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The Role of Pragmatics in Mediating the Relationship Between Social Disadvantage and Adolescent Behavior

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ABSTRACT: ***Objective:*** **The relationship between social disadvantage, behavior, and communication in childhood is well established. Less is known about how these 3 interact across childhood and specifically whether pragmatic language skills act as a mediator between early social disadvantage and adolescent behavior.** ***Method:*** **The sample was the Avon Longitudinal Study of Parents and Children, a representative birth cohort initially recruited in England in 1991/1992 and followed through to adolescence and beyond. Of the original 13,992 live births, data were available for 2926 children at 13 years. Univariable analysis was first used to identify sociodemographic and other predictors of the Strengths and Difficulties Questionnaire (SDQ) at 13 years. The mediational role of the pragmatics scale of the Children's Communication Checklist (CCC) at 9 years was then tested, controlling for age, gender, and IQ.** ***Results:*** **There was evidence of both a direct effect from social disadvantage (path C′) to SDQ Total Behavior Score at 13 years (−.205; $p < .001$) and an indirect effect from social disadvantage to SDQ Total (−.225; $p < .001$) after adjusting for the CCC pragmatics scale as a mediator. The latter represents a reduction in the magnitude of the unadjusted effect or "total effect" (−.430), demonstrating that the pragmatics scale partially mediates the relationship of early social disadvantage and adolescent behavior (even after controlling for other covariates). The same relationship held for all but the pro-social subscale of the SDQ.** ***Conclusion:*** **The results provide evidence to suggest that there maybe a causal relationship between these variables, suggesting that interventions targeting pragmatic skills have the potential to reduce adolescent behavioral symptoms.**

*(J Dev Behav Pediatr 00:*1–10, 2015) **Index terms:** cohort study, mediation, social disadvantage, behavior, pragmatic language.

Although the association between social disadvantage and behavior in childhood and adolescence is well recognized,[1] the nature of that relationship still remains unclear. It has been suggested that social disadvantage predicts psychopathology largely by virtue of its impact on development more generally.[2] One aspect of development that has attracted considerable attention recently is the role played by the child's communication skills. The overlap between such skills and behavior in the early years is well documented, irrespective of how the children are identified.[3,4] Understandably, given the highly contextualized nature of both behavior and communication, these skills are closely associated with social disadvantage.[5,6] Indeed it has been suggested that the association of the 2 in the context of social disadvantage almost certainly exacerbates the long-term implications for the children concerned.[7,8]

In earlier studies, the association between language and behavior was reported to be stronger if the child had expressive/receptive difficulties rather than isolated speech or expressive language difficulties.[9] More recently, however, the suggestion has been made that "higher order" or pragmatic language difficulties that are associated with the child's ability to interpret effectively the intended meaning of others maybe particularly relevant to the perception of a child's behavior. Thus, pragmatic skills have been shown to be particularly relevant for children with autism spectrum disorder (ASD),[10] those referred to psychiatric services,[11] and especially for children with conduct disorders,[12] those identified with attention-deficit hyperactivity disorder (ADHD),[13] and those with reactive attachment disorder.[14] For example, in 1 community sample of 1364 children aged 4 years, pragmatic competence, but interestingly not structural language problems, was found to be highly correlated with behavioral problems of an externalizing nature, specifically hyperactivity.[15] There have also been indications that the patterns of structural and pragmatic language difficulties maybe a defining characteristic of the differences between children with ADHD, with ASD, and those with specific language impairment (SLI).[16] A recent article on the changing nature of

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peer relations between 7 and 16 years of age in a group of children originally identified with SLI[17] suggested that it was pragmatic skills that differentiated those children who were likely to go on to experience persistent peer problems. Nevertheless, the relationship between social disadvantage and behavior with pragmatic skills as a "third factor" has not been tested directly in older children. So it is appropriate, given the social salience of adolescent behavior problems, to ask whether pragmatics plays a role in mediating the association between social disadvantage and adolescent behavior. Such a mechanism is supported by clinical studies of children with SLI,[18,19] but studies are often quite limited in what they collect in terms of sociodemographic information. It has not been tested in large-scale population samples primarily because such studies only very rarely collect data on pragmatic skills. Furthermore, most studies assess communication and behavior at single time points, making it difficult to comment on the direction of the association.

