Categorical and Dimensional Definitions and Evaluations of Symptoms of ADHD: The SNAP and he SWAN Ratings Scales

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Introduction:

Since 1980, the Diagnostic and Statistical Manuals (DSM) of the American Psychiatric Association (i.e., DSM-III, 1980; DSM-III-R, 1987; DSM-IV, 1994) have used symptoms of inattention, impulsivity, and hyperactivity to define a diagnostic category now called Attention Deficit Hyperactivity Disorder (ADHD). A common set of 18 symptoms of ADHD has been incorporated into the criteria stated in DSM-IV (1994) and in the International Classification of Diseases, Edition 10 (ICD-10, 1993). In DSM-IV, the set of 18 items is divided into two subsets, each with 9 items, representing the domains of Inattention (I) and Hyperactivity/Impulsivity (HI). The diagnostic rules for making categorical diagnoses of ADHD are based on symptom counts. To meet DSM-IV criteria for either domain of ADHD, 6 or more of the 9 symptoms must be endorsed by two sources (usually parents and teachers). Based on the two domains, three subtypes of ADHD are specified: Combined Type (ADHD-C), Predominately Inattentive Type (ADHD-I), and Predominately Hyperactive/Impulsive Type (ADHD-HI).

Also since the early 1980's (see Swanson et al, 1982 and 1983), the dimensions of ADHD behavior have been quantified by severity ratings (instead of counting presence) of symptoms specified by the DSM manuals. The DSM-III version of the Swanson, Nolan and Pelham (SNAP-III) rating scale was based on the concept that the items (symptoms) in each ADHD domain describe an underlying dimension of behavior (see Swanson et al, 1982).

Borrowing from the literature on rating scales (e.g., Conners et al, 1969), each item was evaluated on a 4-point scale (Not at All = 0, Just a Little = 1, Pretty Much = 2, and Very Much = 3). Placement on the ADHD dimensions were designated by summary scores on subset of items (Swanson et al, 1982; Swanson, 1992). Response to treatment (Swanson et al, 1983) and direct classroom observation (Atkins et al, 1985; 1988; 1989) established the validity of the SNAP-III. In parallel with the revisions of the DSM criteria for ADHD, the SNAP-III-R and SNAP-IV were formulated using slightly different sets of items and dimensions (see Swanson, 1992). The SNAP-IV has been used in epidemiological studies (Gaub and Carlson, 199x; Carlson and Gaub, 199x; Schuck, 1997) and was chosen as a primary outcome measure in the Multimodality Treatment Study of ADHD (MTA) (MTA Group, 1999).

Several similar questionnaires based on the DSM ADHD symptoms have been developed, including the Vanderbilt Rating Scale by Wolraich et al (199x), the Disruptive Behavior Disorder rating scale by Pelham et al (199x), the ADHD Rating Scale by DuPaul et al (1998), and the ADHD subscales by Conners et al (1999). All of these assign a score on a 4-point scale to each DSM-IV symptom of ADHD. Some scales ask the rater to judge the presence of symptoms (e.g., on the SNAP, DBD, and Conners ADHD scales, the degree of symptom presence is specified by 0 = Not at All, 1 = Just a Little, 2= Quite a Bit, and 3 = Very Much), while others ask the rater to judge the frequency of the symptom (e.g., on the Vanderbilt and DuPaul ADHD scales, the frequency of occurrence is specified by 0 = Never or rarely, 1 = sometimes, 2= Often, or 3 = Very Often).

In all of the ADHD rating scales, parents and teachers complete the same form, similar to the SNAP-IV shown in Table 1. Subscale scores are calculated as the average rating per item, so summary scores have the same range (0 to 3) for subscales based on different numbers of items.

Summary scores can be derived for non-overlapping subsets of symptoms defined in DSM-IV (ADHD-I and ADHD-HI), as well as for the composite set of symptoms (ADHD-C based on all 18 ADHD items). Estimates of population parameters of the summary scores (i.e., the mean and standard deviation) have been derived for large non-referred samples. In general, for the 4-point ratings scales of these instruments, the mean ratings in the general population is between 0 ("Not at All" or "Rarely") and 1 ("Just a Little" or "Sometimes").

Statistical cutoffs based on estimates of population parameters have been proposed to define severity of ADHD based on extreme placement on the ADHD dimensions. For example, Swanson (1992) recommended the use of standard scores intended to identify moderate (mean + 1 sd) or severe (mean + 2 sd) ADHD. Conners (1999) recommended the use of T-scores (> 70) to ensure severity of symptoms. DuPaul et al (1998) provides means and sd of total scores for ADHD-I, ADHD-HI, and ADHD-C, but they recommend the use of 95th percentile as a cutoff to identify extreme cases. (Standard scores, T-scores, and total scores are linear transformation of the same data, and thus they should provide equivalent cutoff to identify the same extreme cases.) This paper discusses some psychometric problems with the use of statistical cutoffs for these summary measures of ADHD symptoms.

If the distribution of summary scores is normal, the cutoff criterion based on the mean and sd can be used to specify the percentage of individuals in the population considered to be extreme. A cutoff equal to the mean + 1.65 sd should identify 5% of the population, and a cutoff equal to the mean + 1.96 sd should identify 2.5% of the population. If the assumption of normality is not met, then the percentage of cases in the population identified as extreme by a statistical cutoff may be unexpected low or high. In fact, it has been known for over a decade that the distribution of summary scores for the general population would not be normal for

ratings of deviant behavior (psychopathology) based on the type of 4-point scale used for the Conners ratings. Sprague and Sleator (1985) described the observed distribution as "J-shaped" for the population, even though for the clinical population the shape was approximately normal. Since the SNAP scale adopted the 4-point rating scale for abnormal behavior (ADHD symptoms), a similar non-normal distribution of summary scores might be expected. McCleary et al (in press) has verified this, and described the distribution of SNAP-IV summary scores as a "contagious Poisson".

