



The Importance of Defining Shared Criteria for the Diagnosis of Nonverbal Learning Disability

Irene C. Mammarella, PhD

The interest in nonverbal learning disability (NVLD) has increased during the past several years. NVLD is a relatively unknown neurodevelopment disorder characterized by visuospatial difficulties, such as problems in learning or encoding through pictures, processing gestures or motor patterns, and orienting in space. Children with NVLD usually have good verbal abilities and a refined vocabulary but can develop emotional difficulties.¹ The fact that NVLD is still nearly unknown is demonstrated by its absence in the international classification systems.

Margolis et al² aimed to estimate the prevalence of NVLD by using 3 large data sets available in the US and Canada. The following criteria were used to estimate the prevalence of the disorder: a discrepancy between verbal and perceptual abilities of 15 points or more and intact single-word reading abilities. In addition, patients have to have deficits in at least 2 domains among fine-motor skills, math calculation, visual executive functioning, or social skills. Also, they could not meet the criteria for autism spectrum disorder (ASD). After having applied sample and inflation weights, the authors estimated that a range of approximately 3% to 4% of patients had NVLD.

To my knowledge, this study was the first to attempt to estimate the prevalence of NVLD by using a large pool of data, and it is a significant contribution that sheds further light on the importance of increasing systematic research in this field. Although researchers have made a remarkable effort in recent years to define and study children with NVLD,^{3,4} the greater limitation of the study by Margolis et al² is that the prevalence has been estimated in the absence of explicit and consistent criteria for the diagnosis of the disorder.⁵ The authors used some of the most common criteria previously used in the literature; however, visuospatial deficits were only estimated by using the Wechsler Intelligence Scale, with a discrepancy between verbal and visuo-perceptual indexes. However, in their research, Semrud-Clikeman et al³ compared children with NVLD with children who had ASD or attention-deficit/hyperactivity disorder and with typically developing children on several neuropsychological tasks. They found that the children with NVLD had more impairment than did those with ASD or attention-deficit/hyperactivity disorder on measures of visuoconstructive skills, such as the Visual-Motor Integration Test⁶ and the Rey Complex Figure Test, and on measures of visual perception, such as the Judgment of Line Orientation Test.⁷ Mammarella et al⁸ used visuoconstructive (such as the Rey complex figure test) and visuospatial working memory tasks to differentiate between NVLD and ASD. Of importance, the groups with NVLD and ASD had similar full-scale IQ and visuo-perceptual reasoning index of the Wechsler scales; thus, differences in the experimental tasks could not be attributable to a low overall or visuospatial intelligence in the group with NVLD. The results revealed that performance in the group with NVLD was worse in both the visuospatial domains examined (ie, visuoconstructive and visuospatial working memory tasks), suggesting the importance of examining in-depth visuospatial processing skills (not only visuo-perceptual reasoning) to differentiate these disorders. Rourke's criteria for defining children with NVLD were based on the discrepancy between verbal and visuospatial intelligence; however, this approach has been criticized by other researchers.^{9,10} Among the problems related to this criterion is the weakness of a discrepancy criterion. Within the diagnostic criteria for a corresponding verbal disorder (eg, the specific language disorder), the Verbal Intelligence Index is not required to be particularly low. Thus, it is possible that by using measures of visuospatial processing (and not a

+ Related article

Author affiliations and article information are listed at the end of this article.

discrepancy between verbal and visuospatial reasoning indexes), the prevalence of NVLD could change in the population.

Another point to consider in estimating the prevalence of NVLD is motor functioning in these children. As suggested by Poletti,¹⁰ further support regarding the independence between visuospatial and motor coordination abilities is needed. To our knowledge, no studies have compared children with NVLD with those with developmental coordination disorder. Although children with NVLD typically have fine-motor skill problems, to date, no data are available on their gross motor skill abilities or possible comorbidities with the developmental coordination disorder.

In summary, the study by Margolis et al² added crucial data about the estimated prevalence of NVLD and serves as an incentive to making progress in the study of this disorder. However, those estimates should be repeated once shared criteria are met. Until now, the lack of clearly defined criteria has impeded research and clinical applications, but a consensus is needed for moving forward in the recognition of NVLD for many reasons. First, for research purposes, the results of different studies should be compared. Shared criteria could allow the determination of how the disorder is associated with social, academic, and emotional development across the lifespan and aid in the development of specific interventions to help individuals with NVLD. Second, but no less important, shared criteria could ensure that children with NVLD are correctly identified and do not receive misdiagnoses of other disorders. A misdiagnosis may have severe negative consequences, creating confusion and uncertainty for families, teachers, and children. The diagnostic category is usually crucial to the choice of the most appropriate intervention because an imprecise diagnosis prompts the adoption of measures intended for other disorders.¹ A definitive recognition of NVLD in the international classification systems is not only important to further our knowledge but also particularly essential to help clinicians, teachers, and families.

ARTICLE INFORMATION

Published: April 10, 2020. doi:10.1001/jamanetworkopen.2020.2559

Open Access: This is an open access article distributed under the terms of the [CC-BY License](#). © 2020 Mammarella IC. *JAMA Network Open*.

Corresponding Author: Irene C. Mammarella, Department of Development and Social Psychology, University of Padova, Via Venezia 8, 35131 Padova, Italy (irene.mammarella@unipd.it).

Author Affiliation: Department of Development and Social Psychology, University of Padova, Padova, Italy.

Conflict of Interest Disclosures: None reported.

REFERENCES

1. Cornoldi C, Mammarella IC, Fine JG. *Nonverbal Learning Disabilities*. Guilford Press; 2016.
2. Margolis AE, Broitman J, Davis JM, et al. Estimated prevalence of nonverbal learning disability among North American children and adolescents. *JAMA Netw Open*. 2020;3(4):e202551. doi:10.1001/jamanetworkopen.2020.2551
3. Semrud-Clikeman M, Walkowiak J, Wilkinson A, Christopher G. Neuropsychological differences among children with Asperger syndrome, nonverbal learning disabilities, attention deficit disorder, and controls. *Dev Neuropsychol*. 2010;35(5):582-600. doi:10.1080/87565641.2010.494747
4. Mammarella IC, Ghisi M, Bombà M, et al. Anxiety and depression in children with nonverbal learning disabilities, reading disabilities, or typical development. *J Learn Disabil*. 2016;49(2):130-139. doi:10.1177/0022219414529336
5. Mammarella IC, Cornoldi C. An analysis of the criteria used to diagnose children with nonverbal learning disability (NLD). *Child Neuropsychol*. 2014;20(3):255-280. doi:10.1080/09297049.2013.796920
6. Beery KE, Buktenica NA. *VMI: Developmental Test of Visual-Motor Integration*. 5th ed. Pearson; 2006.
7. Benton AL, Sivan AB, Hamsher KD, Varney NR, Spreen O. *Contributions to Neuropsychological Assessment*. Psychological Assessment Resources; 1994.
8. Mammarella IC, Cardillo R, Zocante L. Differences in visuospatial processing in individuals with nonverbal learning disability or autism spectrum disorder without intellectual disability. *Neuropsychology*. 2019;33(1):123-134. doi:10.1037/neu0000492

9. Spreen O. Nonverbal learning disabilities: a critical review. *Child Neuropsychol*. 2011;17(5):418-443. doi:10.1080/09297049.2010.546778
10. Poletti M. A research framework to isolate visuospatial from childhood motor coordination phenotypes. *Appl Neuropsychol Child*. 2019;8(4):383-388. doi:10.1080/21622965.2018.1455583