Although the Strengths and Difficulties Questionnaire (SDQ)[20] has become one of the most commonly used measures of behavior, the assessment of pragmatics is much less well developed. Detailed observation of pragmatic skills has been possible for many years,[21] but it is only with the development of the Children's Communication Checklist (CCC) that such data have been collected in population samples[22,23] and that such analyses have become feasible. Only 1 study, The Avon Longitudinal Study of Parents and Children, has combined both these measures, the CCC in middle childhood and the SDQ in adolescence. In the present study, we examine the role played by pragmatics in mediating the relationship between social disadvantage in early childhood and behavior in adolescence, controlling for age, gender, and both verbal and nonverbal performance.

METHODS

Participants

The study draws on data from the Avon Longitudinal Study of Parents and Children (ALSPAC), a prospective population-based cohort study of children born to mothers in the west of England between April 1991 and December 1992, with a resultant cohort of 13,992 live births (49.7% male). Approximately 85% of all eligible mothers were recruited to the study.[24,25] Data are taken from questionnaires completed by the child's parent and teacher and, when the child is older, by the child. The number of participants at a given time reflects response rates on specific measures. For the present analysis, complete data were available on a minimum of 2915 children. Missing data were not imputed for the purposes of the present analysis. The ALSPAC dataset includes a range of cognitive language and behavioral assessments and key to the present article and is the only dataset to include data using the Children's Communication Checklist (CCC) at 9 years and the Strengths and Difficulties Questionnaire (SDQ) at a number of different time points but of specific relevance here at 13 years.

Ethical Approval

Ethical approval for the study was obtained at the inception of the cohort. All data were anonymized.

Analytical Framework

Figure 1 provides a conceptual framework for the question that we are addressing. Language and behavior are, of course, likely to be associated, and we would also predict that nonverbal performance and gender are likely to influence that relationship. The role of pragmatics is, however, much less clear, and the focus of this article is on the potential meditating effects of this variable on the relationship between social disadvantage and behavior. Autism is potentially of considerable influence in such a model, and for this reason, the children with autism spectrum disorder (ASD) were removed from the analyses to establish whether their presence made a difference to the conclusions drawn.

There are a number of approaches to assessing mediation. The approach of Baron and Kenny has recently been developed using the macro by Preacher and Hayes.[26] This estimates the path regression coefficients in a mediator model and generates bootstrap confidence intervals (percentile, bias-corrected, and bias-corrected and accelerated) for total and specific indirect effects of the independent variable, X, on outcome, Y, through a mediator variable, M. Their method adjusts all paths for the potential influence of covariates not proposed to be mediators in the model and extends that of Baron and Kenny, with bootstrapping being one of the more highly recommended approaches for inference about indirect effects.[27] Note that the steps are stated in terms of zero and nonzero coefficients, not in terms of statistical significance, as they were in the original article by Baron and Kenny (1986).[29] As trivially small coefficients can be statistically significant with large sample sizes and very large coefficients can be nonsignificant with small sample sizes, the steps should not be defined in terms of statistical significance. Statistical significance is informative, but other information should be part of statistical decision making. For instance, consider the case in which Path A is large and B is zero. In this case, $C = C'$. It is very possible that the statistical test of C' is not significant (due to the collinearity between X and M), whereas C is statistically significant. It would then appear that there is complete mediation when in fact there is no mediation at all.

Four steps allow us to test for mediation:

1. Establish that the explanatory variable of interest (social disadvantage) is associated with the outcome (SDQ Behaviour) after controlling for the covariates —that is, estimate and test path C in Figure 1.
2. Show that the key explanatory variable (social disadvantage) is associated with the potential mediator

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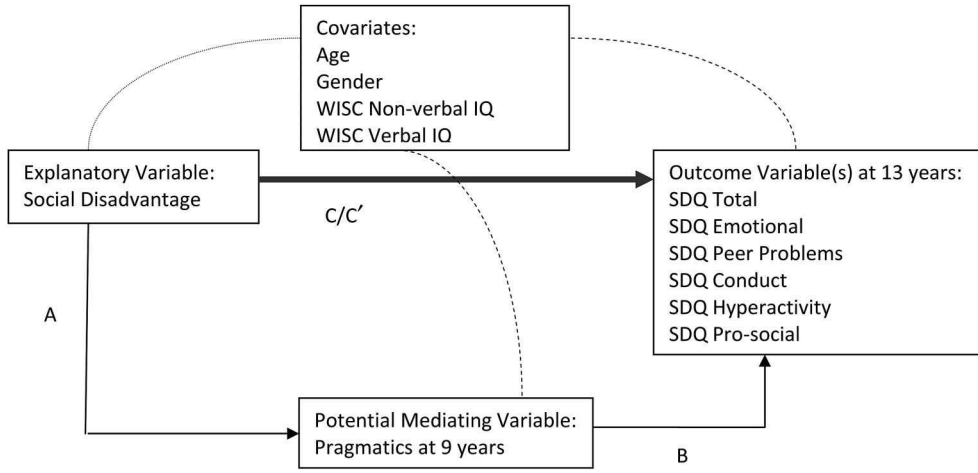

Figure 1. Pragmatics as a potential mediator of the social disadvantage/behavior relationship. SDQ, Strengths and Difficulties Questionnaire.

