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The Role of Pragmatic Language Use in Mediating the Relation between Hyperactivity and Inattention and Social Skills Problems

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The Role of Pragmatic Language Use in Mediating the Relation between Hyperactivity and
Inattention and Social Skills Problems

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Abstract

Purpose: The current study explored whether pragmatic language use was associated with, and perhaps accounted for, the social skills problems children with varying levels of hyperactivity and inattention experience.

Method: A community sample of 54 children aged 9 to 11 years participated. Pragmatic language use, hyperactivity and inattention, and social skills were examined utilizing data collected from standardized parent-report rating scales.

Results: Pragmatic language use fully mediated the relation between hyperactivity and social skills problems, and partially mediated the relation between inattention and social skills problems. Further, pragmatic language use provided a unique contribution in the estimate of children's social skills of 21.6% above and beyond the contribution of hyperactivity and 17.2% above and beyond the contribution of inattention.

Conclusions: Possible explanations for these mediation results are discussed in terms of children with ADHD and the problems they experience with social relations.

Keywords: Pragmatic language use – Hyperactivity - Inattention – Social skills - Mediation

The Role of Pragmatic Language Use in Mediating the Relation between Hyperactivity and Inattention and Social Skills Problems

Peer relationships are the primary context in which children learn the social skills (e.g., cooperation, negotiation, and conflict resolution) that are critical for effective social functioning throughout life (Rubin, Bukowski, & Parker, 1998). Childhood peer problems predict a wide variety of later negative outcomes including academic difficulties, delinquency, dropping out of school, substance abuse, and psychological maladjustment (Rubin et al.; Parker & Asher, 1987). One factor that may be contributing to social skills problems is deficiencies in communication. Typically developing children who are good communicators also find it relatively easy to establish and maintain friendships (Gottman, 1983). The goal of the current study was to understand factors that lead to the social skills problems of a community sample of children. To do that, we identify two well documented “at risk” dimensions for attention deficit hyperactivity disorder (ADHD), hyperactivity and inattention, and examine how well they each predict social skills problems. More importantly, we investigate whether these “at risk” dimensions predict pragmatic language use (an aspect of communication), and whether pragmatic language problems may mediate the relations between the ADHD symptoms and social skills problems. At-risk symptoms for ADHD were chosen because ADHD has been reliably associated with significant peer problems that are rapid in onset and stable over time (Whalen & Henker, 1985).

The bulk of work on communication deficiencies among children with and without ADHD has been in the area of general language impairment; more specifically, receptive and expressive language. Receptive language skill is the ability to understand or comprehend spoken language. Expressive language skill is the ability to communicate thoughts, needs, or wants. Children deficient in these skills are not able to communicate at the same level or with the same

complexity as their peers. Several investigations are consistent in demonstrating no significant difference in receptive language abilities between typically developing children and children with ADHD (Barkley, DuPaul, & McMurray, 1990; Kim & Kaiser, 2000). In contrast, impairments in oral expressive abilities among children with ADHD have been documented with standardized language tests (Kim & Kaiser) and storytelling tasks (Purvis & Tannock, 1997).

Communication in social interaction is part of the pragmatic aspect of language. The pragmatic domain refers to the practical use of language in social interaction (Prutting & Kirchner, 1987). According to Prutting and Kirchner, pragmatics include topic initiation, topic maintenance, turn taking, use of context, interruptions, amount of talk, intensity (tone and volume), eye contact, facial expression, physical proximity, and gestures. Pragmatic impairments are not restricted to spoken language. A broader definition of pragmatics incorporates behaviors that encompass social, emotional, and communicative aspects of social interaction (Adams, Baxendale, Lloyd, & Aldredge, 2005), such as screaming, crying, or yelling dyspragmatically. Assessment of pragmatics can provide a complementary window into aspects of social and cognitive functioning (Adams, Green, Cox, & Gilchrist, 2002) that observation of non-verbal behaviors alone cannot, and can make a sound contribution to communication and social intervention strategies for children with ADHD (Camarata & Gibson, 1999).

Pragmatic language development is an ongoing interaction in child and peer behaviors. The literature on normal children's language shows the beginning of pragmatic competence at a surprisingly early age. For example, 2-year-olds can adapt their message to what the listener knows or does not know, and respond to listener feedback (Furrow, 1984). From 2 years of age, children can maintain a topic in an interaction with an adult, and by age 5, children make turn-taking repairs (Ervin-Tripp, 1979). Between ages 6 and 7, metapragmatic skills (the ability to

reflect on one's own communication) are present (Andersen-Wood & Smith, 1997).

The school-age years bring new settings, audiences, roles, and experiences that provide the motivation for further refinement of communication skills. Conversational skills mature as students improve their ability to perceive others' abilities and knowledge and their ability to shift topics in subtle ways (McLaughlin, 1998). Children are able to achieve their pragmatic goals such as asserting, denying, sharing information, and bonding with others, and learn forms that help them achieve these goals (Dore, 1974; Searle, 1979) As children traverse the school system, their cognitive abilities have developed to the point that they are able to describe, compare and contrast, explain, analyze, hypothesize, deduce, and evaluate.

