
Westchester Institute for Human Development
University Center for Excellence in Developmental Disabilities
And
New York Medical College
Team Project Abstract
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Title: The Childhood Autism Rating Scale: An Examination of Concurrent and Predictive Validity

Authors: Gerald Jones, Ph.D, Brianne Maranino, Liz Marcus, and Kelsey Smith, *LEND Trainees*; Patricia O. Towle, Ph.D, *Team Mentor*

Proposal Description: The prevalence rates for ASD are high and increasing, according to the Centers for Disease Control (CDC), making the need for early detection and intervention crucial. Therefore, accurate tools for early detection of ASD are of great importance. This study investigates the Childhood Autism Rating Scale (CARS, now the CARS-2), which was the first objective measurement developed for evaluating autism (in 1971) and is still widely used clinically and in research. The CARS consists of 15 items rated by a trained clinician and yields a single, total score. More current diagnostic tools, including the DSM-5, however, conceptualize ASD as having multiple domains of symptoms, including social, communication, and repetitive behavior symptom domains. We wondered if we could update the CARS by re-arranging its items into subscales to reflect more current models of symptom domains as seen in the DSM-5. We did this through creating CARS subscales through three different strategies then evaluating concurrent and predictive validity.

Objectives: **1.** Create CARS subscales using three different strategies; **2.** Test concurrent validity of CARS subscales scores; **3.** Test predictive validity of CARS subscales scores.

Method: As part of an ongoing study, the team had access to 208 early intervention charts of children identified with ASD before age 3 years (Time 1). They also had the data from 56 of these children whose parents participated in a longitudinal study by filling out questionnaires when their child was school-age (Time 2). Data accessed at Time 1 included CARS Total Scores, individual CARS items scores, and Vineland Adaptive Behavior Scales. From Time 2: Gilliam Autism Rating Scales (GARS) scores and Vineland Adaptive Behavior Scales scores.

Objective 1. Three different sets of CARS subscales were created. The first was derived from our own data set: correlations were examined on Time 1 CARS items, yielding 4 subscales: Social Communication; Stereotypies; Negative Emotion; Activity and Fear. The second set was taken from a previous study that created subscales through factor analysis. The third we created by logically matching up CARS items to the two DSM-5 symptom domains described in the 2013 manual. **Objective 2.** We correlated Time 1 CARS Total and subscale scores with Time 1 Vineland total and subdomain scores to see if patterns of correlations were logical. **Objective 3.** We first correlated Time 1 CARS Total and subscales scores with Time 2 Vineland total and subdomain scores to see if they were similar to results of Objective 2. Secondly, we correlated Time 1 CARS scores with Time 2 GARS (a measure of autism severity) to see if early CARS accurately predicted a parent-rated autism severity scale at school-age.

Community Partners: Early Intervention Program, Westchester County Department of Health

Results: Objective 1. Across the three strategies, the items that were included on subscales were not very consistent, although each strategy created subscales that reflected the general areas of social and communication and stereotyped behaviors, and in some instances emotional over-reactivity and hyperactivity. One notable outcome was that when trying to assign CARS items to the DSM-5 constructs, very few matched up to the Social-Communication symptom domain, while the majority matched to the Repetitive Behaviors symptom domain.

Objective 2. The first relevant finding was that in fact the CARS Total score produced the most significant correlations with Vineland scores, suggesting that creating subscales did not add much more predictive value to concurrent adaptive behavior when children were 16 to 36 months old. Some subscales from Strategy 1 (our own subscales) and Strategy 2 (subscales from a previous factor analytic study) did correlated significantly, and the extent to which they did was related to the particular individual items that fell on those subscales. The third notable finding was that the DSM-5 subscale strategy produced no significant correlations.

Objective 3. The first notable finding was that the pattern of significant correlations completely changed when the Time 1 CARS was used for future prediction rather than concurrent relationships. Now the CARS Total provided no significant prediction, and the Time 1 CARS subscales reflecting hyperactivity, dysregulated behavior and emotions, and stereotyped behavior correlated the most highly with Vineland subdomains (which reflect adaptive behavior and general developmental competence rather than autism). Most surprising was that a single CARS item—Hyperactivity—had very high correlations above all other Time 1 items. The second set of findings for this objective was related to the ability of a Time 1 autism symptom severity measure (the CARS) to predict a Time 2 autism symptom severity measure (the GARS). The notable finding here was that the strongest predictions were to the GARS Stereotyped behavior subscale rather than others such as Communication and Social. This may be related to the previous observation that the CARS seems to have a preponderance of repetitive/stereotyped symptom items rather than social-communication items. As before, the DSM-5 derived subscales produced no significant predictive results for the GARS.

Conclusion and Next Steps: In an attempt to “update” the Childhood Autism Rating Scale by creating subscales to reflect more current multi-domain conceptualizations of ASD diagnostic structure, the findings were mixed. First, determining clear subscales that reflected an unambiguous construct was not easy to do. Notably, we found that the CARS did not represent social-communication behaviors across a number of items, but instead seemed to combine it in a single “Relating to People” item; for this reason, many more items fell on the DSM-5 symptom domain of Repetitive Behaviors. In correlating the CARS Total and different subscales to Vineland Adaptive Behavior Scales scores that were collected on the children during the same evaluations that the CARS was (when the children were in Early Intervention), the CARS Total produced the most significant correlations, possibly because its increased reliability due to having more items on it (compared to shorter subscales). However, the direction of the associations made intuitive sense, since the negative correlations reflected that as autism severity went up, adaptive and developmental functioning went down. For the predictive validity phase of the study, results suggested that the CARS items reflect behavior that means something different when children are infants and toddlers compared to when they get to be school age. Extent of behavioral and emotional dysregulation, and hyperactivity (which is a type of behavioral dysregulation) seems to exert significant and long-lasting effects in terms of degree of disability and need for support. The predictive correlation patterns also appeared to reflect the degree to which the CARS items relatively neglect social and communication items.