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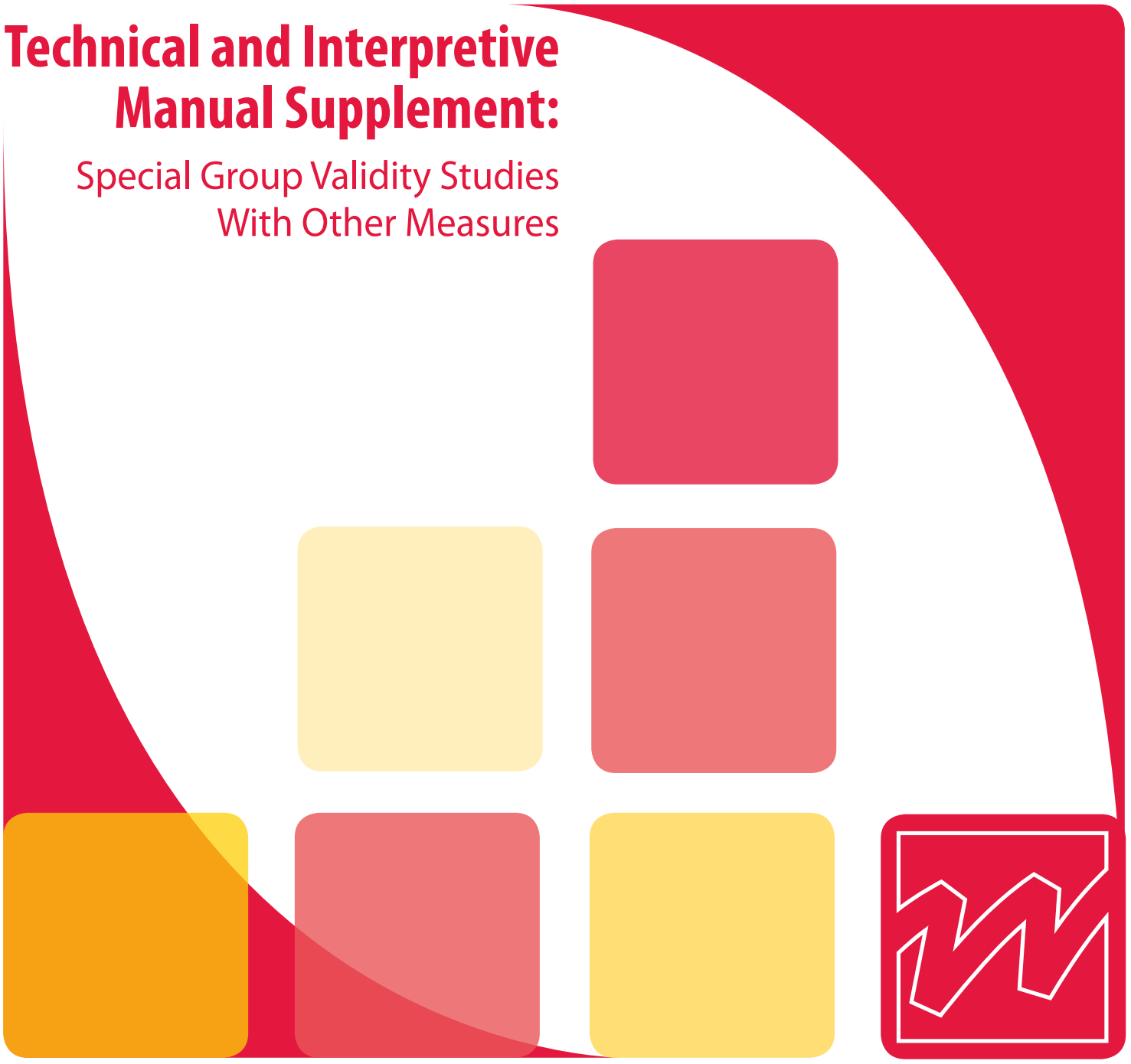
Technical and Interpretive Manual Supplement:

Special Group Validity Studies With Other Measures



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SCALE OF INTELLIGENCE — FOURTH EDITION

Technical and Interpretive Manual Supplement:

Special Group Validity Studies With Other Measures

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Introduction

During the initial phases of test conceptualization and development for the *Wechsler Preschool and Primary Scale of Intelligence–Fourth Edition* (WPPSI–IV; Wechsler, 2012), practitioners were asked about the types of young children they most frequently tested with the *Wechsler Preschool and Primary Scale of Intelligence–Third Edition* (WPPSI–III; Wechsler, 2002). They were also asked to identify any other measures they frequently used in conjunction with the WPPSI–III as part of those evaluations. Based on this feedback, a number of the special group samples were administered measures in addition to the WPPSI–IV during the scale's standardization. Results from these studies provide additional evidence of concurrent convergent and discriminant validity, as well as additional validity evidence supporting its use with special populations.

Eight special group studies were targeted for validity studies using the WPPSI–IV in conjunction with other measures, including Intellectual Disability, Preliteracy Concerns, Attention-Deficit/Hyperactivity Disorder (ADHD), Disruptive Behavior, Expressive Language Disorder, Mixed Receptive-Expressive Language Disorder, Autistic Disorder, and Asperger's Disorder. Table 1 provides sample sizes and demographic data for the WPPSI–IV special group studies with other measures. The mean age of each sample is reported, as well as percentages of sample representation by sex, race/ethnicity, parent education level, and geographic region. Chapter 5 of the *WPPSI–IV Technical and Interpretive Manual* describes the results of studies comparing the performance of special groups in this supplement to matched control groups from the normative sample. Appendix E of the Manual lists specific inclusion criteria for each special group.

Table 1 Demographic Data for the Validity Studies With Other Measures in Special Groups

	Special Group													
	ID	PLC	ADHD			DB	ELD	RELD	AUT			ASP		
	Vineland–II	NEPSY–II	NEPSY–II	BASC–2 PRS	Brown ADD	BASC–2 PRS	CELF Preschool–2	CELF Preschool–2	Vineland–II	NEPSY–II	BASC–2 PRS	Vineland–II	NEPSY–II	BASC–2 PRS
N	52	29	38	49	40	25	19	37	36	34	37	30	33	37
Age														
Mean	5.2	6.2	6.0	5.9	5.8	6.2	5.1	5.2	5.5	5.7	5.5	6.3	6.3	6.3
SD	1.4	0.6	1.1	1.2	1.3	0.8	0.8	0.7	1.2	1.2	1.3	0.8	0.8	0.9
Sex														
Female	30.8	55.2	26.3	24.5	27.5	8.0	52.6	35.1	22.2	17.6	18.9	20.0	18.2	21.6
Male	69.2	44.8	73.7	75.5	72.5	92.0	47.4	64.9	77.8	82.4	81.1	80.0	81.8	78.4
Race/Ethnicity														
African American	13.5	—	2.6	10.2	2.5	12.0	—	10.8	5.6	8.8	8.1	3.3	—	2.7
Asian	—	—	—	—	—	—	—	2.7	—	—	—	3.3	3.0	2.7
Hispanic	5.8	13.8	13.2	10.2	7.5	12.0	10.5	18.9	27.8	23.5	24.3	16.7	15.2	16.2
White	78.8	72.4	73.7	75.5	82.5	76.0	89.5	62.2	58.3	58.8	59.5	73.3	72.7	73.0
Other	1.9	13.8	10.5	4.1	7.5	—	—	5.4	8.3	8.8	8.1	3.3	9.1	5.4
Parent Education														
≤8 years	5.8	—	—	—	—	—	—	—	—	—	—	—	—	—
9–11 years	23.1	6.9	15.8	16.3	12.5	16.0	—	13.5	11.1	8.8	10.8	3.3	—	2.7
12 years	30.8	41.4	23.7	24.5	25.0	48.0	15.8	24.3	27.8	26.5	24.3	23.3	24.2	27.0
13–15 years	15.4	41.4	36.8	30.6	35.0	24.0	36.8	35.1	36.1	41.2	40.5	16.7	18.2	16.2
≥16 years	25.0	10.3	23.7	28.6	27.5	12.0	47.4	27.0	25.0	23.5	24.3	56.7	57.6	54.1
Geographic Region														
Midwest	28.8	20.7	36.8	34.7	40.0	28.0	15.8	29.7	25.0	23.5	24.3	20.0	18.2	16.2
Northeast	3.8	24.1	10.5	14.3	10.0	8.0	10.5	13.5	11.1	8.8	8.1	10.0	9.1	10.8
South	55.8	17.2	39.5	40.8	40.0	44.0	26.3	21.6	44.4	50.0	48.6	33.3	36.4	37.8
West	11.5	37.9	13.2	10.2	10.0	20.0	47.4	35.1	19.4	17.6	18.9	36.7	36.4	35.1

Note. Except for sample size (*N*) and age, data are reported as percentages. Special group abbreviations are: ID = Intellectual Disability, PLC = Preliteracy Concerns, ADHD = Attention-Deficit/Hyperactivity Disorder, DB = Disruptive Behavior, ELD = Expressive Language Disorder, RELD = Mixed Receptive-Expressive Language Disorder, AUT = Autistic Disorder, ASP = Asperger's Disorder.

Brief Descriptions of Other Measures

Children in each of the identified special group samples were administered the WPPSI–IV, as well as portions or complete versions of the following measures: the *Vineland Adaptive Behavior Scales–Second Edition* (Vineland–II; Sparrow, Cicchetti, & Balla, 2005), the NEPSY–II (Korkman, Kirk, & Kemp, 2007), the parent rating scale from the *Behavior Assessment System for Children–Second Edition* (BASC–2 PRS; Reynolds & Kamphaus, 2004), the *Brown Attention-Deficient Disorder Scales for Children and Adolescents* (Brown ADD; Brown, 2001), and the *Clinical Evaluation of Language Fundamentals Preschool–Second Edition* (CELF Preschool–2; Semel, Wiig, & Secord, 2004). The following sections provide a brief summary of each measure. Please refer to each measure's published materials for additional information on appropriate uses, psychometric properties, and other relevant information.

Vineland–II

The Vineland–II is an individually administered measure of adaptive behavior for ages 0–90. It measures adaptive behavior in four broad domains: Communication, Daily Living Skills, Socialization, and Motor Skills. It also includes a Maladaptive Behavior Domain to measure problem behaviors. Each domain includes a number of subdomains, but not all subdomain scores are available for ages 2:6–7:7. Thus, the Vineland–II results reported in this supplement only include scores for the Receptive Communication and Expressive Communication subdomains, the Internalizing and Externalizing behavior subdomains, and the Fine and Gross motor skill subdomains.

The Parent/Caregiver Rating Form of the Vineland–II was administered to the caregivers of children in the Intellectual Disability, Autistic Disorder, and Asperger's Disorder special group studies. Hypotheses specific to each special group about the relations between WPPSI–IV and Vineland–II scores are noted within the results section for each special group. However, a number of general predictions about the relations between WPPSI–IV and Vineland–II scores can be made for all three of the special group studies. Based on a study between the WISC–IV and a measure of adaptive behavior in a nonclinical sample (Wechsler, 2003), it was expected that the WPPSI–IV composite scores would relate most closely to the Communication domain. It was also anticipated that the Vineland–II Communication domain and Receptive and Expressive Communication subdomains would correlate more highly with the VCI and the Verbal Comprehension subtests than with other WPPSI–IV primary index scores or subtests.

NEPSY–II

The NEPSY–II is a comprehensive instrument designed to measure neuropsychological development in preschool and school-age children. Results obtained from a NEPSY–II assessment inform diagnoses and aid in intervention planning for a variety of childhood disorders. It does not provide composite scores; only scores at the subtest level are available. The NEPSY–II subtests measure a broad range of neuropsychological functioning across six domains. As with the WPPSI–IV subtests, the NEPSY–II subtest scores are scaled to a mean of 10 with a *SD* of 3 and a range of 1–19.

For each special group that participated in a NEPSY–II study (i.e., Preliteracy Concerns, ADHD, Autistic Disorder, and Asperger's Disorder), a subset of subtests from the six functional domains was selected based on their relevance to common referral questions and clinical conditions in early childhood. The subtests were selected from the following: from the Social Perception domain, the Affect Recognition and Theory of Mind subtests; from the Memory and Learning domain, the Memory for Faces, Memory for Designs, and Narrative Memory subtests; from the Language domain, the Phonological Processing and Speeded Naming subtests; and from the Attention and Executive Functioning domain, the Inhibition, Auditory Attention, and Statue subtests. The Memory for Faces subtest, which taps a very specific type of memory ability, is also described as a Social Perception domain subtest.

BASC–2 PRS

The BASC–2 PRS is a rating scale used to collect information about children's observable behaviors. Results provide insight into a child's behavior and personality, both adaptive and clinical. It is part of the BASC–2, a multimethod, multidimensional system for ages 2:0–25:11, which is used to facilitate differential diagnosis and educational classification of emotional and behavioral disorders.

