Comparing the Functional Performance of Children and Youths With Autism, Developmental Disabilities, and No Disability Using the Revised Pediatric Evaluation of Disability Inventory Item Banks

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- activities of daily living
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- autistic disorder
- developmental disabilities
- disability evaluation

OBJECTIVE. We compared the functional performance of children with autism spectrum disorders (ASD), intellectual and developmental disabilities (IDD), and without disabilities using the revised Pediatric Evaluation of Disability Inventory–Computer Adaptive Test (PEDI–CAT) Social/Cognitive, Daily Activities, and Responsibility domains.

METHOD. A nationally representative sample of parents of children ages 0–21 without disabilities (n = 2,205), with ASD (n = 108), or with IDD (n = 150) completed an online survey. We obtained predicted PEDI–CAT scaled scores for three reference ages (5, 10, 15) from a modified analysis of covariance model and compared each group's scores using contrasts of the regression parameters.

RESULTS. We found no significant differences between the ASD and IDD groups. The group with ASD demonstrated significantly lower performance than the group without disabilities across the three domains at ages 10 and 15.

CONCLUSION. Scores on the PEDI–CAT differentiated the group with ASD from the group without disabilities. Children with ASD and IDD did not demonstrate different performance profiles.

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Practitioners working with children and youths with autism spectrum disorders (ASD) are aware of the impact of these disorders on the ability to acquire and apply skills needed for daily life. Surprisingly, however, research-based knowledge about the profile of functional strengths and limitations in people with ASD across specific areas of daily life is lacking. Similarly, only very limited knowledge is available about whether or how the functional profile of people with ASD is distinct from that of other groups of people with developmental disorders that also affect information processing and learning (e.g., intellectual and developmental disabilities [IDD]). Without this understanding, it is difficult to identify the most effective and appropriate intervention approaches that support optimal functioning at different stages of childhood and young adulthood.

Most of the research that has examined functioning in the daily life of children with ASD has used the term *adaptive behavior* to describe this focus, which differentiates it from a focus on underlying impairments or symptoms. Studies comparing the performance of children and youths with ASDs and children with other developmental disorders have not identified a consistent relationship between adaptive behavior and diagnosis. The most consistent finding has been that children and youths with ASD have the greatest difficulty in socialization domains

compared with children without ASD and with other diagnoses, even after matching on age and other characteristics such as intelligence (Carpentieri & Morgan, 1996; Fisch, Simensen, & Schroer, 2002; Liss et al., 2001; Perry, Flanagan, Dunn Geier, & Freeman, 2009; Schatz & Hamdan-Allen, 1995; Stone, Ousley, Hepburn, Hogan, & Brown, 1999). In contrast, Mawhood, Howlin, and Rutter (2000) found no significant difference in communication scores among young adults (mean age = 23–24 yr) with ASD and those with language delays.

Other studies have also reported conflicting findings across other domains of adaptive behavior, such as daily living skills (Fisch et al., 2002; Perry et al., 2009). For example, Fenton et al. (2003) compared the adaptive behavior profiles of two groups of children with moderate to severe developmental delay, with and without autism, who were matched for chronological and developmental age (mean age = 48.8–53.8 mo). They found no differences in the adaptive behavior composite or socialization and daily living domain scores between diagnostic groups.

These findings support the suggestion by other researchers (e.g., Liss et al., 2001) that adaptive behavior is more related to cognitive variables than to presence or absence of autism. Age differences among the samples across studies further complicate interpretation of these data, raising the possibility that differences in findings across studies reflect age-related characteristics more than diagnosis-related characteristics.

Studies that have examined changes in adaptive behavior over time or across age groups have also yielded conflicting results. One study found a significant decrease in communication and daily living scores in children with ASD after 2 yr (Fisch et al., 2002), and a second study reported significant improvement in the same domains over a longer time period from adolescence (ages 12–13) to young adulthood (ages 19–20; McGovern & Sigman, 2005). Yet another study found that the Vineland Adaptive Behavior Scales (VABS; Sparrow, Cicchetti, & Balla, 2005) standard score significantly decreased after 5 yr for all children with ASD, but youths with ASD and higher nonverbal intelligence showed a significant increase in VABS total raw scores (Gabriels, Ivers, Hill, Agnew, & McNeill, 2007). Several researchers have suggested that the decline in scores actually reflects a slower rate of skill acquisition than that of typically developing peers and does not reflect declines in individual adaptive behavior (Fisch et al., 2002; Gabriels et al., 2007; Perry et al., 2009). Other researchers have hypothesized that some core symptoms associated with ASD, including social and communication skills, may improve over time, whereas adaptive behaviors do not (Piven, Harper, Palmer, & Arndt, 1996).

