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Racial Differences in Parental Reports of Attention-Deficit/ Hyperactivity Disorder Behaviors

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Abstract

Objective—Accurate assessment of racial disparities in attention-deficit/hyperactivity disorder (ADHD) depends on measurement that is equally valid for all groups. This study examines differences among African American and white children in ADHD measurement with a widely used parental report instrument, the Diagnostic Interview Schedule for Children (DISC).

Methods—Data come from 1070 children in the Fast Track Project, a longitudinal study of predominantly low-income children at risk of emotional and/or behavioral problems. Item Response Theory (IRT) methodology is used to determine whether ADHD screening items provide comparable information for African American and white children or whether differential item function (DIF) exists. IRT scores and race/ethnicity are entered in logistic regression models predicting use of ADHD medication.

Results—Seven of 39 DISC items performed differently among African Americans and whites. In most cases, parents of white children were more likely to endorse these items than were parents of African American children at comparable underlying levels of children's hyperactivity. When items exhibiting differential functioning were deleted, race disparities predicting underlying need as indicated by ADHD medication use decreased and were no longer statistically significant.

Conclusions—Perceptions of ADHD-related symptoms among parents of African American children appear to differ in important ways from those of parents of white children, and screening instruments relying on parent report may yield different results for African American and white children with similar underlying treatment needs. Gathering information from additional sources including teachers and school counselors can provide a more complete picture of the behavioral functioning and therapeutic needs of children in all race/ethnic groups.

Index terms

attention-deficit/hyperactivity disorder; screening tests; disparities; African Americans; children's mental health

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Racial disparities in children's mental and physical health are a high-priority public health problem.[1,2] Differences in treatment exist and are well documented for a range of conditions and illnesses,[3] and these differences can reflect a variety of factors, including patient preferences. However, they are most troubling when individuals—with the same level of apparent need for treatment—receive different care. It is widely recognized that socioeconomic position, community context, and other factors confound the association between race and health outcomes, and disparity-related analyses should attempt to take these characteristics into account.[4] Much less attention, however, has been given to an equally important measurement issue: accurate assessment of racial variation in a health condition depends on measuring the presence of that condition in a way that is equally valid for all groups.

While physical conditions affecting children such as insulin-dependent diabetes are generally diagnosed using standardized biochemical testing, the identification of behavioral and mental health problems is often much less straightforward. Attention-deficit/hyperactivity disorder (ADHD), for example, is one of the most commonly diagnosed childhood disorders[5,6]; however, primary care physicians' evaluation practices for school-age children with ADHD are known to vary widely,[7,8] and prescription patterns for ADHD treatment vary significantly by region.[9,10]

Although recent prevalence estimates of clinical ADHD diagnosis among white and African American children from nationally representative parent surveys are similar, ranging from 7.5% to 8.6% for whites and 7.7% to 8.2% for African Americans,[5,6] some evidence suggests that minority children have greater unmet need for ADHD treatment.[11] In order to accurately compare the prevalence and impact of ADHD in the two populations, the measures used to identify the need for treatment must be equivalent for both groups. Few studies have examined whether the items that comprise psychometric instruments such as those for ADHD diagnosis perform in a comparable way among African American and white populations.

This information is critical for interpreting racial differences in treatment. Comprehensive consideration of treatment differences by race includes recognition of group differences in social class and level of need; however, an additional key issue is whether children of different races and ethnicities *at a comparable level of need* receive the same treatment. As a result, a measure of need (i.e., symptom severity) is required that functions similarly in all groups.

This study examines racial differences in the measurement of ADHD symptoms in a widely used instrument assessing parental symptom perception, the Diagnostic Interview Schedule for Children (DISC). This measure was originally designed for large epidemiological research studies and is currently being used in clinical settings as well. Since 1997, over 130 federally funded investigations have used the DISC, as have nearly 100 research studies funded by other sources.[12] Furthermore, the DISC and measures used in pediatric practice (such as the Vanderbilt ADHD Parent Rating Scale) share a common foundation in the DSM.[13] For that reason, measures like the Vanderbilt Attention Deficit/Hyperactivity Disorder Parent Rating Scale share many items with the DISC.