The purposes of this paper are (1) to demonstrate the consequences of applying statistical cutoffs based on population norms when the assumption of the normal distribution are not met and (2) to develop a new scale of measurement that yields a closer approximation to the normal distribution and avoids a possible fatal flaw in the use of norms for ADHD rating scales.

Method:

We obtained ratings on the SNAP-IV rating scale for students in two elementary schools (kindergarten to grade 6) in the Irvine Unified School District. Based on an approved protocol for an anonymous survey of classrooms, we obtained ratings of 847 students in 15 classrooms. Each of the 15 teachers rated every student in the classroom. The age, gender, and other demographic characteristics of these data are described in detail elsewhere (Schuck, 1997) and will not be repeated here. For the purposes of this paper, the mean and standard deviation (sd) of the ratings (on a 4-point scale) were calculated for each categorical diagnosis of ADHD (ADHD-I, ADHD-HI, and ADHD-C).

Results:

A factor analysis was performed with SPSS, using the principal component method and varimax rotation. As expected, a 2-factor solution was obtained, representing Inattention and Hyperactivity/Impulsivity. These two factors explained 77.78% of the variance, with the rotated factors each accounting for about the same percentage of variance in this sample (see Table 2). The ADHD-I items had higher loadings than the ADHD-HI items on the Inattention factor, which accounted for 41.52% of the variance; the ADHD-HI items had higher loadings than the ADHD-I items on the Hyperactivity/Impulsivity factor, which accounted for 36.26% of the variance.

The mean rating of all 18 ADHD items scored on the 4-point scale of 0 to 3 (i.e., the ADHD-C summary score) was .54, with a variance of .45 and a sd of .67. Using a mean + 1.65 sd cutoff, it was expected that about 5% of the sample (about 42 cases) would be identified as extreme. However, this statistical cutoff identified a significantly higher than expected percentage (8.4%) of individuals in this sample (71 cases) as extreme. A comparison of the expected and observed proportions was statistically significant ($Z = -4.53$, $p < .01$).

The distribution of ADHD-C summary scores (see Figure 1) is obviously skewed to the right. The calculation of skewness ($x = 1.474$) confirmed a significant departure from the expected value (0) based on an assumption of normality. As expected from a general (non-clinical) population, most scores were equal to or below 1.0, which represents a normal level of behavior (i.e., "Just a Little" or less) that would not meet the DSM-IV criteria for symptom presence. In fact, in this sample 79.9% of all students had scores on this range, and this produced the extreme positive (rightward) skewness.

Similar distributions were constructed for the subscales scores of ADHD-I and ADHD-HI. The mean, variance, sd and skewness for the ADHD-I subscale were .73, .74, .86, and 1.12;

for ADHD-HI, these values were .34, .37, .61, and 2.36. Using a mean + 1.65 sd (or 5%) cutoff for these subscales, a higher than expected percentage was also identified as extreme. In this sample, the observed percentage (9.2%) identified by this cutoff on the ADHD-I subscale (78 cases rather than 42) was also statistically significant compared to the expected value of 5% ($Z = -5.86$, $p < .01$), as was the percentage (7.6%, or 64 cases) identified by the cutoff on the ADHD-HI subscale ($Z = -3.47$, $p < .01$).

A Venn diagram (see Figure 2) shows the overlap of extreme cases identified by the multiple cutoff values for ADHD-C, ADHD-I, and ADHD-HI. This diagram makes it clear that few cases met the criteria for ADHD-C, ADHD-I, and ADHD-HI simultaneously (n = 31, or 3.7%), or the criteria for ADHD-I only (n=28, 3.3%) or ADHD-HI only (n=13, 2.4%). Some cases met the criteria for ADHD-C but not ADHD-I and ADHD-HI simultaneously: a subset defined by meeting the cutoff criteria for ADHD-C but not ADHD-HI (n=19, 2.2%), and a subset defined by meeting the criteria for ADHD-C but not ADHD-I (n=13, 1.5%). One case (0.1%) met the cutoff criteria for ADHD-C but not for ADHD-I or ADHD-HI. A total of 112 cases (n=28+19+31+20+13+1=112, 13.2%) met the cutoff criteria for these subtypes of ADHD.

Approximately 80% of the summary scores were equal to or less than 1.0 (which represents a rating of "Just a Little", or normal behavior). This extreme rightward skewness also held at the item level: from 75% to 96% of the sample had scores of 1 or less ("Just a Little" or "Not at All") on the ADHD items of the SNAP-IV.

Discussion:

Due to non-normality in the population, the use of summary scores on the SNAP-IV rating scale produces over-identification of extreme cases. This may represent a fatal flaw in the

use of norms for the SNAP-IV rating scale, and this weakness may characterize other ADHD rating scales of similar construction.

Why does a statistical cutoff (mean + 1.65 SD) identify almost 1.7 times more than the expected percentage of cases beyond the cutoff? One reason that the distributions of summary scores do not meet the assumptions of normality is positive (rightward) skewness. McCleary et al (submitted) evaluated the characteristic of the observed distribution of SNAP summary scores from this sample. Rather than a normal distribution, the Poisson distribution was considered, which described the expected distribution for a summary score based on independent items that take on a 0 ("Not at All" or "Just a Little") or 1 ("Pretty Much" or "Very Much") values. However, a defining characteristic of the Poisson distribution (i.e., mean = variance) was not met: the variance was less than the mean. The observed distribution was described by the "contagious Poisson" distribution (or negative binomial), which is the expected pattern for a summary score when the items are not independent. In fact, when factor analysis identifies items with high intercorrelations (as was the case in this sample), then the assumption based on independence of items should not hold. When factors represent the ADHD domains, then a score on one item (e.g., a 0 for a subject without symptoms) of the domain predicts the same score on all other items in the domain. Variation within the domain is considered to be random noise or "Gaussian" variation. This non-independence results in a reduction of the variance of the distribution of summary scores that is even beyond the expected reduced variance of the Poisson distribution relative to the normal distribution.