Although the literature is inconsistent with regard to changes with age, a few findings have highlighted the importance of adaptive behavior for long-term outcomes in people with ASD as well as with other diagnoses. De Bildt, Sytema, Kraijer, Sparrow, and Minderaa (2005) explored the relation between adaptive behavior scores and placement in special education settings for children with IQs ranging from 61 to 70 (ages 6–18). They found that children in schools for those with severe learning problems had significantly lower domain and subdomain scores on all areas of the VABS except the Play and Leisure Time subdomain. Moreover, for children with the highest level of mild intellectual disability, adaptive behavior was the most important factor that affected school placement; for young people with ASDs, limitations in adaptive behavior often meant that that they did not reach the level of schooling expected on the basis of their IQ. Another study found that young adults (ages 23–24) diagnosed with an ASD showed significantly more limitations in adaptive behavior functioning than people with developmental receptive language disorder (Mawhood et al., 2000). Although young adults in the sample with autism received more passes in exiting school, people with developmental receptive language disorder experienced greater independent employment than did people with ASD.

Across the literature, study limitations have contributed to difficulty interpreting the findings. One frequent limitation is small sample size (Fisch et al., 2002; Gabriels et al., 2007; Mawhood et al., 2000; Perry et al., 2009). Extreme variation among a few participants may significantly influence results based on small samples. A second limitation is that the measurement of functional behaviors in these studies has relied almost exclusively on two instruments: the VABS and the Autism Diagnostic Interview (Lord, Rutter, & Le Couteur, 1994). Thus, the results reflect the particular content, item formulation, and scale structure of these instruments.

This limitation is particularly true for the Communication, Socialization, and Interaction domains of the VABS. A recent analysis using the *International Classification of Functioning, Disability and Health–Children and Youth Version* (World Health Organization, 2008) to code the content of the VABS (Gleason & Coster, in press) found that the VABS Daily Living Skills and Socialization domains had a high percentage of items that assessed communication skills. Because communication is a primary area of impairment in ASD, this finding suggests that differences in domain scores may at least partially reflect the general impact of communication deficits rather than distinct differences in function. For

example, Ben Itzchak and Zachor (2011) found that for children with severe ASD, higher verbal abilities at preintervention correlated with better adaptive skills outcome as measured by the VABS. Because several domains of the VABS tap communication skills, this correlation may possibly reflect the shared content of the two measures. Many items on the VABS also require children to execute a particular skill in a specific manner, particularly those in the areas of communication and socialization (e.g., *verbalize* a particular greeting). ASD-specific characteristics may make it difficult for children to execute those behaviors in the conventional manner specified. Therefore, scores on those scales may reflect the child's or youth's ability to execute tasks in a conventional manner rather than an ability to complete the activity in any functional manner. An assessment that places less emphasis on verbal skills or on the particular form of response might lead to different findings.

The newly revised Pediatric Evaluation of Disability Inventory–Computer Adaptive Test (PEDI–CAT) offers the possibility to examine this issue (Haley, Coster, Dumas, Fragala-Pinkham, & Moed, 2012). The unique features of the PEDI–CAT make it an ideal alternative for measuring and better understanding the functional abilities of children and youths with ASD. Most important, the PEDI–CAT item ratings reflect the effectiveness of children's performance, not the means used, to better capture the functional strengths of children with disabilities, including those with ASDs. These rating scales allow parents and other respondents to consider the environmental supports and modifications that children use to achieve successful performance. For children and youths with ASD, such supports could include visual schedules that enhance functional performance without changing impairment-related symptoms. This approach provides a better understanding of the functional capabilities of children and youths with ASDs in the context of their daily lives.