Three scales of the BASC–2 PRS were selected for several WPPSI–IV special group validity studies (i.e., ADHD, Disruptive Behavior, Autistic Disorder, and Asperger's Disorder) to provide more information about the relation of cognitive ability with specified dimensions of behavior. The selected BASC–2 PRS scales were: Attention Problems (i.e., tendency toward distraction and inability to sustain concentration), Executive Functioning (i.e., ability to control behavior through the use of planning, anticipation, inhibition, or maintenance of goal-directed activity and reacting appropriately to the environment), and Emotional Self-Control (i.e., affect and emotional regulation in response to the environment). Although Executive Functioning and Emotional Self-Control may seem to be positive traits, higher scores on these scales indicate poorer executive functioning and poorer emotional self-control, respectively

Brown ADD

Selected as an additional measure for the WPPSI–IV ADHD special group study, the Brown ADD uses an executive functioning model to measure symptoms of attention-deficit disorders. The scale yields various cluster scores, including Activation (i.e., organizing, prioritizing, and activating to work); Focus (i.e., focusing, sustaining, and shifting attention to tasks), Effort (i.e., regulating alertness, sustaining effort, and processing speed), Emotion (i.e., managing frustration and modulating emotion), Memory (i.e., utilizing working memory and accessing recall), and Action (i.e., monitoring and self-regulating action). The ADD Inattention Total and ADD Combined Total scores are also available. The Brown ADD scores are scaled to *T* scores, with a mean of 50 and a *SD* of 10. Higher scaled scores generally indicate more pronounced ADHD symptoms.

CELF Preschool–2

The CELF Preschool–2 is an individually administered test for identifying, diagnosing, and performing follow-up evaluations of language deficits in children aged 3:0–6:11. For this reason, it was administered to children in the WPPSI–IV Expressive Language Disorder and Mixed Receptive-Expressive Language Disorder special group studies. The CELF Preschool–2 provides a number of composite scores, including a Receptive Language Index, an Expressive Language Index, a Language Content Index, a Language Structure Index, as well as a Core Language Score. Subtests that contribute to each composite score measure more discrete areas of language functioning.

Results of Special Group Validity Studies With Other Measures

Intellectual Disability

Correlations With the Vineland–II

The Vineland–II was administered to parents or caregivers of 52 children with Intellectual Disability-Mild or -Moderate severity aged 2:6–7:6, with a testing interval of 0–35 days following the WPPSI–IV testing and a mean testing interval of 4 days. In addition to the general hypotheses described earlier, it was expected that both the Communication and the Socialization domains would relate most highly to the WPPSI–IV composite scores due to results from a study with a sample of children with intellectual disability (Wuang & Su, 2011). Table 2 presents the means, *SD*s, and correlation coefficients for this study.

Table 2 Correlations Between the WPPSI–IV and the Vineland–II for the Intellectual Disability Group

WPPSI–IV Subtest/Process/ Composite Score	Vineland–II Subdomain					
	Receptive Communication	Expressive Communication	Fine Motor Skills	Gross Motor Skills	Internalizing Behavior	Externalizing Behavior
IN	.39	.48	.48	.23	.04	–.04
SI	.51	.51	.37	.56	–.26	–.16
VC	.27	.55	.22	.41	–.05	–.07
CO	.40	.61	.39	.31	.22	.11
RV	.38	.40	.39	.36	.10	.07
PN	.46	.51	.40	.30	–.06	.17
BD	.48	.47	.48	.28	.01	–.03
OA	–.02	.21	.36	.02	.15	–.10
MR	.14	.50	.05	.26	–.03	.06
PC	.06	.47	.12	.49	–.07	–.06
PM	.42	.42	.35	.26	.15	.15
ZL	.51	.43	.49	.28	–.02	.05
BS	.38	.57	.47	.47	.06	.22
CA	.32	.63	.30	.42	.17	.21
AC	.24	.48	.25	.30	–.08	.16
CAR	.34	.62	.33	.41	.14	.17
CAS	.31	.60	.28	.39	.15	.21
VCI	.54	.62	.53	.46	–.06	–.06
VSI	.30	.42	.50	.20	.09	–.08
FRI	.15	.58	.13	.40	–.06	–.01
WMI	.49	.47	.45	.30	.08	.09
PSI	.43	.71	.45	.48	.15	.26
FSIQ	.58	.71	.58	.44	.07	.15
VAI	.50	.59	.51	.40	.05	.13
NVI	.53	.67	.53	.40	.06	.19
GAI	.58	.73	.58	.44	.00	.01
CPI	.48	.70	.42	.48	.15	.20
Vineland–II						
Mean	8.6	8.7	9.4	10.6	17.5	16.1
SD	2.8	2.4	2.0	1.8	2.1	2.4
n	49	50	48	47	46	48

(continued)

Table 2 Correlations Between the WPPSI–IV and the Vineland–II for the Intellectual Disability Group *(continued)*

WPPSI–IV Subtest/Process/ Composite Score	Vineland–II Domain					WPPSI–IV		
	Communication	Daily Living Skills	Socialization	Motor Skills	Maladaptive Behavior Index	Mean	*SD*	*n*
IN	.48	.48	.53	.40	.08	2.8	2.2	52
SI	.55	.47	.48	.49	–.33	2.6	1.8	38
VC	.39	.45	.43	.35	–.09	3.3	1.9	38
CO	.50	.44	.55	.38	.13	3.4	2.1	38
RV	.44	.43	.49	.45	.14	3.0	2.7	52
PN	.55	.43	.52	.40	.06	2.9	1.6	52
BD	.54	.42	.53	.47	.07	2.5	1.8	51
OA	.17	.19	.16	.21	.00	3.2	1.8	52
MR	.32	.25	.25	.16	–.06	3.2	1.7	38
PC	.23	.26	.25	.34	–.12	3.3	2.1	38
PM	.47	.42	.50	.35	.23	3.6	2.4	52
ZL	.55	.53	.63	.43	.07	3.7	2.5	52
BS	.54	.47	.58	.50	.23	2.8	2.5	37
CA	.47	.50	.46	.42	.17	3.8	3.0	38
AC	.37	.32	.25	.32	–.04	3.3	2.2	37
CAR	.49	.51	.47	.43	.15	3.9	3.2	38
CAS	.45	.48	.46	.37	.17	4.1	3.3	38
VCI	.64	.58	.64	.55	–.09	60.3	11.2	52
VSI	.45	.37	.44	.41	.05	58.7	10.0	51
FRI	.35	.31	.32	.29	–.10	61.1	11.2	38
WMI	.55	.50	.59	.42	.14	62.9	13.9	52
PSI	.61	.56	.61	.51	.23	61.6	15.7	37
FSIQ	.73	.63	.71	.58	.14	55.9	10.1	50
VAI	.61	.55	.61	.52	.12	61.1	11.7	52
NVI	.67	.59	.67	.53	.16	57.3	10.3	50
GAI	.74	.62	.69	.58	.00	55.6	9.7	51
CPI	.61	.57	.62	.49	.20	55.6	14.4	37
Vineland–II								
Mean	64.3	68.0	72.4	69.8	17.5			
SD	12.7	15.6	12.7	9.7	2.0			
n	50	50	48	45	45			

The mean WPPSI–IV primary index scores for this sample range from 58.7 (VSI) to 62.9 (WMI), and the mean FSIQ is 55.9. The mean Vineland–II domain scores range from 64.3 (Communication) to 72.4 (Socialization). The mean WPPSI–IV primary index scores and FSIQ therefore are in the extremely low range, and the mean Vineland–II domain scores are between approximately 2 to 2.5 *SD*s below the mean.

Correlations between the primary index scores and Vineland–II domain scores range from .29 (for FRI–Motor Skills) to .64 (for VCI–Communication and VCI–Socialization). Correlations between the FSIQ and Vineland–II domain scores are generally higher, ranging from .58 (Motor Skills) to .73 (Communication). Overall, the correlations of WPPSI–IV primary index scores and the FSIQ with the Vineland–II domains are moderately high. As expected, the Communication domain score is more highly correlated with the WPPSI–IV primary index scores and the FSIQ than other domain scores. Socialization represented the lone exception; it is slightly more highly correlated with the WMI than is Communication. The VCI is more highly correlated with Communication and Socialization than with other domain scores, and shows moderately high correlations with all Vineland–II domain scores. The VSI and FRI are most highly correlated

with the Communication domain among all of the Vineland–II domain scores. The WMI and the PSI are more highly correlated with the Communication and Socialization domain scores than with the other Vineland–II domain scores. The FSIQ is most highly correlated with Communication and Socialization of all Vineland–II domain scores. Similar correlations Between the WPPSI–IV composites and the Vineland–II domain scores are observed at the ancillary index score level.

As anticipated, the Vineland–II Communication domain and the Receptive and Expressive Communication subdomains generally correlate more highly with the VCI and the Verbal Comprehension subtests than with other WPPSI–IV primary index scores or subtests. A few exceptions are noted. At the composite level, the PSI is slightly more highly correlated with Expressive Communication than the VCI, and at the subtest level, the Processing Speed subtests are more highly correlated with Expressive Communication than expected. These results are consistent with research indicating a close relationship between language and motor development in early childhood (Brassard & Boehm, 2007).

As further evidence of the link between cognitive and motor development in early childhood, Block Design, Picture Memory, and Zoo Locations share moderate correlations with the Communication subdomains that exceeded some of the correlations between the Verbal Comprehension subtests and Communication subdomains. Some WPPSI–IV subtests with motor requirements (Block Design, Object Assembly, and Zoo Locations) tended to correlate more highly with the Fine Motor Skills subdomain than with the Gross Motor Skills subdomain. Interestingly, the same is not true of the WPPSI–IV Processing Speed subtests. This finding suggests success in reducing the fine motor skill requirements of these subtests through use of the ink dauber.

Overall, the pattern of correlations between cognitive and adaptive functioning underscores the importance of measuring both domains when evaluating children with intellectual disability. The results of this study provide some information about the overlap of these related areas in children with intellectual ability, as well as additional evidence of the WPPSI–IV's convergent and discriminant validity.

Preliteracy Concerns

Correlations With the NEPSY–II

The WPPSI–IV and the Phonological Processing and Speeded Naming subtests from the Language domain of the NEPSY–II were administered to 29 children with preliteracy concerns, aged 5:0–7:5, with a testing interval of 0–44 days and a mean testing interval of 14 days. These subtests were selected because they represent basic cognitive processes involved in reading development. It was anticipated that the VCI and the VAI would share the strongest relations with the NEPSY–II Language subtests for children in this special group. Table 3 presents the means, *SD*s, and correlation coefficients for this study.

Table 3 Correlations Between the WPPSI–IV and the NEPSY–II for the Preliteracy Concerns Group

WPPSI–IV Subtest/Process/ Composite Score	NEPSY–II Subtests			WPPSI–IV		
	PH	SN Total Completion Time	SN Combined	Mean	*SD*	*n*
IN	.38	.00	.10	8.6	2.3	29
SI	.15	.18	.44	7.8	2.6	29
VC	.25	.11	.29	8.3	3.1	29
CO	.18	.10	.25	8.2	2.9	29
RV	.47	.27	.38	8.9	2.6	29
PN	.07	−.17	−.09	8.8	2.3	29
BD	.58	.55	.56	8.3	1.8	28
OA	.29	.03	.18	8.9	2.5	29
MR	−.01	.25	.25	8.7	2.4	29
PC	.50	.30	.43	8.6	2.2	29
PM	.11	.27	.41	8.4	3.1	29
ZL	.31	.17	.28	9.0	2.4	29
BS	.29	.01	.07	8.9	2.3	29
CA	−.32	−.19	−.26	9.5	2.7	29
AC	.08	.03	−.01	8.4	2.1	29
CAR	−.37	−.30	−.33	9.7	2.9	29
CAS	−.13	−.03	−.13	9.6	2.8	29
VCI	.30	.14	.34	89.5	10.7	29
VSI	.46	.30	.42	91.9	10.5	28
FRI	.28	.32	.40	92.0	11.0	29
WMI	.25	.30	.46	92.4	12.5	29
PSI	−.04	−.11	−.13	95.5	12.6	29
FSIQ	.37	.34	.53	88.8	10.1	28
VAI	.33	.07	.19	93.1	11.4	29
NVI	.39	.41	.54	89.9	11.2	28
GAI	.37	.34	.51	88.9	9.7	28
CPI	.11	.09	.19	92.8	12.3	29
NEPSY–II						
Mean	7.0	7.4	7.5			
SD	2.5	4.0	3.3			
n	29	29	29			

Note. NEPSY–II abbreviations are: PH = Phonological Processing, SN = Speeded Naming.