(pragmatics)—that is, estimate and test Path *A* in Figure 1.

3. Demonstrate that the potential mediator (pragmatic language) is associated with the outcome variable (SDQ Behaviour), after controlling for the key explanatory variables and the covariates (Path *B* in Fig. 1).
4. Establish the extent to which the potential mediator (pragmatics) mediates the relationship between the explanatory (social disadvantage) and outcome (SDQ Behavior) variables; the extreme case of complete mediation would be reflected by a null relationship between these 2 variables after adjusting for the mediating variable and the covariates (i.e., path *C′* in Fig. 1 would be zero).

If all 4 of these steps are satisfied, then the data are consistent with the hypothesis that the mediator either completely or partially mediates the relationship between the explanatory variable and the outcome. To summarize, path *C* represents the unadjusted (or "total") effect of the explanatory variable of interest on the outcome, which comprises the "indirect effect" (path *AB*) and the "direct effect" (path *C′*) of the explanatory variable on the outcome. The effect represented by *C′* is therefore the effect over and above that of the mediator (and covariates). Each of these 3 effects can be subjected to formal statistical hypothesis tests,[29] and the extent of mediation is represented by the magnitude of the indirect effect per se and (equivalently) by the degree of difference between the total and direct effects.

A series of univariable[30] regression models were initially used to derive a final set of variables associated with SDQ Behaviour Total score and for each of the different subscales of the SDQ at 13 years. So as not to miss any potentially influential variables at an early stage, a threshold of $p < .100$ was used in these models. Since the outcome variable was continuous and the sample size was large, ordinary linear regression was used. All analyses were conducted in SPSS (version 19; IBM Corp, Armonk, NY) and Stata (version 11; StataCorp, College Station, TX).

Variables

We include the variables of gender (male 1; female 2) and age calculated at school entry. We also included birth weight (in kilograms) split at 1.5 kg as a proxy for early developmental risk[31]. To assess social disadvantage, we constructed a composite scale from questionnaire variables identified in the first year of life. We followed Schoon et al[32] in developing a broad measure of social disadvantage comprising 6 binary variables comparable although not identical to those used by Schoon et al.[32] These are parental occupation (unskilled vs skilled), mother's education (O level or below/higher than O levels [ordinary or O levels being the national qualifications completed immediately before the end of compulsory schooling in the United Kingdom, i.e., 16 years of age at the time when the data were collected]), housing tenure (rented or other housing/owner occupied), overcrowding (1 or more person per room/less than 1 person per room), receipt of state benefits (in financial hardship vs not), and car ownership (no/yes). The scale was scored out of a total of 6; the higher the score, the greater the social advantage, and correspondingly, lower the score, the greater the social disadvantage. To check whether children with and without ASD performed differently in our model, we used an existing variable in the data set that corresponded to a clinical diagnosis.[33] This involved combining health and educational data. Initially, all children with developmental delay at any point during their childhood were identified; then all children having special educational needs from their health records were identified. These 2 lists were then matched to the ALSPAC data set. The medical records of those that were in all 3 were then scrutinized for a diagnosis of ASD made after a multidisciplinary assessment. A consultant pediatrician then went through the notes and confirmed that the children met International Statistical Classification of Diseases and Related Health Problems 10th Revision criteria for ASD.

