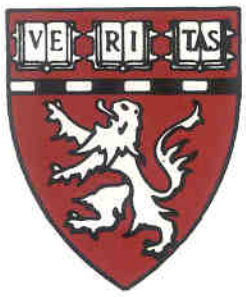

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ORIGINAL REPORT

Bilingual Children: Cross-sectional Relations of Psychiatric Syndrome Severity and Dual Language Proficiency

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The severity of child psychiatric disorders is commonly associated with child language delays. However, the characteristics of these associations in the fast-growing population of bilingual children remain unknown. To begin to address this gap, we studied a unique sample of Spanish-English bilingual children with significant parent-reported psychopathology ($n = 29$), focusing on their language proficiencies and psychiatric severity using the Child Behavior Check List. We present cross-sectional analyses of associations of general and specific language proficiency in Spanish and English with the severity of specific psychiatric syndromes. We found Spanish language-proficiency scores to have negative correlations with a wide range of psychiatric symptoms, particularly externalizing (i.e., delinquency and aggression) symptoms ($r = -.38$ to $-.61$, $p \leq .05$). English scores were similarly associated. Dual language tests covering multiple specific language dimensions explained a large proportion (51%) of overall variance in aggression symptoms and also important proportions (40%) of total and attentional symptoms. While children's proficiency levels in both Spanish and English showed similar associations with the symptom severity measures (explaining close to 20% of the symptom variance; $r_{sp} = -.44$, $p < .01$), these proficiency levels explain nonconverging variance in children's symptomatology. The findings suggest that clinical evaluation of language functioning is often needed in such populations and that it should be comprehensive and include both languages. Such thorough evaluation of bilingual children suffering from psychopathology will help us to precisely identify (1) language deficits, (2) specific relations of these deficits to the child's psychopathology, (3) differential implications of communication at home (e.g., in Spanish) and at school (e.g., in English) for clinical presentation and the child's competence in those differing contexts, and (4) language of choice for therapy, evaluation, and educational services. The findings are discussed in the context of clinical and conceptual implications and future research needs. (HARV REV PSYCHIATRY 2006;14:15–29.)

Keywords: **bilingualism, child, language development disorders, mental health, minorities, psychopathology**

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INTRODUCTION

Language Proficiency and Psychopathology

Epidemiological and clinic-based empirical research has documented relations between language deficits and children's psychiatric symptoms.[1–3] It is now well established that low language skills are associated with poor functional adaptations and specific symptoms, as well as diagnoses.[1,4,5] In particular, poor language skills predict poor social skills,[4] and language-impaired children are often poorly socialized[6] and poorly accepted by their peers.[7] In terms of psychiatric syndromes, language deficits predict language-based learning disorders (e.g., dyslexia), depressive and anxiety ("internalizing") disorders, and greater severity and prevalence of attention deficit/ hyperactivity and other disruptive behavior ("externalizing") disorders.[1,3,4] Receptive language deficits (i.e., deficits in word or sentence comprehension) are the strongest predictors of psychopathology, particularly of aggressive, hyperactive, and antisocial outcomes.[3,4] Receptive language deficits are more likely to be overlooked than the more obvious, often coexisting, expressive deficits (i.e., deficits in the developmentally appropriate production or retrieval of sentences and words). Language deficits and disorders are very common among psychiatrically referred children, with estimated prevalences ranging from 30 to 75%.[1] Suggested causes for the connection between psychiatric and language deficits include shortcomings in social competence, difficulties in language-mediated emotional and behavioral regulation, and the presence common neurodevelopmental and contextual risk factors. When language deficits and disorders go undetected—a frequent occurrence—they are associated with more severe psychopathology and inadequate services later on in the school trajectory.[8] Consequently, researchers in this area have strongly advocated for the early detection of language deficits. The preceding studies clearly document relations between psychiatric and linguistic deficits. Yet virtually all of the language-psychopathology research excludes bilingual children or those speaking languages other than English.[3] To our knowledge, the only exceptions are a study of monolingual Dutch-speaking children[9] and our prior study of bilingual children[10]—see below.

It is extremely important to learn about relations between psychiatric and linguistic deficits in bilingual children—those who communicate in two languages. It is already clear that childhood bilingualism is common and becoming more prevalent. As we witness the largest wave of child immigration in American history,[11] current surveys estimate that ten million American children—19% of the U.S. child population, mostly U.S.-born children of immigrant parents—have English as a second language.[12] Bilingual children as a group probably constitute the fastest growing segment of the American child population. Moreover, most bilingual children are Hispanic; most Hispanic children are bilingual; and the Hispanic child subpopulation has become the largest minority,[12] and the fastest growing group, among American children.[13] As a result, a growing percentage of psychiatrically ill children will be bilingual (and Hispanic). We do not yet have a comprehensive grasp, however, of the likely complex relations between language proficiency and psychopathology in psychiatrically ill bilingual children. Many bilingual children have low proficiency in areas of at least one of their languages (which should not be confused with having a language deficit or disorder)—a diminished competence that has important clinical and educational implications,[14] particularly for those with psychopathology. Consequently, studying relations between dual language proficiency and psychopathology in bilingual children addresses compelling scientific and social needs. Our study represents a first step in considering language-psychopathology questions in dual-language children through its intensive analyses of a targeted clinical sample of Hispanic bilingual children.

The term "language proficiency" refers to competences in multiple domains (e.g., vocabulary, verbal analogies) and multiple modalities (e.g., expressive, receptive).[3] This wide range of linguistic competences, multiplied by two languages, is likely to be related to a wide range of emotional/behavioral adaptations and, in the case of language deficits, psychiatric symptomatology. For instance, in a recent study of bilingual children referred for psychiatric care, we found associations of low bilingual language ability with varied manifestations of psychopathology—total, externalizing, social, thought, and attentional symptoms.[10] In contrast to prior research in monolingual children,[1,4] the study revealed no associations between language ability and internalizing symptoms. While this research on bilingual children is, to our knowledge, the only published work focusing on linguistic and psychiatric dimensions in bilingual children, an important limitation was that our analyses considered bilingual language ability as a single continuous *composite* of proficiencies in the two languages. Thus, the study could not inform us about the possible role of (1) each language and (2) specific dimensions (e.g., vocabulary, receptive modality) of each language. In other words, the results provided us with an introductory and global approximation to the problem. Much remains to be learned.

