

CHAPTER 2

Factor Analysis, Scale Construction, and Item Frequencies

This chapter reports the results of the factor analyses intended to uncover the underlying dimensions of ADHD and SCT symptoms assessed by the BAARS-IV. It then discusses the use of those results to construct the subscales and scoring sheets for the BAARS-IV as they appear in the Appendix. Next, the frequencies with which the items were endorsed by the normative sample for both current and childhood functioning are presented and discussed. Finally, information is presented regarding the age of onset reported for any ADHD symptoms endorsed by the participants and for the domains of major life activities they may have endorsed as being impaired by such symptoms.

Factor Analysis: BAARS-IV Self-Reported Current Symptoms

The initial self-reports of the 27 symptoms on the BAARS-IV Current Symptoms scale were submitted to a principal-components factor analysis (PCFA) using the entire normative sample of 1,249 adults described in Chapter 1. The initial results revealed four factors that had eigenvalues greater than 1.00. The results were then submitted initially to a varimax rotation, which is designed to maximize as many values in each column of the factor loading coefficient table as close to zero as possible. This approach is typically used in an attempt to reduce the degree of correlation among the items (variables). However, the initial PCFA was also submitted to a promax rotation as it is frequently used when variables are known to be correlated, as are the ADHD items, and allows items to be correlated with more than one fac-

tor. Both approaches yielded the same eventual factor structure. The results of the PCFA are shown in Table 2.1. It reports the factor loadings for both the varimax (first line of each row) and promax (second line) rotations.

The first factor (eigenvalue = 11.09) accounted for 41.1% of the variance before rotation and contained the nine inattention symptoms from the DSM-IV-TR. Factor 2 (eigenvalue = 2.21) accounted for 8.2% of the variance prior to rotation and contained nine SCT symptoms. Factor 3 (eigenvalue = 1.34) contained five of the six symptoms of hyperactivity from the DSM-IV-TR and explained 9% of the variance prior to rotation. The only hyperactivity symptom that did not have its highest loading on this scale was “talk excessively,” which loaded more highly on Factor 4 instead. Factor 4 (eigenvalue = 1.17) was composed of the three impulsivity symptoms from DSM-IV-TR, along with “talk excessively.” This factor appears to represent chiefly a verbal impulsivity dimension that is relatively distinct from hyperactivity.

Three of these factors are quite similar to the ones we found previously when conducting a factor analysis of the earlier prototype of the adult ADHD rating scale on a large sample of adults from central Massachusetts that contained just the 18 symptoms from the DSM-IV (Murphy & Barkley, 1996b). This same factor structure was also identified in another population-based study of 1,813 adults in the Netherlands using the earlier version of the AARS (which did not contain the SCT symptoms) (Kooij et al., 2005), in a college student population using this same rating scale (Proctor & Prevatt, 2009), and in a study involving a young adult sample (Caterino, Gomez-Benito, Balluerka, Amador-Campos, & Stock, 2009) that developed scale items equivalent, but not identical, to the DSM-IV symptoms. Unlike factor analytic studies of childhood ADHD symptoms as rated by parents and teachers (see DuPaul, Power, Anastopoulos, & Reid, 1998), which yielded the two dimensions of ADHD symptoms as represented in DSM-IV, these studies of adults indicate that the symptoms of impulsivity, which are principally verbal in nature, form a semi-independent dimension of their own by adulthood.

After the varimax rotation (with Kaiser normalization), the percentage of variance accounted for by each of the factors, in descending order of variance explained, were as follows:

- ADHD Inattention (Factor 1) = 19.4%
- SCT (Factor 2) = 17.4%
- ADHD Hyperactivity (Factor 3) = 11.5%
- ADHD Impulsivity (Factor 4) = 10.2%

Three of these factors are identical to the ones we found previously in three prior studies of adults when conducting a factor analysis of just the 18 symptoms from the DSM-IV (Barkley et al., 2008; Murphy & Barkley, 1996b). The fourth factor is new to this BAARS-IV version of the scale and clearly represents a distinct dimension of attention problems that prior investigators have labeled as SCT (Milich, Ballentine, & Lynam, 2001; Penny, Waschbusch, Klein, Corkum, & Eskes, 2010). These results replicate the earlier studies with children and extend the findings to a nationally representative sample of adults in the general population. Such findings support not only the initial rationale for including these symptoms in the BAARS-IV, but also earlier conclusions that symptoms of SCT are a relatively distinct dimension

TABLE 2.1. Rotated Factor Loadings for BAARS-IV Items from the Current Symptoms Scale Based on PCFA with Varimax (Line 1) and Promax (Line 2) Rotations

Factor name/scale items	Factors			
	1	2	3	4
<u>ADHD Inattention</u>				
1. Fail to give close attention to details or make careless mistakes in my work or other activities	.650 .738	.237 .478	.156 .426	.214 .373
2. Have difficulty sustaining my attention in tasks or fun activities	.659 .768	.293 .540	.243 .503	.129 .314
3. Don't listen when spoken to directly	.612 .663	.109 .346	.109 .354	.269 .401
4. Don't follow through on instructions and fail to finish work or chores	.682 .757	.253 .492	.088 .379	.218 .372
5. Have difficulty organizing tasks and activities	.668 .784	.379 .606	.157 .450	.132 .309
6. Avoid, dislike, or am reluctant to engage in tasks that require sustained mental effort	.634 .752	.386 .600	.154 .436	.116 .288
7. Lose things necessary for tasks or activities	.633 .697	.195 .428	.160 .400	.148 .305
8. Am easily distracted by extraneous stimuli or irrelevant thoughts	.590 .757	.373 .606	.273 .549	.210 .391
9. Am forgetful in daily activities	.627 .755	.348 .578	.222 .492	.144 .323
<u>Sluggish Cognitive Tempo</u>				
1. Am prone to daydreaming when I should be concentrating on something or working	.379 .584	.455 .610	.312 .525	.113 .271
2. Have trouble staying alert or awake in boring situations	.317 .545	.556 .673	.272 .490	.081 .230
3. Am easily confused	.448 .625	.507 .656	.228 .463	.030 .193
4. Am easily bored	.289 .532	.501 .632	.344 .547	.138 .289
5. Am spacey or "in a fog"	.378 .619	.541 .696	.368 .591	.088 .264
6. Am lethargic, more tired than others	.188 .495	.827 .861	.123 .402	.135 .251
7. Am underactive or have less energy than others	.240 .524	.831 .866	.020 .331	.162 .268
8. Am slow moving	.294 .519	.760 .798	-.055 .248	.109 .208
9. Don't seem to process information as quickly or as accurately as others	.457 .624	.570 .697	.142 .394	-.013 .143

(cont.)

TABLE 2.1. (cont.)