As children move from pre-school to upper-elementary school, conversation becomes more important for establishing and maintaining social relationships. Age-appropriate skill in carrying on conversations has been implicated in children's success at making friends and being accepted by peers (Hemphill & Siperstein, 1990). When interacting with peers, upper-elementary school children are able to maintain a topic of conversation, produce more topic continuations, topic invitations and responses, produce fewer silent pauses, and become more proficient at controlling the processes of planning, production, and comprehension (McLaughlin, 1998).

Appropriate pragmatic communication skills are critical in both academic tasks requiring cooperative group learning and nonacademic social occasions (Westby & Cutler, 1994). The children who are able to develop these skills are more successful in their social interactions with peers, family, and teachers (Bierman, 2004). Children who invite others to play and take turns in dyadic interactions are viewed as attractive friends (Gottman, 1983). Successful communicators are able to share information about themselves and their feelings and opinions, and they ask questions to elicit information from others. Thus, these children are able to establish and

maintain effective friendships (Rubin et al., 1998).

Consideration of implications of pragmatic language use may be informative in understanding social difficulties among children who experience problems with hyperactivity and inattention. Empirical research has confirmed hyperactivity and inattention as being associated with ADHD (attention deficit hyperactivity disorder) and ADHD has been documented as one of the most well known and stable risk factors for problematic peer relationships (Whalen & Henker, 1985; Melnick & Hinshaw, 1996). The primary characteristics that define ADHD in children are developmentally inappropriate levels of socially disruptive behavior, inattention, impulsiveness, hyperactivity, or a combination thereof (APA, 1994). Children with ADHD are more likely to experience disturbed peer relationships, rejection by peers, and failure to attain peer acceptance (Melnick & Hinshaw).

The diagnostic criteria for ADHD include behaviors that suggest pragmatic dysfunction, such as talking excessively, interrupting others, not listening to what is being said, blurting out answers to questions before they are completed, and experiencing difficulty waiting for turns (APA, 1994). Although the diagnosis for ADHD does not include problematic peer relationships, the symptomatology included under the diagnosis has major implications for peer relationships. Specifically, difficulty sustaining attention in tasks or play activities, difficulty waiting his or her turn, and talking and fidgeting excessively (Parker, Rubin, Price, & DeRosier, 1995) may compromise children's relationships with others. Understanding pragmatic language use difficulties as a function of "at risk" dimensions of ADHD among typically developing children is important in understanding the potential precursors of social skills problems.

Bignell and Cain (2007) investigated pragmatic aspects of communication and language comprehension in relation to poor attention and/or high hyperactivity in a nondiagnosed

population of 7- to 11-year olds. Three groups were formed: poor attention group, high hyperactivity group, and poor attention/high hyperactivity group. Their performance as reported by their classroom teacher was compared with that of same-age controls. These researchers reported that the poor attention and the poor attention/high hyperactivity groups were impaired in both their comprehension of figurative language and in pragmatic aspects of communication. The high hyperactivity group was impaired in their comprehension of figurative language but they did not exhibit communication impairments. These results extend work with clinical populations of children with ADHD to a nondiagnosed sample of children, in that poor attention and elevated levels of hyperactivity are associated with pragmatic language weaknesses.

To date, virtually no empirical research has been published documenting the relation between pragmatic language use and the social skills problems among children with varying levels of hyperactivity and inattention. Cohen et al. (1998) has suggested that language impairments could possibly cause the social problems of children with ADHD, but this relation has not been formally tested. A possible link may be that children with ADHD seem significantly less adaptive in their ability to adjust social communication behaviors (Landau & Milich, 1988). Deficiencies in these skills have been documented to result in negative consequences such as being teased, victimized, and rejected by their peers (Bierman, 2004), regardless of diagnostic status. Thus, the focus of the current study was to develop a deeper understanding of the complexities of pragmatic language development in children with varying levels of hyperactivity and inattention, specifically the use of pragmatic language in communicative contexts and its association with establishing and maintaining successful peer relationships.

The Current Study

The goal of the current study was to investigate the social skills of a community sample

of children varying in their levels of hyperactivity and inattention, with a specific focus on their pragmatic language use (PLU). The following operational definitions were used for the variables of interest: (1) Social Skills (Outcome variable) - the Social Skills Standard Score (CARS) as reported by the parent on the *Social Skills Rating System (SSRS)* (Gresham & Elliott, 1990), (2) Hyperactivity (Predictor variable) – the Hyperactivity subscale score as reported by the parent on the *Conners Parent Rating Scales-Revised: Short Version* (Conners, 2001), (3) Inattention (Predictor variable) - the Inattention subscale score as reported by the parent on the *Conners' Parent Rating Scales-Revised: Short Version* (Conners, 2001), and (4) Pragmatic Language Use (PLU) (Mediator variable) - the Pragmatic Composite (unstandardized) as reported by the parent on the *Children's Communication Checklist – 2 U.S. Edition (CCC-2)* (Bishop, 2003). The study explored whether PLU was associated with, and perhaps accounted for, the social skills problems these typically developing children experience.