The WPPSI–IV mean index scores range from 88.9 (GAI) to 95.5 (PSI), and the mean FSIQ is 88.8. The mean NEPSY–II Language subtest scaled scores range from 7.0 to 7.5. Thus, the mean WPPSI–IV composite scores are in the low average to average range, and the mean NEPSY–II subtest scores are approximately one *SD* below the mean.

At the primary index score level, the VSI is most highly correlated with the NEPSY–II language subtests. These findings are consistent with results of the special group study described in Chapter 5 of the *WPPSI–IV Technical and Interpretive Manual*, wherein differences between the mean VSI scores of the Preliteracy Concerns and matched control groups yielded the largest effect size at the primary index score level. This result underscores the important link of visual spatial abilities with language development and early reading skills that include phonological processing and rapid automatized naming. The VCI and the VAI share small correlations with the NEPSY–II subtests, and the FSIQ, NVI, and GAI share small to moderate correlations with the NEPSY–II subtests. The correlations of the NVI and the NEPSY–II subtests in this special group suggest that the correlations between these WPPSI–IV composite scores and the NEPSY–II Language subtests are probably not related exclusively to expressive demands but are more broadly related to intellectual ability.

The WPPSI–IV subtest that is most highly related to the NEPSY–II subtests is Block Design. The Verbal Comprehension subtests generally share low to moderate correlations with the NEPSY–II Language subtests. Receptive Vocabulary shares relatively higher correlations with these NEPSY–II subtests than do the other Verbal Comprehension subtests, consistent with prior research indicating receptive vocabulary as a relative weakness for children at risk for reading problems (Lonigan, Burgess, & Anthony, 2000; Mann, Cowin, & Schoenheimer, 1989). Hence, the results of this study are consistent with expectations derived from the literature on children with preliteracy concerns.

Attention-Deficit/Hyperactivity Disorder

The children in the ADHD study were also administered portions of the NEPSY–II, the BASC–2 PRS, and the Brown ADD. Prior to WPPSI–IV testing, the children underwent a minimum 24-hour period without psychostimulant medications. Because sample sizes and testing intervals vary with each of these measures, this information is reported separately in the following sections.

Correlations With the NEPSY–II

The WPPSI–IV and the NEPSY–II Inhibition, Auditory Attention, and Statue subtests were administered to 38 children with ADHD, aged 4:1–7:6, with a testing interval of 0–29 days and a mean testing interval of 5 days. These subtests were selected because ADHD is associated with inattention symptoms that overlap conceptually with executive function (Hale et al., 2012; Martinussen, Hayden, Hogg-Johnson, & Tannock, 2005).

Because working memory is related to both attention and executive function, it was expected that the WMI and Working Memory subtests would correlate moderately with the NEPSY–II subtests for this special group. Because verbal comprehension and perceptual reasoning ability are relatively preserved in children with ADHD and because their global intellectual functioning only displays mild impairment in some studies (Hale et al., 2012), it was anticipated that the WPPSI–IV scores that are conceptually related to these abilities would not show a high correlation with the NEPSY–II subtests for this special group.

Prior studies suggest that children with ADHD may perform lower on measures of processing speed (Martinussen et al., 2005; Mayes, Calhoun, Chase, Mink, & Stagg, 2009; Mayes, Calhoun, Mayes, & Molitoris, 2012). It was therefore expected that the PSI and Processing Speed subtests would share a moderate correlation with the NEPSY–II subtests for this special group. It was predicted that the CPI would additionally share moderate correlations with the NEPSY–II subtests, because the CPI is derived from Working Memory and Processing Speed subtests. Table 4 presents the means, *SD*s, and correlation coefficients for this study.

Table 4 Correlations Between the WPPSI–IV and the NEPSY–II for the Attention-Deficit/Hyperactivity Disorder Group

	NEPSY–II Subtests								WPPSI–IV		
WPPSI–IV Subtest/Process/ Composite Score	**INN Total Completion Time**	**INN Combined**	**INI Total Completion Time**	**INI Combined**	**IN Total Errors**	**AA Total Correct**	**AA Combined**	**ST**	**Mean**	***SD***	***n***
IN	.12	.26	–.06	.08	.19	.01	.03	.48	9.1	2.2	38
SI	.21	.36	.05	.28	.30	.13	.19	.48	8.4	2.4	38
VC	–.05	.04	–.24	–.02	–.01	–.24	–.22	.09	8.4	2.2	38
CO	.17	.21	–.11	–.09	.08	–.04	–.08	.38	8.1	2.9	38
RV	.04	.09	.39	.43	.31	–.16	–.03	.36	9.3	1.9	38
PN	.22	.20	.06	.06	.10	–.04	–.04	–.04	9.4	2.7	38
BD	.13	.15	.05	.11	.07	.09	.05	.23	9.7	2.7	38
OA	.11	–.09	.27	.12	.08	–.01	.01	.17	10.2	3.0	38
MR	–.11	.22	–.05	.11	.26	.04	.08	.23	8.9	2.5	38
PC	.25	.38	.21	.39	.33	.37	.34	.22	8.8	2.6	38
PM	–.02	.04	–.35	–.02	.17	.33	.37	.06	9.0	2.7	38
ZL	.14	.21	–.10	.10	.28	.16	.14	.31	9.1	3.3	38
BS	.26	.41	.39	.47	.50	.14	.26	.26	8.7	3.3	38
CA	.21	.27	.20	.25	.25	.07	.13	.49	8.7	3.0	38
AC	.41	.46	.11	.30	.45	.29	.28	.17	8.4	3.0	38
CAR	.32	.30	.28	.29	.30	.15	.19	.41	8.8	2.9	38
CAS	.15	.28	.15	.20	.23	–.03	.04	.49	9.0	3.0	38
VCI	.20	.35	.04	.22	.29	.08	.13	.56	92.8	10.5	38
VSI	.14	.02	.18	.13	.08	.05	.04	.22	100.1	14.2	38
FRI	.08	.36	.09	.29	.35	.22	.23	.26	93.1	12.3	38
WMI	.06	.14	–.30	.03	.27	.34	.34	.24	94.2	14.2	38
PSI	.31	.45	.38	.47	.49	.14	.26	.43	92.9	14.9	38
FSIQ	.13	.35	.01	.26	.39	.20	.26	.48	92.4	11.7	38
VAI	.21	.22	.23	.25	.23	–.11	–.04	.18	96.3	10.1	38
NVI	.18	.39	.09	.36	.45	.29	.35	.30	93.0	12.7	38
GAI	.11	.31	.01	.20	.27	.08	.12	.52	93.5	11.3	38
CPI	.25	.39	.05	.35	.52	.30	.38	.43	92.1	13.7	38
NEPSY–II											
Mean	9.0	7.2	9.3	7.6	6.2	9.2	8.5	6.4			
SD	4.0	4.1	3.7	3.5	3.8	2.9	3.3	3.5			
n	27	27	26	26	26	28	28	32			

Note. NEPSY–II abbreviations are: INN = Inhibition Naming, INI = Inhibition Inhibition, IN = Inhibition, AA = Auditory Attention, ST = Statue.

The mean WPPSI–IV primary index scores range from 92.8 (VCI) to 100.1 (VSI), and the mean FSIQ is 92.4. The ancillary index scores range from 92.1 (CPI) to 96.3 (VAI). The mean NEPSY–II subtest scaled scores range from 6.2 to 9.3. The mean WPPSI–IV composite scores are in the average range, and the NEPSY–II subtest scores range from slightly below the mean to greater than 1 *SD* below the mean.

At the composite level, the PSI shows consistent moderate correlations with the NEPSY–II Inhibition and Statue subtest scores, whereas the WMI is more closely related to the Auditory Attention subtest. The VCI and the FRI generally share low to moderate correlations with the NEPSY–II subtests. The VCI, in particular, is moderately correlated with the Statue subtest, which may reflect the shared auditory stimulus for both subtests. The low to moderate correlations of the FRI with the NEPSY–II subtests are not surprising, as fluid reasoning has also been identified as a weakness for children with ADHD (Hale et al., 2012). These findings may have been obscured in previous studies prior to the separation of Visual Spatial and Fluid Reasoning factors in the WPPSI–IV, because the VSI is relatively unrelated to the NEPSY–II subtests.

The FSIQ generally shares low correlations with the NEPSY–II subtests. However, a pattern of moderate correlations is observed between the FSIQ and the NEPSY–II subtests with lower group means. This is not surprising, as lower FSIQ scores appear to be associated with more impaired executive functions and inattention symptoms in children with ADHD (Hale et al., 2012). As expected, the CPI also shares moderate correlations with the NEPSY–II subtests.

The relations at the subtest level are relatively consistent with those observed at the composite level. Picture Concepts, Bug Search, and Animal Coding are most consistently related with the NEPSY–II subtests. The Verbal Comprehension subtests generally share moderately high correlations with Statue. Of the Working Memory subtests, Picture Memory is most highly correlated with Auditory Attention, whereas Zoo Locations is most highly correlated with Inhibition and Statue. The results of this study are generally consistent with expectations for the relations between the WPPSI–IV scores and the NEPSY–II Attention and Executive Functioning subtest scores among children with ADHD. Additional research is needed to determine if this pattern of relationships among cognitive processes is noted in children with varying types and severity of ADHD.

Correlations With the BASC–2 PRS

The WPPSI–IV was administered to 49 children with ADHD, aged 3:1–7:6, and the caregivers of these children completed selected scales from the BASC–2 PRS on the same day. Because attention issues are a primary feature of ADHD and executive functioning problems are inherent in its symptoms, it was expected that the WPPSI–IV scores would show inverse correlations with Attention Problems and Executive Functioning scales in this sample. Table 5 presents the means, *SD*s, and correlation coefficients for this study.

Table 5 Correlations Between the WPPSI–IV and the BASC–2 PRS for the Attention-Deficit/Hyperactivity Disorder Group

WPPSI–IV Subtest/Process/ Composite Score	BASC–2 PRS Scale			WPPSI–IV		
	Attention Problems	Executive Functioning	Emotional Self-Control	Mean	*SD*	*n*
IN	–.20	.06	.27	9.4	2.8	49
SI	–.19	.01	.08	8.8	2.5	46
VC	–.14	.06	.20	8.8	2.6	46
CO	–.26	.02	.26	8.3	2.9	46
RV	–.04	.08	.26	9.3	2.2	49
PN	–.04	.10	.22	9.5	2.9	49
BD	–.05	–.17	.04	9.4	2.5	49
OA	–.07	–.10	.07	10.0	3.0	49
MR	–.05	.00	.16	9.3	2.2	46
PC	–.15	–.14	.01	9.1	2.5	45
PM	.17	.14	.17	9.1	2.7	49
ZL	.03	.16	.32	9.0	3.3	49
BS	–.10	.17	.25	8.6	3.2	46
CA	–.16	.07	.24	8.6	2.8	46
AC	.01	.22	.35	8.4	2.9	46
CAR	–.04	.10	.27	8.6	2.7	46
CAS	–.25	–.04	.12	9.0	2.8	46
VCI	–.19	.03	.20	94.3	13.2	49
VSI	–.07	–.15	.07	98.5	13.5	49
FRI	–.15	–.06	.11	94.9	11.3	45
WMI	.10	.17	.30	94.3	14.4	49
PSI	–.16	.13	.29	92.2	14.0	46
FSIQ	–.07	.08	.28	92.9	12.0	49
VAI	–.05	.10	.27	96.5	12.0	49
NVI	.01	.04	.23	92.9	11.9	48
GAI	–.12	–.02	.21	94.3	12.1	49
CPI	–.08	.17	.34	92.2	13.5	46
BASC–2 PRS						
Mean	68.1	68.4	67.2			
SD	6.9	11.2	13.8			
n	49	49	49			

The mean WPPSI–IV index scores and FSIQ are in the average range, with all composite scores falling between 92.2 (PSI and CPI) and 98.5 (VSI). The BASC–2 PRS scores are in the at-risk range, falling between 67.2 (Emotional Self-Control) and 68.4 (Executive Functioning). As expected, with the exception of the WPPSI–IV WMI and Working Memory subtests, generally low inverse correlations are observed between the WPPSI–IV scores and the Attention Problems and Executive Functioning scales.