The item pools of the PEDI–CAT represent the full continuum of function from birth to age 21 in several domains that have been conceptualized as essential aspects of adaptive and functional behavior. The instrument includes four domains: Daily Activities, Social/Cognitive, Mobility, and Responsibility. Items across these domains measure meaningful, functional activities in the context of daily life. Thus, the PEDI–CAT can be used to measure change in functional performance over time as youths with ASD transition from childhood to adolescence to adulthood. In this study, we used data from the revised PEDI–CAT item pool to investigate the following research questions:

1. What is the level of functional performance of children and youths with autism (ASD) and co-occurring conditions as measured by the revised PEDI–CAT Social/Cognitive, Daily Activities, and Responsibility domains?
2. How does the performance of children and youths with ASD compare with that of children and youths with IDD and children without disabilities?
3. How does functional performance as measured by the PEDI–CAT vary by age cohort?

Method

This study involved secondary data analyses of an existing data set. Data were originally collected using a cross-sectional design to examine the psychometric properties of and establish normative scores for the revised PEDI–CAT (Haley et al., 2012).

Procedures

Parent-reported PEDI–CAT data were originally collected by means of the Internet between May 2009 and August 2009. An online survey company coordinated the data collection process. The survey company contacted only panel members with one or more children younger than age 21 living in the United States. The parents were asked a series of disability screening questions to determine their eligibility and placement in either the sample without disability (n = 2,205) or the sample with disability (n = 617). Screening questions asked whether the child received early intervention or special education services and whether the child was limited in any important life areas (e.g., personal care, handling routine needs, play or recreation). For the sample without disability, a quota sampling method based on children's age (100 children per year, ages 0–21) was used to ensure that sufficient cases were collected within each age stratum. Additionally, equal proportions of male and female children were selected, and efforts were made to ensure that participants were representative of the ethnic distribution of the 2000 U.S. Census. A series of parallel forms were developed so that no one participant responded to >175 items. Three-fourths of the sample answered items from each domain. A unique set of cases (n = 512; 25% of sample) completed all items from each domain.

Participants

We selected participants from the data set for inclusion in this study on the basis of their response to the question, "Has a physician or health care provider diagnosed your child with any of the following diagnoses?" Respondents reporting an ASD diagnosis or any other diagnosis, including IDD, were selected for inclusion in the ASD sample (n = 108). We selected respondents reporting an IDD diagnosis with or without a diagnosis other than an

ASD for inclusion in the IDD sample (n = 150). The full sample of children without disabilities was selected for inclusion (n = 2,205). Details about the characteristics of each sample are given in Table 1. We did not generate equivalent sample sizes because the original data set lacked variables that could be used to match groups on functional characteristics that affect adaptive behavior, such as IQ.

We examined groups for differences on key demographic variables using parametric and nonparametric statistics as appropriate. We found no significant difference between groups on age or racial or ethnic distribution. Significant differences between groups were found for gender and income. Therefore, we conducted pairwise χ^2 tests to identify the location of difference. The percentage of female children in the ASD group was significantly less than in the group without disabilities and the group with IDD. The proportion of families with lower incomes in the group with IDD was significantly higher than in the group without disability.

Instrument

The PEDI–CAT, a parent-response questionnaire, was developed to measure function in infants, children, and youths from birth through age 20 (Haley et al., 2012). We focused on three domains in this study; see Table 2 for a description of each domain. Although some studies have reported that children and youths with ASD or IDD may have coordination difficulties, we did not