Related to this absence of more specific information about multiple dimensions of language proficiency, our previous study could not discern whether specific patterns of psychopathology in bilingual children may be associated with particular language-proficiency dimensions. Gaining such knowledge should enhance diagnostic assessment and the construction of future therapeutic and educational interventions for psychiatrically ill bilingual children. For scientific

and clinical reasons, then, we must now identify significant relations among children's psychopathology (type and symptom severity) and their patterns of proficiency in each of their languages.

Research Questions and Hypotheses

Five research questions and three connected hypotheses guided our study:

Research question 1. In bilingual children with psychopathology, to what extent are language-proficiency levels associated with psychiatric syndrome and symptom severity?

Hypothesis 1. Language-proficiency levels will show negative correlations with psychiatric severity.

Research question 2. With respect to identified relations between language-proficiency and psychopathology levels, what are the specific linguistic modalities (receptive, expressive) involved, and in which language(s)?

Hypothesis 2. Language-proficiency levels in the first and second languages will be correlated with psychiatric severity.

Research question 3. Do relations between psychopathology and language-proficiency levels overlap for the child's first and second languages?

Hypothesis 3. The portions of psychiatric severity variation predicted by proficiency in each language will overlap (i.e., share variance) across languages.

Research question 4. Do associations between psychopathology and language-proficiency levels vary as a function of child's age and gender?

Research question 5. Do other dimensions, including immigration, acculturation, and nonverbal intelligence, account for any of the identified relations between psychiatric severity and proficiency levels?

Jim Cummins, a scholar in childhood bilingualism, conceptualized a common, general-purpose language-acquisition competence that he called *common underlying proficiency*.[15,16] This common proficiency would get reflected in the levels of mastery of any language to which the child is exposed. In this way a deficit in common underlying proficiency due to a primary language disorder would cause low levels of both English and Spanish, and be predictive of higher psychiatric severity. From this conceptualization, we expected that the associations of psychiatric severity with language-proficiency levels would reflect common underlying proficiency. We thus predicted that the child's proficiencies (or deficits) in the two languages, acting mostly as a single dimension, would explain the same portion of the variation in severity of psychopathology.

In the present study we analyze a sample of 29 psychiatrically ill bilingual children, examining the associations of psychiatric syndrome type and severity with patterns of linguistic proficiency in each language, while also exploring other dimensions that may influence variations among these associations. Through the consideration of multiple bilingual proficiencies rather than a single composite dimension, these new analyses contrast with prior research on monolingual language-majority children[1,4,5] and also with our previous study of bilingual children.[10] We sought to characterize varied, theoretically meaningful, language-psychopathology relations in a well-defined clinical sample of bilingual children. We did not intend to compare bilingual children to monolinguals with respect to strengths or deficiencies. Nor did we assume bilingualism to be a risk factor for psychopathology.

METHOD

Subjects and Recruitment Procedures

The sample of 29 children was selected (following inclusion and exclusion criteria listed below) from all children, ages 5 to 16, consecutively referred to an outpatient Latino child psychiatry clinic. Inclusion criteria were that the children be members of the Spanish language minority with caregivers communicating solely or primarily in Spanish *and* that the children have clinically significant (parent-reported) psychiatric symptoms. Exclusion criteria included history of severe developmental disorder (autism) or severe sensory-motor sequelae of neurological trauma/ disorder (aphasia, paralysis, deafness, blindness). Of the consecutively referred children ($n = 50$), none met exclusion criteria, all met the first inclusion criterion, and 29 (58% of 50) met the second inclusion criterion. There were 9 girls and 20 boys, whose age ranged from 5 to 16 (mean = 9.4, SD = 3.6). Sociodemographics of the sample will be provided in the results section. Bilingual psychologists culturally competent in both European-American and Hispanic/Hispanic-American cultures (i.e., who were bicultural) conducted the interviews. Most of these interviewers were native Spanish speakers. Human Studies Committees from Cambridge Hospital and Judge Baker Children's Center approved the study, and parental informed consent was obtained for all 29 children.

Assessments

1. Psychiatric syndrome type and severity. The Child Behavior Check List (CBCL) is a widely used, empirically derived symptom inventory.[17] The Spanish version, normed and extensively researched in Puerto Rico and Latin America,[18] was used. Parents completed the CBCL as part of the clinic's intake interview. Each checklist has 113 items and yields total, 2 broad-band (internalizing and externalizing), and

8 problem-scale T scores (a type of standardized score with mean = 50 and SD = 10). The internalizing broad-band score derives from the first three problem scales (Withdrawn, Somatic Complaints, and Anxious/Depressed), and the externalizing score derives from the last two problem scales (Delinquent and Aggressive Behaviors). Three other scales (Social Problems, Thought Problems, and Attention Problems) are not part of any broad-band score. In order to operationalize the second inclusion criterion (only children with "clinically significant parent-reported psychiatric symptoms"), we used the clinical cutoff scores recommended by Achenbach and Edelbrock[17] of T score = 70 for individual syndrome and T score = 63 for total, internalizing, or externalizing scores, and we included only those children who had at least one T score at or above this level. Clinical psychiatric diagnoses were highly likely in these children since CBCL clinical cutoffs have good agreement with DSM-III-R and DSM-IV diagnoses.[17,19]

2. Language proficiency. The five oral language tests of the Woodcock Language Proficiency Battery–Revised[20] (WLPB) assessed language proficiency in English and Spanish for each child. We obtained scores for oral language proficiency in expressive, mixed receptive-expressive, and receptive modalities. The tests, covering semantics and morphosyntax (with the corresponding prevailing modality) were: picture vocabulary (expressive); memory for sentences and oral vocabulary (mixed receptive-expressive); and listening comprehension and verbal analogies (receptive). Besides the separate scores (e.g., picture vocabulary), the five oral test scores can be combined to yield a WLPB oral language cluster score—a global measure of general language proficiency—for each language. The WLPB has published reliability, validity, and Spanish and English norms.[20] Language of administration was randomized to counter potential practice effects.