The following questions and hypotheses were investigated. First, are hyperactivity and inattention correlated with social skills problems? Second, are hyperactivity and inattention correlated with PLU? Third, is PLU correlated with social skills? Fourth, does PLU mediate the relation between hyperactivity or inattention and social skills problems? It is predicted that hyperactivity and inattention will be negatively correlated with social skills and PLU, PLU will be positively correlated with social skills, and PLU will mediate the relation between hyperactivity or inattention and social skills problems.

Method

Recruitment

The University of Kentucky's IRB approved the research protocol and recruitment flyer. Written approval for the distribution of the recruitment flyer was obtained from the

superintendent of the county public school district and from the principal of the private school. Copies of the recruitment flyer were delivered to the respective schools for distribution to all 4th, 5th, and 6th grade children (9-, 10-, and 11-year-olds) to take home to their parent. All children, regardless of special educational needs, were invited to participate. This grade/age range was selected as these children have had an opportunity to experience elementary school for a few years and have had time to establish relationships with their peers as well as develop more mature pragmatic communication skills.

The recruitment flyer invited families to take part in a research study about children's communication and behavior patterns. Interested parents initially were screened over the phone for whether their child spoke English as his or her primary language or had a history of speech or hearing problems. Only two children were reported as having a speech problem. Based on the parent's report that their child should have no problem completing the required tasks, these two children were allowed to participate in the study. There was one child reported as having a confirmed diagnosis of ADHD. This child also was allowed to participate in the study. As requested by the school district, teachers were informed of the purpose of the research study by their respective school principals.

Participants

The final study sample included 54 children from one private and eleven public schools in southeastern communities, ranging in age from 9 to 11 (M age = 10 years, 6 months, SD = 0.81). There were 29 boys (53.70%) and 25 girls (46.30%). Fifty-one children were Caucasian (94.45%), one was African American, one was Hispanic, and one was Biracial. Demographic characteristics are presented in Table 1.

Assessment of Social Skills Ability

The *Social Skills Rating System* (SSRS; Gresham & Elliott, 1990) was developed for the purpose of identifying and classifying children suspected of having social behavior problems and is used to evaluate a broad range of socially validated behaviors including those behaviors that affect peer acceptance in children. The Social Skills Parent Rating Scale emphasizes positive behaviors, or prosocial skills, and is comprised of four subscales: Cooperation, Assertion, Responsibility, and Self-Control (CARS). The subscales include key symptoms such as “Volunteers to help family members with tasks”, “Accepts friends’ ideas for playing”, “Acknowledges compliments or praise from friends”, and “Politely refuses unreasonable requests from others”. The result from the four subscales results in the Social Skills Standard Score. The SSRS Social Skills Standard Score (CARS) has been standardized such that the mean = 100 and the standard deviation = 15. The national median coefficient alpha reliability for the Social Skills Scale was .90 while the internal consistency estimates ranged from .83 to .94, representing a relatively high degree of scale homogeneity. Test-retest reliability for the Social Skills Subscale ranged from .77 to .84 for parents, demonstrating good stability. According to the instrument’s authors, the internal relationships of the SSRS Subscales and Scales are highly consistent with the concepts underlying the development of the system. Reliability analysis of the questions comprising the Social Skills Standard Score (CARS) from this sample revealed a good Cronbach’s alpha of .81. In this study, the Social Skills Standard Score (CARS) was used as the primary measure of social skills. Table 2 represents the breakdown in the SSRS Social Skills Standard Score (CARS).

Assessment of Hyperactivity and Inattention

The *Conners Rating Scales-Revised: Short Version* [CPRS-R:S (Parent), Conners, 2001), has long been the standard instrument for the assessment of ADHD and related problem

behaviors in children. Total internal reliability coefficients for the development of the CPRS-R:S ranged from 0.857 to 0.938 (Conners). The data for the CPRS-R:S items had excellent fit to the three-factor model. The parameter estimates for the relationships among the three factors were the following: Oppositional with Cognitive Problems/Inattention was 0.58, Oppositional with Hyperactivity was 0.60, and Cognitive Problems/Inattention with Hyperactivity was 0.58 (all loadings were significant, $p < .05$). These results support the view that the factor-derived subscales of the CPRS-R:S assess three relatively distinct dimensions (Conners). Findings are consistent with the diagnostic criteria for ADHD and definitions of CRS–R subscales. Based on these findings, practitioners may use CRS–R with confidence (Conners). The four scales include: Oppositional, Inattention, Hyperactivity, and a combined ADHD Index. Scoring is based on the following scale: 44 and below = “No Concern”, 45-55 = Average, 56-60 = “Slightly Atypical – Should Raise Concern”, 61-65 = “Mildly Atypical – Possible Significant Problem”, 66-70 = “Moderately Atypical – Significant Problem”, and 70 and above = Markedly Atypical – Significant Problem”. In this study, the Hyperactivity and Inattention subscale scores were used as the primary at-risk measures of ADHD. The subscales include key symptoms such as “Hard to control in malls or while grocery shopping”, and “Avoids, expresses reluctance about, or has difficulties engaging in tasks that require sustained mental effort (such as schoolwork or homework)”. Table 3 represents the breakdown of all four scales of the CPRS-R:S.