In contrast, the WPPSI–IV correlations with the Emotional Self-Control scale are relatively higher than those with the other BASC–2 PRS scales, and they are in the positive direction. In particular, the highest positive correlations of WPPSI–IV composite scores with the BASC–2 PRS are observed between the WMI, PSI, and CPI and the Emotional Self-Control scale. Whereas the *Diagnostic and Statistical Manual of Mental Disorders*, Fourth Edition, Text Revision (*DSM–IV–TR;* American Psychiatric Association, 2000) does not specify problems with regulating emotion as a criterion for ADHD diagnosis, some ADHD models argue for its inclusion as a core feature (Barkley, 2010). One possible explanation for the positive correlations with the Emotional Self-Control scale may lie in the 24-hour medication washout required for this study. The children's caregivers rated them based on the past six months; it is possible that the children

rated lower on the Emotional Self-Control scale were those responding best to medication. Because the children did not take psychostimulant medications 24 hours prior to WPPSI–IV testing, perhaps the children who were well-controlled on medications performed worse on the WPPSI–IV than they would have if they had taken their medication that day. A similar finding is noted in this supplement for a study of children with ADHD and the Brown ADD.

In further support of this hypothesis, correlations between the other BASC–2 PRS scales and the WMI, CPI, and the Working Memory subtests are in the positive direction, whereas no such patterns are evident in the nonclinical study. Because psychostimulants act, in part, on the prefrontal cortex and working memory is associated with the prefrontal cortex, it seems possible that medication cessation may have affected performance on the Working Memory subtests. These results suggest that among children with ADHD, cognitive abilities share complex relations with attention, executive function, and low emotional control that require further study.

Correlations With the Brown ADD

The WPPSI–IV was administered to 40 children with ADHD, aged 3:1–7:6, and their caregiver completed the Brown ADD. The testing interval ranged from 0–29 days, and the mean testing interval was 3 days.

Due to results from a study using an adult sample (Wechsler, 2008), low to moderate inverse correlations between the Brown ADD scores and the VCI, VSI, FRI, WMI, and PSI were anticipated, with slightly higher correlations between the WMI and the Brown ADD scores than between other WPPSI–IV primary index scores and the Brown ADD scores. Similar patterns were expected at the subtest level. Cancellation was expected to display relatively high correlations with Brown ADD scores based on prior results using an adult sample (Wechsler, 2008). Table 6 presents the means, *SD*s, and correlation coefficients for this study.

Table 6 Correlations Between the WPPSI–IV and the Brown ADD for the Attention-Deficit/Hyperactivity Disorder Group

	Brown ADD Scores								WPPSI–IV		
WPPSI–IV Subtest/Process/ Composite Score	Activation	Focus	Effort	Emotion	Memory	ADD Inattention Total	Action	ADD Combined Total	Mean	*SD*	*n*
IN	.06	–.44	–.31	.23	–.35	–.25	–.17	–.24	9.1	2.6	40
SI	–.03	–.17	–.18	–.24	–.15	–.26	.09	–.19	8.8	2.5	37
VC	–.06	–.47	–.28	–.32	–.42	–.48	–.07	–.41	8.9	2.2	37
CO	–.12	–.40	–.05	.03	–.38	–.27	–.15	–.26	8.6	2.8	37
RV	–.15	–.37	–.15	–.01	–.43	–.29	–.28	–.31	9.4	2.0	40
PN	.23	–.16	–.13	.03	–.31	–.12	–.05	–.08	9.3	2.9	40
BD	–.23	–.24	–.19	.15	–.30	–.24	–.01	–.20	9.5	2.7	40
OA	–.20	–.15	–.14	.26	–.12	–.08	–.26	–.14	9.8	3.1	40
MR	.01	–.19	–.34	–.03	–.45	–.31	–.04	–.26	9.1	2.5	37
PC	.11	–.14	.04	–.01	–.21	–.08	.11	–.01	8.9	2.6	37
PM	–.08	–.53	–.29	–.05	–.31	–.34	–.14	–.35	9.0	2.7	40
ZL	.23	–.18	.06	.16	–.07	.05	–.06	.05	8.9	3.4	40
BS	.05	–.20	–.18	.18	–.28	–.14	–.18	–.14	8.9	3.3	37
CA	–.03	–.15	–.01	.36	–.05	.03	–.16	.00	8.8	2.9	37
AC	–.02	–.25	.14	.10	–.37	–.11	.02	–.09	8.5	3.1	37
CAR	–.02	–.20	.05	.34	–.09	.02	–.24	–.04	8.9	2.7	37
CAS	–.01	–.06	–.01	.35	.03	.08	–.08	.07	9.0	2.9	37
VCI	.01	–.34	–.24	.05	–.29	–.25	–.01	–.19	93.2	11.9	40
VSI	–.26	–.23	–.19	.24	–.24	–.18	–.16	–.20	98.0	14.3	40
FRI	.07	–.19	–.18	–.02	–.37	–.22	.05	–.16	94.1	12.7	37
WMI	.11	–.43	–.14	.07	–.23	–.18	–.12	–.18	93.7	14.4	40
PSI	.02	–.21	–.11	.31	–.20	–.06	–.22	–.09	93.8	14.9	37
FSIQ	–.07	–.46	–.37	.11	–.47	–.37	–.11	–.33	92.6	12.5	40
VAI	.10	–.30	–.17	.00	–.43	–.23	–.17	–.22	96.1	11.4	40
NVI	–.07	–.41	–.29	.12	–.48	–.33	–.09	–.29	92.9	13.2	40
GAI	–.08	–.38	–.33	.10	–.45	–.35	–.04	–.28	93.5	12.0	40
CPI	.08	–.38	–.16	.20	–.25	–.16	–.23	–.18	92.9	14.0	37
Brown ADD											
Mean	67.9	69.6	69.6	59.9	67.7	68.8	66.9	68.9			
SD	5.4	5.6	6.7	8.9	6.9	4.8	6.5	4.6			
n	40	40	40	40	40	40	40	40			

The WPPSI–IV mean primary index scores range from 93.2 (VCI) to 98.0 (VSI). The Brown ADD cluster scores range from 59.9 (Emotion) to 69.6 (Focus and Effort). Of all WPPSI–IV composite scores, the FSIQ is most closely related to the ADD Inattention Total and ADD Combined Total scores. As predicted, low to moderate inverse correlations generally are observed between the WPPSI–IV composites and Brown ADD scores, with few exceptions. The WPPSI–IV primary index scores and the FSIQ show negligible correlations that tended to be in the positive direction with Activation and Emotion, and the PSI and the VSI show low positive correlations with Emotion. The *DSM–IV–TR* does not specify problems with regulating emotion as a criterion for ADHD diagnosis, but some ADHD models argue for its inclusion as a core feature (Barkley, 2010). A similar finding was noted earlier for the ADHD study using the WPPSI–IV in conjunction with the BASC–2 PRS. As with the BASC–2 PRS study, one possible explanation for the positive correlations with Emotion may be the 24-hour medication washout required for this study. The children's caregivers rated them based on the past six months; it is possible that the children rated lower on Emotion (and therefore, functioning better in that area) were those responding best to medication. Because children did not take psychostimulant

medications for the 24 hours prior to WPPSI–IV testing, it is possible that children who were well-controlled on medications (and would be rated lower on Emotion) performed worse on the WPPSI–IV than they would have if they had taken their medication that day.

The correlations of the WPPSI–IV primary index scores and FSIQ with Focus and Memory are higher than those between the WPPSI–IV composite scores and other Brown ADD clusters. Among the WPPSI–IV primary index scores, the VCI, WMI, and PSI are most closely related to Focus, and the VSI and FRI are most closely related to Memory. The highest correlation for the WMI is not with Memory, but with Focus, which describes shifting and focused attention, a related cognitive process that is integral to some working memory models (Cowan, 1988). The FSIQ demonstrates its highest correlation with Memory, closely followed by its correlation with Focus. At the ancillary index score level, the VAI, NVI, and GAI are most related to Memory, and the CPI is most related to Focus. Overall, moderate correlations generally exist between the ancillary index scores and Memory, and low to moderate correlations are observed for ancillary index scores with Focus and Effort.

As at the composite level, the subtests generally displayed low to moderate correlations with the Brown ADD cluster scores, as well as with the ADD Inattention Total and ADD Combined Total scores. A pattern wherein most subtests are more related to Focus and Memory than to other Brown ADD cluster scores is also observed.

Contrary to predictions, Cancellation did not correlate most highly with the Brown ADD scores. The previous study was conducted with the Cancellation subtest from the *Wechsler Adult Intelligence Scale–Fourth Edition* (WAIS–IV; Wechsler, 2008), which is quite different than the WPPSI–IV version. The task demands of the WAIS–IV Cancellation subtest require more inhibitory control than the WPPSI–IV version, and moderate to severe impairment of inhibitory control is consistently found in ADHD samples (Hale et al., 2012). Additional research with more demanding measures of inhibitory control is needed to further describe the interrelationships among these cognitive abilities in young children.

Disruptive Behavior

Correlations With the BASC–2 PRS

The WPPSI–IV was administered to 25 children with disruptive behavior, aged 4:7–7:2, and their caregiver completed selected scales from the BASC–2 PRS on the same day. The relations of disruptive behavior problems with neurocognitive variables appear to differ based on the particular behavior. For example, previous research suggests that physical aggression is related to verbal, visual spatial, working memory, and associative memory tasks; but theft is related to verbal and associative memory tasks (Barker et al., 2011). Disruptive behavior also appears to share complex relations to executive functions (e.g., planning, organizing, and working memory). While some research suggests that good executive function does not always indicate fewer behavior problems (Raaijmakers et al., 2008), other studies indicate that good executive function actually is related to more frequent problematic disruptive behaviors (Drabick, Bubier, Chen, Price, & Lanza, 2011). It is therefore difficult to predict the relationships between the WPPSI–IV scores and the BASC–2 PRS caregiver ratings that might exist in this heterogeneous sample of children with behavior problems. Extrapolating from the findings of some related studies (Barker et al., 2011; Dougherty et al., 2007; Isen, 2010; Séguin, Parent, Tremblay, & Zelazo, 2009), however, led to predictions that the VCI and Verbal Comprehension subtests may be inversely correlated with the Emotional Self-Control scale and the WMI and Working Memory subtests may be inversely correlated with the Executive Function and Emotional Self-Control scales. Table 7 presents the means, *SD*s, and correlation coefficients for this study.

Table 7 Correlations Between the WPPSI–IV and the BASC–2 PRS for the Disruptive Behavior Group

WPPSI–IV Subtest/Process/ Composite Score	BASC–2 PRS Scale			WPPSI–IV		
	Attention Problems	Executive Functioning	Emotional Self-Control	Mean	*SD*	*n*
IN	–.03	–.15	–.14	10.0	1.9	25
SI	–.18	–.40	–.37	8.9	2.4	24
VC	–.11	–.08	–.09	8.1	3.0	25
CO	–.25	–.16	–.13	8.2	2.8	25
RV	–.17	–.19	–.23	9.3	2.3	25
PN	–.34	–.38	–.30	8.2	2.8	25
BD	–.01	–.07	.10	9.5	2.6	25
OA	–.35	–.31	–.26	9.3	2.1	25
MR	–.03	–.18	–.22	9.0	2.2	25
PC	.03	–.14	–.27	9.6	2.3	25
PM	–.16	–.27	–.11	8.8	3.1	25
ZL	–.14	–.22	–.25	8.6	2.3	25
BS	–.13	.01	–.18	7.6	3.0	25
CA	–.29	–.14	–.18	9.8	3.5	25
AC	–.16	–.04	–.29	9.3	3.9	25
CAR	–.40	–.31	–.33	10.1	3.5	25
CAS	–.22	–.01	–.02	9.8	3.5	25
VCI	–.10	–.30	–.28	96.3	10.9	24
VSI	–.22	–.23	–.09	96.8	10.4	25
FRI	.00	–.21	–.32	95.6	10.2	25
WMI	–.17	–.29	–.20	92.2	13.2	25
PSI	–.23	–.07	–.18	92.8	15.9	25
FSIQ	–.17	–.29	–.25	92.1	10.8	24
VAI	–.30	–.33	–.29	92.7	12.6	25
NVI	–.12	–.21	–.22	92.1	11.9	25
GAI	–.10	–.33	–.26	95.6	9.5	24
CPI	–.27	–.21	–.24	91.0	13.6	25
BASC–2 PRS						
Mean	65.2	72.4	73.2			
SD	7.2	8.4	9.5			
n	25	25	25			

All mean WPPSI–IV composite scores are in the low average range, falling between 91.0 (CPI) and 96.8 (VSI). The BASC–2 PRS scores are in the at-risk and clinically significant ranges, with 65.2 (Attention Problems), 72.4 (Executive Functioning), and 73.2 (Emotional Self-Control). The WPPSI–IV composite scores generally show low inverse correlations with the BASC–2 PRS scales.