The present analyses are grounded in Item Response Theory (IRT), a class of measurement models that are used to measure latent properties and to assess and improve the quality of psychometric testing. IRT models are particularly appropriate for the present study because they can identify items that are "biased" such that one racial group is more or less likely to endorse them controlling for the overall level of attention-deficit/hyperactivity symptomatology. We use data from the Fast Track Project, a longitudinal study of emotional

and behavior problems among predominantly low-income African American and white children in four geographically diverse communities.[14]

PREVIOUS RESEARCH

Many screening tests for ADHD used in primary care settings rely on parental reports, and research indicates that parents of African American and white children differ in their perceptions of ADHD. For example, Bussing et al[15] found that parents of African American children were less likely to attribute ADHD to genetic origins. They also were less likely to use medical labels to refer to their child's condition and were thus more likely to refer to their children as "bad" than to believe a medical explanation existed for their behavior. This finding was supported by Stief (Stief EA. Parental Perceptions of Attention-Deficit/ Hyperactivity Disorder: Etiology, Diagnosis, and Treatment. Unpublished dissertation. Virginia Consortium Program in Clinical Psychology August 2003), who also found that parents of white children were more likely than parents of African American children to believe that their child's ADHD was caused by genetics or biology. Parents of African American children were more likely to believe that parenting and stressful life events caused ADHD and were significantly less likely than whites to reject a causal role for schools (Stief EA. Parental Perceptions of Attention-Deficit/Hyperactivity Disorder: Etiology, Diagnosis, and Treatment. Unpublished dissertation. Virginia Consortium Program in Clinical Psychology August 2003). Parents of African American children also have been found to be twice as likely as parents of white children to believe that ADHD is caused by consuming too much sugar.[15]

Levels of parental awareness of ADHD also differ by race and ethnicity. Bussing and colleagues[15] found that parents of African American children were less likely to have ever heard of ADHD compared to parents of white children. Furthermore, they were less likely to receive information from physicians at the time of diagnosis even though they viewed physicians as the preferred source of information.[15]

Perceptions of treatment also differ among parents in different race/ethnic groups. Parents of African American children have been shown to be far less certain that ADHD can be treated with medication,[15] which is consistent with a number of studies indicating that white students are significantly more likely to receive ADHD-related mediation in school than are African American students.[17-22] Since treatment guidelines and experts identify medication as the first-line treatment for ADHD,[23-25] these differences in perception and treatment could have long-term consequences for children's functioning and emotional well-being (Stief EA. Parental Perceptions of Attention-Deficit/Hyperactivity Disorder: Etiology, Diagnosis, and Treatment. Unpublished dissertation. Virginia Consortium Program in Clinical Psychology August 2003).

STUDY OBJECTIVES

In view of evidence that differences exist between African Americans and whites in perceptions and attitudes toward ADHD, it is important to ascertain whether psychometric instruments used to identify ADHD provide comparable results for the two groups. The present study examines differences among African American and white children in the measurement of ADHD with a widely used parental report instrument, the DISC. In addition to identifying specific interview items that appear to perform differently for African Americans and whites, the study explores the degree to which eliminating these biased items reduces racial disparity when the scale is used to predict need for treatment services as indicated by ADHD medication use.

METHODS

Data

The data used in the analyses were collected as part of the Fast Track Project,[14] a longitudinal study of children at risk of emotional and/or behavioral problems conducted in four locations: Durham, NC; Nashville, TN; rural Pennsylvania; and Seattle, WA. Schools within the four sites were selected as high risk based on crime and poverty statistics of the neighborhoods they served. Within each site, the schools were divided into two sets matched for demographics (size, percentage of free or reduced lunch, ethnic composition), and the sets were randomly assigned to intervention and control conditions. Using a multiple-gating procedure for each of three annual cohorts, all 9594 kindergarteners in 54 schools were screened for classroom conduct problems by teachers. Those children scoring in the top 40% within the cohort and site were then solicited for the next stage of screening for home behavior problems by the parents, and 91% agreed (n = 3274).[26] The teacher and parent screening scores were then standardized and combined into a sum score. Children were selected for inclusion into the study based on this sum score, moving from the highest score downward until desired sample sizes were reached within sites, cohorts, and conditions. Deviations were made when a child failed to matriculate in the first grade at a core school (n = 59) or refused to participate (n = 75) or accommodate a rule that no child would be the only girl in an intervention group. Ninety-five percent of the selected sample scored in the top 20% on both the parent and teacher screening measures. The outcome was that 891 children (n = = 445 for intervention and n = 446 for control) were selected. (The Fast Track intervention targeted conduct disorder [oppositional and antisocial behaviors] and is unlikely to have influenced the DISC scores used in the current analyses.)