Factor name/scale items	Factors			
	1	2	3	4
<u>ADHD Hyperactivity</u>				
1. Fidget with hands or feet or squirm in seat	.013 .332	.363 .483	.686 .754	.183 .333
2. Leave my seat in classrooms or in other situations in which remaining seated is expected	.386 .546	.073 .317	.594 .698	.174 .354
3. Shift around excessively or feel restless or hemmed in	.174 .472	.324 .506	.731 .827	.176 .361
4. Have difficulty engaging in leisure activities quietly (feel uncomfortable, or am loud or noisy)	.368 .536	.078 .314	.523 .654	.277 .437
5. Am "on the go" or act as if "driven by a motor" (or I feel like I have to be busy or always doing something)	.156 .315	-.054 .139	.670 .668	.160 .303
<u>ADHD Impulsivity</u>				
1. Talk excessively (in social situations)	.172 .406	.130 .306	.372 .545	.572 .661
2. Blur out answers before questions have been completed (complete others' sentences, or jump the gun)	.162 .378	.079 .244	.176 .401	.787 .826
3. Have difficulty awaiting my turn	.240 .457	.117 .303	.188 .436	.757 .817
4. Interrupt or intrude on others (butt into conversations or activities without permission or take over what others are doing)	.208 .423	.128 .295	.122 .378	.789 .830

Note. Information appearing in parentheses after any item reflects clarifications or expansions of these items that are being proposed by the DSM-5 committee on ADHD diagnostic criteria for eventual inclusion in that next DSM edition. Factor loadings in **boldface** type font indicate the highest loading across the factorial dimensions for that item.

from the attention problems of ADHD. Indeed, the highest loading items on the SCT dimension would be considered the opposite of ADHD: symptoms of hypoactivity, lethargy, and slow movement. More research on this form of attention disorder in adults is to be strongly encouraged. The SCT section of the BAARS-IV should provide great assistance to these endeavors by allowing investigators to use a nationally representative normative sample to select participants who are developmentally inappropriate on this dimension while scoring within the broadly normal range on the other traditional ADHD factors of the BAARS-IV (ruling out ADHD combined type).

Factor Analysis: BAARS-IV Self-Reported Childhood Symptoms

I repeated the same PCFAs as used previously but this time applied them to the self-reports of childhood recall of the 18 ADHD items from DSM-IV-TR. These results appear in Table 2.2. The SCT items were not collected for childhood. Interestingly,

TABLE 2.2. Rotated Factor Loadings for BAARS-IV Items from the Childhood Symptoms Scale Based on PCFA with Varimax (Line 1) and Promax (Line 2) Rotations

Factor name/scale items	Factors	
	1	2
<u>ADHD Inattention</u>		
1. Failed to give close attention to details or made careless mistakes in my work or other activities	.767 .816	.280 .521
2. Had difficulty sustaining my attention in tasks or fun activities	.766 .825	.305 .545
3. Didn't listen when spoken to directly	.677 .756	.351 .558
4. Didn't follow through on instructions and failed to finish work or chores	.813 .848	.243 .502
5. Had difficulty organizing tasks and activities	.831 .864	.245 .509
6. Avoided, disliked, or was reluctant to engage in tasks that required sustained mental effort	.809 .842	.239 .497
7. Lost things necessary for tasks or activities	.712 .767	.286 .508
8. Was easily distracted by extraneous stimuli or irrelevant thoughts	.777 .841	.324 .566
9. Was forgetful in daily activities	.764 .816	.285 .524
<u>ADHD Hyperactivity–Impulsivity</u>		
1. Fidgeted with my hands or feet or squirmed in my seat	.333 .530	.642 .717
2. Left my seat in classrooms or in other situations in which remaining seated was expected	.417 .606	.634 .737
3. Shifted around excessively or felt restless or hemmed in	.416 .611	.652 .754
4. Had difficulty engaging in leisure activities quietly (felt uncomfortable, or was loud or noisy)	.407 .591	.618 .719
5. Was “on the go” or acted as if “driven by a motor”	.231 .459	.716 .752
6. Talked excessively	.180 .430	.775 .790
7. Blurted out answers before questions had been completed (completed others' sentences, or jumped the gun)	.161 .421	.800 .808
8. Had difficulty awaiting my turn	.286 .526	.760 .812
9. Interrupted or intruded on others (buted into conversations or activities without permission or took over what others were doing)	.263 .506	.765 .809

Note. Information appearing in parentheses after any item reflects clarifications or expansions of these items that are being proposed by the DSM-5 committee on ADHD diagnostic criteria for eventual inclusion in that next DSM edition. Factor loadings in **boldface** type font indicate the highest loading across the factorial dimensions for that item.

a two-factor solution emerged in which factors had an eigenvalue of at least 1.00. These explained 63.8% of the variance in the ADHD ratings. Factor 1, with an eigenvalue of 9.59, represented the nine Inattention items and accounted for 53.3% of the variance prior to rotation. Factor 2, with an eigenvalue of 1.91, represented the nine Hyperactivity–Impulsivity items and accounted for 10.6% of the variance prior to rotation. After varimax rotation, the variances accounted for were 34.6% and 29.3%, respectively. Such a factor solution replicates numerous previous factor analytic studies of ADHD symptoms in children as reported by parents and teachers (e.g., DuPaul et al., 1998), including the DSM-IV field trial (Lahey et al., 1994). In contrast to this solution, a three-factor solution was more appropriate for the prior analysis for current functioning in adulthood. Why this should be the case is unclear, yet it suggests that symptoms of impulsivity, especially verbal impulsiveness, begin to emerge as a semidistinct dimension of ADHD symptoms in adulthood that is not so distinct from hyperactivity in either ratings of children or, in this case, in the retrospectively recalled symptoms of childhood as reported by adults.

Scale Construction

The items in Table 2.1 were used to create the subscales for the BAARS-IV Current Symptoms forms published here. All ADHD items were kept in their original sequence on the scale just as they were presented to the normative sample during the survey and just as they appear in DSM-IV-TR. However, the item concerning excessive talking is placed in the Impulsivity section, given our findings indicating this to be the appropriate dimension. The SCT items make up a separate section of the rating scale for obvious reasons in view of the results of the prior factor analysis. Therefore, the BAARS-IV comprises four subscale sections, allowing the examiner to quickly compute four scores: ADHD Inattention, ADHD Hyperactivity, ADHD Impulsivity, and SCT symptoms. By adding the three ADHD scores together, one can also compute the Current ADHD total symptom score. The use of distinct item sections on the scale permits ease of scoring because the examiner can simply sum the scores for the items in each section (subscales) to compute that section's score. The childhood recall of symptoms report forms were constructed based on the results of Table 2.2. Essentially, this organizes the DSM-IV-TR symptoms into two dimensions (sections): ADHD Inattention, ADHD Hyperactivity–Impulsivity. As before, the items in each section are added to obtain the raw score for each section. The two section scores (Inattention, Hyperactivity–Impulsivity) are then added together to create the Childhood ADHD total symptom score.