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The outcome variable is the Strengths and Difficulties Questionnaire (SDQ),[20] a 25-item checklist of a child's behavior with translations into more than 40 languages. A teacher- or parent-rated measure, the SDQ provides a Total Difficulties Score, which is the sum of scores for the emotional, conduct, hyperactivity, and peer problems subscales. Each of the 5 scales of the SDQ are scored from 0 to 10, and one can add up 4 of these (emotional, conduct, hyperactivity, and peer problems) to create a total difficulty score (range, 0–40). There is also a score for the children's strengths—the Prosocial score—which, like the others, has a maximum score of 10 but works in reverse, with a high score indicating more pro-social behaviors. For each question, the respondent is required to say whether a statement is "not true," "somewhat true," or "certainly true." Both the total difficulties score and the individual subscale scores of the parent-rated version of the SDQ are used in the present analysis, completed when the children were aged 13 years. The internal consistency of the SDQ is relatively high (mean Cronbach's alpha = .73) as is the retest stability after 4 to 6 months (mean: .62).[20]

The mediator is the pragmatics composite of the first edition of the CCC,[23,24] a parent and teacher report measure of a specific set of communicative behaviors. The pragmatics composite of the CCC is based on Scales C to G of the CCC, namely, Inappropriate initiation (e.g., "Talks repetitively about things that no-one is interested in"); Coherence (e.g., "Would have difficulty in explaining to a younger child how to play a simple game such as 'snap'"); Stereotyped conversation (e.g., Make frequent use of expressions such as "by the way," "actually," "you know what?," "as a matter of fact," "well you know," and "of course"); Use of conversational context (e.g., tends to repeat back what others have just said); and Conversational Rapport (e.g., Doesn't seem to read facial expressions or tone of voice adequately and may not realize when other people are upset or angry). The CCC has a reported interrater reliability of 0.8 across the scales (range, 0.62–0.83) with Cronbach's alpha of .867 for one rater and .797 for a second.[23] The clinical validity of this scale has been shown to be good, using a threshold of 132 or below to indicate pragmatic language impairment. A normative study gave a mean of 153.7 and SD of 6.5.[10]

In addition, we included the verbal and nonverbal scale of the Wechsler Intelligence Scale for Children (WISC)[34] to enable us to judge the impact of pragmatics above and beyond nonverbal performance and more structured language performance. One of the most commonly used measures of its kind, the WISC involves the child performing specific tasks on request and has reported reliability coefficients for the verbal and performance scales of .95 and .91, respectively.

RESULTS

Descriptive statistics for the key variables together with intercorrelations are provided in Tables 1 and 2. The mean for the Children's Communication Checklist (CCC) pragmatic scale was slightly below that cited in the normative sample,[34] suggesting slightly higher levels of difficulty overall. In addition, 82 children (0.6%) of the total sample were identified as having autism spectrum disorders using the methods described above.

From Table 2, we can see that from the sociodemographic data that younger age at school entry tend to be slightly more disadvantaged in this sample; birth weight is not associated with any of the other variables. As might be expected, there was a correlation, low to moderate, among the key assessment variables, CCC pragmatics, Wechsler Intelligence Scale for Children (WISC) verbal and nonverbal. Gender and social disadvantage were minimally correlated with the key assessments with girls tending to have slightly lower verbal scores ($r_{pbi} = -.035$, $p = .003$) and slightly higher pragmatic ($r_{pbi} = .096$, $p < .001$) and nonverbal scores ($r_{pbi} = .030$, $p < .012$) than boys and those less disadvantaged having greater scores. Perhaps, rather surprisingly, being older was associated with poorer scores on the WISC—nonverbal IQ.

Univariable Analysis

In Table 3, all the explanatory variables (age, gender, WISC verbal and nonverbal scales, and the CCC) except birth weight are associated with the Strengths and Difficulties Questionnaire (SDQ) Total score outcome. Indeed, for this measure and for all the subscales, birth weight was the only variable not associated with all the

Table 1. Descriptive Statistics for All Included Variables

	N	Minimum	Maximum	Mean	SD
Age (mo) at school entry	9645	44	69	54.52	3.753
Birth weight (kg)	13,538	0.200	5.640	3.381	0.582
Social disadvantage[a]	11,853	0	6	4.259	1.435
CCC pragmatic language	7240	96	162	150.74	7.992
WISC—verbal IQ	7184	46.00	155.00	107.066	16.800
WISC—nonverbal IQ	7176	46.00	151.00	99.615	17.112

[a]Higher scores indicate lower social disadvantage (i.e., greater social advantage). CCC, Children's Communication Checklist; WISC, Wechsler Intelligence Scale for Children.