It should be noted that these levels of problems are defined relative to other children in these high-risk schools. Relative to children across the country, however, the elevated levels of problem behavior are clearer. On the kindergarten Teacher's Report Form of the Child Behavior Checklist,[26] which provides national norms, the average Externalizing *T*-score (available for 88% of the high-risk sample) was 66.4, and 76% of these children scored in the clinical range (*T*-scores of 60 or higher).

In addition to the high-risk children, a smaller normative sample of first graders was selected, composed of equal numbers of children from each decile of the distribution of reported behavior problems. This combined sampling procedure yielded a total sample of 1199 children who participated in the Fast Track Project. The present analyses involve the 1070 children from the full sample whose parents completed the Diagnostic Interview Schedule for Children (DISC) during the fourth year of the study. In that year, children were in the third grade unless they had been retained. Among the 1070 children in the analytic sample, boys are disproportionately represented, comprising 64% of the sample (n = 684). The sample includes 541 African American and 529 white children. (The white sample is overwhelmingly white, non-Hispanic, with very few Hispanic and Asian children also included.) Comparisons of the children in the analytic sample with those excluded due to missing data on the DISC reveal no difference by gender; African American children were more likely to have missing data than were white children.

Attention-Deficit/Hyperactivity Disorder (ADHD) Measure: DISC

The DISC assessed DSM-III-R psychiatric symptoms and diagnoses in children through parent interview.[27] Although a revised DSM-IV classification is now in general use, evidence suggests that there are minimal differences between the two classification systems and that diagnostic continuity was maintained.[28] The parent with the primary caretaking responsibility for each child was asked whether the child experienced specific symptoms

related to the disorder during the past 6 months. The possible responses to the DISC questions were “no,” “yes,” “not applicable,” and “don’t know.” Responses in the latter two categories were recoded as “no” during the scoring process, as recommended by the developers of the instrument, and “yes” item responses are totaled to determine whether a child meets the DSM-III-R criterion. The ADHD-related symptoms assessed are similar to those assessed in other commonly used screening instruments such as the Conners Parent Rating Scale and the Vanderbilt ADHD Diagnostic Parent Rating Scale.

Analytic Strategy

Item Response Theory (IRT) methodology was used to determine whether ADHD-related items contained in the DISC instrument provide comparable information for African American and white children or whether differential item function (DIF) exists for one or more of the items. The first step in IRT involves determining which of the items in the instrument are indicators of a single underlying construct; therefore, factor analytic methods were used. Factor analysis may sometimes be used to create new subscales for clinical use; however, this was not the intention in the present analyses. Rather, factor analysis was used here because IRT methodology requires that the factors considered be strictly unidimensional. Iterated principal factor analysis using tetrachoric correlations[29,30] was applied to the ADHD-specific symptom items in the DISC, and five distinct factors were identified: (1) hyperactive, (2) impulsive, (3) concentration, (4) organizational problems at school, and (5) organizational problems at home. Iterated principal factor analysis was used initially to examine the hyperactive and impulsive items. A minimum eigenvalue of 1.0 was used to determine the number of factors that should be retained. Varimax rotation was applied. A similar procedure was used for the concentration and organizational items. Finally, principal components[31] were used to examine all items to confirm the factors identified by the previous analyses. No additional evaluation of validity or reliability was performed.

The specific items within each of the five factors are listed in Table 1.

The items within each factor were then analyzed using a two-parameter IRT model. This model includes three central elements. The first is the latent factor of interest, which is often referred to as θ or theta. The second is a parameter b representing the difficulty of each item. This parameter indicates how likely it is that the item is endorsed at a given level of θ. The higher the value of b, the less likely the item will be endorsed. An additional parameter is a slope, a, which indicates how well the item discriminates between subjects that differ with regard to θ.