At the composite level, as predicted, the VCI and Verbal Comprehension subtests are inversely correlated with Emotional Self-Control, as well as with the other BASC–2 PRS scales. Also as predicted, the WMI and Working Memory subtests are inversely correlated with Executive Function and Emotional Self-Control, as well as with Attention Problems. The VCI, VSI, WMI, FSIQ, VAI, and GAI are more strongly related to Executive Functioning than to the other BASC–2 PRS scales. The FRI was most strongly related to Emotional Self-Control, followed by Executive Functioning. Apart from the VSI and the WMI, the Verbal Comprehension subtests contribute to all of these composite scores. This may indicate that the low verbal abilities common in children with disruptive behavior contribute to their executive functioning problems, or alternately, that executive functioning problems in these children interfere with verbal skill acquisition. It is not surprising that the WMI is most highly associated with

Executive Functioning among these scales, as working memory is understood to be one of a number of executive functions. The FRI is more highly correlated with Emotional Self-Control than with the other BASC–2 PRS scales. This finding may be related to the involvement of the prefrontal cortex in purposeful reactions to environmental stimuli, which is critical to fluid reasoning. The PSI and the CPI are more closely related to the Attention Problems scale than to the other BASC–2 PRS scales.

At the subtest level, correlations with the BASC–2 PRS scales are consistent with the patterns observed at the composite level. The Cancellation Random process score produced relatively high correlations with the BASC–2 PRS scales. This relation may be due to the nature of Cancellation, often described as an inhibition task, and the behavioral inhibition problems inherent in disruptive behavior.

The data presented are consistent with research suggesting that the verbal abilities and working memory of this population are involved with their low emotional control. This study provides preliminary information about the relations between cognitive abilities and attention, executive function, and emotional dyscontrol in children with disruptive behavior.

Expressive Language Disorder

Correlations With the CELF Preschool–2

The WPPSI–IV and the CELF Preschool–2 were administered to 19 children with Expressive Language Disorder, aged 4:0–6:9, with a testing interval of 0–19 days and a mean testing interval of 4 days. The WPPSI–IV was always administered first. Consistent with results from a previous similar study (Wechsler et al., 2004), it was expected that the correlations between the VCI and the VAI and the CELF Preschool–2 index scores would be higher than those with other WPPSI–IV index scores. Table 8 presents the means, *SD*s, and correlation coefficients for this study.

Table 8 Correlations Between the WPPSI–IV and the CELF Preschool–2 for the Expressive Language Disorder Group

	CELF Preschool–2 Subtest							
WPPSI–IV Subtest/Process/ Composite Score	**Sentence Structure**	**Word Structure**	**Expressive Vocabulary**	**Concepts & Following Directions**	**Recalling Sentences**	**Basic Concepts**	**Word Classes–Receptive**	**Word Classes–Expressive**
IN	.13	.46	.22	.31	.34	.56	–.18	.18
SI	–.20	.11	–.18	.04	–.07	.28	.29	.08
VC	–.33	.13	.41	.08	.07	–.12	.00	.27
CO	.21	.63	.10	.69	.27	.50	–.35	–.02
RV	.12	.17	.35	.38	.19	.05	.22	.32
PN	.27	.24	.59	–.28	.10	.14	–.05	.10
BD	.21	.12	–.10	.41	–.03	–.46	.08	.27
OA	.09	.23	.04	.21	.26	.05	.32	.25
MR	–.03	.06	–.26	.28	.07	–.38	.24	.33
PC	–.37	.02	–.06	.17	–.01	.27	.41	.45
PM	–.34	.01	.02	–.09	–.49	.29	.28	.51
ZL	–.27	.25	.09	.15	.18	.43	.34	.18
BS	.05	.11	.02	–.01	.25	.40	.03	–.22
CA	.07	–.40	–.31	.05	.11	–.32	.07	.17
AC	–.08	–.17	–.30	.20	.14	–.17	.15	.29
CAR	.17	–.29	–.15	.09	.19	–.19	–.02	.11
CAS	.04	–.42	–.50	.00	–.05	–.36	.03	.09
VCI	–.01	.33	–.02	.31	.15	.37	.05	.16
VSI	.17	.20	–.04	.36	.13	–.19	.24	.30
FRI	–.24	.05	–.21	.29	.04	–.07	.42	.49
WMI	–.35	.14	.05	.02	–.21	.43	.36	.43
PSI	.06	–.16	–.17	.02	.22	.04	.07	–.02
FSIQ	–.06	.32	–.13	.44	.03	.28	.24	.41
VAI	.27	.25	.62	.04	.17	.12	.12	.27
NVI	–.20	.12	–.14	.26	–.07	.15	.40	.51
GAI	.03	.30	–.19	.52	.13	.05	.20	.33
CPI	–.20	–.01	–.07	.02	–.01	.34	.30	.29
CELF Preschool–2								
Mean	9.3	5.5	6.6	8.4	5.3	8.6	9.6	7.8
SD	2.2	2.2	2.7	1.6	1.9	2.2	2.3	2.3
n	19	19	19	19	19	11	19	19

(continued)

Table 8 Correlations Between the WPPSI–IV and the CELF Preschool–2 for the Expressive Language Disorder Group *(continued)*

	CELF Preschool–2 Composite					WPPSI–IV		
WPPSI–IV Subtest/Process/ Composite Score	**Receptive Language**	**Expressive Language**	**Language Content**	**Language Structure**	**Core Language**	**Mean**	***SD***	***n***
IN	.32	.39	.44	.40	.36	8.1	2.2	18
SI	.12	−.06	.00	−.05	−.11	7.4	2.9	19
VC	−.32	.27	.31	−.06	.12	7.7	2.6	19
CO	.54	.38	.41	.49	.40	7.8	1.7	19
RV	.29	.30	.36	.20	.29	9.6	2.4	19
PN	−.03	.41	.33	.26	.50	8.2	2.4	19
BD	.23	−.01	−.04	.14	.10	10.1	2.2	19
OA	.30	.20	.20	.25	.17	9.8	2.2	19
MR	.14	−.08	−.11	.05	−.11	10.8	3.4	19
PC	.09	−.03	.18	−.16	−.17	9.1	3.0	19
PM	−.02	−.14	.14	−.33	−.12	8.6	2.9	19
ZL	.23	.20	.31	.07	.06	8.4	2.7	19
BS	.23	.13	.14	.17	.09	8.7	2.9	19
CA	−.14	−.27	−.33	−.12	−.28	9.4	2.8	19
AC	.05	−.17	−.12	−.05	−.24	9.4	3.8	19
CAR	−.03	−.12	−.18	.01	−.12	8.8	3.0	19
CAS	−.18	−.42	−.48	−.20	−.40	9.8	2.6	19
VCI	.28	.16	.24	.21	.13	88.0	12.1	18
VSI	.31	.10	.09	.22	.15	99.9	11.0	19
FRI	.16	−.07	.04	−.06	−.17	99.5	14.8	19
WMI	.12	.02	.25	−.16	−.05	91.4	13.5	19
PSI	.05	−.07	−.11	.04	−.11	94.8	12.7	19
FSIQ	.39	.07	.20	.15	.05	92.8	9.9	18
VAI	.16	.45	.44	.29	.52	93.6	10.3	19
NVI	.25	−.04	.12	−.05	−.09	96.2	11.3	19
GAI	.34	.07	.08	.21	.05	94.1	11.0	18
CPI	.12	−.04	.11	−.09	−.11	91.4	11.9	19
CELF Preschool–2								
Mean	94.4	75.6	88.0	80.5	83.1			
SD	6.1	11.3	7.3	9.5	10.3			
n	19	19	19	19	19			

The WPPSI–IV mean primary index scores range from 88.0 (VCI) to 99.9 (VSI), with a mean FSIQ of 92.8, a mean VAI of 93.6, and a mean NVI of 96.2. The mean CELF Preschool–2 index scores range from 75.6 (Expressive Language Index) to 94.4 (Receptive Language Index).

At the composite level, as expected, the correlations of the VCI and the VAI with the CELF Preschool–2 index scores are slightly higher than those with other WPPSI–IV index scores. The correlations of the VCI with the CELF Preschool–2 index scores are low to moderate, and the correlations of the VAI with the CELF Preschool–2 index scores are moderate. The correlations between the VCI and VAI, and the CELF Preschool–2 index scores are lower than one might expect; however, the CELF Preschool–2 scores reflect both word knowledge and grammar, whereas the WPPSI–IV scores reflect only word knowledge (i.e., grammar is not specifically penalized). Of all the WPPSI–IV composite scores, the VAI correlates most highly with the Core Language score. The FSIQ, GAI, and VSI are most highly correlated with the Receptive Language Index, but the VAI correlates most highly with all other CELF Preschool–2 index scores.

With the exception of the VAI, all WPPSI–IV composite scores are more highly correlated with the Receptive Language Index than with other CELF Preschool–2 index scores. Similar relations between prognostic outcomes for Expressive Language Disorder and receptive language skills has been indicated in the literature, in which the treatment outcome improves with increasingly developed receptive language skills (Johnson, Bietchman, & Brownlie, 2010; Wiig, 2011).

At the subtest level, Picture Naming correlated more highly with the Expressive Vocabulary subtest than with other CELF Preschool–2 subtests. The WPPSI–IV Receptive Vocabulary subtest correlated more highly with the Concepts & Following Directions subtest than with other CELF Preschool–2 subtests. The data presented are consistent with research suggesting that children with Expressive Language Disorder show relatively preserved cognitive scores and low expressive language skills. The data also provide preliminary construct validity for inclusion of the WPPSI–IV as part of a test battery for use in Expressive Language Disorder evaluations.

Mixed Receptive-Expressive Language Disorder

Correlations With the CELF Preschool–2

The WPPSI–IV and the CELF Preschool–2 were administered to 37 children with Mixed Receptive-Expressive Language Disorder (RELD), aged 4:0–6:8, with a testing interval of 0–15 days and a mean testing interval of 4 days. Table 9 presents the means, *SD*s, and correlation coefficients for this study.

Table 9 Correlations Between the WPPSI–IV and the CELF Preschool–2 for the Mixed Receptive-Expressive Language Disorder Group

	CELF Preschool–2 Subtest							
WPPSI–IV Subtest/Process/ Composite Score	**Sentence Structure**	**Word Structure**	**Expressive Vocabulary**	**Concepts & Following Directions**	**Recalling Sentences**	**Basic Concepts**	**Word Classes–Receptive**	**Word Classes–Expressive**
IN	.32	.57	.81	.50	.31	.60	.59	.52
SI	.16	.59	.66	.35	.31	.23	.43	.58
VC	.49	.45	.69	.35	.25	.32	.17	.49
CO	.17	.41	.69	.31	.34	.22	.28	.46
RV	.41	.39	.40	.47	.14	.54	.48	.34
PN	.53	.60	.76	.72	.34	.73	.53	.52
BD	.17	.47	.53	.40	.10	.44	.54	.49
OA	.15	.14	.38	.48	–.02	.69	.45	.28
MR	–.06	.34	.31	.35	.16	.31	.44	.31
PC	.16	.29	.41	.27	.01	.37	.58	.45
PM	.26	.47	.65	.53	.22	.41	.49	.45
ZL	.31	.21	.40	.59	–.08	.40	.47	.21
BS	–.06	.21	.26	.25	–.11	.38	.34	.14
CA	.14	.31	.65	.45	.26	.45	.39	.41
AC	–.16	–.01	.33	.27	.30	.51	.37	.34
CAR	.19	.31	.62	.46	.21	.32	.34	.36
CAS	.11	.33	.62	.42	.33	.54	.39	.41
VCI	.28	.62	.79	.40	.37	.49	.53	.55
VSI	.19	.35	.53	.52	.05	.67	.58	.46
FRI	.06	.38	.44	.37	.11	.40	.61	.46
WMI	.27	.34	.55	.64	.01	.41	.51	.36
PSI	.09	.32	.57	.41	.13	.45	.41	.34
FSIQ	.16	.54	.63	.38	.20	.53	.55	.50
VAI	.56	.58	.66	.68	.28	.67	.56	.51
NVI	.10	.45	.55	.44	.09	.44	.60	.47
GAI	.21	.60	.68	.38	.26	.52	.58	.56
CPI	.09	.32	.60	.56	.05	.44	.49	.37
CELF Preschool–2								
Mean	5.3	4.0	5.2	4.4	3.8	4.6	5.8	5.8
SD	2.3	2.1	2.8	2.5	1.8	3.1	3.2	2.5
n	37	37	37	36	36	17	36	36

(continued)

Table 9 Correlations Between the WPPSI–IV and the CELF Preschool–2 for the Mixed Receptive-Expressive Language Disorder Group *(continued)*

