NonVerbal Learning Disability: Evidence for a discrete clinical entity in a community sample.

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BACKGROUND

NonVerbal Learning Disability (NVLD), a debilitating condition deriving from deficits in spatial perception, accompanied by poor executive functions, inattention, anxiety, and social deficits, was first described in 1967 by Johnson and Mykelbust[1]. Whether the condition is a valid and discrete clinical entity remains an open question[2]. A discrepancy between verbal and spatial ability, often operationalized by a Verbal greater than Performance IQ (VIQ>PIQ) discrepancy is the hallmark feature of NVLD[3]. Our strategy for demonstrating the validity of the condition has been to examine the neural[4,5] and behavioral correlates of the VIQ>PIQ discrepancy in an epidemiologic sample, free of ascertainment bias inherent in case-control studies.

Hypothesis:
Larger VIQ>PIQ discrepancy scores will associate with increased levels of difficulty with attention, executive function, anxiety, and social difficulty, symptoms purported to be consistent with NonVerbal Learning Disability.

METHODS

Study Population: We studied the behavioral correlates of the VIQ>PIQ discrepancy in a community sample of 433 children (8-14 years) participating in a prospective longitudinal cohort study (Columbia Children's Center for Environmental Health).

	All (n = 433)	Female (n = 231)	Male (n = 202)
Age (years)	9.06 (0.20)	9.05 (0.17)	9.07 (0.23)
NEPSY Auditory Attention	331	183	148
NEPSY Inhibition	325	178	147
RCMAS Oversensitive	299	165	134
CBCL Social Problems	420	225	195

Measures:

VIQ-PIQ Discrepancy Scores were calculated based on each participant's Verbal Comprehension Index and Perceptual Reasoning Index Score obtained from the WISC-IV. To create the VIQ-on-PIQ score, we regressed VCI onto PRI with an intercept of zero and saved the residual. These scores were normally distributed.

NEPSY Inhibition assesses the ability to inhibit automatic responses in favor of novel responses. The child looks at a series of black and white shapes or arrows and names either the shape or direction or an alternate response, depending on the color of the shape or arrow.

NEPSY Auditory Attention assesses selective auditory attention and the ability to sustain it (vigilance). The child listens to a series of words and touches the appropriate circle when he or she hears a target word.

RCMAS Oversensitivity assesses obsessive concerns about a variety of things, most of which are typically vague and ill-defined, as well as fears about being hurt or emotionally isolated, as measured through an 11-item self report subscale of the RCMAS.

CBCL Social Problems assesses a child's behavior with respect to seeming dependent, lonely, not getting along with others, being teased, not being liked by peers, and getting along better with younger children, as measured through 11-item parent report form.