The iterative characteristic curve method of Stocking and Lord[32] was used to anchor the underlying construct on a common scale for African Americans and whites. This method finds the best stable linear transformation of the IRT parameters for one group and then uses that transformation to rescale θ onto the same scale as that for the other group. This process also identifies items that perform differently in the two groups using the Lord’s χ^2 test. Items for which the p value of the χ^2 is <.01 are considered to exhibit differential item functioning for African American children compared to white children. A relatively conservative p value <.01 is conventionally used in these types of analyses to minimize the likelihood of excluding items purely by chance.

Additional information concerning differential item functioning was provided by employing differential functioning of items and tests (DFIT) methodology.[33] Estimates of item discrimination and difficulty were used to compute two statistics: compensatory differential item function (CDIF) and noncompensatory differential item function (NCDIF). The NCDIF value, which is always positive in sign, compares the characteristics of each item among

African American and white children. The more the item characteristics differ for the two groups, the larger is the NCDIF value. The conventional cutoff of ≥.006 for dichotomous items was used to determine the presence of DIF. The CDIF value, which can be either positive or negative, indicates which group the item favors. An additional statistic, the badness of fit ranking, was also calculated for each item.[34] The larger the badness of fit ranking, the greater the reduction in the overall bias that would occur if that item were to be omitted from the group of factor-related items.

The mean difference in hyperactivity between African Americans and whites was compared across alternative scale versions (Table 3). Note that IRT-based scores are expressed on a different measurement scale than the original raw scores. The first version consists of the standardized between-group difference for the traditional measure of the factor using the full set of 12 ADHD items in the DISC, with scores standardized to a mean of 0 and an SD of 1 for the population as a whole. Alternative versions are derived from IRT-based models. Models were derived for various versions of the scale with items sequentially dropped as discussed below, and Table 3 presents two of these models for comparison—one with all 12 items included and the other with eight items included and the four items that exhibit differential functioning excluded. In the 12-item models, nine cases were dropped due to missing data on one or more items; these cases did have complete information on the variables necessary for the eight-item model and were included in that model.

A final set of analyses used the IRT results to examine the relationship of various versions of the hyperactive scale with ADHD medication use, which can be viewed as an indicator of the need for treatment services. Once the IRT parameters for the hyperactivity items were estimated, overall hyperactivity-related IRT scores for each child in the sample were computed for alternative versions of hyperactivity assessment. An overall IRT score was obtained using the full 12-item scale (HYPER-12). Next, a HYPER-11 score was computed using 11 of the items and omitting the item that exhibited the largest NCDIF value (“always talking at home” as shown in Table 2). Subsequent scores HYPER-10 through HYPER-6 were obtained by sequentially dropping remaining items in descending order of NCDIF magnitude. These overall IRT scores were then entered as independent variables in logistic regression models predicting ADHD medication use, along with an indicator variable for race (African American = 1/white = 0).

RESULTS

Descriptive Analyses

Table 1 provides descriptive information regarding endorsement of items related to each of the five ADHD factors among African American and white children that emerged from the tetrachoric factor analysis. The first column, which includes results for the full sample, depicts the wide variation in the frequency of endorsement found among individual items. For example, within the hyperactive factor, over half of the sample endorsed the item “always talking at home,” while only 12.2% reported their children “often on the go at school.” Similar variation was seen for the other factors with the exception of “organizational problems at school.” Within this factor, frequencies ranged from a high of 26.8% (“often needs to be reminded at school”) to a low of 13.7% (“forgets important things at school”).

Visual comparison of the second and third columns of Table 1 reveals racial differences on items within each factor. The frequency of endorsement of nearly all of the items related to hyperactive, impulsive, and concentration factors was higher among African American children relative to white. In contrast, greater endorsement of items within organizational

problems at school was comparable by race, and five of the six items within organizational problems at home were more likely to be endorsed by parents of white children.

Item Response Theory (IRT) Analyses

These race-specific results highlight differences in the prevalence of particular item endorsement; however, they do not provide information about whether measures composed of these items would perform differently in the two groups given the same underlying level of hyperactivity. This possibility was assessed using the two-parameter IRT model. Results of these analyses are presented in Table 2.