3. Nonverbal intelligence. Nonverbal intelligence was measured through the Test of Non-verbal Intelligence, second version (TONI).[21] This test, a culturally fair measure appropriate for the intellectual appraisal of children whose test performance may be confounded by language impairment or second-language barriers, generates an intelligence quotient (IQ) score.[21]

4. Sociodemographic data. Sociodemographic data—including information about socioeconomic status (SES), and immigration and acculturation dimensions—were collected through parental questionnaires. Indices of *family SES* included *maternal education* and a categorization of the household through Hollingshead's Four Factor Index of Social Status.[22] In regard to *immigration history*, we collected information on children's and parents' places of birth (abroad or the United States) and on children's age of arrival, if born abroad. We quantified generational depth with two indices. We classified children into *immigration depth* levels according to methods by Hakuta and D'Andrea.[23] For instance, depth 1 included immigrant children who arrived after age 10, while higher depths indicated U.S.-born children with two parents (depth 4) or one parent (depth 5) born abroad. In addition, *proportion of lifetime* residing in the United States was calculated. *Acculturation* was estimated through *language use*—the child's relative use of Spanish and English in different settings (school, home) and with different people (siblings, friends, with and between adults at home). Language use was reported by the parents through a Likert scale questionnaire adapted from the WLPB;[20] the question about "language used between adults at home" confirmed the first inclusion criterion—namely, that caregivers communicated solely or mainly in Spanish.

Statistical Analyses

We obtained *descriptive statistics* for sociodemographic, clinical, nonverbal IQ, language-proficiency, and language-dominance data. We calculated *bivariate (Pearson) correlations* of psychiatric symptom and syndrome severity with first- and second-language proficiency patterns in order to identify associations between these indices. We obtained *multiple correlations* (through semipartial and canonical correlations) in order to clarify the unique contribution of proficiencies in each language to overall relations between language-proficiency and syndrome scores. For all statistical analyses, we did not estimate missing values; instead, we applied pairwise and listwise approaches to exclude all cases with missing values from the bivariate and multiple correlations, respectively. Significance level was set at $p = .05$.

RESULTS

Descriptive Data

In terms of sociodemographics (SES, immigration, and acculturation), household SES was low in 65% of the sample and middle in 35%. Less than half (42 %) of the mothers completed high school—half of whom went on to complete college or other tertiary education. Most of the children (97%) had parents born outside the continental United States, most commonly in El Salvador (31%), Puerto Rico (24%), or Dominican Republic (7%). Sixty-nine percent of the children were U.S.-born with both parents born outside the continental United States (immigration depth 4). In 93% of the cases, children had resided in the United States for at least two years. Language use was predominantly Spanish at home and predominantly English at school and with friends. (Detailed information is contained in Appendix Tables 1 and 2.)

TABLE 1. Language Proficiency and Language Dominance ($n = 29$)

Modality	Domain	Spanish Standard score Mean	(SD)	English Standard score Mean	(SD)	Language dominance (%)[a] Balanced bilingual	Nonbalanced: English dominant	Nonbalanced: Spanish dominant	Difference in prevalence p[b]
General language proficiency	*Oral language cluster*	66.9	(20.5)	66.9	(20.7)	41 [24,59]	28 [14,45]	31 [14,48]	.64
Expressive	Picture vocabulary	58.0	(25.7)	64.7	(26.6)	21 [7,38]	45 [28,62]	34 [17,52]	.28
Mixed receptive-expressive	Memory for sentences	72.2	(15.5)	70.3	(14.9)	52 [34,69]	21 [7,38]	28 [14,45]	.10
	Oral vocabulary	78.9	(17.1)	83.8	(20.7)	**55 [38,72]**	21 [7,38]	24 [10,41]	.04
Receptive	Listening comprehension	80.0	(21.3)	65.0	(22.9)	38 [21,55]	10 [1,24]	**52 [34,69]**	.02
	Verbal analogies	82.8	(16.1)	84.0	(17.2)	**55 [38,72]**	14 [3,28]	31 [14,48]	.02

[a]Language-dominance groups are based on each subject's difference in language proficiency (standard scores) between Spanish and English. Subjects with differences smaller than 15 points (one standard deviation in the population) are considered balanced. The most significantly prevalent dominance group appears bolded. Brackets represent 95% confidence intervals for the population prevalence.
[b]Chi-square test (testing whether the proportion of children with differential language abilities is equal).

In terms of nonverbal IQ (mean = 88, SD = 15.7), five children (17.2%) scored below 70—two with IQs of 69 and three with IQs of 57. Psychiatric symptom severity was high as indicated by T scores for total CBCL (mean = 69, SD = 7.0, range = 33 [min 57 to max 90]), internalizing (mean = 67.9, SD = 6.3, range = 31 [min 55 to max 86]), and externalizing (mean = 64.8, SD = 9.7, range = 41 [min 43 to max 84]). T scores exceeded clinical cutoffs for internalizing symptoms in 86% of the cases; for externalizing, in 66%; and for both internalizing and externalizing, in 59%. (Detailed information is contained in Appendix Table 3.)

In terms of language proficiency and dominance (Table 1), children presented a wide range of proficiencies, but with markedly low Spanish and English scores, both in general proficiency and in individual test scores. Only three tests had mean scores above 80: verbal analogies in both languages, and English oral vocabulary in English (Table 1), which can be considered close to normal in bilingual or language-minority children, where mean scores are typically in the 80s.[24] In terms of language dominance, we categorized children whose proficiency was considerably stronger in one language as being *dominant* in that language. We defined a "considerable" proficiency difference as one of at least 15 standard score points—that is, one standard deviation in the sample used to establish norms. Children with smaller differences were categorized as *balanced bilinguals*. Overall, there was roughly equal predominance of English-dominant, Spanish-dominant, and balanced bilinguals, with the exception of three specific domains: listening comprehension (Spanish dominance was more prevalent), and oral vocabulary and verbal analogies (for which balanced bilingualism prevailed).

As for the extent of missing data, 86% or more of the children had complete data for each measured domain.

Associations of Language-Proficiency Levels with Psychiatric Syndrome Type and Severity

Briefly, with our *bivariate and multiple correlation* analyses, we characterized correlational patterns between language proficiency and psychiatric syndrome severity through a set of coefficients derived from bivariate correlations (r), semipartial correlations (r_{sp} and r^2_{sp}), and multiple correlations (R^2 and adjusted R^2). In this way, the mentioned coefficients indicate (1) relations between psychiatric syndrome severity and each of the language domains (r), (2) syndrome severity score variance explained uniquely by language scores in each language (r^2_{sp}), and in total by both—as summarized in the language factor—(R^2 and adjusted R^2), and (3) language score variance explained by syndrome severity scores (obtained by multiplying the factor loadings' r^2 by R^2). The detailed results of these analyses are presented below.