RESULTS

Figure 1. Attention

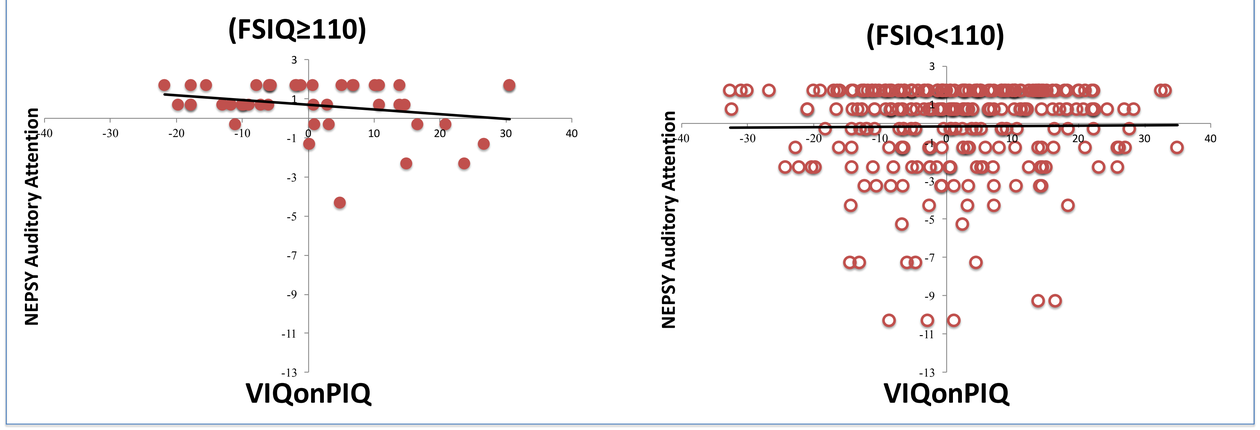


Figure 2. Inhibitory Control

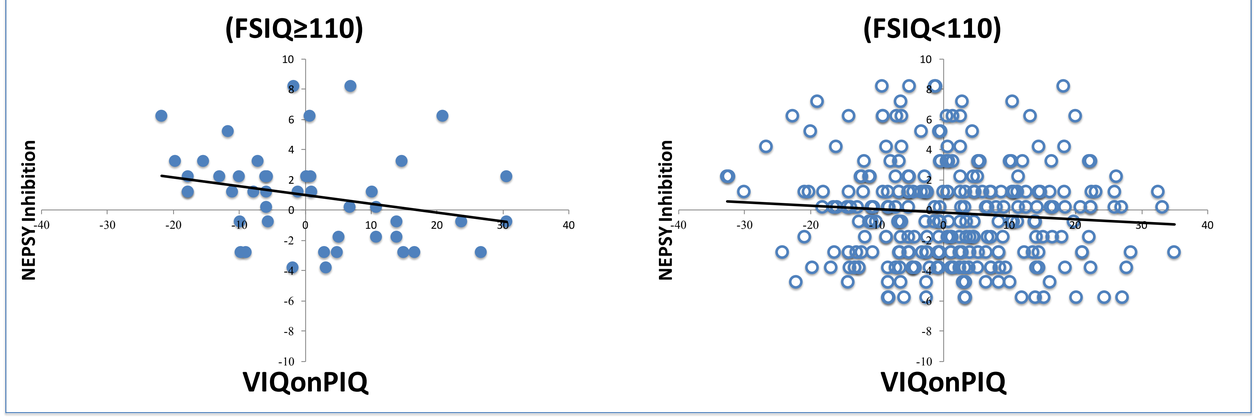


Figure 3. Anxiety

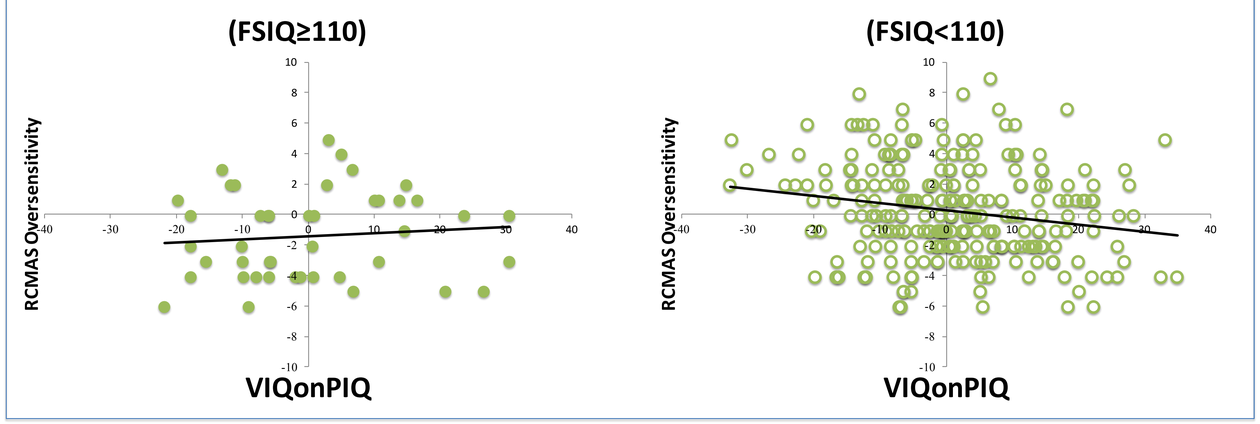
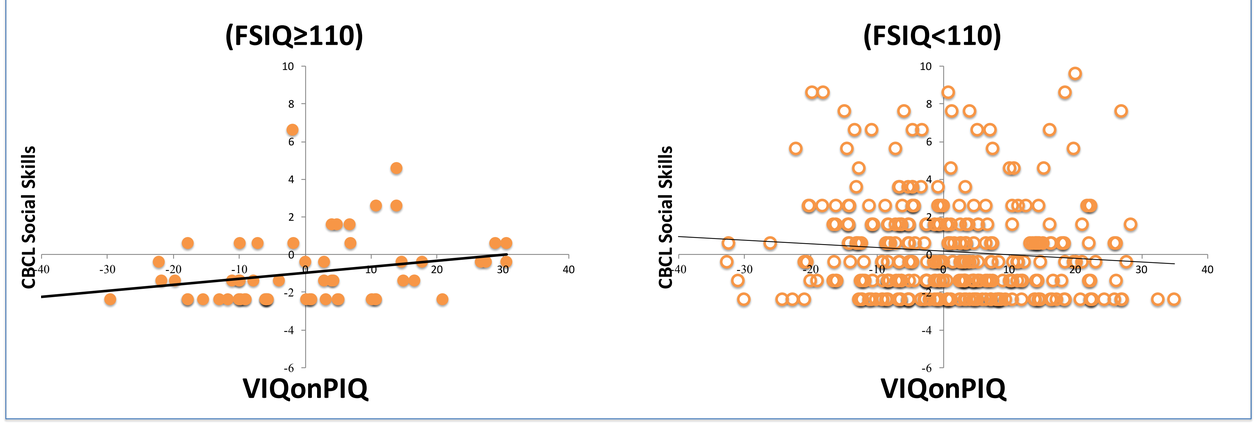


Figure 4. Social Problems



Statistical Analyses:
General linear modeling was used to assess the behavioral correlates of the VIQ-PIQ discrepancy score, controlling for age at test, sex, and ethnicity when significant.

FIGURES 1-4:
We detected significant FSIQ by domain interactions. Among children with Full-Scale IQ (FSIQ) greater than 110, we detected an inverse relationship between the magnitude of the VIQ>PIQ discrepancy and performance on:

- attention (NEPSY-Auditory Attention, p <.047), Figure 1
- Inhibitory control (NEPSY-Inhibition, p <.049), Figure 2.

and a positive relationship between the magnitude of the VIQ>PIQ discrepancy and levels of:

- anxiety (RCMAS, p <.005), Figure 3.
- social problems (CBCL; p<.09) Figure 4

Overall, a larger VIQ>PIQ discrepancy was associated with greater functional impairment. In lower FSIQ children, the relationship was either not significant, or was significant in the opposite direction.

CONCLUSION

In healthy, high IQ children, larger VIQ>PIQ discrepancies correlated with greater impairment in cognitive control, attention, anxiety and social difficulties, the core symptoms of NVLD. These data provide evidence that NVLD as described in clinical practice and case-control studies may be a valid clinical entity.

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