Table 1. Basic Demographic Information Across Three Groups

Characteristic	Group		
	Without Disabilities (n = 2,205)	ASD and Co-Occurring Conditions (n = 108)	Intellectual or Developmental Disabilities (n = 150)
Child's gender,[a] n (%)			
Male	1,126 (51.1)	83 (76.9)	88 (58.7)
Female	1,078 (48.9)	25 (23.1)	62 (41.3)
Child's race,[b] n (%)			
White	1,437 (65.2)	70 (64.8)	102 (68.0)
Black	241 (10.9)	13 (12.0)	15 (10.0)
Hispanic	207 (9.4)	8 (7.4)	13 (8.7)
Asian	30 (1.4)	1 (0.9)	4 (2.7)
Other	288 (13.1)	16 (14.8)	16 (10.7)
Child's current placement in school			
Preschool or early childhood program,[a] n (%)	193 (8.8)	9 (8.3)	14 (9.3)
Kindergarten	101 (4.6)	5 (4.6)	10 (6.7)
Elementary, middle, or high school	1,235 (56.0)	82 (75.9)	100 (66.7)
Ungraded	20 (0.9)	2 (1.9)	4 (2.7)
Undergraduate or college	196 (8.9)	4 (3.7)	2 (1.3)
Not in school	459 (20.8)	6 (5.6)	20 (13.3)
Family income,[a] n (%)			
<$50,000	743 (33.7)	44 (40.7)	70 (46.7)
$50,000–$99,999	833 (37.8)	37 (34.3)	42 (28.0)
≥$100,000	462 (21.0)	22 (20.4)	29 (19.3)
Prefer not to say	166 (7.5)	5 (4.6)	9 (6.0)
Co-occurring disabilities,[c] n (%)			
Developmental delay		57 (52.8)	138 (92.0)
Intellectual disability		10 (9.3)	42 (28.0)
Hearing impairment		4 (3.7)	13 (8.7)
Speech–language impairment		43 (39.8)	66 (44.0)
Vision impairment		6 (5.6)	22 (14.7)
Serious emotional disturbance		4 (3.7)	20 (13.3)
Orthopedic or movement impairment		3 (2.8)	9 (6.0)
Autism spectrum disorder		108 (100.0)	0
Attention deficit disorder		36 (33.3)	53 (35.3)
Traumatic brain injury		1 (0.9)	7 (4.7)
Specific learning disability		16 (14.8)	35 (23.3)
Health impairment		8 (7.4)	19 (12.7)
Multiple disabilities		6 (5.6)	14 (9.3)
Other impairments or problems		5 (4.6)	28 (18.7)

[a]One case is missing in the group without disabilities. [b]Two cases are missing in the group without disabilities. [c]Parents could select more than one disability.

expect the items in the PEDI–CAT Mobility domain to be sensitive to this level of difficulty. In addition, previous studies did not examine this domain. Therefore, we did not include it in our analysis.

We conducted clinician and parent focus groups to ensure that the revised PEDI–CAT items were relevant, meaningful, and interpreted as intended (Dumas et al., 2010). The PEDI–CAT field testing showed that the finalized instrument has good discriminant validity and test–retest reliability (Dumas et al., 2012).

Analysis

The data set included interval-level scaled scores for each PEDI–CAT domain. We calculated scaled domain scores from the original sample using the two-parameter logistic Graded Response Model with PARSCALE (Haley et al., 2011). The ability of the PEDI–CAT domain scores to discriminate between samples was examined using analysis of covariance (ANCOVA). We entered age as a covariate because level of functioning in the Social/Cognitive, Daily Activities, and Responsibility domains was hypothesized to vary with age.

Data were checked to ensure they met ANCOVA assumptions and were found to violate the assumption of homogeneity of regression slopes; regression plots showed an interaction between age and diagnostic group for all domains, indicating that the relationship between PEDI–CAT scaled scores and diagnostic group varied across the age continuum represented in the sample. An ANCOVA with interaction term (Age × Diagnosis) confirmed the significance of this interaction for all domains (Daily Activities domain, $F[2, 2449] = 41.073$, $p = .000$; Social/Cognitive domain, $F[2, 2448] = 47.639$, $p = .000$; Responsibility domain, $F[2, 2456] = 39.350$, $p = .000$).

Therefore, to present the results of our analyses, we selected three reference ages. Age 5 was selected as the first

Table 2. Details of PEDI–CAT Domains

Domain	Content Areas	Example Item	Rating Scale
Daily Activities (68 items)	Eating and mealtime; getting dressed; keeping clean; home tasks	Opens door lock using key.	Please choose which response below best describes your child's ability in the following: □ Unable = *Can't do,* doesn't know how or is too young. □ Hard = Does with *a lot* of help, extra time, or effort. □ A little hard = Does with *a little* help, extra time, or effort. □ Easy = Does with *no* help, extra time, or effort, or child's skills are past this level.
Social–Cognitive (60 items)	Interaction; communication; everyday cognition; self-management	Greets new people appropriately when introduced.	Please choose which response below best describes your child's ability in the following: □ Unable = *Can't do,* doesn't know how or is too young. □ Hard = Does with *a lot* of help, extra time, or effort. □ A little hard = Does with *a little* help, extra time, or effort. □ Easy = Does with *no* help, extra time, or effort, or child's skills are past this level.
Responsibility (51 items)	Organization and planning; taking care of daily needs; health management; staying safe	Keeps track of time throughout the day. Includes arriving on time to scheduled activities or appointments; coming back home at planned time; ending an activity on time to stay on schedule.	How much responsibility does your child take for the following activities? □ Adult or caregiver has *full* responsibility; the child does not take any responsibility. □ Adult or caregiver has *most* responsibility, and child takes a little responsibility. □ Adult or caregiver and child share responsibility about equally. □ Child has *most* responsibility with a little direction, supervision, or guidance from an adult or caregiver. □ Child takes *full* responsibility without any direction, supervision, or guidance from an adult or caregiver.