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Table 2. Correlation Matrix for Included Variables (Pearson's *r*)

	Gender	Age at School Entry	Birth Weight	Social Disadvantage	CCC Pragmatics	WISC—Verbal IQ
Age (mo) at school entry	−.012					
Birth weight	−.003	.001				
Social disadvantage[a]	.003	.026[b]	.007			
CCC pragmatic language	.096[c]	−.002	−.003	.217[c]		
WISC—verbal IQ	−.035[c]	−.004	.003	.351[c]	.248[c]	
WISC—nonverbal IQ	.030[b]	−.029[b]	.007	.237[c]	.201[c]	.500[c]

[a]Higher scores indicate lower social disadvantage (i.e., greater social advantage). [b]Correlation is significant at the 0.05 level (2-tailed). [c]Correlation is significant at the 0.01 level (2-tailed). CCC, Children's Communication Checklist; WISC, Wechsler Intelligence Scale for Children.

outcomes. Accordingly, birth weight was then removed from subsequent analyses.

In Table 4, we present the multivariable regressions with the total SDQ score and the SDQ subdomains.

Table 4 shows that in the multivariable model, social disadvantage and age are now not associated with any of the behavior scores, whereas gender only retains a significant association with emotional problems and hyperactivity, with girls having more emotional problems and less hyperactivity than boys. Of the key assessments, CCC pragmatics was still related as before, with the largest impact being on the SDQ Total score (−.319; confidence interval [CI], −.341 to −.297). On the one hand, the WISC nonverbal scale was no longer associated with the emotional and peer problems, whereas on the other hand, the WISC—verbal scale only remained associated with hyperactivity, with higher scores implying less behavior problems. No differential effect for the genders by social disadvantage was found.

Mediation Analysis for SDQ Total Score

The mediational analyses investigate the role of pragmatic language in the mechanism by which the greater the social disadvantage, the greater the behavior problems. In doing so, we hypothesize that greater social disadvantage might imply lower pragmatic language skills, which would potentially increase the risk of greater behavior problems. The pragmatic difficulties could lead to the behavior problems themselves, poor peer relationships, for example, leading to more friction with the peer group and poor social communication skills aggravating interactions with teachers.

The results of these analyses (Table 5) reveal that the relationship between social disadvantage and behavior (SDQ Total) was mediated by pragmatic language (partial mediation, 52%). The regression coefficient between social disadvantage and pragmatic language was statistically significant, .706 (95% CI, .486–.926), with persons with less social disadvantage exhibiting better pragmatic language; similarly, the regression coefficient between pragmatic language and SDQ, −.319 (CI, −.340 to −.297), where better pragmatic language scores showed better behavior. The indirect effect was statistically significant, .225 (CI, −.312 to −.142), but it is also important to note that social disadvantage influenced behavior independent of its effect on pragmatic language, −.205 (CI, −.338 to −.072).

Mediation Analysis for SDQ Subscales

For the SDQ subscores, pragmatics also partially mediates social disadvantage for the SDQ emotional difficulties, conduct difficulties, hyperactivity, and peer problem subscales (partial mediation 59%, 37%, 49%, and 64%, respectively), with the indirect effects being −.045 ($p < .001$), −.044 ($p < .001$), −.084 ($p < .001$), and −.058 ($p < .001$), respectively. We can see from Table 5 that for emotional and peer problems subscales, the direct effect is no longer significant but is not quite zero. The SDQ pro-social mediation analyses are not shown since there was no association with social disadvantage to mediate.

Because of potential concerns about the role played by autism and the SDQ used as categorical variables, we then reviewed these analyses. The multivariable regression and mediational analyses were repeated for those children without a diagnosis of autism as determined by an earlier analysis of the same data set.[33] In the case of the SDQ, the clinical thresholds used in the original standardization were used. This analysis found very similar levels of association to those reported here and in turn would lead to the same conclusions. The analyses were also repeated with behavior as a categorical outcome and only minor differences were found, in particular, that age was not significant at the univariable level and in the multivariable analyses social disadvantage was significant. Finally, birth weight as a category[31] was investigated and it did not differ from the uncategorized version in the analyses.

DISCUSSION

The association between social disadvantage and behavior in adolescence is predictably confirmed, and the indirect effect of pragmatics suggests that adolescent behavior is, at least partially, mediated by pragmatic language skills in middle childhood. Even when adjusting for both verbal and nonverbal IQ and gender, pragmatic

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Table 3. Univariable Regression Models with Behavior (SDQ Total Score and Subdomains) as the Outcome Variable