Of the 12 items related to the hyperactive factor, for example, low p values associated with the Lord's χ^2 analyses suggest the presence if differential item function (DIF) in four of the items: "trouble staying in seat at school," "talks too much at school," "someone said child is hyperactive," and "always talking at home." For each of these items, comparison of the race-specific difficulty parameters indicates that they are lower for whites than for African Americans. In the case of the item "trouble staying in seat at school," for example, the difficulty parameter for whites was 0.29 compared with 0.63 for African Americans. In IRT analyses, this difficulty parameter is estimated holding constant the latent variable of interest for African Americans and whites, which in this case is level of hyperactivity. The results indicate that at the same underlying level of hyperactivity, parents of white children were more likely to endorse these items than were parents of African American children.

The additional DFIT statistics are also informative and are consistent with the Lord's χ^2 results. The NCDIF reveals that the differential item functioning for "always talking at home" is largest, but values for all four of the items exceed the conventional cutoff of 0.006 indicating DIF. The badness of fit rankings for these items are also high relative to the other items, indicating that their removal from the scale would reduce overall bias.

With the exception of the concentration factor, each of the other factor groupings contains one item that exhibits DIF. Each of these items has a large and highly significant Lord's χ^2 value as well as consistent signs of differential functioning in the DFIT statistics.

Analyses of Racial Differences in Hyperactivity in Alternative Measurement Models

Table 3 compares the magnitude of mean differences across various scales that could be constructed for the hyperactive factor. We focus here and in a subsequent table on the hyperactive factor because it contains the greatest number of items that exhibit differential functioning. The first row presents the standardized between-group difference for the traditional measure of the factor in column 3 using the full set of 12 questionnaire items, with scores standardized to a mean of 0 and an SD of 1 for the population as a whole. For the hyperactive factor, the score for African American children is significantly higher. The results are similar in row 2, where all 12 items, including those shown to exhibit differential functioning, are incorporated in an IRT-based model. The IRT-based model in row 3, however, which excludes the four items that exhibit differential functioning by race in the presence of similar underlying levels of hyperactivity, shows that once these items are dropped, the racial difference in means is reduced and is no longer statistically significant.

Analyses Relating IRT Results to ADHD Medication Use

IRT results were also used in a series of multiple logistic regression models to examine the relationship of versions of the hyperactive scale with ADHD medication use. Table 4 shows the coefficient for the race variable in each of the regression models, along with the associated p values. As items exhibiting DIF were dropped from the instrument, the coefficient on the race variable tended to decrease in magnitude. In other words, as items

exhibiting differential functioning were deleted, race disparities in the instrument's performance in predicting underlying need as indicated by ADHD medication use decreased and were no longer statistically significant.

Because household structure, income, and other aspects of socioeconomic position can influence children's medication use, a second set of logistic regression models was fit in which the following covariates were included: educational attainment of child's mother, the total number of children in the household, presence or absence of biological father in the household, and the Hollingshead Index[35] of socioeconomic status. In each of these models, the magnitude of the race coefficients was smaller; however, the overall pattern of results was unchanged—as items exhibiting differential functioning were deleted race disparities in the instrument's overall performance in predicting medication use gradually decreased and became statistically insignificant.

DISCUSSION

Findings from this study indicate that perceptions of attention-deficit/hyperactivity disorder (ADHD)-related symptoms among parents of African American children differ in important ways from those of parents of white children. Consequently, screening instruments commonly used in ambulatory pediatric practice settings that rely on parent report may yield quantitatively different results for African American and white children with similar underlying treatment needs. Further examination and refinement of these instruments among different race/ethnic groups is an important next step that may improve the diagnosis and treatment of ADHD. The results of the current analyses suggest that identifying and eliminating items that function differently for different race/ethnic groups would significantly improve the accuracy and between-group comparability of screening tools.