	CELF Preschool–2 Composite					WPPSI–IV		
WPPSI–IV Subtest/Process/ Composite Score	**Receptive Language**	**Expressive Language**	**Language Content**	**Language Structure**	**Core Language**	**Mean**	***SD***	***n***
IN	.51	.64	.71	.37	.65	5.1	2.8	34
SI	.24	.63	.50	.38	.54	6.2	2.7	37
VC	.37	.59	.51	.45	.66	5.9	2.6	34
CO	.25	.55	.52	.27	.47	5.5	1.9	35
RV	.54	.17	.54	.24	.41	6.7	3.0	37
PN	.71	.69	.82	.62	.74	6.6	3.0	35
BD	.27	.41	.42	.20	.41	8.0	3.3	37
OA	.43	.03	.50	–.05	.20	8.8	3.8	37
MR	.13	.16	.29	.01	.12	7.5	2.9	37
PC	.28	.21	.37	.12	.31	7.7	2.8	37
PM	.42	.48	.60	.25	.51	7.9	2.3	37
ZL	.54	.15	.54	.05	.34	7.8	3.4	36
BS	.02	–.03	.14	–.18	.09	7.1	2.9	37
CA	.37	.46	.59	.11	.44	7.6	4.3	37
AC	.26	.03	.45	–.21	.01	8.1	3.6	36
CAR	.35	.45	.56	.12	.45	7.7	4.3	37
CAS	.37	.47	.59	.15	.42	7.7	4.3	37
VCI	.39	.70	.64	.40	.64	76.8	12.2	34
VSI	.42	.27	.55	.09	.36	91.3	16.8	37
FRI	.26	.26	.43	.08	.27	86.2	13.6	37
WMI	.55	.33	.63	.16	.47	87.9	14.0	36
PSI	.26	.32	.47	.00	.35	85.3	17.7	37
FSIQ	.30	.48	.53	.23	.46	78.4	12.5	34
VAI	.70	.53	.76	.54	.68	81.7	14.7	35
NVI	.27	.36	.48	.11	.37	83.8	14.9	37
GAI	.34	.57	.57	.33	.53	78.0	13.2	34
CPI	.43	.36	.61	.07	.44	84.8	15.8	36
CELF Preschool–2								
Mean	71.0	69.1	69.9	69.1	71.1			
SD	12.4	9.3	13.0	7.9	10.6			
n	34	32	34	32	35			

The WPPSI–IV mean primary index scores range from 76.8 (VCI) to 91.3 (VSI), with a mean FSIQ of 78.4, a mean VAI of 81.7, and a mean NVI of 83.8. The mean CELF Preschool–2 index scores range from 69.1 (Expressive Language Index and Language Structure Index) to 71.0 (Receptive Language Index), with a mean Core Language Score of 71.1.

At the composite level, as expected, the correlations of the VCI and the VAI with the CELF Preschool–2 index scores are higher than those with other WPPSI–IV index scores. The correlations of the VCI with the CELF Preschool–2 index scores are moderate to high, and the correlations of the VAI with the CELF Preschool–2 index scores are high. As with the Expressive Language Disorder group, the VAI correlates more highly with the Core Language Index than any other WPPSI–IV composite score. The VCI is most highly correlated with the Expressive Language Index, but the VAI correlates most highly with all other CELF Preschool–2 index scores.

With the exception of the VCI and the GAI, all WPPSI–IV composite scores are more highly correlated with the Language Content Index than with other CELF Preschool–2 index scores. The VCI is more closely related to the Expressive Language Index than other CELF Preschool–2 index scores, and the GAI is equally related to the Expressive Language Index and the Language Content Index. The Language Content Index includes subtests that measure children's vocabulary and word meaning knowledge in both the receptive and expressive modalities. Children with RELD have difficulty in both language modalities.

This finding differs from that of the Expressive Language Disorder group, where cognitive abilities are more related to the Receptive Language Index than to other CELF Preschool–2 index scores. The differing relations of the WPPSI–IV index scores with the CELF Preschool–2 index scores across the two special groups with Language Disorders speaks to how the interplay of language skills and cognitive ability diverges between the two conditions. Furthermore, the subtest composition for each CELF Preschool–2 index score varies and divergent relations with the WPPSI–IV scores may be expected. For example, the Expressive Language Index is composed of subtests that measure vocabulary more than grammar, whereas the Receptive Language Index is composed of subtests that measure grammar more than vocabulary. The findings across the two studies, therefore, may have varied with the vocabulary and grammar difficulties that are symptomatically characteristic of each type of Language Disorder.

Not surprisingly, the WPPSI–IV Receptive Vocabulary subtest correlated more highly with the Word Classes–Receptive subtest than with most other CELF Preschool–2 subtests, and the Picture Naming subtest correlated more highly with the Expressive Vocabulary subtest than with other CELF Preschool–2 subtests. The data presented are consistent with research suggesting that children with Mixed Receptive-Expressive Language Disorder have patterns of low overall cognitive ability scores and deficits in a variety of areas that are associated with their language impairments (e.g., Archibald & Gathercole, 2006; Bavin, Wilson, Maruff, & Sleeman, 2005; Cardy, Tannock, Johnson, & Johnson, 2010; Marton, 2008; Wechsler, 2002, 2003), and provide preliminary construct validity for inclusion of the WPPSI–IV as part of a test battery for use in RELD evaluations.

Autistic Disorder

Correlations With the Vineland–II

The Vineland–II was administered to caregivers of 36 children with Autistic Disorder, aged 2:10–7:6, with a testing interval of 0–65 days and a mean testing interval of 10 days. Previous research indicates the communication symptoms of autism spectrum disorders are more strongly related to the VCI and PSI than to other primary index scores, and that some Working Memory and Processing Speed subtests show moderate correlations with other autism spectrum disorder symptoms (Happé, 1994; Oliveras-Rentas, Kenworthy, Roberson, Martin, & Wallace, 2012). It was therefore predicted that the VCI, the WMI, and the PSI would show the strongest relations with the Vineland–II Communication domain. Table 10 presents the means, *SD*s, and correlation coefficients for this study.

Table 10 Correlations Between the WPPSI–IV and the Vineland–II for the Autistic Disorder Group

WPPSI–IV Subtest/Process/ Composite Score	Vineland–II Subdomain					
	Receptive Communication	Expressive Communication	Fine Motor Skills	Gross Motor Skills	Internalizing Behavior	Externalizing Behavior
IN	.51	.52	.37	.25	–.25	.06
SI	.25	.29	.15	.20	.07	.04
VC	.54	.42	.19	.10	–.14	.20
CO	.32	.29	.02	.33	.03	.12
RV	.27	.37	.04	–.03	–.05	.08
PN	.44	.44	.18	–.10	–.16	.04
BD	.61	.59	.49	–.02	–.17	.09
OA	.29	.43	.21	.06	–.18	.13
MR	.03	–.05	.08	.12	.28	.03
PC	.18	.27	.24	.30	.09	.21
PM	.38	.29	.23	–.15	–.09	.05
ZL	.29	.39	.09	–.12	–.14	–.09
BS	.21	.29	.25	.03	–.01	.15
CA	.35	.41	.16	.17	–.20	.26
AC	.21	.11	.08	–.01	.23	–.05
CAR	.34	.35	.14	.16	–.15	.26
CAS	.38	.47	.19	.16	–.28	.22
VCI	.46	.47	.26	.20	–.10	.09
VSI	.51	.54	.38	.02	–.19	.12
FRI	.13	.13	.17	.24	.20	.14
WMI	.38	.37	.19	–.15	–.12	–.02
PSI	.34	.46	.24	.14	–.13	.26
FSIQ	.49	.47	.34	.05	–.02	.13
VAI	.40	.45	.12	–.08	–.11	.06
NVI	.42	.41	.32	.04	.01	.17
GAI	.48	.43	.32	.11	–.01	.10
CPI	.38	.46	.28	.04	–.14	.10
Vineland–II						
Mean	10.8	10.6	11.7	11.9	20.5	17.8
SD	2.6	2.0	2.5	1.7	2.7	2.0
n	35	34	35	35	35	35

(continued)

Table 10 Correlations Between the WPPSI–IV and the Vineland–II for the Autistic Disorder Group *(continued)*

WPPSI–IV Subtest/Process/ Composite Score	Vineland–II Domain					WPPSI–IV		
	Communication	Daily Living Skills	Socialization	Motor Skills	Maladaptive Behavior Index	Mean	*SD*	*n*
IN	.47	.40	.30	.38	–.15	4.8	2.6	36
SI	.29	.36	.13	.19	.05	5.5	2.9	32
VC	.53	.48	.34	.18	–.01	5.1	2.6	32
CO	.28	.34	.26	.17	.01	4.5	2.6	31
RV	.27	.32	.08	.00	.05	5.8	2.3	36
PN	.54	.35	.35	.06	.06	6.4	3.3	36
BD	.64	.61	.34	.34	–.05	8.1	3.4	35
OA	.37	.60	.46	.18	.02	7.5	3.6	36
MR	.02	.15	–.16	.12	.16	7.6	3.3	32
PC	.28	.30	–.04	.32	.17	6.8	3.1	32
PM	.32	.38	.12	.09	–.02	7.2	3.5	35
ZL	.26	.56	.26	.00	–.11	7.2	3.5	36
BS	.21	.44	.08	.19	.07	5.8	3.3	32
CA	.38	.38	.15	.18	.02	4.7	3.4	32
AC	.21	.40	.21	.04	.18	6.6	3.4	31
CAR	.35	.35	.11	.16	.04	4.9	3.6	32
CAS	.42	.42	.19	.20	–.05	4.8	3.2	32
VCI	.44	.50	.31	.27	–.02	75.0	10.9	36
VSI	.54	.67	.42	.28	–.01	87.7	17.5	35
FRI	.17	.25	–.10	.24	.18	83.8	15.7	32
WMI	.32	.54	.20	.05	–.07	83.5	16.9	35
PSI	.37	.48	.16	.22	.05	73.4	16.2	32
FSIQ	.46	.59	.23	.26	.04	77.6	12.7	34
VAI	.46	.36	.25	.03	.07	78.5	13.6	36
NVI	.40	.56	.16	.25	.09	81.1	15.0	34
GAI	.46	.51	.21	.28	.03	78.5	13.4	35
CPI	.38	.58	.20	.22	–.04	75.5	16.7	31
Vineland–II								
Mean	79.4	80.9	75.2	80.4	20.0			
SD	12.4	14.5	12.3	10.6	1.7			
n	34	36	34	35	35			

The mean WPPSI–IV primary index scores for this sample range from 73.4 (PSI) to 87.7 (VSI), the mean FSIQ is 77.6, and the mean NVI is 81.1. The mean Vineland–II domain scores range from 75.2 (Socialization) to 80.9 (Daily Living Skills). The mean WPPSI–IV primary index scores and FSIQ therefore are in the borderline and low average range, and the Vineland–II domain scores are approximately 1.5 *SD* below the mean.

Correlations between the primary index scores and Vineland–II domain scores range from -.10 (for FRI–Motor Skills) to .67 (for VSI–Daily Living Skills). Correlations between the FSIQ and Vineland–II domain scores are generally higher, and range from .23 (Socialization) to .59 (Daily Living Skills). Overall, the correlations of WPPSI–IV primary index scores and the FSIQ with the Vineland–II domains range widely from negligible to moderately high.

At the primary index score level, as predicted, the VCI and PSI share high correlations with the Communication domain relative to most other domains. The VSI had a higher correlation with the Communication domain than any other primary index score. The VSI also produced higher correlations with Daily Living Skills, Socialization, and Motor Skills than any other WPPSI–IV composite score. This result is unexpected and may have been obscured prior to the separation

of the visual spatial and fluid reasoning abilities into separate index scores. This pattern of results suggests that the VSI may be predictive of overall adaptive functioning in children with Autistic Disorder; however, these results require further study and replication.

Of all the Vineland–II domain scores, the Daily Living Skills score shares higher correlations with all of the WPPSI–IV composite scores than any other Vineland–II domain score. The Daily Living Skills domain is designed to describe how the child functions personally (e.g., eating, dressing, hygiene), and how the child functions domestically (e.g., household tasks performed) and in the community (e.g., use of time, money, the telephone, and the computer). It is not surprising that this domain is most correlated with the WPPSI–IV primary index scores and the FSIQ, as ample evidence suggests that intellectual functioning is strongly predictive of eventual independence in the community (Klinger, O'Kelley, Mussey, Goldstein, & DeVries, 2012).

At the ancillary index score level, the VAI is predictably more highly correlated with the Communication domain than with other Vineland–II domains. Both the NVI and the GAI show patterns of correlations with the Vineland–II domain scores that are similar to the FSIQ, although the correlations of NVI and GAI with the Vineland–II scores are slightly lower than those observed for FSIQ. The CPI is more highly correlated with the Daily Living Skills domain than with other Vineland–II domains. Following the VSI and the FSIQ, the CPI shares the next highest correlation with the Daily Living Skills domain. This result highlights the importance of working memory and processing speed to the expression of adaptive functioning in children with Autistic Disorder.