Assessment of Pragmatic Language Use

The *Children’s Communication Checklist – 2 U.S. Edition (CCC-2; Bishop, 2003)* is a measure designed to assess children’s communication skills in the areas of pragmatics, syntax, morphology, semantics, and speech. CCC-2 is used with children ages 4:0 to 16:11 years who speak in sentences and whose primary language is English. It is administered using a Caregiver

Response Form on which the caregiver rates the frequency that the child demonstrates the communication behavior described in each item. The CCC-2 is designed to identify children with pragmatic language impairment, identify children who may have a speech and language impairment, and whose receptive and expressive language skills should be further evaluated with a comprehensive speech and language assessment, or assist in identifying children who may require further assessment for an autistic spectrum disorder. While there are many tests that are excellent for assessing aspects of speech and language, the CCC-2 has demonstrated high sensitivity to communication impairments under the domain of pragmatics (Bignell & Cain, 2007). In a selective review and critique of current formal and informal testing methods and pragmatic analytic procedures, Adams (2002) states the *Children's Communication Checklist* developed by Bishop (1998) appears to be the only pragmatics checklist which has provided satisfactory estimates of internal consistency and inter-rater reliability, and has rapidly become the instrument of choice for the identification of pragmatic language impairment.

The questionnaire covers mainly pragmatic skills and contains 70 items (each with 7 items) that were grouped in 10 scales: (a) Speech, (b) Syntax, (c) Semantic, (d) Coherence, (e) Inappropriate Initiation, (f) Stereotyped Language, (g) Use of Context, (h) Nonverbal Communication, (i) Social Relations, and (j) Interests. For each scale, five items address difficulties in communication skills that children may have and two items focus on strengths. The first four scales (A through D) assess aspects of articulation and phonology, language structure, vocabulary, and discourse. These are areas that are often impaired in children with specific language impairment (SLI). The next four scales (E through H) address pragmatic aspects of communication that are not readily assessed by conventional language assessments (Bishop & Baird, 2001). Pragmatic skills can be impaired in children with or without structural

language difficulties. In other words, Scales E, F, G, and H identify children whose language is not impaired in the areas of content and form, but is impaired in the area of use. The last two scales (I and J) assess behaviors that are usually impaired in children with autistic spectrum disorder (ASD). Because pragmatic difficulties do occur in both children with HFA (high functional autism) and ADHD, these items have been shown to discriminate case identification in children with ADHD, HFA, and normal controls (Geurts et al., 2004). The CCC-2 has been found to have strong reliability and validity, including good interrater agreement ($r = .79$).

The standardized Pragmatic Composite (PC) included in the CCC is no longer available in the CCC-2, although the six scales (E through J) relating to the pragmatic aspects of communication are retained. For this study, an unstandardized PC was calculated by averaging the six scales to determine whether this score was associated with the Hyperactivity and Inattention subscale scores. Scoring from the original PC is based on mean = 60 and standard deviation = 18. Reliability analysis of the questions comprising the unstandardized PC from this sample revealed a good Cronbach's alpha of .88. In this study, the unstandardized PC was used as the primary measure of pragmatic language use. **Key symptoms of the PC include the following: Initiation – “Talks repetitively about things that no one is interested in”, Scripted Language – “Provides over-precise information in his or her talk (e.g., if asked “When did you go on vacation?” may say “July 13, 2005” instead of ‘in the summer’)”, Context – “Is too literal (e.g., if asked ‘Is it hard to get up in the morning?’ replies, “No, you just put one leg out of the bed and then the other and stand up;” or if told “watch your hands” when using scissors, proceeds to stare at his or her fingers)”, Nonverbal Communication – “Does not look at the person he or she is talking to”, Social Relations – “Appears anxious in the company of other children”, and Interests – “Moves the conversation to a favorite topic, even if others do not seem**

interested in it". Table 4 reflects the breakdown in the unstandardized PC scores of the CCC-2.

Assessment of General Verbal and Nonverbal Intelligence

The *Kaufman Brief Intelligence Test -2 (KBIT-2)*; Kaufman & Kaufman, 2004) was administered individually to each child to obtain an estimate of general verbal and nonverbal intelligence. *KBIT-2* measures two distinct cognitive abilities through two scales – Crystallized and Fluid. The Crystallized (Verbal) Scale contains two item types: Verbal Knowledge and Riddles. This scale includes receptive and expressive vocabulary items that do not require reading or spelling. The Fluid (Nonverbal) Scale is a Matrices subtest. Scores were provided on a familiar scale where mean = 100 and standard deviation = 15.