Creating the BAARS-IV Quick Screen

There may be instances when the examiner wishes to conduct a very preliminary quick screening to determine the likelihood that an individual has adult ADHD. For such a screening tool, one would want to identify just those ADHD symptoms that contributed significantly to the accurate classification of adults clinically diagnosed with ADHD. To do this, I examined the data we collected in an earlier large-scale study of adults diagnosed with ADHD, a community control group of adults,

and a clinical control group of adults who self-referred to an adult ADHD clinic believing they might have the disorder but who subsequently were not diagnosed using DSM-IV-TR diagnostic criteria (see Barkley et al., 2008). The adult ADHD rating scale that contained the 18 DSM-IV symptoms (the prototype to the BAARS-IV [P-BAARS]) was administered to these groups for both current and childhood functioning. I used binary logistic regression analyses with forward conditional entry to identify those current ADHD symptoms that best discriminated the ADHD group from the community group. These were:

- Fails to give close attention to details or makes careless mistakes in school-work, work, or other activities.
- Has difficulty organizing tasks or activities.
- Loses things necessary for tasks or activities.
- Is easily distracted by extraneous stimuli.

These four items accurately classified 97.8% of the ADHD group and 95.2% of the community group, yielding an overall classification rate of 96.7%. Noteworthy is that no symptoms of hyperactivity or impulsivity contributed significantly to this group classification, a result we also found for an interview used in this project for assessing ADHD (see Barkley et al., 2008). It seems that by adulthood the most discriminating items for identifying adults with ADHD from a general population sample are those from the domain of Inattention.

This analysis was repeated again, except this time attempting to identify items that best discriminated the ADHD group from the clinical control group. Just one item was identified, this being:

- Avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort.

Although this item correctly identified 89.6% of the ADHD group, it correctly classified only 12.1% of the clinical group (overall = 58.2%). This is not surprising in view of the fact that all of these clinical cases thought they had ADHD and nearly half of them met DSM-IV-TR criteria for the disorder when only their self-reports were considered in the diagnosis. Yet the clinician did not diagnose them with ADHD according to DSM-IV-TR criteria. A further problem to consider in interpreting these findings is that DSM-IV-TR criteria were developed for children and tested only on children. Ample evidence, including from this large project, suggested that DSM-IV-TR symptom thresholds (six of nine symptoms) are too severe for identifying adults with ADHD and that thresholds of four or five may be more appropriate. Thus, it is likely that a sizable minority of these clinical cases would have met such modified diagnostic criteria for having adult ADHD or at least a diagnosis of ADHD not otherwise specified (NOS). This makes it clear why it may have been so difficult to find symptoms that distinguished these two groups with sufficient accuracy. Nevertheless, for the purposes here, these five items were used to create the current symptoms section of the BAARS-IV Quick Screen scale.

Next, the raw scores were computed for these five symptoms and the distributions for each group were examined. From this inspection a score of 10 using this section of the BAARS-IV Quick Screen would accurately classify 95.3% of the com-

munity group (misclassifying 4.7% as having ADHD). This score would accurately identify 97.1% of the ADHD group (misclassifying just 2.9% as not having ADHD). This is a very respectable result for a screening tool for separating adults with ADHD from the general population. It would, of course, misclassify 92.6% of the clinical group as also having ADHD. In short, the Quick Screen is best for identifying adults with ADHD relative to a general community sample of adults but would not be of much use in distinguishing adults with ADHD from those with other clinical disorders than ADHD or who may have ADHD NOS.

To identify items for the childhood symptoms section of this screening scale, the prior two analyses were repeated using the self-reported symptoms from childhood on this same adult ADHD rating scale. Just three items significantly contributed to discriminating between the ADHD group and the community group. With the exception of one item, these were the same as those found previously for the current symptoms of ADHD:

- Has difficulty organizing tasks or activities.
- Loses things necessary for tasks or activities.
- Is easily distracted by extraneous stimuli.

These symptoms accurately classified 91.3% of the ADHD group and 97.1% of the community group (overall = 94%). Repeating this analysis for the discrimination of the ADHD group and the clinical control group identified the following two symptoms:

- Does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace.
- Is easily distracted by extraneous stimuli.

These two symptoms accurately identified 81.9% of the ADHD group and 55.6% of the clinical control group (overall = 71.6%), a far better showing than was evident for the evaluation of current symptoms but still a disappointing rate of classification for the clinical group. Obviously, the same reasons given previously would apply here as to why it is so difficult to accurately classify cases in the clinical group. Because the second of these two symptoms is redundant with that identified in discriminating the ADHD group and the community group, just the four remaining inattention items were used to create the Childhood Symptoms section of the BAARS-IV Quick Screen.

A score for these four items was then computed from the Childhood Symptoms section, and again the distributions for each of these groups examined to see what cutoff score might be useful to employ in discriminating among them. A score of 9 on this section of the BAARS-IV Quick Screen would have accurately classified 92.8% of the ADHD group (misclassifying 7.2% as not having ADHD) and 95.3% of the community group (misclassifying 4.7% as having ADHD). Of course, once again, it is far more difficult to discriminate those in this ADHD group from those cases making up the clinical control group. In this case, a score of 9 would have accurately classified just 32.2% of this group as not having ADHD (misclassifying 57.8% as having ADHD). However, again, as discussed previously, there are good

reasons why that discrimination would have been difficult to achieve given that all individuals in this group thought they may have had ADHD—half of them just relying on their reports and not any clinical judgment—and this subset may well have had ADHD NOS in view of our using (probably inappropriately) strict DSM-IV-TR criteria designed for children with these adults.

The likelihood that someone would meet both thresholds for current (score of 10+) and childhood (score of 9+) sections of this screen was then determined; 92.5% of the adults with ADHD would do so while 6% would pass the cutoff score on either section alone. Just 0.9% of the community control group would have met the thresholds for ADHD on both sections of the scale, while 7.5% would have surpassed the threshold for at least one of the sections alone. In short, requiring that an adult surpass the cutoff score threshold for ADHD on both sections of the screener would accurately detect more than 92% of adults with a clinical diagnosis of ADHD while misclassifying less than 1% of the community control group as having ADHD. This is a quite reasonable performance for a screening device. Not surprisingly, in view of the prior discussions, 64.3% of the clinical control group would have met both thresholds on the screen, while 29.8% would have passed just one of the two cutoff scores. Nevertheless, it is recommended that adults must surpass both the Current and Childhood Symptoms section thresholds to identify them as likely having ADHD.