	SDQ Total	Emotional Problems	Conduct Problems	Hyperactivity	Peer Problems
	Coefficient (95% CI)	Coefficient (95% CI)	Coefficient (95% CI)	Coefficient (95% CI)	Coefficient (95% CI)
Gender (male 1/female 2)	−.720*** (−.955 to −.484)	.399*** (.319 to .480)	−.075* (−.143 to −.008)	−.820*** (−.923 to −.716)	−.236*** (−.312 to −.160)
Age (mo) at school entry	−.056** (−.095 to −.017)	−.014 (−.027 to .000)	0 (−.011 to .12)	−.028** (−.045 to −.010)	−.016* (−.028 to −.003)
Birth weight	−.062 (−.275 to .152)	−.017 (.090 to .057)	−.028 (−.089 to .034)	−.018 (−.113 to .077)	−.009 (−.078 to .061)
Social disadvantage	−.728*** (−.822 to −.634)	−.135*** (−.167 to −.102)	−.161*** (−.188 to −.134)	−.301*** (−.343 to −.259)	−.148*** (−.179 to −.117)
CCC pragmatic language	−.331*** (−.345 to −.316)	−.063*** (−.068 to −.057)	−.058*** (−.063 to −.054)	−.131*** (−.137 to −.124)	−.080*** (−.085 to −.075)
WISC—verbal IQ	−.057*** (−.065 to −.049)	−.011*** (−.013 to −.008)	−.009*** (−.012 to −.007)	−.029*** (−.032 to −.025)	−.008*** (−.011 to −.006)
WISC—nonverbal IQ	−.053*** (−.061 to −.046)	−.009*** (−.012 to −.007)	−.01*** (−.012 to −.007)	−.026*** (−.03 to −.023)	−.008*** (−.011 to −.006)
Birth weight <1500 (g)	.294 (−.935 to 1.522)	.077 (−.346 to .501)	.087 (−.267 to .44)	.167 (−.38 to .714)	−.056 (−.456 to .343)

*$p < .05$; **$p < .01$; ***$p < .001$. CCC, Children's Communication Checklist; CI, confidence interval; SDQ, Strengths and Difficulties Questionnaire; WISC, Wechsler Intelligence Scale for Children.

Table 4. Multivariable Regressions for All SDQ Domains, with Gender and Social Disadvantage Interaction

	SDQ Total	Emotional Problems	Conduct Problems	Hyperactivity	Peer Problems
	Coefficient (95% CI)	Coefficient (95% CI)	Coefficient (95% CI)	Coefficient (95% CI)	Coefficient (95% CI)
Gender (male 1/female 2)	−.183 (−1.375 to 1.01)	.598* (.132 to 1.064)	−.104 (−.479 to .27)	−.583* (−1.129 to −.036)	−.189 (−.601 to .223)
Age (mo) at school entry	−.023 (−.064 to .018)	−.005 (−.021 to .011)	.004 (−.009 to .017)	−.015 (−.034 to .003)	−.009 (−.023 to .005)
Social disadvantage	−.198 (−.601 to .205)	.001 (−.157 to .158)	−.121 (−.248 to .005)	−.074 (−.259 to .111)	−.054 (−.193 to .085)
CCC pragmatic language	−.319*** (−.341 to −.297)	−.061*** (−.07 to −.053)	−.062*** (−.069 to −.055)	−.118*** (−.128 to −.107)	−.079*** (−.087 to −.071)
WISC—verbal IQ	−.003 (−.014 to .008)	.002 (−.003 to .006)	.003 (−.001 to .006)	−.009** (−.014 to −.004)	.002 (−.001 to .006)
WISC—nonverbal IQ	−.017** (−.027 to −.007)	−.004 (−.008 to .001)	−.004* (−.007 to 0)	−.009*** (−.013 to −.004)	−.001 (−.005 to .002)
Gender × social disadvantage	−.005 (−.254 to .245)	−.021 (−.118 to .077)	.031 (−.048 to .109)	−.009 (−.124 to .105)	.014 (−.072 to .101)

*$p < .05$; **$p < .01$; ***$p < .001$.

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Table 5. Mediational Effect of Pragmatics on the Relationship Between Social Disadvantage and the SDQ Subscales, Adjusted for IQ, Age, and Gender