What are the consequences of this for using SNAP ratings to make diagnoses of ADHD? In this sample, the impact of the reduced variance is to overcome the under-identification tendency of right-skewness to the extent that over-identification occurs. Apparently, the use of

statistical cutoffs for ratings of items describing abnormal behavior (such as the ADHD symptoms) on a 4-point scale of severity of the psychopathology (degree of presence of the symptom) will over identify individuals who qualify for extreme placement on a presumed underlying dimension of behavior. In this sample, the restricted variance contributes to the over-identification (by a factor of almost 1.7) of cases (8.4%) beyond the cutoff than the expected 5%.

What can be done to correct this tendency, which may be viewed as a fatal flaw for the use of norms and statistical cutoffs based on ADHD rating scales? Since the over-identification is related to reduced variance of the summary score in the population, we considered ways that the full range of variability might have been truncated in the SNAP-IV summary scores. In Study II, we maintained the DSM-IV content for the ADHD items, but we re-worded them and changed the scale of possible ratings to capture the full range of SNAP summary scores that we expected to exist in the population.

Study II:

Introduction:

The wording of the items in the DSM-IV manual (and on the SNAP) describes extreme behavior that would qualify as a symptom of a disorder if it present more than usual (i.e., more than "Just a Little") or more frequently than usual (i.e., more than "Sometimes"). By this definition, the "abnormal" or extreme behavior would not be present in most individuals in the population.. Thus, in most cases a zero score should be assigned by a veridical rater on each item. Study 1 shows that this does happen when a school-wide sample is evaluated by using an ADHD rating scale.

The categorical definition of items in terms of psychopathology may fail to capture variation in the population related to strengths as well as weaknesses of individuals. Due to the wording and scoring of the item, an individual who has strengths (and thus has extreme placement on the dimension but in the opposite direction than an individual with a weakness) would receive the same ratings and scores as an average individual with respect to symptom presence (e.g., Not at All= 0).

To attempt to capture the population variation presumed to exist in nature but truncated by the wording and scoring of items of the SNAP-IV, we re-worded the DSM-IV items of ADHD as shown in Table 3. For example, consider the first symptom listed in the DSM-IV criteria for ADHD – "Often fails to give close attention to detail or make careless mistakes". Instead of using the DSM-IV formulation of this item as a categorical questions ("Does this child often fail to give close attention to detail and make careless mistakes?") we re-worded the item as a dimensional question and asked "How does this child pay attention to detail". Also, instead of scoring the re-worded item on a 4-point scale to measure presence of psychopathology (e.g., Not at All = 0, Just a Little = 1, Pretty Much = 2, and "Very Much = 3), we extended the 4-point scale to reflect strengths as well as weaknesses by using a 7-point scale anchored to average behavior (Far Below Average = 3, Below Average = 2, Somewhat Below Average = 1, Average = 0, Somewhat Above Average = -1, Above Average = -2, and Far Above Average = -3). To distinguish this revised scoring on a 7-point scale from the old scoring on a 4-point scale, we will call this the Strengths and Weakness of ADHD-symptoms and Normal-behavior (SWAN) scale.

Method:

We collected teacher ratings on the SWAN scale for 327 elementary school-aged children in 12 classrooms. Each teacher completed the revised rating scale shown in Table 2 for each student in the classroom. Each item was scored on the full 7-point scale (-3 to +3) that measures both strengths and weaknesses (SWAN scoring), as well as the truncated 4-point scale (0 to 3) for symptom presence that collapses all behaviors average or better into the same ratings (0) and measures just variation in weaknesses (SNAP scoring).

Results:

The distributions for the summary scores (ADHD-I, ADHD-HI, and ADHD-C) based on the SWAN scale and scoring are presented in Figure 3. The summary statistics for the ADHD-C score were mean = -.57, sd = 1.63, and skewness = .07. The summary statistics for the ADHD-I summary score were mean = -.43, sd = .1.76, and skewness = .12. The summary statistics for the ADHD-HI summary score were mean = -.72, sd = 1.65, and skewness = .17. The positive skewness of these distributions was less than for the SNAP distribution in Study I and not statistically significant. As shown in Figure 3, the distributions of the summary scores based on SWAN scoring suggest that these summary scores have uniform distributions (about 10%) over most of the range of possible scores with a reduced percentage (5% or less) at the "far below average" extreme.

For each summary score, a statistical cutoff (mean + 1.65 sd) was calculated, and the cutoff scores were 2.11 for ADHD-C, 2.48 for ADHD-I, and 2.00 for ADHD-HI. In this sample, these cutoff scores identified less than the expected 5% extreme cases for ADHD-C (n=14, 4.28%), ADHD-I (n=13, 3.98%, and ADHD-HI (n=14, 4.28%). None of the differences were statistically significant from the expected value (5%) based on the normal distribution. The

slight under-identification is expected for the slight positive (rightward) skewness observed for this sample.

A Venn diagram (see Figure 4) shows the overlap of extreme cases identified by these statistical cutoffs. A total of 23 cases (7.0%) were identified by meeting the $p < .05$ cutoff values for the SWAN on at least one of the subtypes of ADHD, compared to 13.2% identified by the $p < .05$ cutoff values for the SNAP in Study I (see Figure 2). This total (7+1+5+1+7+2=23) for the SWAN was based on cases meeting the cutoff criteria only for ADHD-I (n=7), for ADHD-I and ADHD-C but not ADHD-HI (n=1), for ADHD-C as well as ADHD-I and ADHD-HI (n=5), for ADHD-C but not ADHD-I or ADHD-HI (n=1), for ADHD-HI and ADHD-C but not ADHD-I (n=7), and for only ADHD-HI (n=2).