Assessment of General Receptive and Expressive Language Abilities

The *Oral and Written Language Scales: Listening Comprehension (LC) Scale* (receptive language) and the *Oral Expression (OE) Scale* (expressive language) (*OWLS*; Carrow-Woolfolk, 1995) was administered individually to each child. The assessment of receptive and expressive language abilities provided a broad picture of the children's general language abilities. *OWLS'* scoring is based upon correct response (e.g., Preferred, Acceptable, or No Differentiation) and incorrect response (e.g., Grammatical Error, Semantic/Pragmatic Error, or No Response). Three standardized scores were calculated: Oral Expression (OE) Standard Score, Listening Comprehension (LC) Standard Score, and a combined OE and LC Standard Score (OLS). Scores were provided on a familiar scale where mean = 100 and standard deviation = 15.

Procedure

All study procedures were approved by the University of Kentucky's IRB. One child with a confirmed diagnosis of ADHD as reported by the parent participated in this study. The child was medication free for the 24 hours prior to the study. This is considered an acceptable washout

period for stimulant medication. Informed consent was obtained from the parent and the parent was then provided instructions on completing the pragmatic language use, hyperactivity and inattention, and social skills standardized measures. While the parent was completing the rating forms, the child was taken to the testing room where the child was seated at a table across from the Experimenter. The child was read the Child Assent Form and verbal assent for participation was obtained from the child prior to the start of session. To determine general verbal and nonverbal intelligence and general expressive and receptive language abilities, children completed the *KBIT-2* (Kaufman & Kaufman, 2004) and the *OWLS* (Carrow-Woolfolk, 1995). All together, the testing lasted approximately 35 minutes. Following the testing, the child was returned to his parent. Each family was paid \$15 for participating in the study.

Analyses

Means and standard deviations describing the sample on each of these measures are listed in Table 1. As is evident in Table 1, the sample averaged somewhat above the mean on general verbal and nonverbal intelligence (range = 81 to 137), general receptive and expressive language abilities (range = 78 to 144), and social skills (range = 59 to 131). The Hyperactivity and Inattention subscale scores represented a normal distribution of scores with an average of 54.30 and 51.48, respectively. The sample averaged above the mean on pragmatic language use (PLU) (range = 88 to 152). These distributions represented enough variability to examine the relations among the measures.

Analyses proceeded in two steps. First, correlation coefficients were calculated to examine associations among language measures, hyperactivity and inattention, and social skills. Second, following procedures established by MacKinnon, Krull, & Lockwood (2000), a series of multiple linear regressions were computed to test the prediction that PLU would mediate the

relation between hyperactivity or inattention and social skills problems. Four conditions must be met for PLU to be a mediator: (1) hyperactivity or inattention (predictor) is significantly associated with social skills problems (outcome); (2) hyperactivity or inattention is significantly associated with PLU (mediator); (3) PLU is significantly associated with social skills problems (after controlling for hyperactivity or inattention); and (4) the impact of hyperactivity or inattention on social skills problems is significantly less after controlling for PLU. An alpha level of 0.05 was used for all statistical tests. Power analysis using an alpha of .05, an effect size r of .5, and a total sample size of 54 reveals a power greater than .90 to find a large effect.

Results

Intercorrelations among Language Measures

Results presented in Table 5 indicate there were significant positive correlations between the general language measures: *KBIT-2*: Verbal Standard Score (VSS) and the *OWLS*: Listening Comprehension (LC) Standard Score, Oral Expression (OE) Standard Score, and the combined OE/LC (OLS) Standard Score. These expected correlations indicate that the higher the child's verbal intelligence as measured by the *KBIT-2*, the higher the score obtained on the receptive and expressive language domains as measured by the *OWLS*.

There were no significant correlations between verbal intelligence (*KBIT-2*: VSS) and pragmatic language use (PLU) [*CCC-2*: Pragmatic Composite (*CCC-2*: PC - unstandardized)] nor between PLU and general language abilities [*OWLS*: Listening Comprehension (LC) Standard Score, Oral Expression (OE) Standard Score, and the combined OE/LC (OLS) Standard Score]. These findings indicate that the pragmatic communication skills measured by the *CCC-2*: PC are distinct from more general verbal abilities. Thus, PLU as measured by the *CCC-2* is not simply synonymous with language use.

Intercorrelations among the Predictor, Mediator, and Outcome Variables

As hypothesized and reflected in Table 6 and Table 7, a set of preliminary zero-order correlations demonstrated the expected predictive relations between the following: (1) hyperactivity or inattention and social skills such that as the Hyperactivity or Inattention subscale scores increased social skills scores (CARS) decreased, (2) hyperactivity or inattention and PLU such that as the Hyperactivity or Inattention subscale scores increased PLU scores (PC) decreased, and (3) PLU and social skills such that as PLU scores (PC) increased social skills scores (CARS) increased. Thus, mediation testing was warranted.