Inspection of the distribution of the current symptoms score using the large normative sample collected for this manual ($N = 1,249$) showed that a score of 10 would place someone at the 92nd percentile. When the distribution of scores for the normative sample for the childhood symptoms section of the BAARS-IV Quick Screen was examined, a score of 9 would represent the 91st percentile. What percentage of this normative sample would have passed both thresholds? The answer is 5.8%. Given that ADHD characterizes approximately 5% of U.S. adults, one would expect that 5% of this normative sample would have the disorder and, therefore, surpass both cutoff scores. This is nearly what was found. Hence, clinicians seeking to identify an adult likely to have ADHD should require the respondent to surpass thresholds for both current and childhood symptoms.

In summary, the BAARS-IV Quick Screen was constructed from these five current ADHD self-rated symptoms and these four childhood ADHD self-rated symptoms. Evidence suggests that it can perform very well at identifying someone as likely having adult ADHD if the scores on both sections of the scale surpass the cutoff threshold for probable ADHD (scores of 10 and 9, respectively).

Frequency of Item Responses

It is clinically and scientifically informative to examine the percentage of respondents in the normative sample who endorsed each of the item responses for current and childhood recall. This gives an indication of how common or uncommon the four different frequency (answer) levels for each item were in this sample. This information can also be used to determine what frequency of occurrence for each item can be used to indicate that this item at that frequency level can be judged to be a “symptom” of ADHD rather than a common occurrence in the population. For

instance, if the vast majority of adults respond to an item with “rarely” or “sometimes,” then responses of “often” or “very often” can be considered indicative of a symptom of an EF deficit.

A “symptom” in this case would be a behavioral complaint that occurs at a frequency that is relatively low in the population and so may be indicative of disorder. Whether it is or not, of course, is eventually a question of validity, to be tested against other forms of information. To gain some idea about how often typical adults endorse ADHD (and SCT) symptoms in daily life and at what frequency of occurrence (never or rarely, sometimes, often, very often), the percentage of adults in the normative sample who endorsed each of the possible answers to each item was computed. The results for current symptoms appear in Table 2.3. The same information from the retrospective recall of childhood symptoms version are provided in Table 2.4. This is interesting information for mental health professionals and others who may have an interest in knowing the proportion of the population that endorses particular ADHD symptoms at various relative frequency estimates.

What the tables clearly show is that, with a few exceptions, the vast majority of a general population sample endorses most items at a frequency of either “never or rarely” or “sometimes.” Answers of “often” and especially “very often” appear to be given by less than 2 to 8% of the population in most cases (although clearly there are a few exceptions). However, if one wanted to identify a symptom of ADHD (or SCT), it does not seem at all unreasonable to use an answer of “often” or “very often” to indicate the possibility of this item having “symptom” status. The examiner should, therefore, not only focus on scoring the BAARS-IV section raw scores through simple summation of items but also inspect the scale for items on each subscale that were endorsed with responses of 3 (often) or 4 (very often). These are uncommon answers (symptoms). Doing so can provide another perspective on just how symptomatic a respondent may be in each component of ADHD assessed by each subscale. By adding the number of symptoms in the ADHD sections, one can compute a Current ADHD total symptom count from the Current Symptoms scale and a Childhood ADHD total symptom count from the Childhood Symptoms scale. For this reason, normative information is provided on both of these symptom count scores using the normative sample for each self-report version of the rating scale.

These results have implications for the current DSM-IV-TR criteria as applied to adults as well as for the ongoing DSM-5 committee deliberations. The normative sample can be used to assess whether or not the diagnostic threshold currently set for ADHD is appropriate for adults. That threshold was set at 6 or more symptoms on either the Inattention or Hyperactivity–Impulsivity symptom list. However, the threshold is based on a field trial of children. Prior research has raised considerable doubt about the applicability of this threshold to adults (see Barkley et al., 2008; Murphy & Barkley, 1996b), finding it to specify an unusually deviant threshold in a general population sample. Examining the results for the normative sample, a threshold of 6 on the Inattention symptom count (answers of “often” or “very often”) is equivalent to the 98.6th percentile, thus identifying slightly more than 1% of adults in the United States as passing this threshold. And a threshold of 6 on the Hyperactivity–Impulsivity symptom count is similarly equal to the 98.8th percentile, creating the same dilemma. Using such thresholds for adults can virtually define ADHD out of existence or limit the diagnosis to just the top 1% of the adult population. Using a

TABLE 2.3. Percentage of the Normative Sample That Endorsed Each Possible Answer to Each Item on the BAARS-IV Current Symptoms Scale

	Never or rarely	Sometimes	Often	Very often
<u>ADHD Inattention items</u>				
1. Fail to give close attention to details or make careless mistakes in my work or other activities	73.7	24.2	1.4	0.6
2. Have difficulty sustaining my attention in tasks or fun activities	72.1	23.6	3.7	0.6
3. Don't listen when spoken to directly	72.1	24.2	2.9	0.8
4. Don't follow through on instructions and fail to finish work or chores	75.3	21.5	2.6	0.6
5. Have difficulty organizing tasks and activities	67.4	27.0	4.5	1.1
6. Avoid, dislike, or am reluctant to engage in tasks that require sustained mental effort	65.7	27.5	5.2	1.6
7. Lose things necessary for tasks or activities	69.1	25.9	3.7	1.3
8. Am easily distracted by extraneous stimuli or irrelevant thoughts	60.0	32.7	5.0	2.3
9. Am forgetful in daily activities	62.9	30.5	5.0	1.7
<u>Sluggish Cognitive Tempo items</u>				
1. Am prone to daydreaming when I should be concentrating on something or working	58.2	34.4	5.3	2.1
2. Have trouble staying alert or awake in boring situations	43.7	42.9	10.2	3.1
3. Am easily confused	71.7	23.5	3.3	1.5
4. Am easily bored	47.6	39.8	9.3	3.3
5. Am spacey or "in a fog"	71.7	21.6	4.6	2.1
6. Am lethargic, more tired than others	53.8	33.8	8.3	4.1
7. Am underactive or have less energy than others	51.3	35.5	8.6	4.6
8. Am slow moving	61.3	29.4	6.9	2.4
9. Don't seem to process information as quickly or as accurately as others	66.5	28.0	3.4	2.0
<u>ADHD Hyperactivity items</u>				
1. Fidget with hands or feet or squirm in seat	62.7	26.4	7.4	3.4
2. Leave my seat in classrooms or in other situations in which remaining seated is expected	88.3	9.1	1.9	0.6
3. Shift around excessively or feel restless or hemmed in	68.7	23.2	5.5	2.6
4. Have difficulty engaging in leisure activities quietly (feel uncomfortable, or am loud or noisy)	83.1	13.5	2.2	1.3
5. Am "on the go" or act as if "driven by a motor" (or I feel like I have to be busy or always doing something)	64.7	24.0	7.6	3.7

(cont.)

TABLE 2.3. (cont.)