Bivariate correlations. We first calculated bivariate correlations to address research questions 1 to 3 (about presence and nature of associations between language-proficiency levels and symptom severity), hypothesis 1 ("Language-proficiency levels will show negative correlations with psychiatric severity") and hypothesis 2 ("Language-proficiency levels in the first and second languages will

be correlated with psychiatric severity"). *Bivariate (Pearson r product-moment) correlations* were calculated between (1) 12 language scores—six for each language: one general language-proficiency (oral language cluster) and five individual WLPB standard scores, and (2) eight syndrome scores grouped in three sets of CBCL *T* scores (total, internalizing/externalizing, and five syndrome-scale [social, thought, attentional, delinquency, and aggression]). We excluded the three individual syndrome scales under internalizing (withdrawn, somatic complaints, and anxious/depressed), as our previous findings revealed no significant associations of this syndrome with a global bilingual ability composite.[3] *Results* showed significant bivariate correlations between Spanish and English WLPB scores and CBCL total, with externalizing, thought, attentional, delinquency, and aggression symptom scores ranging from −.61 to −.37 (Table 2)—generally consistent with hypotheses 1 and 2. In terms of general language-proficiency (cluster) scores, in Spanish they correlated significantly with syndrome scores in 6 of 8 cases, varying from −.55 to −.42, and with externalizing they showed a trend. In English, general language-proficiency (cluster) scores correlated significantly with social symptoms (−.44) and showed trends with three additional syndrome scores (total and attentional symptoms, both = −.35, $p = .07$; delinquency = −.37, $p = .06$). In terms of individual test scores, the two receptive tests correlated significantly in both languages: verbal analogies with total, broad-band externalizing, attentional, delinquency, and aggression *T* scores (from −.40 to −.61); and listening comprehension with delinquency (−.46 and −.52). Spanish verbal analogies scores (a receptive test) correlated significantly with all syndrome scores (7 correlations, varying from −.61 to −.41), with the exception of internalizing symptoms. Another ten correlations of Spanish WLPB scores with CBCL attentional, delinquency, and aggression scores were also significant (ranging from −.37 to −.52). English verbal analogies scores were significantly correlated with five symptom scores, ranging from −.46 to −.40. In addition, five other correlations of English WLPB scores with CBCL social, thought, and delinquency scores were significant (ranging from −.39 to −.46). Of 48 correlations for each language, virtually all were of negative sign, consistent with hypothesis 1; 23 correlations for Spanish and 11 for English were statistically significant, consistent with hypotheses 1 and 2. Of note, all correlations for internalizing were nonsignificant. Correlations between Spanish and English general language-proficiency scores were nonsignificant. While statistical power for our sample of $n = 29$ and alpha level = .05 was sufficient (.80) to detect a hypothetical one-tailed correlation larger than $r = .45$ (moderate and large size effects), the power was only .48 to detect a .30 (small size) correlation.[25]

Multiple correlations. The purpose of calculating multiple correlations was to address hypothesis 3 ("The correlations of psychiatric severity levels and proficiency levels for each language will overlap (i.e., share variance) across languages") and research question 3 by providing an estimate of how much the listed bivariate correlations overlapped. In addition, we were seeking additional evidence for hypotheses 1 and 2 and research questions 1 and 2. As an additional benefit, while "false positives" are more likely when multiple statistical significance tests are conducted (such as in bivariate correlations), multiple correlations offer valid control for this risk of false positives. Two separate series of multiple correlation analyses were conducted. Though the two series differed on the type of WLPB scores entered, they reported on the same eight CBCL syndrome scores; together they yielded a total of 16 analyses. In *series 1* of multiple correlations, in each analysis we entered only the general proficiency (cluster) scores for English and Spanish and one of the eight CBCL syndrome scores—making for a total of eight analyses (see Table 3). For each analysis we report results as semipartial correlation (r_{sp} and its squared version, r^2_{sp}) and multiple correlation (R^2 and adjusted R^2) coefficients. Adjusted R^2 is a conservative estimation of the population's value of R^2—which is more appropriate for our small sample size. These coefficients respectively represent the portion of CBCL score variance explained by each language uniquely (r^2_{sp}, nonshared variance), and the total CBCL variance explained (R^2 and adjusted R^2). We also calculated shared variance ($= R^2 - r^2_{sp}$). Additionally, we report loadings for a "language factor" characterizing the maximal correlation between each syndrome score and the general proficiency scores. When squared and multiplied by R^2, these factor loadings—representing the Pearson correlation of the language factor and each general proficiency score—yield the total variance in each language explained by the syndrome scores. In this way, we can establish the correlations' effects in a bidirectional way, from language scores to syndrome scores, and vice versa. This is important because the directionality of these relations is not well known. Series 1 of multiple correlations (Table 3 and Figure 1) resulted in significant R^2 and adjusted R^2 in all syndrome types except the broad-band externalizing and internalizing scores. Semipartial correlation coefficients corresponding to significant adjusted R^2 were negative in all cases, consistent with hypothesis 1, and significant for Spanish (all correlations, with explained nonshared variances; $r^2_{sp} = 16$ to 26%) and for English (most correlations, with explained nonshared variances; $r^2_{sp} = 13$ to 25%), consistent with hypothesis 2. However, shared variance was not significantly different from zero, *leading us to reject hypothesis 3*. Also supportive of hypotheses 1 and 2, total CBCL *T* scores explained 19% of the variance in Spanish and in English general proficiency

TABLE 2. Bivariate Pearson r Correlations of Psychiatric Symptoms and General and Domain-Specific Language Proficiency ($n = 29$)