Note. PEDI–CAT = Pediatric Evaluation of Disability Inventory–Computer Adaptive Test.

reference because the regression lines crossed at around age 5 in all three domains. We selected 10 and 15 as the second and third reference ages to keep equal age intervals between reference groups. Moreover, we hypothesized that these ages would be associated with meaningful differences in functional ability.

Predicted PEDI–CAT scaled scores (adjusted means) were obtained for each reference age from the modified ANCOVA (Aiken & West, 1991; Kleinbaum, Kupper, Muller, & Nizam, 1998). We calculated adjusted means on the PEDI–CAT for each age reference group by inserting parameter estimates into the following formula: adjusted mean = $\beta_0 + \beta_1$ age + β_2 diagnosis + β_3 age * diagnosis.

Finally, for each age reference group, we compared the adjusted means of each diagnostic group using contrasts of the regression parameters (with the sample with ASD serving as the reference group for comparisons). This procedure enabled a valid interpretation of the relationship between PEDI–CAT scores and diagnostic group while controlling for the influence of age.

Results

Results from the ANCOVAs showed a similar pattern in the relationship between level of function and diagnostic group in all PEDI–CAT domains.

In the Social/Cognitive domain (Table 3), children with ASD had statistically significantly lower domain scores than children without disabilities at ages 10 and 15 ($p < .001$). Children with ASD at age 5 had lower scores than children without disabilities, but the difference was not statistically significant. We found no significant difference between the children with ASD and the children with IDD at any age on the Social/Cognitive domain, although the adjusted mean scores were slightly higher for children with ASDs.

In the Daily Activities domain (Table 3), children with ASD had lower scores than children without disabilities, but the difference was only statistically significant at ages 10 and 15 ($p < .001$). Children with ASD had slightly higher adjusted means than children with IDD at ages 10 and 15, but we found no significant difference between the Daily Activities adjusted mean scores for children with ASD and IDD at any age.

In the Responsibility domain (Table 3), children with ASD had the lowest adjusted mean scaled scores across all age groups, with the largest differences in scores emerging at age 15. At ages 10 and 15, children with ASD had significantly lower Responsibility scores than children without disabilities ($p < .001$). We found no significant differences between children with ASD and children with IDD at any age in this domain.

Discussion

We found no relationship between diagnosis and children's level of functioning at age 5 for the PEDI–CAT Social/Cognitive, Daily Activities, and Responsibility domains. However, older children with ASDs had significantly lower levels of function than children without disabilities on all domains. We found no significant difference in the level of functioning of children with ASDs and children with IDD across all reference ages (5, 10, 15). These findings suggest that children with ASD and IDD may demonstrate similar levels of functional performance and task management responsibilities after controlling for age. However, both groups demonstrated lower performance than children without disabilities.

Although some other studies have found that children with ASD had significantly lower scores than children with other disabilities in adaptive behavior, particularly in the area of socialization and communication (Carpentieri & Morgan, 1996; Fisch et al., 2002; Liss et al., 2001; Perry et al., 2009; Schatz & Hamdan-Allen, 1995; Stone et al., 1999), this finding was not replicated in this study. We found no significant differences between children with ASD and children with IDD on any of the PEDI–CAT domains.