We also used the 4-point scale similar to the SNAP scale for scoring the SWAN items. The similarity was based on collapsing the rating categories representing average or higher placement in the dimension (0 to –3) into one rating class (0). This transforms the 7-point scale into a 4-point scale: Average or better = 0, Somewhat below Average = 1, Below Average = 2, and Far Below Average = 3. As shown in Figure 5, the distributions based on truncated scoring of the SWAN matched the distributions of the SNAP obtained in the first study.

We performed factor analyses for the summary scores derived from the SWAN (-3 to +3) scoring. As shown in Table 4, the SWAN items loaded on two factors as expected from the DSM-IV criteria (and similar to the SNAP items in Study I). The factor analysis of the SWAN ratings produced about a 10% increase in the percentage of variance explained by the two factors (87.87%) than for the factor analysis of the SNAP ratings in Study I (77.78%). Also, there was a slight difference in the order of higher loading (higher loadings of the SWAN ADHD-H/I items on factor 1, in contrast to the higher loadings of the SNAP ADHD-I items on factor 1).

Discussion:

The use of statistical cutoffs based on items that define abnormal behavior may have a serious flaw, due to the distribution of scores in the population. The population distributions for item scores and summary scores are likely to approximate the "contagious Poisson" distribution, with a high percentage of score centered between 0 and 1. If this occurs, then the statistical cutoffs based on total scores, z-scores, or T-scores and the assumptions of normality (e.g., mean + 1.65 sd) will over-identify extreme cases. In the sample of study I, the SNAP-IV identified nearly 1.7 times more (8.4%) than the expected number of cases (5%) with extreme placement on the ADHD dimensions.

By re-wording the items to render them dimensional, the SWAN scale captures variation related to strengths as well as weaknesses. This produces a distribution that approximated the normal distribution, and the minor violations of the assumptions do not result in over-identification of extreme cases. The use of percentile cutoffs also avoids over-identification (see Swanson et al, 1999 and DuPaul et al, 1998). However, this approach does not capture strengths that may balance weaknesses in individual cases, as does the SWAN approach.

If the domains of ADHD are dimensions of behavior, then the categorical definition of items (and the related scoring that assigned the same score to all individuals considered to be normal) will truncate the range of scores and reduce the true degree of variability in the population. The present studies suggest how to create dimensions of ADHD domains from items that are defined dimensionally rather than categorically. This allows for use of parametric statistics and corrects the over identification flaw likely to be present with scales that are based on categorical definitions of items.

Table 1: The SNAP-IV Rating Scale

Name: _____ Gender:_____ Age:_____ Grade:_____

Ethnicity: African-American _____ Asian _____ Caucasian _____ Hispanic _____ Other_____

For teacher: Completed by: _____ Type of Class:_____ Class size: _____

Telephone # at school: _____ Recommended times for follow-up call: _____

For parent: Completed by: _____ # Parents Living in Home: _____ Family Size: _____

Period of Time Covered by Rating: Past Week _____ Past Month _____ Past Year _____ Lifetime _____ Other _____

For each item, check the column that best describes this child:	Not At All	Just A Little	Quite A Bit	Very Much
1. Often fails to give close attention to details or makes careless mistakes in schoolwork or tasks	_____	_____	_____	_____
2. Often has difficulty sustaining attention in tasks or play activities	_____	_____	_____	_____
3. Often does not seem to listen when spoken to directly	_____	_____	_____	_____
4. Often does not follow through on instructions and fails to finish schoolwork, chores, or duties	_____	_____	_____	_____
5. Often has difficulty organizing tasks and activities	_____	_____	_____	_____
6. Often avoids, dislikes, or reluctantly engages in tasks requiring sustained mental effort _____	_____	_____	_____	
7. Often loses things necessary for activities (e.g., toys, school assignments, pencils, or books)	_____	_____	_____	_____
8. Often is distracted by extraneous stimuli	_____	_____	_____	_____
9. Often is forgetful in daily activities	_____	_____	_____	_____
10. Often fidgets with hands or feet or squirms in seat	_____	_____	_____	_____
11. Often leaves seat in classroom or in other situations in which remaining seated is expected	_____	_____	_____	_____
12. Often runs about or climbs excessively in situations in which it is inappropriate	_____	_____	_____	_____
13. Often has difficulty playing or engaging in leisure activities quietly	_____	_____	_____	_____
14. Often is "on the go" or often acts as if "driven by a motor"	_____	_____	_____	_____
15. Often talks excessively	_____	_____	_____	_____
16. Often blurts out answers before questions have been completed	_____	_____	_____	_____
17. Often has difficulty awaiting turn	_____	_____	_____	_____
18. Often interrupts or intrudes on others (e.g., butts into conversations/games)	_____	_____	_____	_____
	_____	_____	_____	_____

ADHD-In		ADHD-H/Im	
# 1	_____	#10	_____
# 2	_____	#11	_____
# 3	_____	#12	_____
# 4	_____	#13	_____
# 5	_____	#14	_____
# 6	_____	#15	_____
# 7	_____	#16	_____
# 8	_____	#17	_____
# 9	_____	#18	_____
Total =	_____	=	_____
Average =	_____	=	_____

The 4-point response is scored 0- 3 (Not at All = 0, Just A Little = 1, Quite A Bit = 2, and Very Much = 3). Subscale scores on the SNAP-IV are calculated by summing the scores on the items in the specific subset (eg., Inattention) and dividing by the number of items in the subset (eg., 9). The score for any subset is expressed as the Average Rating-Per-Item.