Outcome		SDQ Total	Emotional Problems	Conduct Problems
Step	**Path**	**Coefficient (95% CI)**	**Coefficient (95% CI)**	**Coefficient (95% CI)**
1	C, total effect	−.430*** (−.579 to −.280)	−.076** (−.129 to −.023)	−.119*** (−.162 to −.075)
2	A	.706*** (.486 to .926)	.729*** (.509 to .949)	.718*** (.499 to .937)
3	B	−.319*** (−.340 to −.297)	−.061*** (−.069 to −.053)	−.062*** (−.068 to −.055)
4	C , direct effect	−.205** (−.338 to −.072)	−.031 (−.084 to .022)	−.075** (−.116 to −.033)
WISC—verbal IQ		−.003 (−.014 to .008)	.002 (−.002 to .006)	.003 (−.001 to .006)
WISC—nonverbal IQ		−.017** (−.027 to −.007)	−.004 (−.008 to .000)	−.004* (−.007 to −.000)
Age (mo) at school entry		−.023 (−.064 to .018)	−.005 (−.021 to .011)	.004 (−.009 to .017)
Gender (male 1/female 2)		−.204 (−.508 to .101)	.501*** (.381 to .621)	.037 (−.059 to .133)
Mediation (%)		.52	.59	.37
	R^2	.261	.087	.116
	Sample size	2915	2923	2923

Outcome		Hyperactivity	Peer Problems
Step	**Path**	**Coefficient (95% CI)**	**Coefficient (95% CI)**
1	C, total effect	−.172*** (−.237 to −.106)	−.090*** (−.139 to −.041)
2	A	.710*** (.491 to .929)	.737*** (.518 to .957)
3	B	−.118*** (−.128 to −.108)	−.079*** (−.087 to −.071)
4	C , direct effect	−.088** (−.149 to −.027)	−.032 (−.078 to .014)
WISC—verbal IQ		−.009** (−.014 to −.004)	.002 (−.001 to .006)
WISC—nonverbal IQ		−.009*** (−.013 to −.004)	−.001 (−.005 to .002)
Age (mo) at school entry		−.015 (−.034 to .004)	−.009 (−.023 to .005)
Gender (male 1/female 2)		−.626*** (−.766 to −.485)	−.123* (−.229 to −.017)
Mediation (%)		.49	.64
	R^2	.232	.142
	Sample size	2924	2921

*$p < .05$; **$p < .01$; ***$p < .001$.

skills play a major role in mediating the relationship between social disadvantage and adolescent behavior. Thus, it follows, pragmatic language skills are likely to be a contributory factor in later social and emotional difficulties. More specifically, although this does hold for all children, it seems to be particularly salient for children from more socially disadvantaged backgrounds who also have pragmatic difficulties. It is noteworthy that this is the largest data set of its kind that allows the examination of the relationship of pragmatics in middle childhood with adolescent behavior.

At one level, these results may not appear very surprising given that we know that social disadvantage is likely to be associated with early and potentially persisting language delay and with behavior problems. But it is the interaction between these factors and specifically the role played by pragmatics, which is important here. The same relationship was observed by Ketelaars et al[15] in their community sample of 4-year-old children. They also found that pragmatic competence, as measured on the same scale (the Children's Communication Checklist [CCC]) predicted behavioral problems independently of social disadvantage and structural language problems. This current study extends this analysis by using a larger data set and by looking at the relationship between pragmatics and behavior across time and specifically into adolescence.

The interaction of pragmatic competence with children's emotional and behavioral development and functioning is of interest here. The pragmatic composite score of the CCC consists of 5 scales (Scales C to G) covering the domains of (1) inappropriate initiation, (2) coherence, (3) stereotyped conversation, (4) use of conversational context, and (5) conversational rapport.

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These domains all cover communicative behaviors that are necessary for effective interaction and communication between children and their caregivers, their learning environments and their peers. Given that pragmatic competence was found to mediate partially the relationship between social disadvantage and adolescent behavior, this suggests that these abilities are necessary preconditions for emotional and behavioral functioning and development. Without these abilities, children are likely to be at risk of disengaging from those contexts where relating positively to family, peers, and professionals is essential.

As discussed above, it might be assumed that the relationship between pragmatics and behavior would best be explained by the fact that children with autism spectrum disorder (ASD) would, almost by definition, experience both. The fact that the relationship did not change substantively once the 82 children with ASD were excluded suggests that there is not sufficient evidence to support this proposition. This suggests that it is the pragmatic skills themselves rather than autism that makes the difference in our model. There are clearly a great many children with poor pragmatic skills who would not warrant an ASD diagnosis. It is not possible, given both the available data in the cohort concerned and the lack of agreed diagnostic criteria, to identify a group of children who would meet the DSM-5 criteria for Social (Pragmatic) Communication Disorder.[35] Nevertheless, it would be reasonable to assume that such a group could be affecting the results.