As anticipated, the Vineland–II Communication domain and the Receptive and Expressive Communication subdomains generally correlate more highly with the VCI and the Verbal Comprehension subtests than with other WPPSI–IV primary index scores or subtests. The VSI is more highly correlated with the Communication subdomains than the VCI; this appears to be largely attributable to the high correlations of Block Design with both Communication subdomains. The WMI, PSI, Working Memory subtests, and Processing Speed subtests are moderately correlated with both Receptive and Expressive communication.

As in the Intellectual Disability group study with the Vineland–II, Block Design correlates more highly with Fine Motor Skills than any other WPPSI–IV subtest. The Processing Speed subtests produce low correlations with Fine Motor Skills, perhaps further evidence of the successful reduction of these demands on the new Processing Speed subtests, which utilize a dauber rather than a pencil.

Overall, the pattern of convergent and discriminant validity between cognitive and adaptive functioning underscores the importance of measuring both domains when evaluating children with autism spectrum disorders. The results of this study provide some information about the overlap of these related areas in children with Autistic Disorder.

Correlations With the NEPSY–II

The WPPSI–IV and the Affect Recognition, Theory of Mind, and Memory for Faces subtests (i.e., the Social Perception subtests) of the NEPSY–II were administered to 34 children with Autistic Disorder aged 3:0–7:6, with a testing interval of 0–33 days and a mean testing interval of 6 days. Social perception refers to a number of cognitive processes that facilitate social interactions. Research suggests social perception skills are impaired in autism spectrum disorders; including facial affect recognition (Ashwin, Wheelwright, & Baron-Cohen, 2006; Lindner & Rosén, 2006); perception, encoding, and recognition of faces (Dakin & Frith, 2005; Hedley, Brewer, & Young, 2011); and theory of mind (Lam & Yeung, 2012; Shimoni, Weizman, Yoran, & Raviv, 2012). Theory of mind, or the ability to understand that other people have different perceptions and thoughts than one's own, is required in order to accurately understand, explain, and predict others' behavior.

Previous studies indicate the communication symptoms of autism are more strongly related to the VCI and PSI than to other primary index scores, but that the social symptoms of autism spectrum disorders are more strongly related with the VCI. At the subtest level, Comprehension is typically more strongly related with socialization symptoms than do other subtests, but all Verbal Comprehension subtests, as well as some Working Memory and Processing Speed subtests, show moderately high correlations with other autism symptoms (Happé, 1994; Oliveras-Rentas et al., 2012). It was therefore predicted that the VCI would show the strongest relation with the NEPSY–II Social Perception subtests. It was also expected that the PSI, because it has been consistently associated with autism symptom severity, may share moderately high correlations with the NEPSY–II subtests. It was anticipated that the WMI may be moderately related with these subtests due to prior results (Happé, 1994; Oliveras-Rentas et al., 2012). At the ancillary index level, extrapolating from previous results (Happé, 1994, Oliveras-Rentas et al., 2012), it was predicted that the GAI and the CPI would show moderate correlations with the NEPSY–II subtests. Table 11 presents the means, *SD*s, and correlation coefficients for this study.

Table 11 Correlations Between the WPPSI–IV and the NEPSY–II for the Autistic Disorder Group

WPPSI–IV Subtest/Process/ Composite Score	NEPSY–II Subtests			WPPSI–IV		
	AR	TM	MF	Mean	*SD*	*n*
IN	.61	.36	−.05	4.6	2.5	34
SI	.53	.62	.45	5.6	2.9	32
VC	.28	.17	−.14	5.2	2.6	32
CO	.45	.48	.10	4.6	2.6	32
RV	.39	.37	.24	5.8	2.3	34
PN	.36	.38	.33	6.6	3.4	34
BD	.37	.37	.39	8.1	3.4	34
OA	.34	.31	.40	7.6	3.7	34
MR	.15	.40	.48	7.8	3.1	32
PC	.40	.12	.41	6.7	2.9	32
PM	.37	.13	.21	7.9	3.2	33
ZL	.56	.53	.26	7.5	3.4	34
BS	.40	.53	.26	6.0	3.2	32
CA	.38	−.04	.44	5.0	3.4	32
AC	.47	.69	.47	7.0	3.0	31
CAR	.35	−.05	.35	5.3	3.7	32
CAS	.37	.00	.46	5.0	3.2	32
VCI	.65	.49	.23	75.0	11.3	34
VSI	.40	.40	.43	88.0	17.7	34
FRI	.31	.30	.56	83.9	14.6	32
WMI	.54	.39	.30	86.3	16.3	33
PSI	.47	.29	.51	74.7	15.9	32
FSIQ	.55	.53	.47	78.5	12.3	33
VAI	.41	.44	.31	79.4	13.8	34
NVI	.47	.42	.51	82.1	14.3	33
GAI	.51	.52	.42	78.9	13.3	34
CPI	.58	.42	.46	77.3	15.7	31
NEPSY–II						
Mean	6.0	4.9	6.0			
SD	3.9	2.7	3.6			
n	33	28	23			

Note. NEPSY–II abbreviations are: AR = Affect Recognition, TM = Theory of Mind, MF = Memory for Faces.

The mean WPPSI–IV primary index scores range from 74.7 (PSI) to 88.0 (VSI), the mean FSIQ is 78.5, and the mean NVI is 82.1. The ancillary index scores range from 77.3 (CPI) to 82.1 (NVI). The mean NEPSY–II subtest scaled scores range from 4.9 to 6.0. The mean WPPSI–IV composite scores are in the borderline to low average range, and the NEPSY–II subtest scores are between 1 and 2 *SD*s below the mean.

At the primary index score level, the VCI and the PSI generally share their highest correlations with the NEPSY–II Social Perception subtest scores. The VCI is more closely related to Affect Recognition and Theory of Mind than other WPPSI–IV primary index scores. The FRI and the PSI are more highly correlated with Memory for Faces than other WPPSI–IV primary index scores. The WMI shares the second highest correlation with Affect Recognition, following the correlation between VCI and Affect Recognition. The VSI shares moderate correlations with all of the NEPSY–II subtests. It is not surprising that the FSIQ shares moderately high correlations with the NEPSY–II Social Perception subtests, because all WPPSI–IV primary index scores are at least moderately related to the NEPSY–II subtests.

The high correlation of the FRI with Memory for Faces is not surprising, as fluid reasoning has been identified as a weakness for children with autism spectrum disorders (Semrud-Clikeman, Walkowiak, Wilkinson, & Christopher, 2010) and a similar correlation is observed in the nonclinical study reported in Chapter 5 of the *WPPSI–IV Technical and Interpretive Manual*. This relation is also likely to reflect the shared visual processing demands of meaningful stimuli for subtests that contribute to the FRI and for Memory for Faces. These findings may have been obscured in previous studies (e.g., Oliveras-Rentas et al., 2012) prior to the separation of Visual Spatial and Fluid Reasoning factors in the WPPSI–IV, because Block Design was shown to be less related to the Memory for Faces subtests than Matrix Reasoning and Picture Concepts in prior research.

At the ancillary index score level, as predicted, the GAI and the CPI produced moderately high correlations with the NEPSY–II subtests. The NVI is also moderately related to the NEPSY–II subtests. This is not surprising, because Fluid Reasoning, Working Memory, and Processing Speed subtests contribute to the NVI.

The relations at the subtest level are relatively consistent with those observed at the composite level. Verbal Comprehension, Working Memory, and Processing Speed subtests are generally more strongly related than Visual Spatial and Fluid Reasoning subtests with the NEPSY–II subtests. Of the WPPSI–IV subtests, Information and Zoo Locations are most closely related to Affect Recognition; Animal Coding, Similarities, and Zoo Locations are most closely related to Theory of Mind; and Matrix Reasoning, Animal Coding, and Similarities are most closely related to Memory for Faces. The strong relations of Zoo Locations and Animal Coding with the NEPSY–II Social Perception subtests for this special group may suggest sensitivity of these subtests to more severe autism spectrum disorder symptoms and warrant further investigation. Overall, the results of this study are generally consistent with expectations for the relations of the WPPSI–IV and the NEPSY–II Social Perception subtests among children with Autistic Disorder.

Correlations With the BASC–2 PRS

The WPPSI–IV was administered to 37 children with Autistic Disorder, aged 2:10–7:6, and their caregiver completed selected scales from the BASC–2 PRS on the same day. Due to the executive function deficits thought to be involved in Autistic Disorder, it was expected that the WMI and Working Memory subtests would show low inverse correlations with the BASC–2 PRS Attention and Executive Function scales. Table 12 presents the means, *SD*s, and correlation coefficients for this study.

Table 12 Correlations Between the WPPSI–IV and the BASC–2 PRS for the Autistic Disorder Group

WPPSI–IV Subtest/Process/ Composite Score	BASC–2 PRS Scale			WPPSI–IV		
	Attention Problems	Executive Functioning	Emotional Self-Control	Mean	*SD*	*n*
IN	–.18	.06	–.02	4.7	2.5	37
SI	.05	.18	.02	5.5	2.9	33
VC	–.21	.04	.16	5.2	2.6	33
CO	–.03	.08	.07	4.5	2.6	33
RV	–.18	–.01	–.13	5.8	2.3	37
PN	–.14	–.15	–.15	6.6	3.3	37
BD	–.36	–.06	–.12	8.0	3.4	36
OA	–.16	–.13	–.23	7.6	3.6	37
MR	.14	.25	.11	7.6	3.2	33
PC	.05	.25	.12	6.5	2.9	33
PM	–.26	–.23	–.19	7.4	3.5	36
ZL	–.08	.01	–.15	7.4	3.3	37
BS	–.17	.06	.03	5.8	3.2	33
CA	–.20	–.03	–.19	4.9	3.4	33
AC	–.07	–.08	–.09	6.8	3.1	32
CAR	–.18	–.01	–.12	5.2	3.6	33
CAS	–.28	–.08	–.28	5.0	3.2	33
VCI	–.09	.12	.03	74.9	10.9	37
VSI	–.30	–.12	–.22	87.6	17.3	36
FRI	.12	.30	.13	83.2	15.0	33
WMI	–.21	–.14	–.21	84.8	16.4	36
PSI	–.18	.06	–.08	74.2	15.9	33
FSIQ	–.24	.04	–.01	77.6	12.5	35
VAI	–.16	–.08	–.14	79.2	13.5	37
NVI	–.21	.05	–.02	80.9	14.8	35
GAI	–.16	.13	.01	78.2	13.2	36
CPI	–.27	–.09	–.21	76.8	15.8	32
BASC–2 PRS						
Mean	62.7	64.4	65.2			
SD	7.3	8.3	11.8			
n	37	37	37			

All mean WPPSI–IV composite scores are in the borderline and low average ranges, falling between 74.2 (PSI) and 87.6 (VSI). The mean FSIQ is 77.6, and the mean NVI is 80.9. The BASC–2 PRS scores are in the at-risk range.

As expected, the WMI and Working Memory subtests generally show low inverse correlations with the BASC–2 PRS Attention and Executive Function scales. The VSI shows inverse correlations with all BASC–2 PRS scales. This is not entirely unexpected, because the VSI is relatively preserved in this sample and represents a cognitive strength for this particular group. The FRI shares low positive relations with the BASC–2 PRS scales; this unexpected finding requires further study and replication.

The PSI, FSIQ, VAI, NVI, GAI, and CPI share their highest (inverse) correlations with the Attention Problems scale. Attention problems, an associated feature of autism spectrum disorder, appear to be predictive of cognitive abilities in this sample.

At the subtest level, the relations with the BASC–2 PRS scales are similar to those observed at the composite level. Overall, these results are consistent with research suggesting that working memory is associated with attentional and executive function difficulties in Autistic Disorder.

Asperger's Disorder

Correlations With the Vineland–II

The Vineland–II was administered to caregivers of 30 children with Asperger's Disorder, aged 4:8–7:6, with a testing interval of 0–28 days and a mean testing interval of 5 days. Table 13 presents the means, *SD*s, and correlation coefficients for this study.