	Total	Externalizing	Internalizing	Social	Thought	Attentional	Delinquency	Aggression
Spanish								
Oral language cluster	−.50**	−.37	−.13	−.42*	−.45*	−.49**	−.55**	−.46*
Expressive								
Picture vocabulary	−.27	−.20	.06	−.12	−.31	−.37*	−.38*	−.29
Mixed receptive- expressive								
Memory for sentences	−.41*	−.32	−.18	−.24	−.32	−.43*	−.42*	−.36
Oral vocabulary	−.30	−.21	−.16	−.26	−.23	−.23	−.44*	−.23
Receptive								
Listening comprehension	−.38*	−.29	−.05	−.35	−.32	−.40*	−.52**	−.40*
Verbal analogies	−.58**	−.41*	−.30	−.42*	−.44*	−.58**	−.50**	−.61**
English								
Oral language cluster	−.35	−.26	−.24	−.44*	−.26	−.35	−.37	−.22
Expressive								
Picture vocabulary	−.25	−.25	−.23	−.29	−.10	−.18	−.25	−.12
Mixed receptive-expressive								
Memory for sentences	−.27	−.22	−.20	−.43*	−.18	−.29	−.31	−.14
Oral vocabulary	−.30	−.13	−.26	−.41*	−.39*	−.37	−.26	−.12
Receptive								
Listening comprehension	−.33	−.22	−.19	−.44*	−.15	−.27	−.46*	−.24
Verbal analogies	−.42*	−.40*	−.22	−.37	−.36	−.46*	−.43*	−.41*

*$p \leq .05$; **$p \leq .01$.

TABLE 3. Multiple Correlations of Psychiatric Symptoms and General and Domain-Specific Language Proficiency ($n = 29$)

	Total	Externalizing	Internalizing	Social	Thought	Attentional	Delinquency	Aggression
Associations of psychiatric symptoms and general language-proficiency scores (Spanish and English oral language cluster scores) (Series 1 of multiple correlations)								
Language factor loadings[a]								
Spanish oral language score	−.73	−.67	−.26	−.66	−.80	−.79	−.80	−.77
English oral language score	−.72	−.78	−.98	−.78	−.65	−.66	−.65	−.68
Nonshared variance explained by Spanish								
r_{sp}[b]	−.44**	−.29	−.05	−.42*	−.40*	−.45*	−.51**	−.41*
r^2_{sp}[c]	20%**	9%	0%	18%*	16%*	20%*	26%**	16%*
Nonshared variance explained by English								
r_{sp}[b]	−.44**	−.34	−.23	−.50**	−.32	−.37*	−.40*	−.35
r^2_{sp}[c]	19%**	12%	5%	25%**	10%	13%*	16%*	12%
Shared variance explained jointly by Spanish and English								
R^2–r^2_{sp}	3%	1%	0%	3%	2%	2%	3%	2%
Total variance explained								
R^2[d]	42%**	22%	5%	46%**	28%*	35%**	45%**	30%*
Adjusted R^2[e]	36%**	NS	NS	41%**	22%*	30%**	40%**	25%*
Associations of psychiatric symptoms and domain-specific language proficiency (10 language test scores, 5 for each language) (Series 2 of multiple correlations)								
Total variance explained								
R^2[d]	65%*	64%*	NS	NS	NS	64%*	NS	71%*
Adjusted R^2[e]	42%*	40%*	NS	NS	NS	40%*	NS	51%*

All squared coefficients shown as percentage of variance explained.

[a]Factor loadings indicate the correlation between the initial variables and the language factor score best correlating with each of the psychiatric symptom scores.

[b] Semipartial correlation coefficients (r_{sp}).

[c]Squared semipartial correlation coefficients (r^2_{sp}), representing portion of variance in psychiatric symptoms uniquely explained by language variable(s).

[d]R^2 is the multiple correlation measure between the set of language variables and each of the psychiatric symptom scores. It can also be interpreted as the squared bivariate correlation (r^2) between each psychiatric symptom scores and the language factor scores.

[e]R^2 conservatively adjusted (due to small sample size) using the Wherry estimate, a shrinkage formula.

*$p \leq .05$; **$p \leq .01$; NS = nonsignificant.

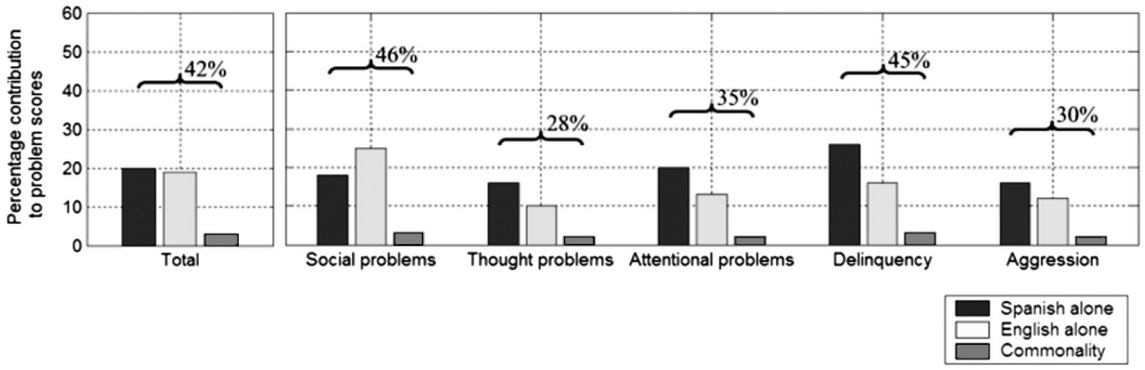

FIGURE 1. Associations of general language proficiency and psychiatric symptoms. The multiple correlations of each psychiatric symptom score and the language factors are represented, with the percentage of explained variance (R^2) listed above the brackets. This correlation is bidirectional; that is, it represents both the percentage of symptom score variance explained by the language factor and, vice versa, the percentage of language factor variance explained by symptom scores. Bars represent variances explained by Spanish alone and English alone (nonshared or unique variances), and variances explained in common by both Spanish and English (shared variance).

through negative correlations. In *series 2* of multiple correlations, in each analysis we entered the scores for all ten individual WLPB tests (five in English and five in Spanish, instead of the two general proficiency scores in series 1) and one CBCL syndrome score, also for a total of eight analyses (Table 1). Because more variables are entered than in series 1, we only report R^2 and adjusted R^2 values, as factor loadings and semipartial correlation coefficients are not considered reliable with such a small sample. Series 2 of multiple correlations (Table 3) yielded significant, large-size R^2 (.64 to .71) and moderate-size adjusted R^2 (.40 to .51) for total, externalizing, attentional, and aggression syndromes. As an illustration, the adjusted $R^2 = 51\%$ for aggression corresponds to explaining a conservatively estimated 51% of the population's variability in reported symptom severity on aggression through individual Spanish and English language test scores.