	Never or rarely	Sometimes	Often	Very often
<u>ADHD Impulsivity items</u>				
1. Talk excessively (in social situations)	71.5	22.7	4.0	1.8
2. Blurt out answers before questions have been completed (complete others' sentences, or jump the gun)	67.4	26.0	5.4	1.2
3. Have difficulty awaiting my turn	71.0	24.5	3.5	1.0
4. Interrupt or intrude on others (butt into conversations or activities without permission or take over what others are doing)	73.0	22.7	3.2	1.1

more typical definition of clinical significance, such as the 93rd percentile or $+1.5 SD$ above the mean for the population, would result in a threshold of three or higher on the Inattention list. The same holds for the Hyperactivity–Impulsivity list. A score of 5 or more on both lists would also represent the 93rd percentile. If the current symptoms list is to be retained into the DSM-5 criteria for adult ADHD, then a separate threshold of symptoms should be specified for adults rather than extrapolating an inappropriate one from children to the adult segment of the population. The results here strongly recommend that the threshold be 3 or more on either list or a total of 5 from both lists. For recall of childhood symptoms, a score of 4 on either list or 8 total would represent this same threshold (93rd percentile or higher).

Clinicians and researchers using the BAARS-IV scale should, therefore, view reports of three or more current symptoms on either list or five total symptoms endorsed as occurring often or very often (symptom counts) as being sufficiently deviant to be of clinical significance. For SCT symptoms, this threshold should be four or more. For the childhood recall version of the scale, the appropriate thresholds for clinical significance would be four on either list or eight total symptoms from both lists.

To summarize, the BAARS-IV Current Symptoms scales will be able to be scored to yield 6 different raw scores: ADHD Inattention, ADHD Hyperactivity, ADHD Impulsivity, ADHD total score, SCT score, and ADHD symptom count (excludes SCT symptoms). Norms (percentiles) are provided in the Appendix for each of these scores. In addition, the scale also contains a self-report of the *age of onset* of these symptoms if the respondent endorsed at least one or more ADHD items as occurring often or very often (see later discussion). And each scale indicates whether the respondent thought he or she had been *impaired in school, home, work, or social functioning by his or her symptoms* (provided he or she had endorsed at least one symptom as occurring often or very often; see later). The BAARS-IV Childhood Symptoms self-report scale can be scored to yield four raw scores: ADHD Inattention, ADHD Hyperactivity–Impulsivity, ADHD total score, and ADHD total symptom count. Norms are provided on the score sheets in the Appendix for these scores as well. The scale can also be used to assess whether or not the individual thought he or she was impaired in school, home, or social functioning in childhood. The BAARS-IV

TABLE 2.4. Percentage of the Normative Sample That Endorsed Each Possible Answer to Each Item on the BAARS-IV Childhood Symptoms Scale

	Never or rarely	Sometimes	Often	Very often
<u>ADHD Inattention items</u>				
1. Failed to give close attention to details or made careless mistakes in my work or other activities	59.4	32.2	6.7	1.7
2. Had difficulty sustaining my attention in tasks or fun activities	66.0	24.8	7.7	1.5
3. Didn't listen when spoken to directly	64.4	28.3	6.5	0.8
4. Didn't follow through on instructions and failed to finish work or chores	62.8	29.3	6.1	1.8
5. Had difficulty organizing tasks and activities	61.1	30.1	6.8	2.0
6. Avoided, disliked, or was reluctant to engage in tasks that required sustained mental effort	62.2	28.1	7.8	1.8
7. Lost things necessary for tasks or activities	68.5	25.3	4.8	1.4
8. Was easily distracted by extraneous stimuli or irrelevant thoughts	57.3	31.5	8.7	2.5
9. Was forgetful in daily activities	65.6	27.1	5.5	1.8
<u>ADHD Hyperactivity–Impulsivity items</u>				
1. Fidgeted with my hands or feet or squirmed in my seat	54.7	31.7	10.6	3.0
2. Left my seat in classrooms or in other situations in which remaining seated was expected	79.4	15.5	4.2	0.9
3. Shifted around excessively or felt restless or hemmed in	67.6	23.2	7.4	1.8
4. Had difficulty engaging in leisure activities quietly (felt uncomfortable, or was loud or noisy)	74.5	19.6	4.3	1.5
5. Was “on the go” or acted as if “driven by a motor”	66.5	24.7	7.0	1.8
6. Talked excessively	68.5	21.6	7.4	2.5
7. Blurted out answers before questions had been completed (completed others' sentences, or jumped the gun)	64.9	27.9	5.9	1.3
8. Had difficulty awaiting my turn	63.8	28.6	6.3	1.3
9. Interrupted or intruded on others (buted into conversations or activities without permission or took over what others were doing)	68.2	25.1	5.8	1.0

Quick Screen yields two scores: Current Symptoms and Childhood Symptoms. A score of 10 to 11 on the Current Symptoms section and 9 to 10 on the Childhood Symptoms section are most useful for identifying adults likely to have ADHD.

Age of Onset

The DSM-IV-TR diagnostic criteria for ADHD require that symptoms be present since at least 7 years of age. There is no evidence that supports choosing this age of onset for the diagnosis of ADHD, and what is available suggests that a self-reported onset in childhood or adolescence, ages 12 to 16, would be sufficient to capture more than 98% of all adults diagnosed with ADHD (see also Barkley, 2010a; Barkley et al., 2008; Barkley & Biederman, 1997; McGough & Barkley, 2004). It is not necessary to have norms available for evaluating the age of onset of a disorder because that is established more on the basis of the conceptualization of the disorder as well as an evaluation of large samples of individuals having the disorder, as was done by me and my colleagues in *ADHD in Adults: What the Science Says* (Barkley et al., 2008). Yet it can still be informative to determine the typical or average age of onset of complaints of symptoms that make up a diagnosis of ADHD within a general population sample.

To address this issue, information was obtained from adults in the normative sample who answered any item as occurring often or very often by having them estimate the age of onset of the earliest ADHD symptom. The results for this sample of 430 adults are shown in Figure 2.1. Those results indicate a relatively skewed distribution toward the younger age range, with a gradual tapering off into mid to late life. A case could be made for either a unimodal distribution, with a peak at age 12 years, or a bimodal distribution, with a first peak at age 5 to 6 years and a second peak at about 12 to 16 years. The overall mean age of onset was 20.6 years ($SD = 17.96$, range = 0–90). In sum, there is a wide range of onset of symptoms of ADHD in the general population, and while the mean is in young adulthood, the range within ± 1 SD of the mean is from 3 to 39 years.