In the absence of better information on screening performance, gathering information about ADHD-related behavior from teachers and other school personnel should provide clinicians with a more complete picture of the behavioral functioning and therapeutic needs of children in all race/ethnic groups. While current clinical practice guidelines specify that input be obtained from the classroom teacher or other school personnel,[36] evidence suggests that such communication does not occur regularly,[7] particularly regarding African American children.[37,38]

As with other health-related disparities observed among racially identified groups, differences in knowledge, perceptions, and attitudes toward ADHD among parents of African American and white children may be driven not only by culturally based influences but also by other factors that are correlated with race. Most importantly, African Americans in the United States have long experienced social, educational, and economic disadvantage relative to whites,[39] and evidence strongly suggests that these factors have multiple and complex effects on health status and attitudes.[39,40] For example, lower parental educational attainment in itself may affect perceptions of ADHD symptoms.[41] Although the majority of both African American and white families in the present study are of low income and the distribution of mothers' education level is similar in the two groups, the presence of social class–related influences remains a possibility.

Previous studies have shown, however, that rates of unmet ADHD treatment needs are higher among minority children compared to white children controlling for socioeconomic status,[11] and researchers have suggested that a key reason for this disparity may be cultural differences in the response of African American and white families to hyperactivity,[19,20] Although reasons for these cultural differences are not clear, some see various possibilities: a lack of information may exist due to a lack of awareness about ADHD in African

American communities[42]; parents of African American children may view symptoms of ADHD as normal or, alternatively, may view the labeling of children with an ADHD diagnosis as a form of discrimination.[15] These theories are supported and expanded on in a qualitative study by Davison and Ford[43] of African American and white educators, medical personnel, and social workers/counselors who worked with parents of children attending four inner-city schools with large African American populations. Five major themes emerged from their research: (1) general distrust of the educational system among the African American community, (2) perception among parents of African American children that white educators lack cultural awareness, (3) perceived social stigma in the African American community related to mental illness, (4) widespread concern among parents of African American children about encouraging stimulant drug use in treating ADHD that might lead to abuse and addiction, and (5) political pressure from education officials to discourage labeling of children with disabilities in schools with large African American populations in view of the overrepresentation of minorities in special education programs that was documented in the early- and mid-1990s.

A limitation of the Fast Track Project data used in these analyses is that while the sample includes both urban and rural white children, the African American children are concentrated in the urban study locations. If race and rural/urban location exert separate effects (and it is not clear that they do), we cannot assess their independent contribution. Further analyses in a more spatially diverse sample are warranted. Also, as noted previously children in the Fast Track Project sample come predominantly from poor and nearly poor families, and therefore replication of these analyses using more socioeconomically diverse data sets would illuminate whether the racial differences observed here generalize to more advantaged populations.

In light of current policy efforts to identify and ultimately eliminate disparities in health among children as well as adults,[1] the study results underscore the importance of assessing health conditions in an equivalent way across all population subgroups. Without such measurement equivalence, the true magnitude of disparity is unknown from the start. Moreover, efforts to relate subsequent trends in disparity reduction or to increase policy interventions are also subject to error. The IRT-based methodology presented here is applicable to a wide range of other disorders in addition to ADHD and has the potential to greatly enhance the accuracy of disparity-related measurement.

In addition to the desirability of gathering information about ADHD-related behaviors from multiple sources in addition to parents as mentioned above, the results of this study also have several other implications for clinical practice. First, physicians should assess parents' factual understanding of ADHD as well as their feelings about this diagnosis and its implications for their child. Second, it is important to fully educate parents about the symptoms and etiological factors related to ADHD and about the risks and benefits of various treatment options including pharmacologic therapy. Most importantly, clinicians should be aware of, and sensitive to, culturally based differences in beliefs and attitudes about ADHD. These beliefs and attitudes can have an important impact, not only on perceptions of symtomatology, but also on receptiveness to and ultimate compliance with recommended treatment regimens.