Moderators. In order to address research question 4 ("Do associations between psychopathology and language-proficiency levels vary as a function of child's age and gender?"), we explored gender and age (in two groups split by median age—8.3 years old) as potential moderators of the correlations between WLPB general language-proficiency and total CBCL scores. Although these analyses did not show significant effects, our statistical power to detect these effects was extremely limited. With our $n = 29$ and alpha level = .05, power (1-β) to detect correlation differences larger than $r = .8$ was 1-$\beta = .68$ for age and 1-$\beta = .61$ for gender, while the power to detect differences larger than $r = .5$ was 1-$\beta = .35$ for age and 1-$\beta = .33$ for gender.

Other variables of interest. In order to investigate research question 5 ("Do other dimensions, including immigration, acculturation, and nonverbal intelligence, account for specific relations between psychiatric severity and proficiency levels?"), we explored the potential effect of these variables as explaining the associations between WLPB and CBCL scores. These variables, which were explored individually and in group combination, included age, gender, maternal education, immigration depth, proportion of lifetime resided in the United States, acculturation (language use), and nonverbal IQ (see Assessments subsection for descriptions). To identify potential *individual* variables, we examined whether these individual variables significantly correlated with *both* total CBCL T scores and any general language-proficiency (cluster) scores. While some variables, such as nonverbal IQ, immigration depth, and residence in the United States, were individually correlated with WLPB scores, none was significantly correlated to both total CBCL and WLPB cluster scores (Table 4). For example, nonverbal IQ showed significant associations with English WLPB scores ($r = .40$, $p = .037$), but not with Spanish ($r = .12$, $p = .54$) or CBCL ($r = -.27$, $p = .16$) scores. To consider potentially relevant variable *combinations*, canonical factors were extracted through two separate canonical correlation analyses (Table 5). A canonical factor expresses the main dimension of correlation between two variable sets—that is, the fraction of the variability in set II that correlates with (or could be due to) the influence of the variables in set I. Set I included the other variables of potential interest. Set II included WLPB oral language cluster and CBCL total scores. In the first canonical analysis for Spanish, set II included the Spanish WLPB scores (Spanish set II), while in the separate, second analysis, English WLPB scores were entered (English set II). These canonical correlations resulted in a significant canonical factor with the Spanish set II ($p = .02$) but not with the English set II ($p > .22$). This significant canonical factor appeared to reflect immigration and acculturation dimensions,

TABLE 4. Analysis of Other Potentially Relevant Variables ($n = 29$): Individual Variables. Pearson Bivariate Correlations

	CBCL total symptoms t score	Spanish oral language standard score	English oral language standard score
Immigration depth	.15	**−.44***	**.43***
Proportion of lifetime in U.S.	.28	**−.63****	.28
Maternal education	−.18	−.10	.37
Nonverbal intelligence	−.27	.12	**.40***
Language use	−.08	**.42***	**−.46***
Age	−.19	**.57****	−.25
Gender	.06	−.17	−.04

Notes:
CBCL, Child Behavior Check List.
Significant correlations appear bolded: $^{*}p \leq .05$; $^{**}p \leq .01$.

as suggested by the corresponding factor loadings. We subsequently controlled for this canonical factor in a partial correlation between total CBCL scores and Spanish oral language cluster scores; results remained significant, and effect size was similar to that of its Pearson correlation counterpart (p$r = -.46$ and $p = .02$, vs. $r = -.50$ and $p \leq .01$; explained variance dropped from 25% to 21%). Therefore, this immigration/acculturation factor explained only a small portion (16%) of the associations that we found. In summary, none of the variables conceptualized as potentially relevant for our sample, considered individually or in variable combinations, was actually confirmed to meaningfully explain the association between psychiatric severity and language proficiency.

DISCUSSION

To date, to our knowledge, there are no other data available to address the research questions and hypotheses we raised. The sample we studied—of referred bilingual children

TABLE 5. Analysis of Other Potentially Relevant Variables ($n = 29$): Variable Combinations. Two Separate Canonical Correlation Analyses Between Set I (Potentially Relevant Variables) and Two Versions of Set II (Either Spanish or English WLPB, and CBCL)—Canonical Factors and Corresponding Correlations

	Spanish Set II (Spanish WLPB oral language cluster score and CBCL total symptom t score)	English Set II (English WLPB oral language cluster score and CBCL total symptom t score)
		Factor loadings[a]
Set I (other variables)		
Immigration depth	.56	.67
Proportion of lifetime in U.S.	.80	.48
Maternal education	.15	.52
Nonverbal intelligence	−.13	.51
Language use	−.54	−.73
Age	−.73	−.41
Gender	.21	−.05
Set II		
CBCL total t score	.37	−.17
Oral language cluster score	−.79	.98
Set I variance[b]	26%	**27%**
Set II variance[b]	38%	**50%**
r^2	**.63***	.46
p	**.04**	.22

CBCL, Child Behavior Check List; WLPB, Woodcock Language Proficiency Battery–Revised.
[a]Factor loadings indicate the correlation between the factor score and each of the initial variables.
[b]Set I and II variances indicate the proportion of each set variance explained by the corresponding factor score. r^2 is a correlation measure between the Set I and II factor scores.
Significant correlations appear bolded: $^{*}p \leq .05$; $^{**}p \leq .01$.

with significant psychopathology—is unprecedented in the literature. In our sample, general as well as specific proficiencies in the two languages were generally lower as psychiatric severity increased. To what extent was psychiatric syndrome and symptom severity associated with language-proficiency levels in our sample (first research question)? Most of the associations were of moderate to large size, and scores from detailed evaluation of specific language domains explained 70% of the variance in aggression and around 65% in total, externalizing, and attentional syndrome scores. A conservative estimate (using a shrinkage formula for regression) of the explained variance in the population that this sample came from exceeds 50% for aggression and is around 40% for total, externalizing, and attentional scores. A large portion of the variance can be explained by scores derived from a broad language assessment (series 2 of multiple correlations, Table 3)—which included five oral language tests for each language. These results suggest highly specific associations of total, externalizing, attentional, and aggression syndromes with language domains indexed by these scores. Our findings are consistent with results from studies of monolingual children demonstrating low language skills in children with externalizing and attentional disorders.[3]