Perhaps some of these data can be used to determine whether the age of onset by 7 years specified in the DSM-IV-TR diagnostic criteria has any validity in identifying adults reporting more severe symptoms. If we limit the sample to just those adults whose ratings of current ADHD symptoms placed them at the 95th percentile or higher (ADHD total score ≥ 38) for current functioning ($N = 64$), we could let this serve essentially as a proxy for a diagnosis of current ADHD. Then the mean age of onset for these 64 adults would be somewhat earlier, at 16.7 years ($SD = 15.6$, range = 2–70). Even so, the range is still substantial even for ± 1 SD of the mean (1–31). A similar result is evident if a symptom count of 5 or more is used as the threshold (this was found above to be the 93rd percentile for current symptoms). In that case, the age of onset would be a mean of 16.6 ($SD = 14.9$), which is significantly different from those having fewer symptoms of ADHD ($M = 21.7$, $SD = 18.5$; $F = 5.57$, $p = .019$).

A better test of the validity of the age of onset criterion would be to evaluate the onset of those reporting significantly high symptoms from their childhood (95th percentile for those ADHD ratings or ADHD total score ≥ 45). Their mean age of onset was 12.2 years ($SD = 12.8$). This is significantly younger than for individuals whose childhood ADHD ratings were below the 95th percentile ($M = 21.9$, $SD = 18.3$). If rather than using a ADHD total score we use the recommended threshold

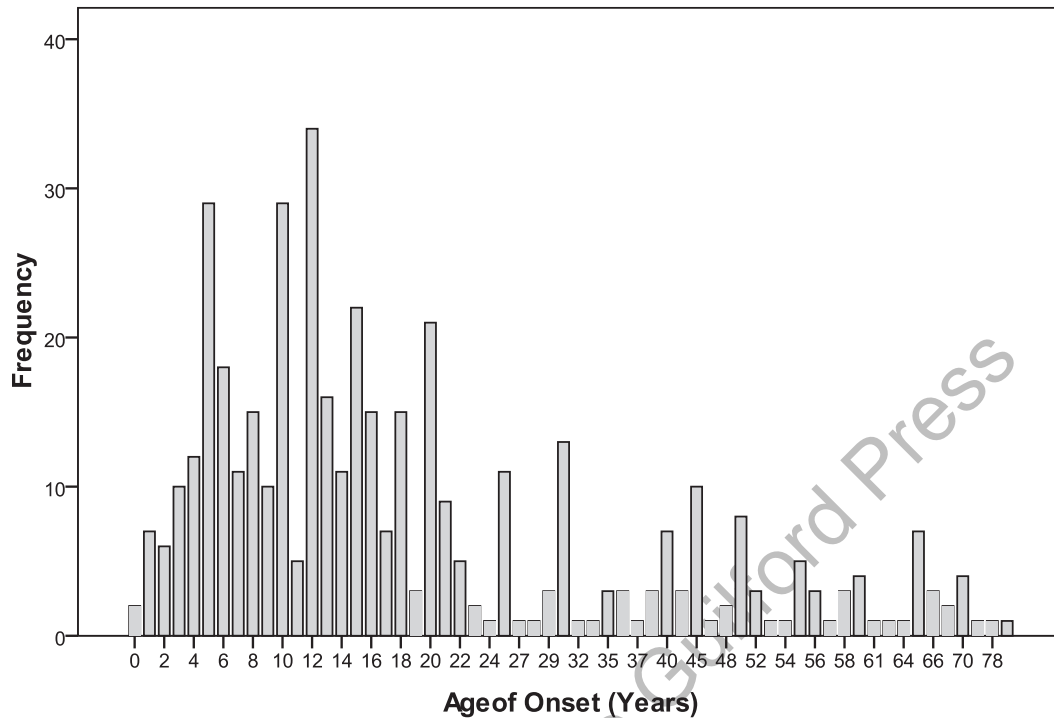


FIGURE 2.1. The frequencies of the ages of onset reported for the earliest ADHD symptom identified as occurring at least often or very often in the normative sample.

of 8 or more for the symptom count for childhood recall as suggested previously, the result is nearly the same. Those passing the threshold report a substantially earlier age of onset ($M = 13.7$, $SD = 13.6$) than those having a threshold of 7 or less ($M = 22.1$, $SD = 18.4$).

We can look at this issue a different way by comparing those who did and did not have at least one symptom (often or very often) of ADHD and who reported symptom onset by 6 years of age or younger ($N = 89$) with those having an onset of 7 years or later ($N = 435$) in their current and childhood ADHD scores. The groups did not differ in Current Inattention, Hyperactivity, Impulsivity, ADHD total score, or SCT score. In contrast, those who reported symptom onset by 6 years of age did differ significantly in Childhood Inattention ($M = 17.5$, $SD = 6.2$), Hyperactivity–Impulsivity ($M = 17.0$, $SD = 6.3$), and ADHD total scores ($M = 34.4$, $SD = 12.3$) compared with those with an onset at or after age 7 years: Inattention, $M = 15.3$ ($SD = 5.9$); Hyperactivity–Impulsivity, $M = 14.9$ ($SD = 5.3$); and ADHD total score, $M = 30.1$ ($SD = 10.0$; all $ps < .003$, Cohen’s $d = 0.36$, 0.36 , and 0.38 , respectively). Despite being significant, the differences are relatively small to moderate in magnitude, as indicated by the Cohen’s d values (effect sizes). However, the result does suggest that adults reporting an onset of one or more ADHD symptoms before age 7 recall having somewhat greater childhood ADHD symptoms than do adults with an onset of 7 years or later. At least for a general population sample, there is little utility to specifying an age of onset of ADHD symptoms in terms of identifying a group of adults who may be markedly different from other adults. This result and those from the prior analyses all suggest that there is little clinical utility to specifying an age of

7 years for onset of ADHD symptoms, as previous reports have concluded (Barkley, 2010a; Barkley et al., 2008; Barkley & Biederman, 1997).

The DSM-5 committee is considering changing the age of onset of ADHD symptoms to at least 12 years or earlier. This is at least consistent with the mean age of onset found previously for adults reporting childhood symptoms of ADHD at the 95th percentile or higher for our normative sample. When we compared adults who reported an age of onset of at least one symptom of ADHD of 12 years or younger ($N = 193$) with those with an onset at 13 years or older ($N = 242$), a somewhat different pattern of results was evident. It suggests some utility to specifying an onset by age 12 years or earlier. The results are shown in Table 2.5. Adults with symptom onset by 12 years reported significantly higher current Hyperactivity and Impulsivity scores and significantly higher childhood Inattention, Hyperactivity–Impulsivity, and ADHD total scores than those reporting a symptom onset after age 12. Again, the differences in means, although significant, are of a relatively small size for current symptoms and of a moderate to large size for childhood ratings, as indicated by Cohen's d (effect size in Table 2.5). Hence, there is greater utility (validity) to using an age of onset of 12 years than 7 years to identify individuals with more severe ADHD symptoms among those who endorsed at least one or more symptoms of ADHD, especially concerning their recollections of their childhood ADHD symptoms.

