# ADHD SYMPTOMS IN AMERICAN INDIAN/ALASKA NATIVE BOYS AND GIRLS

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*Abstract: Despite the commonality of attention-deficit/hyperactivity disorder (ADHD), the diagnostic criteria are based largely on research with European American boys. Much less research is available regarding the prevalence of ADHD in other groups, specifically American Indian/Alaska Native (AI/AN) children. Moreover, research on sex differences in ADHD has typically not included AI/AN children. The current study examined parent- and teacher-reported ADHD symptoms in 72 AI children from one region in the Southern U.S., with a focus on sex differences. Data showed that AI children may have more pronounced sex differences in ADHD symptomology than is found in studies with primarily European American children. Implications, limitations, and future directions are discussed.*

Attention-deficit/hyperactivity disorder (ADHD), as defined by the *Diagnostic and Statistical Manual of Mental Disorders, 5th Edition* (*DSM-5*; American Psychological Association [APA], 2013), is among the most common mental health problems of childhood, affecting approximately 5 to 10% of school-age children in the U.S. (APA, 2013; Barkley, 2006; Pelham & Gnagy, 1999; Ramtekkar, Reiersen, Todorov, & Todd, 2010; Remschmidt et al., 2005; Rowland, Lesesne, & Abramowitz, 2002) and worldwide (Polanczyk, de Lima, Horta, Biederman, & Rohde, 2007). In a community sample of over 9,000 participants, Ramtekkar et al. (2010) found that ADHD prevalence rates are highest in children and decrease in adolescents, but ADHD is still seen in approximately 5% of adults (Willcutt, 2012). ADHD is characterized by developmentally inappropriate levels of inattention (e.g., difficulty sustaining attention, forgetfulness) and/or hyperactivity/impulsivity (e.g., excessive talking, often being "on the go"). This two-factor structure results in three subtypes of ADHD: Predominately Inattentive, Predominately Hyperactive/Impulsive, and Combined (APA, 2013). These clusters of symptoms show developmental variability. Hyperactivity and impulsivity appear at ages 3 to 4 years, whereas inattention appears at ages 5 to 7 years (Hart et al., 1995). Hyperactivity and impulsivity decline with age, but stay at levels above those of non-ADHD peers

through adolescence (Fischer, Barkley, Fletcher, & Smallish, 1993; Hart et al., 1995). Inattention is stable in childhood and adolescence, and, although it decreases in late adolescence, it tends to stay above normative levels (Fischer et al., 1993; Hart et al., 1995).

Despite the commonality of ADHD, the diagnostic criteria are based on studies involving primarily school-age European American boys (Faraone, Biederman, Keenan, & Tsuang, 1991; Gingerich, Turnock, Litfin, & Rosén, 1998; Hartung & Widiger, 1998; Lahey et al., 1994). Therefore, the generalizability of ADHD symptoms for girls, preschoolers, adolescents, adults, and ethnic minorities is questionable, and more research examining sex differences in the disorder, as well as research on the disorder in understudied populations, is needed.

**Ethnicity and ADHD**

Although ADHD has been referred to as the most extensively studied childhood mental health disorder (Wolraich, 1999), only a small percentage of research has examined ethnic differences in this disorder. Information regarding differential prevalence rates by ethnicity is limited (Gingerich et al., 1998). The *DSM-5* states that cultural variations may affect prevalence estimates, but differences among minority groups in the U.S. are not reported (APA, 2013). It is believed that ADHD affects children of all cultures and ethnicities (e.g., Bauermeister et al., 2005; Jacobsen, 2002; Rasmussen et al., 2002; Remschmidt et al., 2005; Wolraich et al., 2003), but more research is warranted. Therefore, and because only relatively recently have researchers begun to examine ADHD in girls, the purpose of the current study was to examine sex differences in ADHD symptoms in one of these understudied groups: American Indian/Alaska Native (AI/AN) children.[1]

Although our understanding of ADHD in ethnic minority groups is limited, the literature has been expanding. Existing studies have suggested that ADHD may be more common or more severe in African American children than in other ethnic groups in the U.S. (Arnold et al., 2003; Cuffe, Moore, & McKeown, 2005; DuPaul et al., 1998; Epstein, March, Conners, & Jackson, 1998; Epstein et al., 2005; Martel, 2013; Nolan, Gadow, & Sprafkin, 2001; Reid, Casat, Norton, Anastopoulos, & Temple, 2001). However, as noted by Barbarin and Soler (1993), this higher rate of ADHD may be due to chronically unpredictable and stressful life situations. A meta-analysis by Miller, Nigg, and Miller (2009) suggests that African American children have more *symptoms* of ADHD than European American children, but lower rates of *diagnosis* and *treatment*. The authors suggested that this seemingly contradictory finding was due to the fact that many African American children and families have limited access to medical/psychological services (Miller et al., 2009).

