Narrative Analysis: To reveal neurocognitive impairments, count errors not desirable features.

Rationale

One purpose of narrative analysis is to identify neurocognitive impairments. Impairments can impede performance in two ways: 1) by reducing the rate at which desirable features of discourse occur and/or 2) by increasing the rate of discourse errors. Here, we explore the prediction that error rates will be more revealing of impairment than counts of desirable features for any error measure involving narrative features that are *highly frequent* and *obligatory*. Highly frequent forms assure sufficient tokens, while obligatory forms allow for reliable judgment of performance and eliminate factors of motivation and creative choice that may reduce desirable features in narratives independent of impairment.

Subjects/ Data

53 school-age children (ages 7;5 to 11;11) with narratives and clinical testing data available from previous research.

Methods

Using existing standardized language and cognitive testing, as well as clinical records, each participant's level of neurocognitive impairment risk was determined. Following Astley (2004) a child was considered to have no-risk of impairment based on scores within 1 SD from the normative mean on all available tests. Children with scores outside this range *in any area of functioning* were considered at risk for impairment. Narratives were analyzed and two measures were compared: *Number of Different Words* (NDW), which quantifies a desirable feature—lexical diversity; and the *rate of Nominal Reference*

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Errors (rNRE), which quantifies errors in the highly-frequent and obligatory marking of "New vs. Known" distinctions in noun phrases.

Analysis

Mean and standard deviation from 22 unimpaired children were used to determine 2 clinical cut-points for each measure (1.5 SD, and 2 SD). Sensitivity, specificity, and accuracy of these cut-points, of two "best" cut-points (most-accurate, 100% specificity), and overall accuracy for predicting "at-risk" status were calculated. Area Under the Receiver Operating Characteristic Curve (AUC) quantified overall predictive potential.

Results

While both measures were more accurate than a random test (Figure 1), rNRE (AUC = 0.84; 95% CI 0.71 to 0.93; $p<0.0001$) showed greater predictive potential than NDW (AUC = 0.65; 95% CI 0.51 to 0.78; $p = 0.049$). This difference was statistically significant ($p= 0.019$). As seen in Table 1, rNRE outperformed NDW by showing greater sensitivity and overall accuracy with little or no sacrifice in specificity.

Discussion

Results strongly support our prediction. The advantage in prediction comes from rNRE's greater sensitivity to impairment risk even when that risk is mild and not necessarily revealed by performance on standardized language testing. While both measures have good specificity, at its most-accurate cut-point NDW only identified 8 of the 31 "at risk" children (26%) compared to 22 children (71%) identified by rNRE.

Reference

Astley, S. J. (2004). *Diagnostic guide for fetal alcohol spectrum disorders: The four-digit diagnostic code* (3rd ed.). Seattle: FAS Diagnostic and Prevention Network, University of Washington, electronic version available from http://fasdpn.org.

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Figure 1. ROC curve comparison: rNRE to NDW to random test (diagonal line)

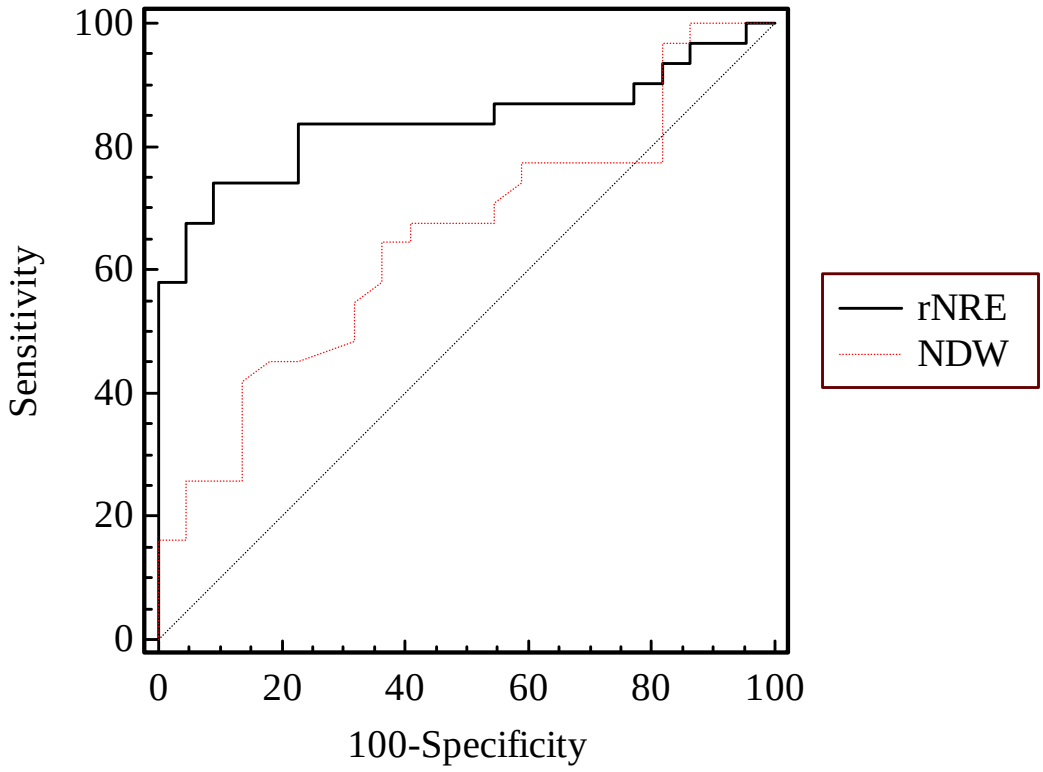

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Table 1. Mean, Standard Deviation (SD) and classification measures for rNRE and NDW at 4 cut-points based on performance of group with NO IMPAIRMENT RISK (n = 22)

					Best cut-points	
	"no risk" Mean	"no risk" SD	2 SD cut	1.5 SD cut	Most accurate[a]	100% specificity
rNRE	1.63%	0.75%	>3.13%	>2.76%	>2.60%	>3.03%
NDW	121.8	40.3	<42	<62	<80	≤71

True Positives	rNRE	16	21	22	18
	NDW	0	2	8	5
Sensitivity	rNRE	52%	68%	71%	58%
	NDW	0%	6%	26%	16%
Specificity	rNRE	100%	95%	91%	100%
	NDW	100%	100%	94%	100%

[a]2.60% rNRE cut-point falls at the 90th percentile of the unimpaired group (81% accurate); NDW<80 is at 10th percentile (53% accurate).

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