However, as shown previously in this chapter and in our studies of clinically diagnosed adults with ADHD and children with ADHD followed to adulthood, an age of onset of 16 years would be of even greater utility, as we previously found that it would capture nearly all of the clinically referred cases of adults diagnosed with ADHD (Barkley et al., 2008). When adults in the normative sample reporting one or more ADHD symptoms are used to compare an age of onset of 16 years with an onset of 17 years or later, the pattern of differences becomes even more striking than for age 7 or 12 years. These results appear in Table 2.6. Again, the groups differ significantly in Current Hyperactivity, Impulsivity, and ADHD total symptom scores

TABLE 2.5. Comparisons of Adults in the Normative Sample Reporting an Age of Onset of at Least One ADHD Symptom (Rated Often or Very Often) at or before Age 12 and Those Reporting an Onset of Age 13 Years or Later on the BAARS-IV Subscales

Subscale	Groups				F	p	Cohen's d
	Onset by 12		Onset at 13 or later				
	Mean	SD	Mean	SD			
Current Inattention	15.4	5.5	15.4	4.5	0.01	NS	—
Current Hyperactivity	9.1	3.0	8.4	2.9	5.47	.020	0.24
Current Impulsivity	7.1	2.6	6.4	2.4	9.36	.002	0.28
Current ADHD total score	31.6	8.6	30.2	7.5	3.56	NS	—
Current SCT	17.5	5.9	17.3	5.2	0.14	NS	—
Childhood Inattention	17.1	6.8	14.6	5.4	19.06	< .001	0.41
Childhood Hyperactivity–Impulsivity	17.2	5.8	13.8	4.9	44.07	< .001	0.63
Childhood ADHD total score	34.3	11.3	28.4	9.3	36.76	< .001	0.57

Note. F , results for the F -test from the analysis of variance; p , probability value for the F -test if $\leq .05$; NS, not significant; Cohen's d , effect size (difference in means expressed as a proportion of a standard deviation).

but not in Current Inattention score. These differences are of a small magnitude. However, the differences in childhood ratings are significant and of a moderate to large magnitude for Childhood Inattention, Childhood Hyperactivity–Impulsivity, and ADHD total scores. When examining the results for ages of onset of 7, 12, and 16 years, the greatest differences—and across the most dimensions of ADHD—occur when an age of 16 years is employed. To conclude this section, then, the normative data and earlier research indicate that specifying an age of onset of ADHD symptoms of between 12 and 16 years has far greater merit than an age of 7 years, which even the ADHD field trial for DSM-IV found to be problematic (Applegate et al., 1997). These results, and those from our earlier work (Barkley et al., 2008), favor specifying an age of onset of 16 years if a precise age is to be selected.

For clinicians and researchers using the BAARS-IV scale, note should surely be taken of the answers provided by informants as to when they report the onset of any symptoms of ADHD (answers of “often” or “very often”) on the scale. However, the DSM-IV-TR requirement for an onset of symptoms by age 7 can be essentially ignored in determining whether individuals may have ADHD. Instead, an onset of symptoms by 16 years of age has a greater empirical basis in that (1) it identifies individuals likely to have significantly higher ratings of current and childhood ADHD symptoms, (2) nearly all individuals in the normative sample who reported highly deviant childhood symptoms of ADHD had an onset of those symptoms by age 16, and (3) nearly all clinically referred adults eventually diagnosed with ADHD based on all other criteria except symptom onset by age 7 had symptom onset by 16 years.

Noteworthy here is that symptoms of SCT did not differ in severity regardless of which age of onset was evaluated. If those indicating high levels of current SCT symptoms (95th percentile or a score ≥ 23) are examined for their reported age of symptom onset, the result is 19.3 years ($SD = 17.3$, range = 15–23), which is not significantly different from the onset reported by those placing below the 95th per-

TABLE 2.6. Comparisons of Adults in the Normative Sample Reporting an Age of Onset of at Least One ADHD Symptom (Rated Often or Very Often) at or before Age 16 and Those Reporting an Onset of Age 17 Years or Later on the BAARS-IV Subscales

Subscale	Groups				<i>F</i>	<i>p</i>	Cohen's <i>d</i>
	Onset by 16		Onset at 17 or later				
	Mean	<i>SD</i>	Mean	<i>SD</i>			
Current Inattention	15.4	5.4	15.3	4.2	0.03	NS	—
Current Hyperactivity	9.2	3.2	8.0	2.5	16.54	< .001	0.42
Current Impulsivity	7.0	2.5	6.4	2.4	5.92	.015	0.24
Current ADHD total score	31.6	8.8	29.7	6.6	5.55	.019	0.24
Current SCT	17.5	5.8	17.1	5.2	0.67	NS	—
Childhood Inattention	16.8	6.7	14.2	5.0	19.28	< .001	0.44
Childhood Hyperactivity–Impulsivity	16.7	5.8	13.3	4.4	43.56	< .001	0.66
Childhood ADHD total score	33.5	11.3	27.5	8.4	36.70	< .001	0.60

Note. *F*, results for the *F*-test from the analysis of variance; *p*, probability value for the *F*-test if $\leq .05$; NS, not significant; Cohen's *d*, effect size (difference in means expressed as a proportion of a standard deviation).

centile ($M = 20.9$, $SD = 18.1$, range = 19–23 years; $F = 0.46$, $p = \text{NS}$). Virtually the same result is obtained when a threshold of 5 symptoms on the symptom count score was used to identify those with SCT.

All this being said, self-reports of the age of onset of psychiatric symptoms are notoriously unreliable; therefore, a precise age of onset should probably not be specified for any mental disorder, at least one like ADHD, whose symptoms are likely to have developed in childhood. The retrospective reporting of adults of the childhood onset of their symptoms is rather poor in terms of agreement with other-reports. For instance, in the University of Massachusetts Medical School (UMASS) study (Barkley et al., 2008), the self-report of age of onset of ADHD symptoms on the P-BAARS correlated just .37 with the other-report of this same scale. Although this correlation is significant ($p < .001$, $N = 132$), it is not reassuring concerning the precision of memory for ADHD symptom onset. Adults in that study (ADHD, clinical control, and community control groups) reported a mean age of onset of 9.2 years ($SD = 5.9$), while data based on other-reports revealed a mean of 12.8 years ($SD = 12.2$; $t = -3.61$, $p < .001$). If one analyzes just the clinically diagnosed ADHD sample, the agreement between self-report and other-report is not significant ($r = .63$, $p = \text{NS}$, $N = 87$), and the difference in means is several years (self-reports, $M = 8.0$, $SD = 4.0$; other-reports, $M = 10.6$, $SD = 9.1$; $t = -2.45$, $p = .016$).

