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Regional Comparison Study Using the DASH-2

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Abstract

The DASH-2 was published in 2024 and standardized using normative data that were collected in Australia, New Zealand, and the United Kingdom. To support the validity of the DASH-2 norms for individuals living in the United States, mean performance on the DASH-2 was compared between a sample of individuals in the United States (*N*=56) and a matched control group from the DASH-2 normative sample. Performance on the DASH-2 task and total scores did not differ significantly between groups. These findings support the valid use of the DASH-2 norms for individuals residing in the United States.

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Contents

The *Detailed Assessment of the Speed of Handwriting* (2nd ed.; DASH-2; Barnett et al., 2024a) is a reliable measure of handwriting speed and legibility for children and young adults ages 8–25. The DASH-2 includes four core tasks (Copy Best, Alphabet Writing, Copy Fast, and Free Writing) and a Graphic Speed task. Data from the DASH-2 can be used to identify individuals with handwriting difficulties, support eligibility determination for extra supports or accommodations, provide a detailed description of handwriting performance, monitor and evaluate progress and intervention effectiveness, and aid research.

The DASH-2 was published in 2024 and standardized using normative data that were collected in Australia, New Zealand, and the United Kingdom. The multi-region approach to data collection follows a common practice of standardizing tests across cultures where appropriate; for instance, in the DASH-2 normative sample, all regions use Roman/Latin alphabet letter forms (International Test Commission, 2001). The DASH-2 data were compared and found to be similar across these regions. These findings suggest that the DASH-2 may be used to provide valid scores in these and other comparable countries.

A post-publication study was conducted to further validate the appropriate use of the DASH-2 for individuals living in the United States. The primary objective of this matched control study was to determine if individuals in the United States performed similarly to individuals from the DASH-2 normative sample (residing in Australia, New Zealand, and the United Kingdom). Because the DASH-2 scoring is focused on speed and overall legibility rather than exact letter formation, it is not impacted by regional differences in spelling rules and variations in handwriting style (e.g., print, cursive). Hence, this study tested the null hypothesis that there are no significant differences in performance across regions. Results were expected to inform the valid use of the DASH-2 in the United States.

Description of the Samples

DASH-2 data from a sample of 56 individuals residing in the United States were collected as part of the development of the Bruininks-Oseretsky Test of Motor Proficiency (3rd ed.; BOT-3; Bruininks & Bruininks, 2024a). See the *BOT-3 Examiner Manual* (Bruininks & Bruininks, 2024b) for details on participant recruitment and data collection. Participants were excluded from the sample if they had diagnosed conditions that would impact fine motor and/or handwriting performance.

Table 1 summarizes the demographic characteristics of the U.S. sample. Mean age of the participants was 13.5 (range: 8–25), 51.8% were male, and a majority of the sample (55.4%) was White. Consistent with the BOT-3 data collection approach, education level for participants was based on the highest education level attained by the participant's mother or female guardian, if available/applicable; otherwise, the primary guardian's education level was used. The education level for a majority of the U.S. sample was at least a high school education, with 41.4% reporting having attained a bachelor's degree or higher.

A subsample of DASH-2 cases from the Australia, New Zealand, and U.K. normative sample were matched to the U.S. sample based on age, sex, and parent/caregiver education level. See the *DASH-2 Administration and Scoring Manual* (Barnett et al., 2024b) for details on participation recruitment and data collection. The highest level of parent education for participants across all four countries was grouped into four levels. The specific qualifications at each level varied by country according to their educational systems (see DASH-2 manual for details); however, the four levels were generally defined as follows: (1) senior secondary school certificate not completed, nor any higher levels of education; (2) completion of senior secondary school certificate or equivalent; (3) completion of nonuniversity tertiary qualification, including higher level vocational education and training and preuniversity level diploma/certificates; and (4) completion of bachelor's degree or any high level graduate degree, certificate, or diploma. For matching purposes,

the education levels for the U.S. sample (originally collected using three levels, as reported in Table 1, for the BOT–3 project) were split into four levels for consistency with the Australia, New Zealand, and U.K. (UK/AU/NZ) sample.

Table 1. Demographic Characteristics of the U.S. Sample

	U.S. Sample
N	56
Age	
Mean	13.5
SD	4.2
Range	8–25
Education	
0–12 years of school, no diploma	3.6
High school diploma or equivalent; some college or technical school, associate's degree	55.4
Bachelor's degree	41.1
Race/ethnicity	
African American	7.1
Asian	3.6
Hispanic	30.4
Other	3.6
White	55.4
Region	
Midwest	11.1
Northeast	33.3
South	46.3
West	9.3
Sex	
Female	48.2
Male	51.8

Results

Table 2 presents the results of the study comparing DASH-2 performance in a nonclinical sample from the United States compared to a matched control sample comprised of nonclinical individuals in the United Kingdom, Australia, and New Zealand. The table lists the group performance means and SDs and the difference statistics including effect size for the Total Score, four core tasks (Copy Best, Alphabet Writing, Copy Fast, and Free Writing), and Graphic Speed.

The mean scores for both groups on the DASH-2 are in the average range with most scores just slightly below the normative means of 10 (task scores) and 100 (Total Score). The four core DASH-2 tasks are sensitive to parent education level, where higher education levels tend to result in higher task scores (Barnett et al., 2024a). The samples included 59% of participants with parent education levels below a bachelor's degree, thus the slightly lower means in both groups are expected.

Mean Total Standard Score and mean scaled scores for all five tasks are not significantly different between regional groups. The standard difference, as indicated by Cohen's *d*, was used to quantify the magnitude of score differences between the groups. Values for Cohen's *d* that range from .2 to .49 are considered small, and ranges below .2 are considered negligible. The effect sizes for mean score differences are negligible for the Total Score and four core tasks (*d* = .05–.09) and small for Graphic Speed (*d* = -.30). The small effect size for Graphic Speed is not statistically significant, indicating that although a small difference is observed between groups (with the U.S. group having a scaled score 0.9 points higher than the UK/AU/NZ group), the observed difference may be due to chance or sampling variability. In addition, the magnitude of the difference is minimal and suggests limited practical implications.

Table 2. DASH-2 Scores of U.S. Sample Compared to Matched UK/AU/NZ Sample

		U.S.		UK/AU/NZ					
Task	***N***	**Mean**	***SD***	**Mean**	***SD***	**Diff**	***t*-value**	***p***	***d***
Copy Best	56	9.2	3.2	9.4	3.0	0.20	0.35	.730	0.06
Alphabet Writing	56	9.3	3.3	9.5	3.0	0.20	0.30	.762	0.06
Copy Fast	56	9.3	2.4	9.5	2.9	0.23	0.46	.648	0.09
Free Writing	56	9.5	3.3	9.6	2.9	0.16	0.30	.766	0.05
Graphic Speed	56	10.7	3.3	9.8	2.8	-0.93	-1.66	.103	-0.30
Total Score	56	95.9	14.5	97.1	14.9	1.21	0.45	.653	0.08

Implications

In this study, a matched sample was used to control for variation in DASH-2 scores related to age, sex, and education level, allowing the impact of geographic region on DASH-2 scores to be parsed out. The results of this study confirm the hypothesis that performance on the DASH-2 task and total scores does not significantly differ between groups in the U.S. and the UK/AU/NZ regions. Given these results, examiners can have increased confidence that the DASH-2 can provide valid scores for individuals residing in the United States. Future investigations utilizing the DASH-2 are expected to provide additional evidence of the test's utility and validity.

References

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