Fig. 1: The SNAP-IV Norms

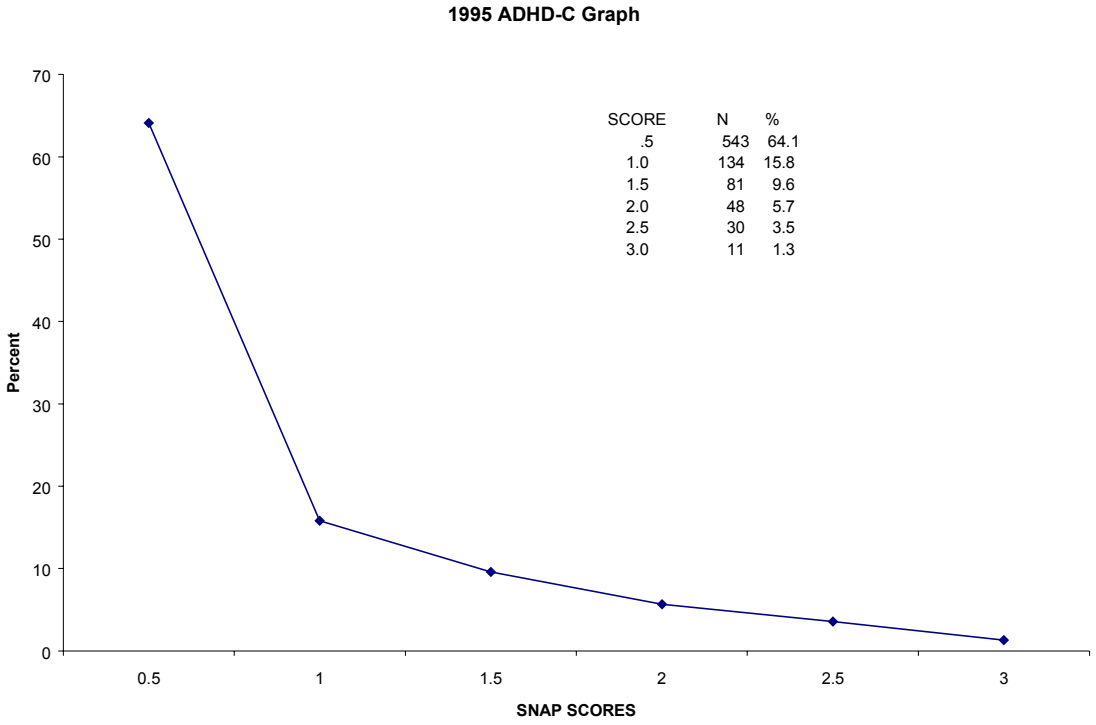


Table 2: SNAP-IV Factor Loading

SNAP-IV Question #	Factor 1	Factor 2
1 Difficulty attenting to detail	***.840***	.226
2 Difficulty sustaining attention	***.862***	.347
3 Does not listen	***.805***	.340
4 Does not follow through on instructions	***.891***	.225
5 Difficulty organizing tasks	***.910***	.203
6 Avoids sustained mental effort	***.874***	.234
7 Loses things	***.820***	.304
8 Distracted	***.789***	.441
9 Forgetful	***.884***	.248
10 Fidgets or squirms	.520	***.658***
11 Leaves seat	.425	***.737***
12 Runs about or climbs	.265	***.731***
13 Difficulty playing quietly	.398	***.736***
14 On the go or driven by a motor	.228	***.843***
15 Talks excessively	.263	***.797***
16 Blurts out answers to questions	.179	***.866***
17 Difficulty awaiting turn	.202	***.899***
18 Interrupts or intrudes	.205	***.887***
% of Variance Accounted	41.52	36.26

Figure 2: Venn Diagram of Overlap of Subsets Indentified by Statistical Cutoffs on SNAP-IV

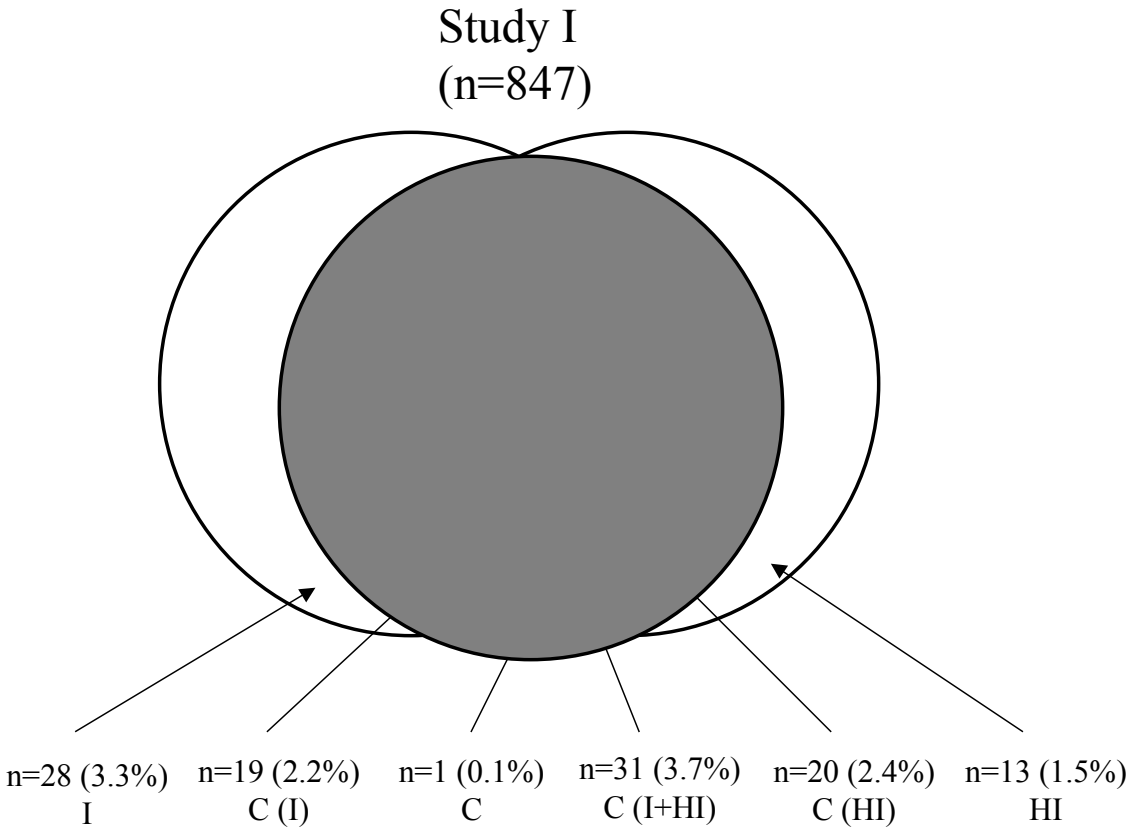


Table 3: The New SNAP (SWANSON scale) Gender: _____ Age: _____ Grade: _____
Name:_____