Additionally, the limited research on ADHD in Hispanic children is mixed. Some studies have suggested that ADHD is more common or more severe in Hispanic children than in those of other ethnic groups (Arnold et al., 2003), whereas others have suggested that it is less so (Cuffe et

al., 2005; Domingeuz de Ramirez & Shapiro, 1998; Goyette, Conners, & Ulrich, 1978). In adults, there is some preliminary evidence that Hispanics have lower rates of ADHD than European Americans (Kessler et al., 2006). Further, findings by Nguyen and colleagues (2004) suggest that Asian American children have lower rates of ADHD than other groups.

Data regarding ADHD in AI/AN children are very limited. Costello, Farmer, Angold, Burns and Erkanli (1997) reported that AI/AN youth ages 9 to 13 years had marginally, but not statistically significantly, lower rates of ADHD than European American youth. In another research group, AI/AN children were combined with Asian American and Pacific Islander children because the sample was too small to analyze each group separately (Cuffe et al., 2005). Nonetheless, based on parent report, this combined group, ages 4 to 17 years, had lower rates of ADHD than European American and African American children. Additionally, Beiser, Dion, and Gotwiec (2000) reported some evidence that the two-factor structure of *DSM* ADHD symptoms found in AI/AN children was as valid in this group as in other ethnic groups. Taken together, these data suggest that AI/AN youth might have slightly lower levels of ADHD diagnoses when compared to European or African American youth, and that the two-factor structure of ADHD may hold for AI/AN youth. However, much more research is warranted. The paucity of research regarding ADHD in AI/AN populations may lead to inappropriate assessment procedures, diagnostic considerations, and treatment options for these groups.

**Sex and ADHD**

The *DSM-5* (APA, 2013) states that, in children, the male-to-female ratio for ADHD is approximately 2:1, and this seems to be consistent across studies (Ramtekkar et al., 2010; Willcutt, 2012). Two meta-analyses, conducted by Gaub and Carlson (1997) and Gershon (2002), presented a comprehensive examination of sex differences in ADHD. The two meta-analyses had many similar findings, including: (1) community sample boys had higher rates of inattention and hyperactivity than community sample girls, (2) community sample boys had higher rates of comorbid externalizing disorders than community sample girls, (3) girls with ADHD might be more cognitively impaired than boys with ADHD (but possibly only in clinic samples), and (4) there were no sex differences on math or reading achievement, nor on social impairment.

In the years since the publication of these meta-analyses, more data have been presented. For example, Hartung et al. (2002) found that boys displayed more symptoms of ADHD, especially in educational settings. Conversely, Fedele, Lefler, Hartung, and Canu (2012) found that, in college-age young adults, women with ADHD actually reported higher levels of ADHD symptoms and related

impairment than men. Moreover, Martel (2013) indicated that in very young children (ages 3-6 years), no sex differences in ADHD symptoms were found, but that the cumulative risk of being male, African American, and of low socioeconomic status was predictive of ADHD symptoms.

Despite this growing literature base, few studies have examined ethnicity along with sex. That is, although we have increasing amounts of information about sex and ADHD, the field is still in need of data regarding the interaction of sex and ethnicity. Thus, it is imperative to examine sex differences in AI/AN populations to understand more fully the manifestation of ADHD symptoms in AI/AN boys and girls.

