



## Aberrant Behavior Checklist: Current Identity and Future Developments

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The Aberrant Behavior Checklist (ABC) is a standardized problem behavior rating scale originally designed to assess treatment effects in people with Intellectual Disabilities (ID) [1,2]. It was developed in the early 1980s, because we, as researchers, could find no adequate instrument for assessing outcomes in individuals with ID. The upshot was a principal-components-derived tool encompassing five subscales and 58 items. The subscales were dubbed as follows: (1) Irritability, Agitation, Crying (15 items); (2) Lethargy/Social Withdrawal (16 items); (3) Stereotypic Behavior (7 items); (4) Hyperactivity/Noncompliance (16 items); and (5) Inappropriate Speech (4 items).

Following its introduction, the ABC was slowly but gradually adopted as an outcome measure for pharmacological studies. It was also adopted as an outcome for other treatments (e.g., behavior intervention), for research on behavior phenotypes, and to characterize samples that were studied in various contexts (e.g., effects of planned changes in living environments). The ABC has been translated (or is in the process of being translated) into 39 languages other than English ([http://psychmed.osu.edu/media/ABC\\_Annotated\\_Bibliography.pdf](http://psychmed.osu.edu/media/ABC_Annotated_Bibliography.pdf)), and it has been used around the world. To date, it has been employed in over 325 studies.

In 1997, the United States National Institute of Mental Health formed the Research Units on Pediatric Psychopharmacology (RUPP) Autism Network, whose mandate was to conduct drug research in areas of significant need. The first project undertaken by the NIMH Autism RUPP was an ambitious evaluation of the acute effects of risperidone in children with autistic disorder complicated by substantial irritability, tantrums, aggression, and other severe behavior problems (RUPP [3]). This investigation was complemented by a discontinuance study of risperidone, which entailed medication maintenance for half of the participants and blinded medication withdrawal for the other half after 6 months of continuous treatment (RUPP [4]). The acute study showed a remarkable therapeutic effect of risperidone on the Irritability subscale as well as complementary parallel effects on hyperactivity and stereotypic behavior. The discontinuance study showed a very high rate of relapse in children randomized to placebo and stable maintenance of improvement in children who were randomized to continue risperidone.

After requesting access, Johnson & Johnson Pharmaceutica submitted these and complimentary data to the U.S. Food and Drug Administration (FDA) in pursuit of a clinical indication for treating irritability in children with autistic disorder. The application was approved in 2008, and this set the stage for considerable pharmaceutical company interest in the ABC for treating children with autistic disorder ([http://pediatrics.about.com/od/autism/a/1006\\_risperdal.htm](http://pediatrics.about.com/od/autism/a/1006_risperdal.htm)). Not long after, Bristol-Myers Squibb launched analogous studies, and established that aripiprazole was useful in reducing irritable and serious problem behaviors as measured by ABC's Irritability subscale [5,6]. Aripiprazole is also FDA-approved for treating severe behavior problems in children with autism.

Numerous pharmaceutical companies have molecules potentially capable of altering the course of autistic disorder or related symptoms in developmental disorders such as Fragile X syndrome. The website, [Clinicaltrials.gov](http://Clinicaltrials.gov), reveals several such trials by pharmaceutical companies such as Novartis, Seaside, and Hoffmann-La Roche.

Naturally, investigators and pharmaceutical interests are looking for the "Holy Grail" of outcome measures, and the ABC has come into its fair share of attention. Several of its subscales seem to have logical counterparts in autism disorders (e.g., Lethargy/Social Withdrawal encompasses elements of social disability; stereotypic behavior encompasses some repetitive and restrictive behaviors; and inappropriate speech includes echolalia and other repetitive speech). Not surprisingly, the ABC maintains a toehold in autism research.

In early spring 2012, the foundation called Autism Speaks convened a major meeting to identify the most optimal outcome measures for treating patients with ASDs. The participants, who included many distinguished researchers in the ASD field, identified the ABC Lethargy/Social withdrawal subscale as the optimal outcome measure at the time for measuring social disability and the stereotypic behavior subscale as a reputable outcome for restrictive and repetitive behaviors. The correctness of these recommendations remains to be determined, but it is clear that the ABC occupies an important niche at present.