Completed by: _____ Class size: _____ Type of Classroom: _____

Ethnicity (circle one which best applies): African-American Asian Caucasian Hispanic Other

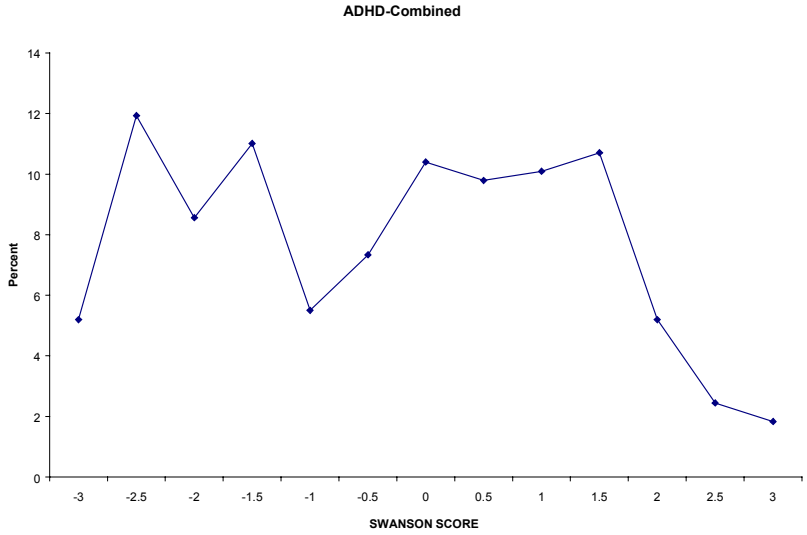
Children differ in their abilities to focus attention, control activity, and inhibit impulses. For each item listed below, how does this child compare to other children of the same age? Please select the best rating based on your observations over the past month.

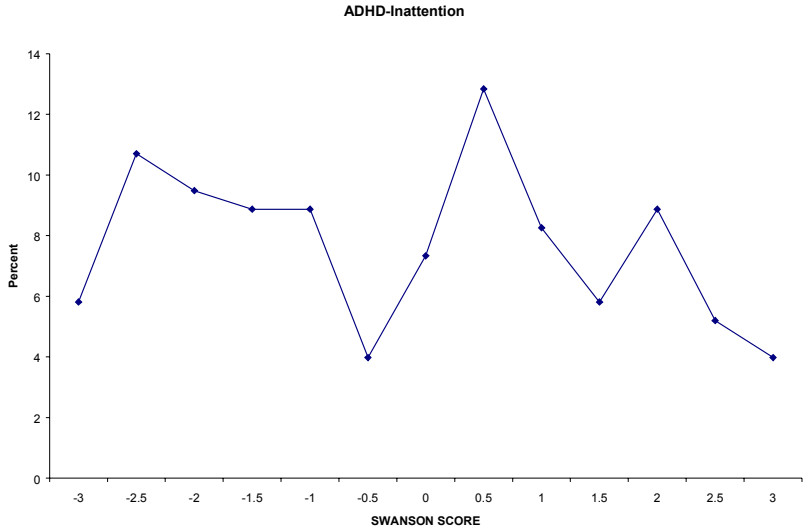
Compared to other children, how does this child do the following:	**far below avg.**	**below**	**slightly below avg.**	**avg.**	**slightly above avg.**	**above**	**far above avg.**
1. Give close attention to detail and avoid careless mistakes	_____	_____	_____	_____	_____	_____	_____
2. Sustain attention on tasks or play activities	_____	_____	_____	_____	_____	_____	_____
3. Listen when spoken to directly	_____	_____	_____	_____	_____	_____	_____
4. Follow through on instructions and finish school work or chores	_____	_____	_____	_____	_____	_____	_____
5. Organize tasks and activities	_____	_____	_____	_____	_____	_____	_____
6. Engage in tasks that require sustained mental effort	_____	_____	_____	_____	_____	_____	_____
7. Keep track of things necessary for activities	_____	_____	_____	_____	_____	_____	_____
8. Ignore extraneous stimuli	_____	_____	_____	_____	_____	_____	_____
9. Remember daily activities	_____	_____	_____	_____	_____	_____	_____
10. Sit still (control movement of hands or feet or control squirming)	_____	_____	_____	_____	_____	_____	_____
11. Stay seated (when required by class rules or social conventions)	_____	_____	_____	_____	_____	_____	_____
12. Modulate motor activity (inhibit inappropriate running or climbing)	_____	_____	_____	_____	_____	_____	_____
13. Play quietly (keep noise level reasonable)	_____	_____	_____	_____	_____	_____	_____
14. Settle down and rest (control constant activity)	_____	_____	_____	_____	_____	_____	_____
15. Modulate verbal activity (control excess talking)	_____	_____	_____	_____	_____	_____	_____
16. Reflect on questions (control blurting out answers)	_____	_____	_____	_____	_____	_____	_____
17. Await turn (stand in line and take turns)	_____	_____	_____	_____	_____	_____	_____
18. Enter into conversations & games without interrupting or intruding	_____	_____	_____	_____	_____	_____	_____

ADHD-In		ADHD-H/Im	
# 1	_____	#10	_____
# 2	_____	#11	_____
# 3	_____	#12	_____
# 4	_____	#13	_____
# 5	_____	#14	_____
# 6	_____	#15	_____
# 7	_____	#16	_____
# 8	_____	#17	_____
# 9	_____	#18	_____
Total =	_____	=	_____
Average =	_____	=	_____

The 7-point response is scored +3 to - 3 (Far Below Avg. = 3, Below Avg. = 2, Slightly Below Avg. = 1, Average = 0, Slightly Above Avg. = -1, Above Average = -2, and Far Above Average = -3). Subscale scores on the SWAN are calculated by summing the scores on the items in the specific subset (eg., Inattention) and dividing by the number of items (eg., 9) to express the summary score as the Average Rating-Per-Item.