Test of the Mediation Model with Hyperactivity

Multiple linear regression analyses were used to develop a model for predicting children's social skills from their hyperactivity levels and PLU. The continuous predictor (hyperactivity) and mediating (PLU) variables were centered at their means for these analyses. Basic descriptive statistics and regression coefficients are shown in Table 6. The predictor variable (hyperactivity) and the mediator variable (PLU) each had a significant ($p < .01$) zero-order correlation with the outcome variable (social skills problems), and hyperactivity and PLU had significant ($p < .01$) full mediating effects in the complete model. The correlation between hyperactivity and social skills drops from $r = -.462, p < .01$, to $r = -.228, p = .059$, when PLU is entered as a mediator in the model, suggesting that PLU mediates the relation between hyperactivity and social skills problems. In addition, Hyperactivity provided a unique contribution in the estimate of children's social skills of approximately 4% above and beyond the contribution of PLU, $sr^2 = .0416, p < .01$, and PLU provided a unique contribution in the estimate of children's social skills of 22% above and beyond the contribution of hyperactivity, $sr^2 = .2162, p < .01$. The full model was able to account for 42.9% of the variance in children's

social skills, $F(2, 51) = 19.174, p < .01$. The 95% confidence interval for R^2 was .425 to 1.140.

Test of the Mediation Model with Inattention

Multiple linear regression analyses were used to develop a model for predicting children's social skills from their inattention levels and PLU. The continuous predictor (inattention) and mediating (PLU) variables were centered at their means for these analyses. Basic descriptive statistics and regression coefficients are shown in Table 7. The predictor variable (inattention) and the mediator variable (PLU) each had a significant ($p < .01$) zero-order correlation with the outcome variable (social skills problems), and inattention and PLU had significant ($p < .01$) partial mediating effects in the complete model. The correlation between inattention and social skills drops from $r = -.654, p < .01$, to $r = -.467, p < .01$, when PLU is entered as a mediator in the model but still remains significant, suggesting that PLU partially mediates the relation between inattention and social skills problems. In addition, inattention provided a unique contribution in the estimate of children's social skills of approximately 13% above and beyond the contribution of PLU, $sr^2 = .1310, p < .01$, and PLU provided a unique contribution in the estimate of children's social skills of 17.2% above and beyond the contribution of inattention, $sr^2 = .1722, p < .01$. The full model was able to account for 55.9% of the variance in children's social skills, $F(2, 51) = 32.38, p < .001$. A 95% confidence interval for R^2 extends from .298 to .930.

Because PLU mediated the relation between hyperactivity and inattention and social skills problems, it was necessary to determine whether the interpretation of the mediational findings were specific to PLU or due to general language impairment (receptive or expressive language dysfunction). Preliminary analyses revealed that no significant correlations existed between any of the three scores from the *OWLS* (Listening Comprehension (LC) Standard Score,

Oral Expression (OE) Standard Score, combined OE/LC (OLS) Standard Score) and either social skills or hyperactivity and inattention, so additional mediational analyses were not warranted.

These findings demonstrate that PLU mediates the relation between hyperactivity and inattention and social skills problems, and the findings are not due to a more general language impairment.

Test of the Moderation Model

Was it possible that general language impairment was acting as a moderating variable in the relation between hyperactivity or inattention and social skills problems? Moderation analyses determine under what conditions of the moderator variable [general language ability as measured by the *OWLS* (LC) or (OE)] the predictor variable (hyperactivity or inattention) is significantly associated with the outcome variable (social skills problems). In contrast to mediation analyses, significant correlations do not have to exist between the predictor, moderator, and outcome variables before conducting moderation analyses. Multiple linear regression analyses were conducted with the *OWLS*: Listening Comprehension (LC) Standard Score and the Oral Expression (OE) Standard Score as potential moderators between social skills and hyperactivity or inattention. Before conducting the analyses, the continuous predictor and moderator variables were centered at their means to eliminate multicollinearity effects between the predictor and moderator, and the interaction terms. The predictor and moderator variables along with their interaction terms were entered into the regression equation. The interaction was interpreted using predicted values at one *SD* below and above the means of the predictor and moderator variables and was probed using simple slope analyses. No moderation was evident.

Discussion

The primary hypotheses of this study were confirmed in that: (1) hyperactivity and inattention were negatively associated with social skills, (2) hyperactivity and inattention both

had a significant negative relation with pragmatic language use (PLU), (3) PLU had a significant positive relation with social skills, and (4) the relation of hyperactivity or inattention and social skills problems were fully and partially (respectively) mediated by PLU. It is not surprising that hyperactivity and inattention and social skills deficits are associated as current literature clearly has established this relation (Landau, Milich, Diener, 1998; Hinshaw & Melnick, 1995). What is unique about this study is that in a community sample of children, hyperactivity and inattention are associated with pragmatic language use, and the latter mediates the relation between hyperactivity and inattention and social skills problems.

Why are hyperactivity and inattention associated with pragmatic language difficulties?