### The Current Study

Information about ADHD symptoms in AI/AN children may have implications for accurate identification and effective treatment. It is important to note that the current study does not examine differences in diagnostic base rates between AI/AN children and other ethnic groups. The aim of the current study was to determine whether AI boys and girls from a geographic region in the Southern U.S. differ in terms of ADHD *symptoms*. Based on the results of the Gaub and Carlson (1997) and Gershon (2002) meta-analyses, as well as more recent studies (Hartung et al., 2002; Martel, 2013), it was hypothesized that AI boys would have higher rates of ADHD symptomology than AI girls, as this pattern has been shown in other ethnic groups. Because these sex differences are highly important for understanding the etiology of ADHD, it is critical to determine whether this pattern is replicated in understudied groups.

## METHOD

### Procedure

IRB approval was obtained from both the university (prior to data collection) and the tribe (prior to data collection, before manuscript submission, and upon final revision for publication). The current study was one part of a larger neuropsychological study of ADHD (Bartgis, Lefler, Hartung, & Thomas, 2009). The initial study did not find neuropsychological differences between AI children and non-AI children, and, therefore, results in Bartgis et al. (2009) were presented for the group as a whole. Sex differences were not reported in the Bartgis et al. (2009) study, but are analyzed here as they are central to the current study. Only relevant procedures and materials from the larger study are discussed here.

Children ranging in age from 6 to 13 years ($M$ = 9.32, $SD$ = 2.09) were recruited from health clinics within a Southern Plains tribe that serve individuals from over 180 different tribes, thus representing an entire tribal service population. Parents presenting at the clinic were seeking a psychoeducational evaluation for their child; thus, they are representative of those seeking outpatient mental or behavioral health evaluation and/or treatment for their child.

Upon contacting the tribal health clinic, these parents were provided with information about the study and were asked about their willingness to allow their child to participate. Children also were recruited from families who expressly asked to be involved in the research project after seeing posted advertisements. A majority of parents who decided to participate had concerns about their child's behavior (e.g., possible ADHD or Oppositional Defiant Disorder). Thus, this is a convenience sample that was over-selected for possible ADHD.

Families who chose to participate began the research protocol in lieu of an evaluation with the staff psychologist, as the protocol included all testing that would have been done by the psychologist, as well as some additional testing (see Bartgis et al., 2009 for details on the full protocol). Doctoral students in a clinical psychology program conducted the testing. Informed consent from parents and teachers, and assent from children, were obtained. Parents completed parent rating forms and teachers completed teacher rating forms for the measures described below. Parents provided the teacher-report and consent forms to their children's teachers, and were responsible for returning them to the research team. Both forms included sections that measured ADHD symptoms, but in slightly different ways. Families were paid $25 total for their participation and travel expenses.

After all data were collected, the researchers provided a clinical report to the tribal health clinic's licensed psychologist, then met with every family and made appropriate diagnoses and treatment recommendations where necessary.

Overall, 72 AI children participated in this study. Children with parent-reported neurological impairment resulting from injury or illness, prenatal substance exposure, and pervasive developmental disorders were excluded from the study prior to scheduling the initial session. Children with full scale IQ below 80 (as measured for the purposes of the larger study) were excluded from data analyses after participation. Of the participants, 41 (57%) were boys and 31 (43%) were girls.

## Measures

### Child Symptom Inventory, Fourth Edition (CSI-4)

The CSI-4 is a rating scale designed to assess specific symptoms of a wide range of childhood disorders founded on *DSM* criteria (Gadow & Sprafkin, 1994). The CSI-4 provides both parent and teacher report versions for measuring the behavior of children ages 5 to 14 years, and includes responses on a 4-point Likert-type scale (*never* through *very often*). For the ADHD subscale of the

parent CSI-4, sensitivity was estimated at .80, and for the ADHD subscale of the teacher CSI-4, sensitivity was estimated at .60 (Gadow & Sprafkin, 1998). For the ADHD subscale of the parent CSI-4, specificity was estimated at .74, and for the ADHD subscale of the teacher CSI-4, specificity was estimated at .86 (Gadow & Sprafkin, 1998). Because the CSI-4 was designed based on *DSM* criteria, it has limited normative data and is not recommended for normative interpretations (Frick & Kamphaus, 2001). However, given that *DSM* ADHD criteria were derived from research with European American boys (Lahey et al., 1994) and the CSI-4 is directly based on the *DSM*, it can be assumed that AI/AN children were not central in the construction of this measure.