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Table 1

Rates of ADHD Item Endorsement by Race, Diagnostic Interview Schedule for Children

Item	% Endorsing Item		
	Total	African American	White
Hyperactive			
At school often on the go	12.2	14.2	10.1
Climbs on things shouldn't at school	13.7	16.2	11.1
School says noisier than peers	17.2	20.6	13.8
At playtime noisier than peers	25.8	27.7	23.8
Often climbs on things shouldn't	28.2	29.2	27.2
Often has trouble staying in seat	29.5	29.1	29.9
Often too fidgety or restless	31.0	33.0	28.9
Trouble staying in seat at school	32.1	39.3	24.6
At home often on the go/moving	33.7	33.2	34.2
Talks too much at school	35.4	42.1	28.5
Someone said child hyperactive	44.6	47.9	41.2
Always talking at home	53.1	59.2	46.9
Impulsive			
At school pushes/cuts in line	13.9	18.2	9.4
At school butts in on others	14.4	18.4	10.3
At school blurts out answers	17.2	23.1	11.1
Pushes/cuts ahead in line	17.6	20.0	15.1
At school has trouble waiting turn	18.8	23.1	14.3
At school talks when others are	23.8	31.0	16.5
Blurts out answers to questions	36.5	41.9	30.9
At home has trouble waiting turn	38.1	39.2	37.0
Concentration			
At school avoids concentrating lots	19.9	22.2	17.4
Easily distracted at home	28.7	28.8	28.6
Trouble paying attention to schoolwork	29.1	28.5	29.6
At home avoids concentrating lots	29.2	29.4	29.1
Dislikes school tasks needing attention	29.7	31.3	28.0
Easily distracted at school	34.7	36.4	33.0
Dislikes talks requiring attention	43.3	42.4	44.2
Organizational problems at school			
Forgets important things at school	13.7	14.4	13.1
Often loses things at school	15.6	15.5	15.6
Very disorganized at school	15.9	13.2	18.6
Lot of careless mistakes at school	19.8	18.4	21.1
At school doesn't seem to listen	24.7	29.1	20.3
Often needs reminded at school	26.8	26.8	26.7
Organizational problems at home			

Item	% Endorsing Item		
	Total	African American	White
Trouble paying attention to games	12.6	11.7	13.6
Often forgets what should be doing	22.5	23.6	21.3
Lot of careless mistakes, chores	28.5	27.3	29.7
Often loses things at home	33.9	29.6	38.4
At home has trouble finishing things	43.8	38.1	49.7
Very disorganized at home	47.9	43.6	52.3

Table 2

Item Response Theory Parameters by Race and Tests of Differential Item Functioning

	White		African American		Lord's χ^2				
	Difficulty (*b*)	**Discrimination (*a*)**	**Difficulty (*b*)**	**Discrimination (*a*)**	**Statistic**	***p***	**CDIF**	**NCDIF**	**BOF**
Hyperactive									
At school often on the go	1.16	3.56	1.22	3.40	0.74	.69	0.0020	0.0005	0.25
Climbs on things shouldn't at school	1.18	2.45	1.23	3.15	2.61	.27	0.0068	0.0010	0.42
School says noisier than peers	0.96	2.62	1.13	2.60	5.89	.05	0.0122	0.0044	0.50
At playtime noisier than peers	0.81	1.70	0.90	1.75	1.77	.41	0.0141	0.0010	0.58
Often climbs on things shouldn't	0.74	1.80	0.68	2.26	3.04	.22	0.0048	0.0012	0.33
Often has trouble staying in seat	0.63	2.45	0.52	3.46	7.04	.03	0.0062	0.0036	0.17
Often too fidgery or restless	0.56	1.98	0.55	2.87	7.69	.02	0.0188	0.0021	0.67
Trouble staying in seat at school	0.29	2.53	0.63	4.21	61.04	.00	0.0940	0.0317	0.83
At home often on the go/moving	0.58	1.96	0.45	2.11	3.36	.19	0.0213	0.0024	0.08
Talks too much at school	0.30	1.42	0.74	1.60	45.23	.00	0.1022	0.0275	0.92
Someone said child hyperactive	0.05	1.83	0.20	3.26	36.41	.00	0.0761	0.0181	0.75
Always talking at home	−0.41	1.13	0.13	1.33	53.43	.00	0.1438	0.0514	1.00
Impulsive									
At school pushes/cuts in line	1.00	3.75	1.15	2.74	4.45	.11	0.0004	0.0018	0.38
At school butts in on others	1.09	2.55	0.97	3.70	3.64	.16	0.0002	0.0014	0.50
At school blurts out answers	0.91	2.32	1.04	2.62	2.43	.30	0.0016	0.0008	0.25
Pushes/cuts ahead in line	1.07	2.15	1.10	1.53	4.93	.09	0.0016	0.0007	0.75
At school has trouble waiting turn	0.85	2.98	0.70	5.21	5.17	.08	0.0013	0.0015	0.63
At school talks when others are	0.62	2.28	0.69	2.95	2.97	.23	0.0018	0.0006	0.13
Blurts out answers to questions	0.31	1.46	0.27	1.35	1.29	.52	0.0019	0.0004	0.88
At home has trouble waiting turn	0.41	1.41	−0.04	1.64	30.06	.00	0.0107	0.0110	1.00
Concentration									
At school avoids concentrating lots	0.80	4.19	0.89	6.46	5.25	.07	0.0016	0.0016	0.86
Easily distracted at home	0.77	1.58	0.73	1.78	0.43	.81	0.0002	0.0001	0.71
Trouble paying attention to schoolwork	0.67	2.41	0.55	3.57	3.98	.14	0.0017	0.0018	0.14
At home avoids concentrating lots	0.62	2.65	0.62	2.14	1.13	.57	0.0003	0.0001	0.43