Theoretical models of the relations between inattention, hyperactivity, and pragmatic language skills have come from the ADHD literature. These models propose that children with increased levels of hyperactivity and inattention may experience pragmatic language difficulties because ADHD involves poor behavioral inhibition, which affects executive control and is related to problems with attention, impulsivity, and hyperactivity (Barkley, 1997, 1999).

Pragmatic language use taps into executive skills such as planning, organizing and/or monitoring behaviors. Thus, pragmatic language deficits seem to reflect difficulties with language use rather than deficits in the basic subsystems of language (i.e., phonology, semantics, and syntax) (Purvis & Tannock, 1997). Purvis and Tannock suggest a systematic deficit in the cognitive processes underlying the social use of language by children with ADHD, as well as the accompanying impairment in their social skills.

Although the current study did not incorporate a measure of response inhibition, Barkley's (1997, 1999) assumption of defective behavioral inhibition has become a current view of ADHD and has had an impact on new intervention programs focusing on pragmatic and meta-

cognition (Bruce, Thernlund, & Nettelbladt, 2006). Because ADHD consists of developmental deficiencies in the regulation and maintenance of behavior by rules and consequences, these deficiencies are associated with problems with inhibiting, initiating, or sustaining responses to tasks or stimuli and adhering to rules or instructions (Barkley, 1990).

Why is PLU associated with social skills?

Regardless of hyperactivity and inattention levels, the quality and the frequency of children's interactions with caregivers and peers also may explain why pragmatic language difficulties and social skills deficits are related. Pragmatic language skills are important for developing relationships with others, and for communicating with a range of interlocutors in a variety of contexts (Hyter, 2007). The way in which a child's language is used in the important contexts and encounters in their social environment (e.g., home, school, peer environments) may be more relevant to adjustment and social success than their competence in the more traditionally assessed language areas (Russell & Grizzell, 2008). Children expressing a low degree of pragmatic competence may not comprehend the contextual norms of the public context where peer group influence is the predominant force of children's play and interaction. This underdeveloped pragmatic competence may lead to disruption in the development of appropriate social skills. Because the design of the current study did not measure the quality and frequency of the children's interactions with caregivers or peers, this alternative explanation as to why PLU and social skills are related remains open to future investigation.

Why might PLU mediate the relation between hyperactivity and inattention and social skills problems?

Perhaps it is not surprising that a measure of PLU would be important in accounting for the deficits children with increased levels of hyperactivity and inattention have in developing

social skills. Much, if not most, social interaction is achieved through the use of language. A competent language user knows not only rules of social interaction, but also how and when to apply them, and how to vary communicative style and content according to moment-by-moment changes in the social environment (Lapadat, 2001).

Children with varying levels of hyperactivity and inattention may engage in a social context with an interactional goal in mind. However, for some children with high levels of inattention, impulsivity, or hyperactivity, an ineffective filtering mechanism may create problems in that steps are skipped (e.g., a shortcut is taken) to achieve the interactional goal. Stressors that may cause the filtering mechanism to drop may include prior experience of, and anticipation for name calling, insults, rejection, victimization, peer alienation, and rudeness from their social partner(s). As stressors are encountered, the filtering mechanism, often perceived by social partners as a measure of self control (or lack thereof), redirects children such that pragmatic language difficulties occur (e.g., interruptions, deficiencies in topic initiation and maintenance, lack of eye contact, or reduction in politeness). The children then can fail to follow the subtle nuances associated with appropriate PLU, which can result in disruptive social skills.

Once children with increased levels of hyperactivity and inattention establish a history of ineffective social experiences, these children take longer to learn and require additional practice to incorporate appropriate pragmatic language utterances and behaviors, while at the same time attempting to control the behaviors specific to hyperactivity and inattention /impulsivity. If these children encounter those already knowledgeable of their pragmatic difficulties, an offensive stance (e.g., aggressiveness) or defensive stance (e.g., withdrawal) may ensue dependent on the specific social group. Over the years and through the process of trial and error (potentially more error than trial), children with increased levels of hyperactivity and inattention must either learn

how to effectively manage their pragmatic language abilities through this learned filtering process, or suffer the long-term consequences of problematic social relations.

Limitations

Two key limitations must be addressed. First, given the complexity of the objective assessment of the social skills problems, “at-risk” factors for ADHD, and pragmatic aspects of children’s communication, this study is limited in the measurement of these variables through a single standard measure. Although we have utilized widely used instruments to assess social skills problems and “at-risk” factors for ADHD, only a handful of standardized pragmatic language assessments exist, and none is entirely satisfactory for evaluating the range of pragmatic abnormalities described in clinical accounts.

What might it take to capture the nuances in these variables? Because the assessment of social skills problems, “at-risk” factors for ADHD, and pragmatics are complex and problematic, multi-method, multi-source assessment procedures are desirable. Additional, assessment using natural social contexts may provide greater sensitivity in detecting social skills problems, “at-risk” factors for ADHD, and language and social-communicative abilities. Further, language assessment needs to be far more broadly based than the formal testing or analysis of spoken narrative that is commonly thought to suffice (Mathers, 2006) or the structural (grammatical) aspects of language often assessed on standardized tests (Camarata & Gibson, 1999).