Further questioning the requirement for a precise age of ADHD symptom onset are the results of our longitudinal study of hyperactive children followed to adulthood. We found that the other-reports by the parents of children at adulthood regarding onset of their child's ADHD symptoms were off by an average of more than 4 years later than the actual onset, as documented at the childhood entry point (see Barkley et al., 2008). The correlation between what the hyperactive children as adults reported as their age of onset and what others reported was just .009 and not significant. On average, the hyperactive children grown up reported a mean age of onset of 16.1 years ($SD = 25.4$), while others who knew them well reported it to be 10.8 years ($SD = 8.9$). Of course, it must be noted that the children being followed in this study substantially underreported their symptoms at both the age 21 and age 27 follow-up points relative to others who knew them well (see Barkley et al., 2008), so it is not surprising that these relationships for age of onset would be so poor. Yet they are in agreement in that respect with the relatively poor showing for the results from the UMASS study. All this suggests that (1) the actual onset of symptoms of ADHD as retrospectively recalled by adults is likely to be 4 years or more later, on average, than the actual onset of symptoms and (2) the interrater reliability of that age of onset when self-reports are compared with other-reports is also likely to be low.

Domains of Impairment

Impairment is an essential diagnostic criterion for ADHD in the current DSM-IV-TR and will likely remain so into DSM-5. Although it is not defined explicitly in DSM-IV-TR, it can be taken to mean that the symptoms of the disorder are significantly interfering with functioning in major life activities. The DSM-IV-TR specifies four such major life activities for adults: school, home, work, and social relationships. A total of 435 adults in the normative sample reported at least one or more current symptoms of ADHD (or SCT) as occurring often or very often. These adults were

then queried as to whether or not their symptom or symptoms impaired their functioning in any of the following four domains: school (education), home, work, and social relations, indicating all domains in which this occurred. Of these 435 adults, 45.3% indicated that symptoms impaired functioning with school, 52% with home life, 38.4% with work, and 49% with social relationships. Overall, a total of 81.6% who reported having a current symptom of ADHD reported being impaired in at least one of these domains. Of those indicating impairment, 26.7% reported a single domain, 23.2% reported two or more impaired domains, 15.4% reported three impaired domains, and 16.3% reported impairment in all four domains. In short, if an adult indicates at least one or more current symptoms of ADHD as occurring often or very often, the result is not benign because most patients report that such symptoms have interfered with their functioning in one or more of the four major life activities listed here.

The same procedure was followed in collecting information from the normative sample concerning childhood symptoms of ADHD. Individuals who reported that a symptom was present in childhood often or very often were asked to indicate whether or not these symptoms impaired their functioning in school, home, or social relationships. These were chosen because they represented the same domains listed in the DSM-IV-TR criteria for ADHD as applied to children. There were 431 adults who reported having at least one or more symptoms of ADHD in childhood: 66.8% reported impairment with school, 45.9% with home life, and 36.2% with social relationships. Overall, 82.1% of adults reported that their ADHD symptoms interfered with at least one or more of the three domains. Among those reporting impairment, 36.2% reported a single domain, 25.1% two domains, and 20.9% all three domains. Again, this suggests that childhood symptoms of ADHD as recalled by adults are generally not benign in that the majority of adults reporting such symptoms as occurring often or very often indicate that it impaired one or more of these three major life activities.

The probability that an individual will report being impaired in one or more current major life activities increases with each ADHD symptom added to the count endorsed. This relationship can be seen in Figure 2.2. With each increase in the symptom count for the total ADHD symptom list, the likelihood of reporting impairment rises until at 5+ symptoms it reaches over 98% and by 10+ it is 100%. This further supports the position taken previously concerning the appropriate symptom threshold for diagnosing ADHD. It was recommended that 5 or more symptoms using both symptom lists be the threshold for diagnosis. This analysis indicates that nearly 98% of those reporting 5 or more symptoms are impaired. A similar association was found for the relationship of symptom count for childhood recollected symptoms and impairment in the childhood domains (see Figure 2.3). Certainly by 8+ symptoms or higher the vast majority of individuals (98%) report impairment and by 10+ symptoms the rate reaches 100%.

All of this impairment information from the normative sample indicates that clinicians or researchers using the BAARS-IV scale should expect that most adults who endorse at least one or more items on the current or childhood scale as a symptom (often or very often) will report that it impaired their functioning in at least one or more major life activities. Of those reporting 5 or more current symptoms or 8 or more childhood symptoms, 98 to 100% will report being impaired in at least one or more of the current or childhood domains, respectively.

BARKLEY ADULT ADHD RATING SCALE-IV (BAARS-IV)

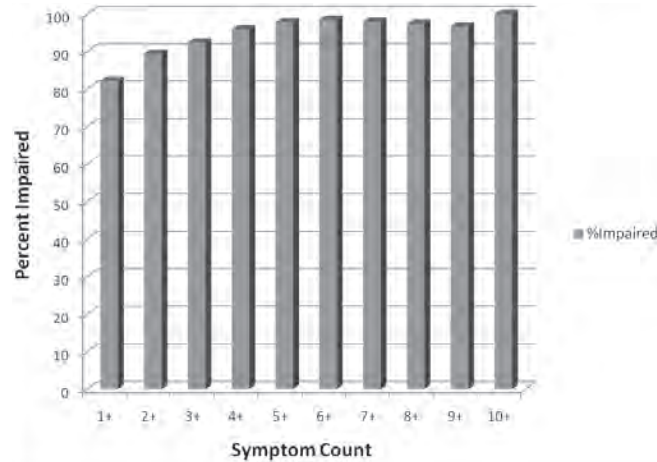


FIGURE 2.2. The percentage of adults reporting impairment in one or more of four domains of current functioning for each level of the number of symptoms they endorsed (or higher). A symptom is any item endorsed as occurring often or very often.

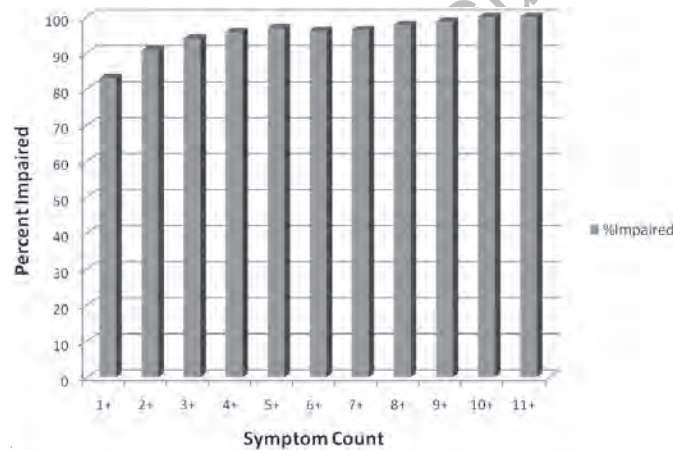


FIGURE 2.3. The percentage of adults reporting impairment in one or more of three domains of childhood functioning for each level of the number of symptoms they endorsed (or higher). A symptom is an item endorsed as occurring often or very often (symptom count).

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