There is considerable overlap between the behaviors that constitute pragmatic language skills and those behaviors that are indicative of difficulties in emotional and behavioral functioning.[3,4] Differentiating between such behaviors is challenging and may reflect different conceptual approaches to understanding children's behavior. Measuring and quantifying pragmatic language behaviors is a challenge for large cohort studies, which require short and often self or parental report measures rather than in-depth observation carried out by a skilled researcher and/or practitioner. This study measured pragmatic language skills using the CCC and behavior with the Strengths and Difficulties Questionnaire (SDQ). These are both parental report measures and the measures may not differentiate robustly between pragmatic language skills and those behaviors indicative of emotional and behavioral functioning. In effect, the scales maybe tapping into the same construct.

Implications for Practice

There are 2 major implications of these findings. The first concerns the process of identification and diagnosis, and the second relates to the intervention and management of these children. From the relationships described above, it is clear that all children referred to child and adolescent mental health services or to speech and language pathology services ought to have both domains (communication and behavior) assessed. The literature indicates that approximately 50% of children referred to mental health or speech and language therapy services will have comorbid problems and diagnosing on the basis of one or other dimension is likely to lead to misunderstandings and confusion among professionals and parents. Whether this constitutes a call for a screening procedure, given the poor sensitivity of most screening tests for development and language development in particular, remains an issue. Nevertheless, given the validity and relatively inexpensive nature of both scales, there is a case for both the CCC and the SDQ to be a part of any assessment battery used with children in middle childhood.

Meditational analyses of the type reported here are likely to have implications for intervention because they help identify mechanisms that are potentially important for intervention. Indeed, the suggestion has been made that "If we fail to identify mediators, we are likely to make faulty assumptions about the design of improved treatments."[36] The Cochrane Review of randomized controlled trials of a range of speech and language interventions for children with primary language impairment has demonstrated the potential benefit of such interventions, especially with young children and especially for those with speech and expressive language difficulties.[37] Clearly, it is possible to introduce environmental modifications that can stimulate the development of speech and language skills through a combination of direct instruction and the development of metacognitive skills that allow the children to acquire the requisite skills more efficiently. To date, the research literature would tend not to support the introduction of social skills training as such, especially in high incidence conditions, but social skills and pragmatics are not the same thing. Pragmatics represents a much more closely defined set of behaviors. A recent randomized controlled trial of an intervention to promote pragmatics language skills in the United Kingdom targeting children identified with pragmatic language impairment has shown positive outcomes on parent report measures of pragmatic language skills.[38] The study involved 87 children with a mean age of 8 years randomly allocated to 2 groups, the first to receive the Social Communication Intervention programme analogous to the treatment for pragmatics and the second treatment as usual. Although children's performance generally improved, the posttest group comparisons were not significantly different for the primary outcome (structural language), but they did reach significance on a number of the secondary outcomes, including, at 6 months postintervention, the pragmatics scale of the CCC. Of course, such findings need to be replicated, but they do suggest that the more social aspects of pragmatic language maybe more mutable than those aspects of language that would traditionally be seen as more structural in nature, especially toward the latter half of middle childhood. Although behavior was not an outcome in that study, two-thirds of the children also had considerable behavior difficulties, suggesting that it would be reasonable to assume that such an intervention would, at least, have the potential to reduce behavioral symptoms,

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given the mechanism described. This begs the question of whether early intervention to promote language skills could have a "knock-on" effect on pragmatics and thus adolescent behavior. The data in the present study do not allow us to test this, but it is possible that this would be the case given the developmental relationship between early structural skills and pragmatics.

Study Limitations

Meeting the steps required for mediation does not conclusively establish that mediation has occurred because there maybe other models that are consistent with the data. The fact that the targeted behaviors are separated by time increases confidence that the relationship maybe directional rather than simply one of association. The mediational analysis presupposes measurement without error and, although the measures used are widely recognized and have been developed for both clinical and research purposes, measurement error is always a risk in such analyses. That such errors are "non-differential" in that they do not lead to biased estimates of the regression coefficients maybe a more reasonable contention. As with most longitudinal studies, attrition over the time course is an issue and this has to be recognized here with the numbers available for these analyses remaining large, albeit subject to predictable attrition.

CONCLUSIONS

The findings from this study support those of other recent studies highlighting the importance of the role played by pragmatics in the relationship between language skills and behavior, specifically conduct problems and hyperactivity. Indeed, in this population and with these measures, it seems that pragmatics plays a major role in accounting for some aspects of behavior. These findings need to be replicated in both comparable and different populations, but if the relationship holds, then it is likely to have considerable implications for the development of valid and effective interventions in this area.

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