This finding can be approached from two perspectives. First, the absence of difference may be related to the assessment itself. Several unique features of the PEDI–CAT may explain this finding. One is that the PEDI–CAT items do not specify that children complete activities in a standardized manner. Rather, when creating the PEDI–CAT items, an explicit attempt was made to measure children's ability to effectively perform activities using means that are functional given their abilities and impairments. For example, many communication items on the Social/Cognitive domain do not require children to communicate using speech; instead, the items assess children's ability to communicate in a variety of ways, including gestures, picture systems, or verbalization or vocalization (e.g., "Asks one or more peers to play using words or gestures"). Conversely, other adaptive behavior socialization and communication scales may emphasize verbal communication, increasing the likelihood that children with ASD may obtain lower scores than children with other diagnoses that do not present with the same set of impairments. Similarly, the items included in the PEDI–CAT Daily Activities domain were carefully written to limit the extent to which performance depended on specific motor, communication, or interaction skills. The items are designed to measure the child's ability to perform home care, dressing, mealtime, and hygiene

Table 3. Results: Adjusted Means and Pairwise Comparisons

Age and Group	Adjusted Means	Mean Difference[a]	t[a]	df	p
Social/Cognitive Domain					
5 yr					
ASD	53.55				
IDD	52.89	0.66	−0.47	2448	.64
Without disabilities	54.20	−0.65	0.56	2448	.58
10 yr					
ASD	57.00				
IDD	56.54	0.46	−0.54	2448	.59
Without disabilities	61.92	−4.91	7.26	2448	<.001
15 yr					
ASD	60.46				
IDD	60.20	0.26	−0.26	2448	.80
Without disabilities	69.64	−9.18	11.57	2448	<.001
Daily Activities Domain					
5 yr					
ASD	49.78				
IDD	50.09	−0.31	0.22	2449	.83
Without disabilities	50.69	−0.91	0.79	2449	.43
10 yr					
ASD	54.96				
IDD	54.86	0.10	–0.13	2449	.90
Without disabilities	59.37	−4.41	6.59	2449	<.001
15 yr					
ASD	60.14				
IDD	59.62	0.52	–0.52	2449	.61
Without disabilities	68.06	−7.91	10.09	2449	<.001
Responsibility Domain					
5 yr					
ASD	40.63				
IDD	41.17	−0.54	0.43	2456	.67
Without disabilities	41.02	−0.39	0.37	2456	.71
10 yr					
ASD	46.20				
IDD	46.54	−0.35	0.45	2456	.65
Without disabilities	49.85	−3.65	5.96	2456	<.001
15 yr					
ASD	51.77				
IDD	51.92	−0.15	0.16	2456	.87
Without disabilities	58.68	−6.91	9.63	2456	<.001

Note. ASD = autism spectrum disorders (with co-occurring conditions); IDD = intellectual and developmental disabilities (without ASD).
[a]ASD is reference group for comparisons.

activities using whatever methods are effective for that child and family, including use of assistive devices.

A second possible interpretation is that the absence of difference between children with ASD and children with IDD on any of the PEDI–CAT domains may be related to other confounding variables, such as cognitive level. Liss et al. (2001) have suggested that adaptive behavior is related more to cognitive variables than to presence or absence of autism. Because we did not have information regarding the children's cognitive level (i.e., IQ), we were not able to compare the two diagnosis groups (ASD and IDD) controlling for the influence of the cognitive variable. Therefore, we cannot rule out the possibility that the absence of difference may be related to these children's cognitive level. However, the absence of a significant difference in the Social/Cognitive score suggests that the two groups were not significantly different in general cognitive functioning.

One of the major purposes of other measures of adaptive behavior has been to establish diagnosis of intellectual disability. The American Psychiatric Association and the American Association of Intellectual and

Developmental Disability criteria for this diagnosis stipulate that in addition to below-average IQ, the person must demonstrate substantial limitations in adaptive behavior. Although the PEDI–CAT can be used to identify delay in functional skills, it was also designed to support individual service delivery planning and evaluation of outcomes for children and youths with diverse disabilities. Thus, each group of instrument developers has operationalized the construct of function or adaptive behavior in somewhat different ways. These methodological decisions may have resulted in instruments sufficiently different that they yield different profiles of performance across groups. This possibility emphasizes the importance not only of addressing research questions such as similarities and differences across diagnostic groups but also of using more than one instrument. Moreover, it emphasizes the importance of validating results against an external criterion to establish which profile is a more accurate representation of the child's typical performance in his or her daily context.

These findings suggest that one cannot assume that impairment profiles secondary to ASD lead to functional difficulties that differ from those of other children and youths with disabilities. The results do indicate that children and youths with ASD have difficulty performing daily activities, interacting with peers and adults, and managing daily life tasks, as indicated by adjusted means that are lower than those of other comparison groups at ages 5, 10, and 15. However, the increase in adjusted means associated with age also suggests that the adaptive, functional behavior of children and youths with ASD improves over time.