### Unexpected Developments

#### Inappropriate use of total scores

For quite some time, some investigators have collapsed scores across all five subscales to compute a single total score. This is despite instructions within the ABC manual not to calculate total scores across subscales: "To score the ABC, the individual items for each subscale are simply summed to their respective subtotals. Thus the scale renders five subscale scores. It is inappropriate to compute a 'total aberrant score,' based on a summation of all 58 items, as the subscales are largely independent." For readers familiar with factor methods, the problem will be obvious. With mathematical procedures such as principal components analysis and exploratory factor analysis (EFA), the intent is to derive psychological constructs that have a core of symptoms in common. To illustrate the problem with ignoring psychological constructs, let us manufacture a ridiculous rating scale that comprises 5 symptoms: (1) thumb sucking, (2) fear of strangers, (3) temper tantrums, (4) bed wetting, and (5) hoarding worthless objects. What is wrong with this scale? The answer, of course, is everything! The scale measures a multiplicity of constructs and none of them well. Although the items within each subscale of the ABC have been shown empirically to cluster together, the same cannot be said of the relationship of the subscales with one another. Thus, the compilation of a total across subscales is a number that represents no construct; it is a meaningless summation. Furthermore, a total score may allow subscale scores to cancel out one another. For instance, in one of our studies, there was a

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tendency for haloperidol to reduce irritability, stereotypic behavior, and hyperactivity/noncompliance scores, while increasing lethargy/social withdrawal scores (Aman, Teehan, White, Turbott, & Vaithianathan, 1989). It may be the case that some investigators and/or companies have been encouraged to use overall total scores by oversight agencies, such as the FDA. If this is the case, it is in everyone's interest to point out the potential negative consequences of this practice so that we maintain the validity of our research.

### Revisions to factor structure

As already noted, investigators are looking for the Holy Grail of outcome measures. With this as background, Sansone et al. [7] conducted a methodologically sound EFA of the ABC in approximately 630 individuals with Fragile X syndrome. Sansone et al. [7] extracted five factors that were quite similar to the original [8], but the Lethargy/Social Withdrawal subscale splintered into two, one of which was called "Lethargy" and the other called "Social Avoidance." Is this problematic for how one chooses to use the ABC? At the time of this writing, I simply do not know. But here is food for thought.

EFA is a quantitative tool that aids us by reducing a large volume of information into more manageable "clusters" of data. One issue is that, if one conducts two successive EFAs, even in closely related samples, the analyses will always produce slightly different factor structures, no matter how conscientiously they are done. This is because EFA is data-driven, and there will be subtle shifts in ratings with each new sample, thus leading to different correlations between scale items. A second issue concerns what clinical groups should be characterized by independent EFA. Should we have an ABC factor structure for Cornelia de Lange syndrome? Another for phenylketonuria? Still another for Asperger's disorder? Another for Tay-Sachs Disease? After awhile, this seems to be a self-defeating argument. The third issue is pragmatic, but it has important implications for what research issues can be addressed. When they developed their 1983 version of the Child Behavior Checklist (CBCL), Achenbach and Edelbrock derived four different factor structures for four subgroups in their large normative samples: one for young boys (5-11 years, inclusive), one for older boys (12-16 years), one for younger girls, and one for older girls [9]. The same was true of the 1986 version of the Teacher Report Form (TRF) [10]. Consider the practical problems that this caused for researchers. Longitudinal (age-related) research became difficult to do, because the items and scoring systems changed with age. Likewise sex research was exceptionally difficult to do for the same reasons. Later editions of the manuals for the CBCL and the TRF [11,12] reported factor-analytically derived subscales that comprised the same items for each gender and age group within each of the respective instruments.

Where does this leave most of us in the developmental disabilities field? On the one hand, we would like to compare and contrast the behavior of people with idiopathic intellectual disability, autistic disorder, and Fragile X syndrome with a single tool. If not with a single tool, then how do we compare them at all? On the other hand, if the behavior of these groups differs qualitatively, then it is possible that any amount of quantitative comparison will fall short of our goals. For example, if we glibly use the same tool to assess repetitive behavior in obsessive compulsive disorder and in autistic disorder, without prior refinement and reconceptualization, we may arrive at very misleading conclusions.

### Whither the Future?

Although the ABC was derived from a large sample of people with intellectual disabilities, it is also true that a substantial portion of that

sample had severe autism. These likely accounts for the appearance of the three subscales that overlap with ASD symptoms. At the same time, there is impatience within the autism spectrum disorder and Fragile-X fields to have instruments that are tailor-made to their clinical populations (or at least of demonstrated relevance). With this in mind, we are seriously considering studies to assess the original items within the ABC to determine the appropriateness of its current factor structure within autism spectrum disorders and perhaps in other developmental disabilities. In addressing this issue, it will be imperative that we have certainty that our participants are truly on the autism spectrum. We welcome input and collaboration of research colleagues, who are encouraged to join us in the worthy effort.

In the meantime, we ask our clinical and research colleagues to avoid using undifferentiated total scores with the ABC, which was never justifiable. To the extent that we can support colleagues in the effort, we shall do so. We also ask our colleagues to keep an open mind about whether different subscale scoring systems are desirable for the ABC across clinical populations. There is a positive case to be made, but unfortunately this is coupled with negative consequences as well.

These are exciting times. We have new treatments that we hope will help to ameliorate the disabilities of those with whom we work. We are also much better at diagnosing and identifying these individuals. Now we must also turn our attention to the task of ensuring that our outcome instruments are as psychometrically sound as possible.

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