**Behavior Assessment System for Children (BASC)**

The BASC rating scales were designed as an integrated system to facilitate differential diagnosis of a variety of emotional and behavioral disorders in children (Reynolds & Kamphaus, 1992). In the current study, the BASC Parent Rating Scales and Teacher Rating Scales were used. Both of these versions measure a wide range of symptoms, and include a 4-point Likert-type scale (*never* through *almost always*). The BASC has good internal consistency, with subscale alphas averaging .80, and the composite alphas averaging in the mid .90s (Reynolds & Kamphaus, 1992). The BASC was normed on a nationally representative sample that was not over-selected for AI/AN children; thus, very few AI/AN children were included in the initial normative sample.

## Data Preparation and Analysis

The dependent variables (DV) in the current study were CSI-4 summary scores for inattention and hyperactivity, as well as BASC summary scores for attention problems and hyperactivity. All four of these subscales were reported by parents and teachers, creating a total of eight DVs. It should be noted that far fewer people ($n = 46$) completed the BASC than the CSI-4 because of a data collection error. CSI-4 and BASC summary scores were computed by assigning 0 points for a response of *never* through 3 points for a response of *very often* or *almost always*, and then summing all scores from each subscale. BASC summary scores were used in place of BASC *t*-scores because the *t*-scores control for age and sex, and the current study aimed to examine sex differences. We did not combine parent and teacher reports, as Shemmassian and Lee (2012) found that parent and teacher reports tend to predict different types of impairment, and no one method of combining reports or using reports independently was found to be clearly superior to other methods.

Demographic variables were examined as possible covariates (Table 1). Only one variable, family income, was significantly different between boys and girls. Specifically, family income was higher for girls than boys, $t = 2.47$, $p = .017$. Thus, in the following analyses family income was included as a covariate where appropriate.

**Table 1**
**Demographic Variables for Boys and Girls**

| | Sex | | *t*-test | | |
|---|---|---|---|---|---|
| | **Boys** | **Girls** | ***t*** | **df** | ***p* value** |
| Age | 9.04 (2.04) | 9.69 (2.12) | 1.31 | 70 | .196 |
| Mother's education level | 3.18 (1.25) | 3.62 (1.44) | 1.29 | 63 | .201 |
| Father's education level | 2.36 (1.31) | 2.76 (1.59) | 1.10 | 62 | .276 |
| Family income | 1.87 (1.28) | 2.76 (6.21) | 2.47 | 62 | .017 |

Note: Education level was rated on a 7-point scale; Family income was rated on a 5-point scale.

To test the primary hypothesis, that AI boys from the sampled tribal service area will have higher levels of ADHD symptoms than AI girls, we used Analyses of Covariance (ANCOVA) with family income as the covariate (see Tables 2 and 3, in Results). Specifically, four ANCOVAs were conducted for the CSI subscales (i.e., parent-rated inattention and hyperactivity and teacher-rated inattention and hyperactivity; see Table 2) and four ANCOVAs were conducted for the BASC subscales (i.e., parent-rated attention problems and hyperactivity and teacher-rated attention problems and hyperactivity; see Table 3). No alpha correction was made per Crick and Zahn-Waxler (2003), who recommend not performing an alpha correction when Type II error risk is high. In particular, in ADHD research where there are fewer girls than boys, the power is often too low to detect sex differences; therefore, an alpha correction would be overly conservative.

## RESULTS

Regarding family income, 45.3% of families earned less than $25,000 per year; 21.9% earned between $26,000 and $40,000; 21.9% earned between $41,000 and $70,000; and 10.9% earned more than $70,000. Regarding mother's highest level of education, 4.6% of mothers did not have a high school diploma, 26.2% had a high school diploma or GED, 37.5% had an associate's degree or some college, and 27.7% had a bachelors or master's degree. As for father's highest level of education, 21.9% of fathers did not have a high school diploma, 42.2% had a high school diploma or GED, 21.9% had an associate's degree or some college, and 14.1% had a bachelors or master's degree.

Before testing the primary hypothesis, we calculated correlation coefficients between BASC and CSI-4 scores. BASC and CSI-4 parent-rated inattention were positively correlated ($r = .79$, $p < .001$), as were BASC and CSI-4 parent-rated hyperactivity ($r = .88$, $p < .001$). Likewise, BASC and CSI-4 teacher-rated inattention and BASC and CSI-4 teacher-rated hyperactivity were significantly positively correlated ($r = .94$, $p < .001$; $r = .94$, $p < .001$, respectively).