Figure 3: The SWAN Norms





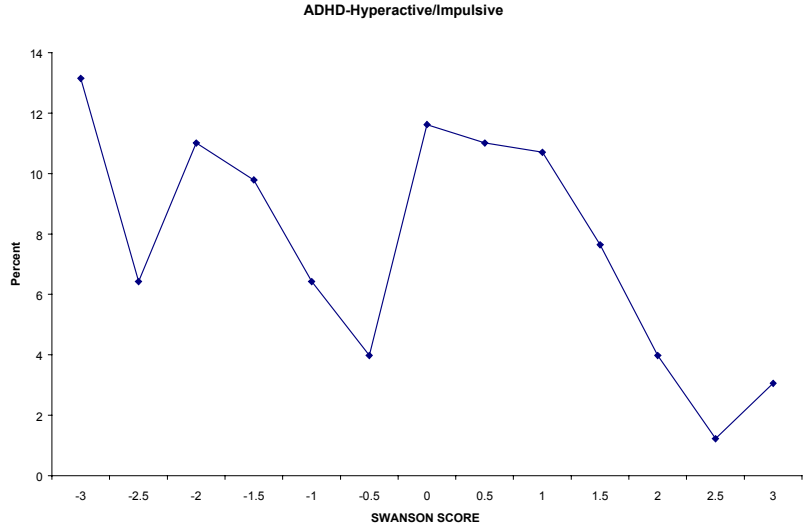


Figure 4: Venn Diagram for Subsets Identified by Statistical Cutoffs on New SNAP with SWANSON Scoring

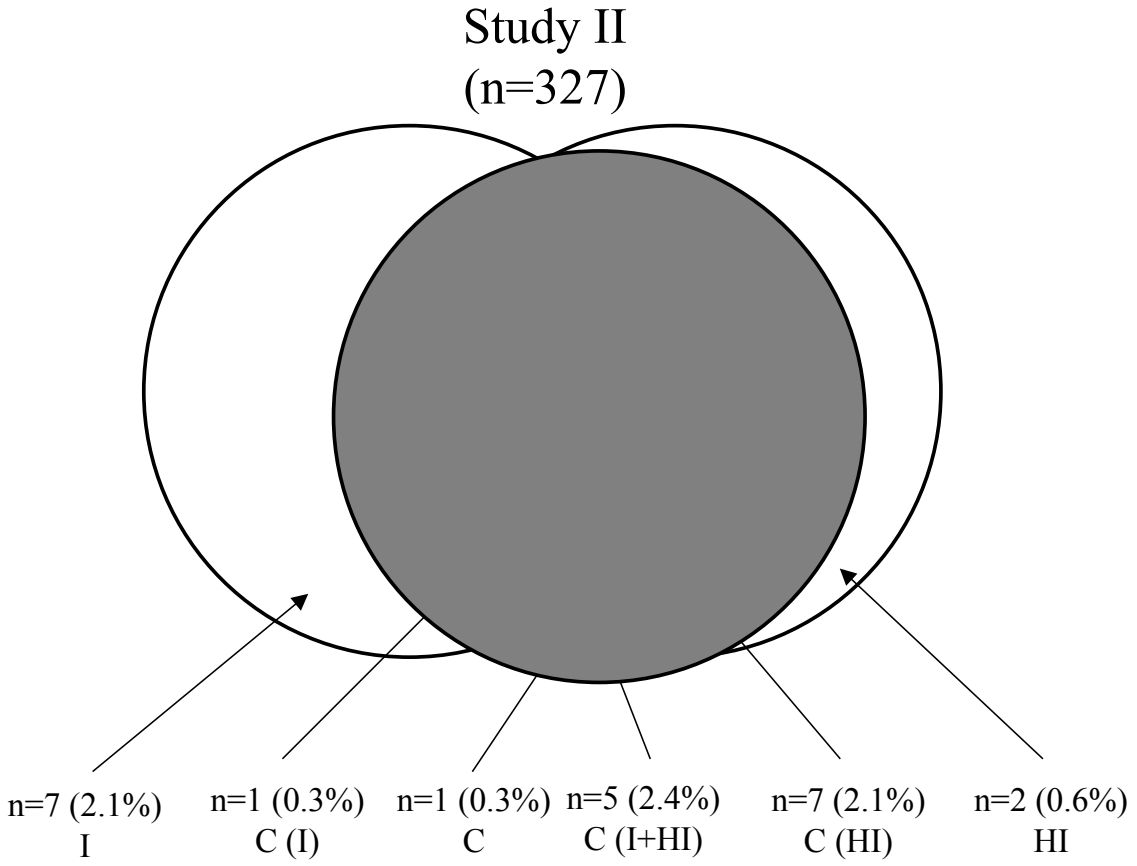
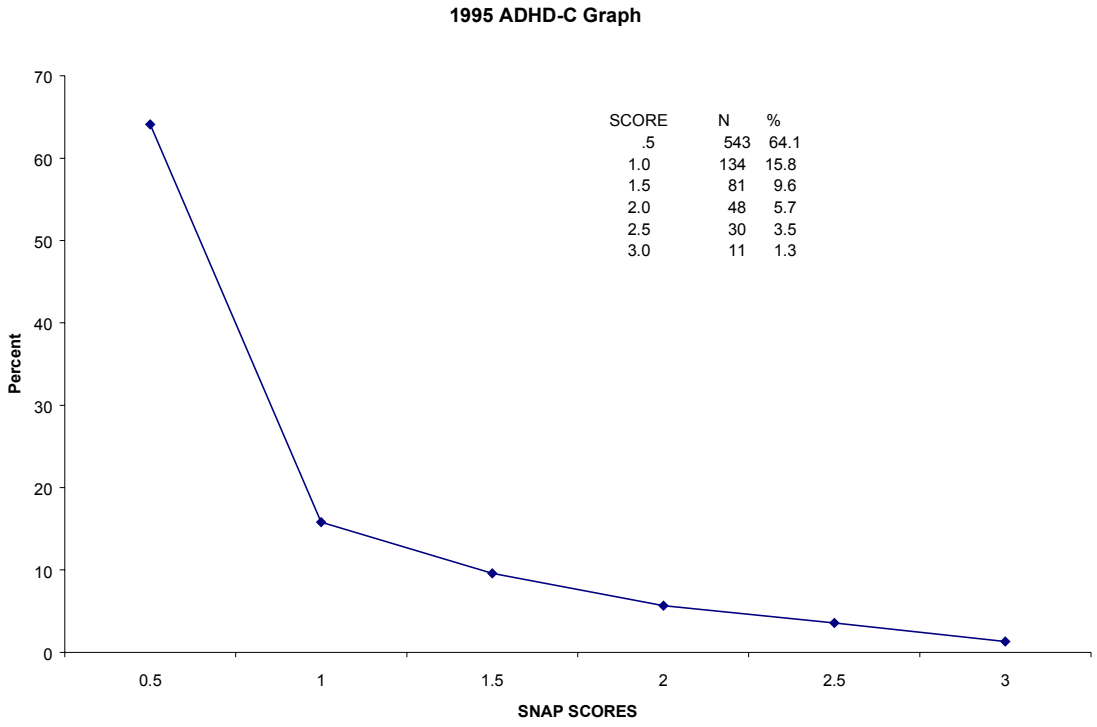