What were the specific linguistic modalities (receptive, expressive) and domains involved in the associations (research question 2)? Receptive domains both in Spanish and English (verbal analogies, listening comprehension) appeared particularly linked to total, externalizing, attentional, delinquency, and aggression symptoms. The consistent association of receptive semantic domain (verbal analogies) scores in both languages with most syndrome scores argues for a close connection of this language domain and these children's clinical severity. Of interest, while other language scores were very low, verbal analogies scores in both languages were the only ones within a probably normal range for bilingual children, but this within-normal variability was strongly associated with a wide variety of psychiatric syndromes and their severity. These findings may be related to the role of verbal analogies as building blocks and precursors of metaphoric and other eminently symbolic uses of language. Analogic reasoning provides capacity for abstraction applied to emotional and behavioral regulation. Also, inability to understand subtle and abstract messages may lead children to behave disruptively. These new, multidimensional findings build upon and enrich the knowledge derived from our prior unidimensional study (of bilingual skills as a single composite dimension).[10]

Consistent with our first hypothesis, practically all correlations were in the expected—negative—direction, and most correlations were statistically significant. For most syndromes, the correlations were of at least moderate effect size in bivariate or multivariate analyses. The only exception was that internalizing scores and proficiency levels were not significantly correlated—despite considerable heterogeneity in internalizing symptom severity (T scores ranged from 55 to 86, SD = 6.3) and the high prevalence (86%) of clinical elevations in internalizing scores. The lack of internalizing associations in our sample contrasts with associations found in monolingual research. However, our statistical power to detect small correlations ($\leq$.3) was modest (.48), which makes this finding only tentative.

Consistent with our second hypothesis, general proficiency in both Spanish and English presented significant association patterns with psychiatric severity. Contrary to our prediction, however, these association patterns were distinct and nonconvergent; as a result, our third hypothesis is rejected. In other words, first- and second-language proficiencies were related to psychiatric severity in our sample (as predicted by hypothesis 2), but they were related *independently*, therefore leading us to reject the hypothesized overlap of associations across languages (hypothesis 3) (Table 3). These findings appear to go against possible interpretations of single or dominant "shared causes," such as a deficit in common underlying proficiency due to a preexistent language disorder that would cause both low levels of English and Spanish and increases in psychiatric severity in our sample. A "shared cause" would have tended to result, instead, in English and Spanish proficiencies as overlapping correlates of clinical severity, and in overlapping (shared variance) correlations as being larger than non-overlapping (unique or nonshared variance) ones. Instead, the scenario suggested is one in which language proficiencies in English and Spanish are responsible for important (around 20% each), but unique, nonshared fractions of the variability in psychiatric syndrome severity. These findings are clinically and theoretically important; in addition to supporting the need to assess linguistic function in both languages, they suggest equally important, but differentiable, roles for each language. As an illustration (although we did not conduct a formal statistical comparison of these association patterns), a wide range of Spanish proficiency domains appeared to be associated with psychiatric scores, while possibly fewer English proficiency domains were so associated—perhaps indexing the presence of more widespread language difficulties at home. This trend toward a broader association of home language-proficiency levels with psychiatric scores would seem to suggest the specific weight of language-related vulnerabilities or lack of protective processes linked to parental and family influences; low language proficiency generally impairs communication, hindering access to protective and compensatory resources. The findings may also point, however, at ways in which psychopathology (and the neuropsychological functioning associated with it) may "block" language acquisition. For instance, attentional symptoms may

hinder the "multitasking" involved in simultaneous functioning in, and acquisition of, two languages. If replication were to confirm this finding of independent associations for English and Spanish, language evaluation and intervention research should potentially focus on *both* languages. This recommendation should be viewed cautiously, however, as a causal connection is not clear. This study only tested low language proficiency as a risk *correlate*, with unclear temporal precedence—a precondition for considering it a risk *factor* amenable to intervention. Therefore, we steer away from attributing causality or even directionality to the relations we describe.

Did other variables explain the associations we found (our fifth research question)? Other variables, combined in a canonical factor, reduced the correlation between Spanish WLPB and total CBCL score. This canonical factor had a statistically significant, although limited, effect on the correlation of Spanish proficiency and total psychiatric score. The factor reflects length of residence in the United States and acculturation—according to our interpretation based on the loadings for each variable. This effect suggests that immigration/acculturation elements typical of a longer stay in the host country are related to higher psychopathology and lower Spanish proficiency. Longer stays in the country and increased acculturation have been associated with decreased physical and mental health—a phenomenon known as the "immigrant paradox"; immigrants are healthier than their non-immigrant counterparts, and their health deteriorates the longer the stay in the country.[26] Our data are consistent with the concept of "immigrant paradox." Longer stays and increased acculturation are also associated with first-language loss.[23] However, the small size of the length of stay/acculturation factor's effect suggests that these variables could not solely or mainly explain our findings of associations between psychiatric severity and language proficiency. Beyond this canonical factor, interestingly, none of the sociodemographic, immigration, acculturation, or intelligence variables explained the relations in this report. Nonverbal intelligence has long been argued to be associated with stronger bilingual skills[27] and healthy adaptation, as our prior study of bilingual competence seemed to corroborate.[10] Nonetheless, in our present study, nonverbal IQ, despite its association with general English proficiency, did not explain the associations. While we did not find that the psychopathology–language proficiency associations varied as a function of the child's age and gender (our fourth research question), our power to detect these effects was extremely limited.

The absence of significant associations between Spanish and English general linguistic proficiency in this sample ($r = .06$) is surprising when contrasted with prior research in the general bilingual population, where correlations between first- and second-language skills were typically of .6 to .8.[15] This issue merits further research since statistical power was limited in the present study. If proficiencies across languages proved to be unrelated, this would suggest that skills in one language are not transferred to the other, somehow compromising, in bilingual children with psychopathology, strategies or processes of language acquisition and maintenance.