## CSI-4

All four CSI-4 ANCOVAs (i.e., parent-rated inattention and hyperactivity and teacher-rated inattention and hyperactivity) were statistically significant, such that boys had higher symptomology than girls (see Table 2). Also, all four ANCOVAs had medium effect sizes (Partial Eta Squared > .08; see Table 2).

**Table 2**
**Parent- and Teacher-rated Child Symptom Inventory, Fourth Edition (CSI-4) Scores for Boys and Girls**

| | Sex | | ANCOVA | | | |
|---|---|---|---|---|---|---|
| | **Boys** | **Girls** | ***F*** | **df** | ***p* value** | **Par Eta Sq** |
| Parent-rated CSI-4 Inattention | 12.77 (7.77) | 8.12 (7.38) | 5.57 | 64 | .022 | .08 |
| Parent-rated CSI-4 Hyperactivity | 10.46 (7.89) | 6.28 (7.50) | 5.29 | 64 | .025 | .08 |
| Teacher-rated CSI-4 Inattention | 15.69 (8.35) | 8.52 (9.55) | 6.48 | 53 | .014 | .12 |
| Teacher-rated CSI-4 Hyperactivity | 9.13 (7.89) | 3.95 (6.04) | 5.17 | 53 | .027 | .09 |

Note: All scores are on a scale of 0-27. Data were excluded listwise, resulting in slightly reduced *n*s

## BASC

Again, far fewer people ($n$ = 46) completed the BASC than the CSI-4 because of a data collection error. Nonetheless, even with lower *n*s, two of the four BASC ANCOVAs (i.e., parent-rated attention problems and teacher-rated attention problems) were statistically significant such that boys had higher symptomology that girls (see Table 3). Parent- and teacher-rated hyperactivity were not statistically significant. Also, both significant ANCOVAs had large effect sizes (Partial Eta Squared > .29; see Table 3). It is possible that the non-significant ANCOVAs can be attributed to low power due to the lower *n*.

**Table 3**
**Parent- and Teacher-rated Behavior Assessment System for Children (BASC) Scores for Boys and Girls**

| | Sex | | ANCOVA | | | |
|---|---|---|---|---|---|---|
| | **Boys** | **Girls** | ***F*** | **df** | ***p* value** | **Par Eta Sq** |
| Parent-rated BASC Attention Problems | 11.00 (3.16) | 6.91 (3.11) | 9.06 | 25 | .006 | .29 |
| Parent-rated BASC Hyperactivity | 11.86 (6.50) | 6.09 (6.23) | 3.87 | 25 | .062 | .15 |
| Teacher-rated BASC Attention Problems | 15.17 (6.71) | 5.11 (6.58) | 11.88 | 21 | .003 | .40 |
| Teacher-rated BASC Hyperactivity | 13.17 (11.30) | 5.78 (8.50) | 2.16 | 21 | .159 | .11 |

Note: BASC summary score for Parent-rated BASC Attention Problems is on a scale of 0-21. Parent-rated BASC Hyperactivity score is on a scale of 0-30. Teacher-rated BASC Attention Problems score is on a scale of 0-24. Teacher-rated BASC Hyperactivity score is on a scale of 0-39.

### Internal Consistency Reliability

In addition to the primary analyses, internal consistency reliability was examined for each of the eight DVs (four from the CSI-4 and four from the BASC; see Table 4). Seven of eight alphas showed good or better internal consistency reliability (alpha coefficients > .89), with the parent report BASC inattention subscale showing poor internal consistency (alpha coefficient = .53).

**Table 4**
**Internal Consistency Reliability for the *DV*s**

| | Alpha Coefficient |
|---|---|
| Parent-rated CSI-4 Inattention | .95 |
| Parent-rated CSI-4 Hyperactivity | .95 |
| Teacher-rated CSI-4 Inattention | .97 |
| Teacher-rated CSI-4 Hyperactivity | .95 |
| Parent-rated BASC Attention Problems | .53 |
| Parent-rated BASC Hyperactivity | .89 |
| Teacher-rated BASC Attention Problems | .94 |
| Teacher-rated BASC Hyperactivity | .94 |

## Discussion

The results of the current study show that, in a convenience sample from one tribal service area, AI boys have higher ADHD symptomology (inattention and hyperactivity) than AI girls. The Gaub and Carlson (1997) and Gershon (2002) meta-analyses came to this conclusion regarding studies of primarily European American children, and, thus, the current study extends those sex difference findings to AI youth, albeit from only one geographic region of the U.S.