The lack of significant difference between groups at age 5 may be explained by several factors. First is the variability in children's performance at this age. Children with and without disabilities may present with different functional abilities at this age, influenced by environmental opportunities and resources for performing and practicing those activities as well as by individual strengths and motivation for performing specific activities. Second, activities completed by children of this age have fewer cognitive, fine motor, and communication demands. Task simplicity also means that children with disabilities receiving intervention may be able to learn how to complete those tasks using operant intervention approaches. These approaches are more likely to be accessible to young children and children with disabilities. Third, the significant difference that emerges between children and youths with ASD and children without disabilities at older ages (10 and 15) suggests a slower rate of skill acquisition, an explanation that is consistent with conclusions drawn by other researchers (Fisch et al., 2002; Gabriels et al., 2007; Perry et al., 2009).

Limitations and Directions for Future Research

Several features of the study design and secondary data analysis limit the interpretations we can draw from our findings. First, we were unable to examine the relationship between impairment severity and adaptive behavior as measured by the PEDI–CAT because the initial study did not gather information that might be used for this purpose, such as IQ, communication style, or diagnostic measures such as the Social Communication Questionnaire. Second, uneven sample sizes, specifically the smaller diagnostic sample sizes, reduce the power to detect potentially subtle but meaningful differences between diagnostic groups. However, the sample size in this study is larger than those of previous studies investigating differences in adaptive behaviors among groups and is an important first step in investigating profiles of adaptive and functional behavior of children with ASDs.

Future research using the PEDI–CAT with children and youths with ASDs should investigate the relationship between impairment severity, age, and functional behavior. Especially valuable would be for a study using a measure of communication skills separate from the VABS, PEDI–CAT, or Autism Diagnostic Interview to allow investigation of the extent to which variance in adaptive behavior scores may be accounted for by communication deficits. Although researchers have recognized that variations in level of cognitive impairment are related to differences in adaptive behavior (Liss et al., 2001; Perry et al., 2009), the same level of attention has not been given to investigation of the influence of communication impairment. A second question in need of further research is the relation between scores on adaptive behavior measures and actual daily functioning at home, in school, and in the community.

Ongoing work to validate an ASD-specific version of the PEDI–CAT with a larger national sample of parents of children and youths with ASD (Kramer, Coster, Kao, Snow, & Orsmond, 2012) will provide evidence that the PEDI–CAT can be used in a consistent and valid manner with this population. The new study will provide the groundwork to establish the PEDI–CAT as an alternative measure of adaptive behavior for children with ASD that can evaluate the impact of cutting-edge interventions and therapies on their everyday function as they transition to adulthood. This version of the PEDI will also be available as a computer program (CAT) that reduces assessment time and respondent burden. The PEDI–CAT will select assessment items that are based on the parent's rating scale responses to previous items; it selects those items best able to provide a precise measure of a child's ability rather than items based on a standardized age range that may contain

tasks not relevant to a child's current needs and abilities. As a result, the PEDI–CAT will produce sensitive criterion domain scores that can be used to assess change over time.

Implications for Occupational Therapy Practice

The results of our study have the following implications for occupational therapy practice:

- The PEDI–CAT Social/Cognitive, Daily Activities, and Responsibility domains can differentiate children with ASD from children without disabilities.
- The PEDI–CAT can be used to identify the need for services to support effective management of daily life activities and routines for children and youths with ASD and IDD.
- Different impairment profiles may not result in different performance profiles in children and youths with disabilities.

Conclusion

Children and youths with ASD have significantly lower levels of adaptive behavior as measured by the PEDI–CAT Social/Cognitive, Daily Activities, and Responsibility domains than children without disabilities at ages 10 and 15. The PEDI–CAT can identify the need for services such as occupational therapy to support effective management of daily life activities and routines for children with ASD. However, we found no significant differences between children with ASD and those with IDD at any age. ▲

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This article is dedicated to the memory of our colleague Stephen Haley, whose passion to improve services and outcomes for children with disabilities guided the development of the original Pediatric Evaluation of Disability Inventory and its recent revision. We will miss his intellect, passion, warmth, and humor.

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