Limitations

The study was conducted in a small sample. While conclusions are suggestive and hypothesis generating, they should be interpreted cautiously and cannot be generalized. The effect size of multiple correlations is likely to be inflated in a small sample, making the conclusions more tentative; this potential shortcoming is partially, if not totally, compensated, however, by our conservative approach of using shrinkage formulas (adjusted R^2). Along the same lines, while redundant associations are a concern in a small sample, the documented nonconverging associations suggest the validity of our findings. Although we studied several other variables, still other factors may be responsible for the findings. The lack of effect of our other variables requires replication and comparison. Lower language competence has been linked to minority and low SES;[3] lacking a control group, it is unclear if the generally low language-proficiency level in our sample is truly linked to psychopathology. The potential moderating effects of age, gender, and low IQ need to be addressed in future reports with larger samples, as psychopathology and language profiles may differ across groups. While several children had IQs under 70, we had no evidence from either our research assessment or the recruitment clinic that they functioned in the mentally retarded range. We used a culturally fair test, but biased, artificially low scores in immigrant and other minority children are possible. Nevertheless, the wide range of IQ variation in our sample allows us to arrive to conclusions applicable to children with a broad range of cognitive functioning. Checklists such as the CBCL are widely used, but they do not substitute for a full diagnostic evaluation; some children with clinical elevations may not meet diagnostic criteria for a mental disorder. We do not know if these associations would be found in the general bilingual child population. A population-based study looking at the association of bilingual language proficiency and psychopathology with more complete language, psychiatric, sociodemographic, and cross-cultural/immigration assessments would be needed to establish a true association. Finally, questions about causality, although clearly important, cannot be answered by the present study. Given the stated limitations of statistical power, findings of nonsignificant associations should be taken cautiously.

Conclusion

From a clinical perspective, this study supports the need to conduct language evaluations in the two languages of bilingual children with psychopathology. Language deficits need to be suspected more often in psychiatrically ill bilingual children, and particularly in those with prominent externalizing, attentional, social, and thought symptoms. Although it is sometimes argued (incorrectly) that it is not possible to validly assess language functioning in bilingual children or that "when it comes to language, bilingual children are just a little late compared to monolingual children," delaying the identification of children with potential language deficits runs counter to the advances in clinical practice and empirical developmental evidence in this area and is potentially harmful to the children themselves. Screening for language deficits in both languages is possible. When a full clinical language evaluation is in order (requiring, in most cases, no more than a few sessions), it must be broad and include several linguistic modalities (receptive, expressive) in the two languages. In order to reduce the practice effects of consecutive administration of parallel versions of the same test in both languages, assessment of the weaker language (which takes less time) should occur first, so that testing duration is kept to a minimum and practice is minimal.

From a conceptual perspective, both languages seem to play a role in the language/psychopathology relation in bilingual children (Hypothesis 2). This role seems to be independent, however, for each language (Hypothesis 3, rejected). As suggested by our findings, future studies of this association in children with psychopathology should not automatically assume that both languages share a common mechanism or pathway. Close connections between attentional and externalizing (delinquency, aggression) symptom severity and receptive language deficits are supported. These receptive (i.e., comprehension) deficits can be easily overlooked but have strong implications for symptom exacerbation in, and for the clinical evaluation, treatment, and educational placement of, bilingual children suffering from psychopathology.

For optimal clinical practice, a close association between child psychiatry and language services is at least as important for bilinguals as it is for monolingual children. The ideal language-pathology services will have specialized resources to conduct bilingual language evaluations. Helping bilingual children with psychopathology involves early detection of language problems, empirically supported service planning and policy, and research based on well-grounded conceptual models. We hope that more complex and ambitious analyses will come from future larger studies built on exploratory data generated by this and other descriptive work. A future logical step will be discovery of those explanatory models, which can account for these and other observations. These steps are all necessary for our continued commitment to work with increasingly diverse child populations.

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APPENDIX

APPENDIX TABLE 1. Sociodemographics (n= 29)

	n	%	Mean	SD
Gender				
Girls	9	31		
Boys	20	69		
Age			9.4	3.6
5–6	8	27.5		
7–11	13	45		
12–16	8	27.5		
Race				
White	12	42		
Black	1	3		
Mixed	16	55		
Socioeconomic status of household				
Low	19	65		
Middle	10	35		
Maternal education			3.3[a]	2.3
Less than 7th grade completed	11	38		
Junior high—9th grade completed	2	7		
Partial high school—10 or 11th grade completed	4	14		
High school graduate	2	7		
Partial college (at least a year) or specialized training	4	14		
Standard college or university	2	7		
Graduate professional training (with graduate degree)	4	14		

[a]A mean of 3.3 indicates that the average mother completed 11th grade (education level 3), but not high school (education level 4).

APPENDIX TABLE 2. Immigration and Acculturation (n= 29)

	n	%	Mean	SD
Country or place of origin				
El Salvador	9	31		
Puerto Rico	7	24		
Dominican Republic	2	7		
Other	5	17		
Mixed	6	21		
Residence in the United States				
Proportion of lifetime resided (%)			84	33
Five or more years	23	79		
Two or more years	27	93		
Immigration depth (the average child is U.S. born or early-arrival foreign born)			3.4	1.2
Foreign-born child arrived:				
After age 10	4	14		
Between ages 6 and 10	3	10		
Before age 6	1	3		
U.S.-born child				
Both parents born abroad	20	69		
Only one foreign-born parent	1	3		
Language use (Likert-type scale: 1 = only English, 5 = only Spanish, 3 = balanced use)				
Language used: Average			2.9	1.0
At school			1.8	1.2
With friends			2.2	1.3
With siblings			3.2	1.5
With adults at home			4.4	1.2
Between adults at home			4.9	.4

APPENDIX TABLE 3. Nonverbal Intelligence and Psychopathology (n = 29)

	n	%	Mean	SD
Nonverbal IQ (TONI)			88	15.7
Psychopathology				
CBCL total score			69	7.0
CBCL broad band scales[a]				
Internalizing	25	86	67.9	6.3
Externalizing	19	66	64.8	9.7
Both internalizing and externalizing	17	59		
CBCL scales[a]				
Withdrawn	7	24	63.8	7.8
Somatic complaints	5	17	61.8	8.1
Anxious/depressed	10	35	67.2	10.0
Social symptoms	9	31	64.4	9.5
Thoughts symptoms	6	21	60.2	10.6
Attentional symptoms	9	31	66.3	9.7
Delinquent behavior	6	21	60.3	9.7
Aggressive behavior	10	35	67.7	11.8

CBCL, Child Behavior Checklist; TONI, Test of Nonverbal Intelligence, second version.
[a]The percentages denote those in the clinical range for a given score.