Interestingly, however, although the meta-analyses found sex differences, the effect sizes in the current study are somewhat larger than the effect sizes reported in the meta-analyses. Specifically, Partial Eta Squared for the CSI-4 analyses in the current study ranged from .08 to .12 (medium), and Partial Eta Squared for the significant BASC analyses in the current study ranged from .29 to .40 (large). Compared to the Gaub and Carlson (1997) meta-analysis, where the average Cohen's *d* was .16 for hyperactivity and .19 for inattention (both small), and the Gershon (2002) meta-analysis, where the average Cohen's *d* was .29 for hyperactivity and .23 for inattention (both small), the current study suggests that AI youth from this sample may have more pronounced sex differences than participants in studies including primarily European American children. However, this interpretation warrants caution given the small sample size, recruiting limitations, limited normative data for

assessment tools for this population, and need for replication. Nevertheless, this finding suggests a need for more research on ADHD symptoms in AI/AN populations. It should be noted that AI boys do not necessarily have higher levels of ADHD psychopathology than boys of other ethnic groups; boys have consistently been found to have higher levels of ADHD symptomology than girls, regardless of ethnic group (Gaub & Carlson, 1997; Gershon, 2002). It is also possible that AI girls from the current sample were particularly low on ADHD symptomology.

This finding of pronounced sex differences has several possible explanations. First, it is possible that data collection procedures (i.e., oversampling children whose parents or teachers had concerns about ADHD vs. using a pure community sample) explain the results; the current study used a convenience sample that was overselected for possible ADHD, whereas the meta-analyses used both community and clinic samples. However, the sample alone is unlikely to explain the robust finding that these AI youth have more pronounced sex differences because it cannot explain why girls' symptoms are lower than boys' symptoms.

Second, given that the data collection procedure difference alone likely cannot account for the larger-than-expected effect sizes between AI/AN boys and girls, there could be a cultural explanation. For example, it has been posited that AI/AN men and boys have unique experiences of and responses to historical trauma when compared to AI/AN women and girls because of the loss of their traditional male role as the protector of the community (Brave Heart, Elkins, Tafoya, Bird, & Salvador, 2012). Thus, the entangled histories of historical trauma and intergenerational trauma may have a unique manifestation for AI/AN men and boys. Research has shown that direct exposure to trauma is a factor in increased disruptive behavior problems, including ADHD and ADHD-like symptoms (Ford, Gagnon, Connor, & Pearson, 2011; Villodas, Litrownik, & Roesch, 2012). Therefore, it is conceivable that the high level of historical trauma faced by AI/AN communities plays some unique role in the findings of the current study. Future studies on ADHD symptomatology in AI/AN populations should take into account the role of historical and intergenerational trauma as a potential variable.

Third, in some AI/AN cultures women and girls are held to different standards of behavior than men and boys. For example, the Southern Plains tribe from which a majority of the current sample was drawn is a traditionally matriarchal society in which women and girls often are expected to be the household and community managers (Mann, 2006). This is, of course, not representative of every tribe or even every family unit within a particular tribe, but it is possible that some AI/AN girls are earlier and more strongly reprimanded for disorganized behavior than are AI/AN boys (and possibly girls of other ethnic groups), and consequently may learn to inhibit their behavior at a younger age. Of course, this is an empirical question that warrants additional research.

Fourth, this difference may be due to a form of rater bias or bias related to the use of assessment tools that were not developed with AI/AN communities (e.g., construct, items). All of the parents and many of the teachers who were raters in this study were of AI/AN descent. Because of this fact, and because most raters in prior studies utilizing the BASC and CSI-4 were European American, it is possible that some questions were interpreted differently by AI/AN raters. Moreover, given that the BASC was normed on a nationally representative sample (Reynolds & Kamphaus, 1992) and not one that over-selected for AI/AN families, it might not be valid for use with this population, as only a few AI/ANs may have been in the normative sample.