Figure 5: Comparison of the SNAP and SWAN Norms (based on the same 0-3 scoring)



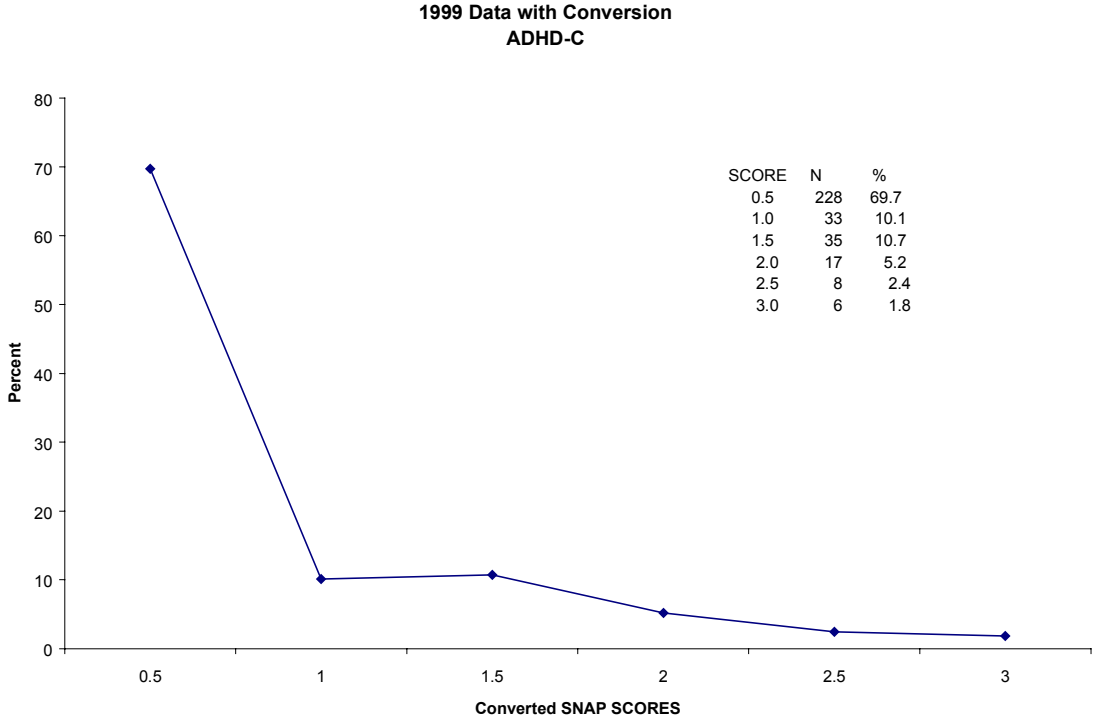


Table 4: SWAN Factor Loadings

NEW SNAP-SWAN SCORING	Factor 1	Factor 2
1 Attending to detail	.362	***.835***
2 Sustaining attention	.445	***.845***
3 Listening	.498	***.782***
4 Following through	.398	***.864***
5 Organizing	.435	***.857***
6 Engaging in sustained effort	.329	***.853***
7 Keeping track of things	.429	***.851***
8 Ignoring extraneous stimuli	.616	***.697***
9 Remembering	.469	***.816***
10 Sitting still	***.781***	.529
11 Staying seated	***.802***	.505
12 Modulating motor activity	***.816***	.476
13 Playing quietly	***.843***	.415
14 Settling down	***.867***	.407
15 Modulating verbal activity	***.857***	.375
16 Reflecting on questions	***.842***	.372
17 Awaiting turn	***.854***	.363
18 Entering into games or conversations	***.816***	.400
% of Variance Accounted	44.65	43.22