	White		African American		Lord's χ^2				
	Difficulty (*b*)	**Discrimination (*a*)**	**Difficulty (*b*)**	**Discrimination (*a*)**	**Statistic**	***p***	**CDIF**	**NCDIF**	**BOF**
Dislikes school tasks needing attention	0.49	4.63	0.59	4.40	4.50	.11	0.0028	0.0050	1.00
Easily distracted at school	0.42	2.25	0.44	3.29	0.76	.68	0.0003	0.0001	0.29
Dislikes talks requiring attention	0.19	3.50	0.03	2.67	6.24	.04	0.0003	0.0002	0.57
Organizational problems at school									
Forgets important things at school	1.32	2.00	1.52	2.29	4.30	.12	0.0036	0.0026	0.83
Often loses things at school	1.30	2.23	1.33	2.47	0.48	.79	0.0010	0.0001	0.50
Very disorganized at school	1.41	2.26	1.21	2.07	5.30	.07	0.0044	0.0026	0.17
Lot of careless mistakes at school	1.50	1.29	1.32	1.29	2.05	.36	0.0026	0.0011	0.33
At school does not seem to listen	0.82	1.58	1.20	1.69	18.99	.00	0.0081	0.0086	1.00
Often needs reminded at school	0.70	3.42	0.77	2.34	4.85	.09	0.0028	0.0013	0.67
Organizational problems at home									
Trouble paying attention to games	1.59	1.98	1.74	1.90	1.57	.46	0.0034	0.0014	0.67
Often forgets what should be doing	0.98	1.83	1.29	2.11	25.77	.00	0.0146	0.0176	1.00
Lot of careless mistakes, chores	0.98	1.31	1.06	1.60	5.59	.06	0.0043	0.0023	0.83
Often loses things at home	0.70	2.11	0.65	2.43	1.46	.48	0.0024	0.0009	0.33
At home has trouble finishing things	0.42	1.80	0.31	2.27	6.00	.05	0.0051	0.0039	0.17
Very disorganized at home	0.22	2.00	0.23	2.15	0.61	.74	0.0004	0.0002	0.50

Table 3

Racial Differences in Levels of Hyperactivity in Alternative Measurement Models

	African American Mean	White Mean	Difference in Means	*T*-Statistic	*df*	*p*
Hyperactive						
Traditional measure standardized to normal (0,1)	0.11	−0.11	0.22	3.48	1019	.00
θ (12 items)	−0.55	−0.71	0.16	3.41	1019	.00
θ (8 items)	−0.67	−0.75	0.07	1.63	1028	.10

Table 4

Race Coefficients in Logistic Regression Models Predicting ADHD Medication Use

	HYPER-12	HYPER-11	HYPER-10	HYPER-9	HYPER-8	HYPER-7	HYPER-6
Race	−0.61	−0.62	−0.56	−0.52	−0.46	−0.45	−0.47
p	0.06	0.05	0.08	0.10	0.14	0.14	0.12

ADHD, attention-deficit/hyperactivity disorder.

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