Finally, teachers rated boys' ADHD symptoms more highly than did parents, especially on the BASC. As noted earlier, parent and teacher report are both valid in predicting different types of impairment (Shemmassian & Lee, 2012), but it is possible that teachers in the current study had a rater bias where they artificially rated boys as more symptomatic, girls as less symptomatic, or both, which has been found in prior research (Ullebø, Posserud, Heiervang, Obel, & Gillberg, 2012). Such bias could explain some of the significant results and strong effect sizes. Alternatively, parents may be less susceptible to such a rater bias (Ullebø et al., 2012), and/or boys may be more readily referred to a mental health professional when they display externalizing behaviors (Coles, Slavec, Bernstein, & Baroni, 2012). Again, more research is needed to address these subtle issues.

**Implications**

AI/AN families are in need of affordable, empirically based, reliable mental health care (Gone & Alcantara, 2007), and the first step in delivering that care is understanding the manifestation of mental health and behavior problems in AI/AN groups. Although it is premature to generalize beyond the present sample and tribe, given our finding that AI/AN boys may be displaying higher rates of ADHD symptoms than AI/AN girls, this need may be especially apparent for AI/AN boys with early warning signs of behavior problems. Therefore, training primary care providers in identification and referral procedures, disseminating empirically based treatments to AI/AN communities, understanding whether our current assessment measures are appropriate for AI/AN children, and continuing research with these understudied populations are of utmost importance. Additionally, continuing research on ADHD sex differences with other diverse, underserved populations is warranted.

While studies have indicated that AI/AN adults have higher levels of many mental health problems than other groups (Huang et al., 2006), it is important to examine cultural and contextual factors more closely before making assumptions about prevalence rates. In addition to the possibility that historical and intergenerational trauma may be a unique risk factor for AI/AN boys, AI/ANs also face serious access-to-care issues, due to significant underfunding of the Indian health care system,

which may contribute to such findings. Specifically, AI/AN families have less access to mental health care as compared to other ethnic groups (Office of Inspector General, 2011; Urban Indian Health Commission, 2007); therefore, problems tend to go untreated and may worsen. Examining potential cultural and contextual factors related to ADHD symptomology will be important for future studies to understand more fully gender differences in AI/AN populations and to support early identification of and prevention efforts for at-risk youth.

**Limitations and Future Directions**

The primary dependent measures used in this study were parent and teacher report behavior rating forms. The findings may be limited by the fact that only two measures were used, and the results must be interpreted within the parameters of these measures, especially given that the internal consistency of one subscale was poor in this sample. Also, because the measures were not created with large samples of AI/AN children, the results may be suspect. However, given the relatively small amount of data available related to ADHD in AI/AN children, these findings can still be viewed as important and informative, albeit preliminary. Another limitation is that the AI/AN children in this study were mainly from one Southern geographic region, which limits the generalizability of the results. Specifically, there are hundreds of AI/AN tribes in the U.S., and it would be a great oversimplification to assume that the results found in this study are relevant for all AI/AN children. In the future, researchers may want to consider engaging tribal communities in the design of such studies to support more culturally driven assessments that include full diagnostic interviews and account for related cultural and contextual factors. Further, a convenience sample was used in this study, and symptoms, rather than diagnoses, were analyzed. Other research teams should consider alternative sampling and analytic procedures to gain a better understanding of this disorder in AI/AN children.

This study is one of only a few studies of ADHD symptoms in an AI/AN population. There is little research on AI/AN mental health problems in general, and this study can be viewed as part of a growing trend to examine one of these issues. In the future, researchers should use larger samples, a wider array of assessment measures, and more diverse AI/AN samples that address the unique cultural and contextual factors facing these populations.

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## ENDNOTE

[1] The term AI/AN herein refers to the current day descendants of North American indigenous peoples who inhabited the continent centuries before the arrival of European settlers. They are organized by governments of nations, tribes, and other land areas (e.g., pueblos, rancherias, villages, tribal consortiums), with over 550 of these governments in the U.S. alone (Bureau of Indian Affairs, 2001). They each maintain distinct and longstanding cultural practices, and are not homogeneous (LaFromboise, 1988; U.S. Census Bureau, 2010; Urban Indian Health Commission, 2007).

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