A second limitation exists in that results are based solely on a community sample of children with varying levels of hyperactivity and inattention. Regardless of this limitation, the predicted relations were evident in the population utilized. It is possible the relations would be stronger if future samples were to include a clinically diagnosed population, and thus a wider range of ADHD symptomatology and social skills problems. In addition, children with a

diagnosis of ADHD can be classified into unique subtypes; predominately inattentive, predominately hyperactive/impulsive, and combined types. Because the children classified into these unique ADHD subtypes have been shown to display different behavioral profiles (Milich, Balantine, & Lynam, 2001), it is crucial that future researchers make these distinctions in evaluating the relations among ADHD symptoms, PLU, and social skills problems. Children with ADHD and children with pragmatic language deficits are a relatively heterogeneous population (Tirosh & Cohen, 1998). Although some effort (Bignell & Cain, 2007) has been directed at disentangling how hyperactivity/ impulsivity and poor attention are separately related to school children's pragmatic language skills, future research should also try to further our understanding of these children's peer difficulties as they relate to PLU.

Future Directions

Poor peer relationships have been found to predict serious difficulties in later life, including truancy, antisocial behavior, social anxiety, and an increased need for mental health services (Parker & Asher, 1987). Children experiencing these relationship difficulties, specifically children with ADHD, often present with comorbid disorders such as aggression, conduct disorder, oppositional defiant disorder, and multiple learning disabilities. Because empirical evidence exists documenting problematic peer relationships in children presenting with these comorbid difficulties (Hinshaw & Melnick, 1995), it is critical that research continues to disentangle the relations between social skills problems, "at risk" dimensions for ADHD, and PLU difficulties.

In conducting future research, if clinically significant pragmatic deficits are detected, one could argue that interventions for these deficits should be a priority (Camarata & Gibson, 1999). The development of interventions for children with increased levels of hyperactivity or

inattention symptoms and social skills problems should be reformulated to integrate children's participation in focused communicative interactions in multiple communicative contexts that clarify and expand on the appropriate use of pragmatic utterances and behaviors. Specific targets for intervention include topic initiation, topic maintenance, and the appropriate use and timing of pauses and intensity. In order for children with increased levels of hyperactivity and inattention to change behavior and increase the appropriateness of their PLU and social skills, it is necessary that the intervention allow students to understand the purpose for the skills, the effect the inappropriate use of the skills may have on the perceptions others may garner toward them, and realize the benefits that the skill has on their social relationships, specifically those with their peers. Meaning must be attached to strategies that are taught so that children develop an understanding of the relation between behavior and the consequences (Westby & Cutler, 1994).

In a similar vein, future studies can examine the role of treatment with stimulant medication may have on the relation between pragmatic language difficulties and peer problems. Such treatment clearly improves the attention and overall behavior of children with ADHD, but as Derefinko, Bailey, Milich, Lorch, and Riley (2009), medication treatment may not have an impact on higher order cognitive processing, such as goal-based story recall. Thus, it is reasonable to wonder whether stimulant medication will positively impact the children's language skills.

In addition to interventions with children, both parents and teachers also should be provided feedback and instruction as well as strategies to monitor the child's progress. Such feedback and instruction may lead to changes in the home and at school resulting in changes to parent and teacher perceptions and affective behavior towards the child. In light of the problematic social relationships children with increased levels of hyperactivity and inattention

experience, such interventional efforts may guide children to more positive and successful interactions with peers, family, and teachers, resulting in tenacious communicative abilities and social developmental outcomes in this population.

Finally, future investigations can begin to examine why it is that children with ADHD have such pragmatic language difficulties. There are many symptoms associated with ADHD that may contribute to these difficulties, including poor executive functioning, attention problems, impulsivity, and problems with affect regulation (Barkley, 1997). If research can identify factors that may contribute to the development of pragmatic language problems, then it may be possible to intervene early to prevent or attenuate the onset of these difficulties.

Conclusion

In closing, this is the first known study directly evaluating the relations among pragmatic language use (PLU), hyperactivity and inattention symptoms, and social skills problems utilizing a community sample of children with varying levels of hyperactivity and inattention. The current results highlight the complex interactive nature of PLU, hyperactivity and inattention, and social skills. This issue has begun to be addressed in the reported work. Given that peer relations, both successful and unsuccessful, are complex and have many contributing factors, it is reasonable to assume that the treatment of disturbed relations requires an intensive, multimodal approach (Landau, Milich, & Diener, 1998). Such an approach may benefit by including pragmatic language assessment beyond the typically assessed receptive and expressive language abilities, and a more rigorous social skills assessment including the quality and frequency of interactions with caregivers and peers. Expanded assessment procedures may provide a more fully elaborated model regarding relations between the subtypes of ADHD, pragmatic language ability, and social development.

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