Table 13 Correlations Between the WPPSI–IV and the Vineland–II for the Asperger's Disorder Group

WPPSI–IV Subtest/Process/ Composite Score	Vineland–II Subdomain					
	Receptive Communication	Expressive Communication	Fine Motor Skills	Gross Motor Skills	Internalizing Behavior	Externalizing Behavior
IN	.07	–.26	.28	.24	.07	.10
SI	.11	.22	.33	.11	–.03	.07
VC	.24	.19	.33	.19	–.13	–.05
CO	.20	.10	.33	.13	–.01	.08
RV	.13	.11	.34	.29	.14	.05
PN	.19	.22	.41	.29	–.17	–.01
BD	.09	.13	.30	.11	–.03	.05
OA	.46	.16	.36	.24	–.14	–.10
MR	.25	.34	.16	.28	–.21	–.22
PC	.10	.12	.20	.10	.15	–.14
PM	.46	.16	.65	.61	–.31	.05
ZL	.22	.00	.37	.24	–.19	.04
BS	.15	–.22	.02	.05	–.16	–.11
CA	.06	–.17	–.08	–.33	.08	.04
AC	.15	.11	.04	–.01	–.02	–.06
CAR	.10	–.08	–.05	–.26	.06	–.04
CAS	.01	–.23	–.09	–.37	.14	.10
VCI	.09	–.02	.36	.19	.02	.10
VSI	.32	.15	.37	.20	–.10	–.05
FRI	.20	.26	.20	.21	–.06	–.20
WMI	.38	.11	.60	.49	–.30	.05
PSI	.10	–.21	–.05	–.19	–.04	–.03
FSIQ	.26	.08	.42	.34	–.16	–.02
VAI	.18	.18	.42	.33	–.04	.02
NVI	.31	.13	.37	.34	–.18	–.11
GAI	.18	.15	.36	.25	–.09	–.01
CPI	.28	–.08	.29	.14	–.19	.02
Vineland–II						
Mean	12.8	12.8	12.5	12.0	19.8	18.3
SD	3.0	3.0	2.7	1.9	2.3	2.3
n	28	28	26	27	29	30

(continued)

Table 13 Correlations Between the WPPSI–IV and the Vineland–II for the Asperger's Disorder Group *(continued)*

WPPSI–IV Subtest/Process/ Composite Score	Vineland–II Domain					WPPSI–IV		
	Communication	Daily Living Skills	Socialization	Motor Skills	Maladaptive Behavior Index	Mean	*SD*	*n*
IN	–.09	–.09	–.01	.30	.17	11.0	2.9	30
SI	.23	.23	–.02	.27	–.05	10.8	3.1	30
VC	.21	.20	–.02	.31	–.23	8.1	3.0	30
CO	.15	.20	–.08	.30	–.03	7.2	2.8	30
RV	.10	.11	–.12	.37	.02	10.0	3.5	30
PN	.28	.26	.13	.39	–.10	11.0	3.6	30
BD	.12	.13	–.06	.22	–.01	10.8	2.6	30
OA	.33	.40	.14	.28	–.07	10.1	3.0	30
MR	.35	.41	.23	.22	–.20	10.6	2.7	30
PC	.08	.16	.02	.18	.00	9.6	2.4	30
PM	.44	.43	.41	.71	.02	9.7	3.1	30
ZL	.05	.14	.02	.36	–.09	9.8	2.9	30
BS	–.11	–.08	.04	.02	–.09	9.0	3.3	30
CA	–.06	.00	–.07	–.22	.02	9.3	3.7	30
AC	.04	.09	–.06	.01	–.07	9.4	2.8	30
CAR	.01	.10	.05	–.19	.01	9.2	3.5	30
CAS	–.12	–.09	–.18	–.23	.04	9.4	3.6	30
VCI	.08	.08	–.03	.33	.05	104.7	15.2	30
VSI	.24	.29	.04	.29	–.05	103.0	14.5	30
FRI	.26	.33	.16	.22	–.12	100.5	13.9	30
WMI	.28	.31	.24	.62	–.04	98.4	15.5	30
PSI	–.10	–.05	–.03	–.14	–.04	95.5	18.1	30
FSIQ	.21	.23	.13	.42	–.05	102.3	14.4	30
VAI	.21	.21	.02	.42	–.05	102.9	18.0	30
NVI	.23	.28	.17	.39	–.10	99.6	13.9	30
GAI	.22	.25	.05	.34	–.05	105.0	13.4	30
CPI	.06	.11	.10	.25	–.05	96.2	16.7	30
Vineland–II								
Mean	90.3	85.6	76.5	83.0	19.5			
SD	14.9	16.7	17.8	13.2	1.9			
n	26	25	25	26	27			

The mean WPPSI–IV primary index scores for this sample range from 95.5 (PSI) to 104.7 (VCI), and the mean FSIQ is 102.3. The mean Vineland–II domain scores range from 76.5 (Socialization) to 90.3 (Communication). The mean WPPSI–IV primary index scores and FSIQ are in the average range, and the mean Vineland–II domain scores are approximately .5–1.5 *SD*s below the mean.

Correlations between the primary index scores and Vineland–II domain scores range from –.14 (for PSI–Motor Skills) to .62 (for WMI–Motor Skills), but are generally low to moderate. Correlations between the FSIQ and Vineland–II domain scores range from .13 (Socialization) to .42 (Motor Skills). Overall, the correlations of the WPPSI–IV primary index scores and FSIQ with the Vineland–II domains range widely from negligible to moderately high. Contrary to expectations established from the Autistic Disorder study results, Daily Living Skills and Motor Skills share stronger relations with the primary index scores than the Communication and Socialization Vineland–II domains.

The VCI is most strongly related to Motor Skills among the Vineland–II domains. As with the Autistic Disorder group, the VSI is most highly correlated with Daily Living Skills and Motor Skills among the Vineland–II domains. The FRI is most strongly related to Daily Living Skills among the Vineland–II domains. The WMI is most highly correlated with Motor Skills among the Vineland–II domains, and the PSI is not meaningfully related to any Vineland–II domain.

The FSIQ is most strongly related to Motor Skills among the Vineland–II domains. Motor skill difficulties can be an associated feature of Asperger's Disorder, and are linked with other aspects of autism spectrum disorders such as language and socialization (Bhat, Landa, & Galloway, 2011; Noterdaeme, Wriedt, & Höhne, 2010). Similar to the FSIQ, all ancillary index scores are most highly correlated with the Motor Skills domain.

In this sample, adaptive functions appear to be more closely related with the FRI and WMI than with other WPPSI–IV primary index scores. The Communication, Socialization, and Motor Skills domains are more highly related with the WMI than other WPPSI–IV composite scores, and Daily Living Skills is most highly related with the FRI among the WPPSI–IV composite scores. Dysfunction of the prefrontal cortex (which is important to both fluid reasoning and working memory) could be partially responsible for this pattern of relations. The medial prefrontal cortex may play a role in integrating emotion, sensory perception, motor skills, and memory domains, and this integrative function may be impaired in autism spectrum disorders (Shalom, 2009). Additional research involving objective motor skill assessment is required to confirm and extend these results.

All WPPSI–IV subtests generally share low correlations with the Vineland–II Communication domain and Receptive and Expressive Communication subdomains, and low to moderate correlations with the Motor domain and the Fine and Gross Motor subdomains. The Processing Speed subtests are not related to adaptive functioning in a meaningful way. Overall, the pattern of convergent and discriminant validity between cognitive and adaptive functioning underscores the importance of measuring both domains when evaluating children with autism spectrum disorders, and provides some information about the overlap of these related areas in children with Asperger's Disorder.

Correlations With the NEPSY–II

The WPPSI–IV and the Affect Recognition, Theory of Mind, and Memory for Faces subtests of the NEPSY–II were administered to 33 children with Asperger's Disorder, aged 4:8–7:6, with a testing interval of 0–46 days and a mean testing interval of 5 days.

Previous research indicates the communication symptoms of autism are more strongly related to the VCI and PSI than to other primary index scores, and that some Working Memory and Processing Speed subtests show moderate correlations with other autism spectrum disorder symptoms (Happé, 1994; Oliveras-Rentas et al., 2012). It was predicted that the WMI and the PSI would show the strongest relations with the NEPSY–II Social Perception subtests. Because verbal skills can be relatively more preserved in lower severity autism spectrum disorders such as Asperger's Disorder, it was not expected that the VCI would show high correlations with NEPSY–II Social Perception subtests in this group. Furthermore, all correlations were predicted to be somewhat weaker than those observed in the Autistic Disorder group. At the ancillary index score level, it was anticipated that in this group the CPI would show moderate to moderately high correlations with the NEPSY–II subtests. Table 14 presents the means, *SD*s, and correlation coefficients for this study.

Table 14 Correlations Between the WPPSI–IV and the NEPSY–II for the Asperger's Disorder Group

WPPSI–IV Subtest/Process/ Composite Score	NEPSY–II Subtests			WPPSI–IV		
	AR	TM	MF	Mean	*SD*	*n*
IN	.23	.38	.42	11.1	2.8	33
SI	.29	.44	.40	10.9	3.1	33
VC	.12	.47	.34	8.5	3.4	33
CO	.22	.30	.39	7.5	3.2	33
RV	.06	.30	.33	10.1	3.6	33
PN	.20	.26	.14	11.6	3.5	33
BD	.31	.18	.44	11.2	3.2	33
OA	.58	.45	.58	10.1	3.1	33
MR	.10	.23	.32	10.6	2.8	33
PC	–.03	.36	.34	9.5	2.5	33
PM	.29	.29	.19	9.7	3.2	33
ZL	.16	.49	.22	9.8	2.8	33
BS	.04	.35	.32	8.8	3.2	33
CA	.24	.19	.49	8.9	3.8	33
AC	.01	.13	.19	9.2	2.9	33
CAR	.31	.27	.51	8.9	3.6	33
CAS	.17	.08	.40	9.0	3.6	33
VCI	.29	.46	.45	105.2	15.3	33
VSI	.49	.35	.56	104.1	16.2	33
FRI	.05	.33	.37	100.2	14.3	33
WMI	.27	.41	.24	98.5	15.2	33
PSI	.15	.30	.47	93.9	18.0	33
FSIQ	.31	.44	.49	102.8	14.8	33
VAI	.13	.33	.28	104.5	17.6	33
NVI	.23	.40	.48	99.6	14.2	33
GAI	.32	.41	.51	105.8	14.3	33
CPI	.23	.44	.46	95.2	16.4	33
NEPSY–II						
Mean	8.0	6.1	7.0			
SD	3.9	3.5	3.2			
n	33	24	30			

Note. NEPSY–II abbreviations are: AR = Affect Recognition, TM = Theory of Mind, MF = Memory for Faces.

The WPPSI–IV mean primary index scores range from 93.9 (PSI) to 105.2 (VCI), and the mean FSIQ is 102.8. The ancillary index scores range from 95.2 (CPI) to 105.8 (GAI). The mean NEPSY–II subtest scaled scores range from 6.1 to 8.0. The mean WPPSI–IV composite scores are in the average range, and the mean NEPSY–II subtest scores are almost 1 *SD* below the mean.

At the primary index score level, the VSI and the VCI generally show the highest correlations with the NEPSY–II Social Perception subtest scores. Among the primary index scores, the VSI is most highly correlated with Affect Recognition and Memory for Faces, and the VCI is most highly correlated with Theory of Mind. The VCI and the WMI show higher correlations with Theory of Mind than with other NEPSY–II subtests. The VSI, FRI, and PSI are more highly correlated with Memory for Faces than with the other NEPSY–II subtests. The FSIQ is most highly correlated with Memory for Faces among the NEPSY–II subtests. As with the Autistic Disorder Group, the high correlation of the FRI with Memory for Faces is not surprising: Fluid reasoning has been identified as a weakness for children with autism spectrum disorders (Semrud-Clikeman et al., 2010). A similar correlation was observed in children without clinical conditions in the corresponding WPPSI–IV–NEPSY–II study reported in Chapter 5 of the *WPPSI–IV Technical and Interpretive Manual*. The relation between the FRI and Memory for Faces may partially reflect the shared task demands of contributing subtests that require visual processing of meaningful stimuli.

At the ancillary index score level, the GAI and the CPI generally have moderate correlations with the NEPSY–II subtests. The NVI is also moderately related to the NEPSY–II subtests, consistent with results for the Fluid Reasoning, Working Memory, and Processing Speed subtests that contribute to the NVI.

The relations at the subtest level are relatively consistent with those observed at the composite level. In general, all WPPSI–IV subtests share low to moderate correlations with the NEPSY–II subtests. Correlations between the Visual Spatial subtests and the NEPSY–II Social Perception subtests are generally higher than those between other WPPSI–IV subtests and the NEPSY–II Social Perception subtests. In particular, Object Assembly shows strong relations with the NEPSY–II subtests. Somewhat surprisingly, Comprehension is not more related to the NEPSY–II Social Perception subtests than the other Verbal Comprehension subtests. This was unexpected, because the mean Comprehension score is the lowest of all subtests. This finding suggests that, among children with Asperger's Disorder, other aspects of cognitive ability are more predictive of Social Perception subtest performance than Comprehension. Among the WPPSI–IV subtests, Object Assembly is most highly correlated with Affect Recognition and Memory for Faces, and Zoo Locations is most closely related to Theory of Mind. Overall, the results of this study are generally consistent with expectations for the relations of WPPSI–IV and the NEPSY–II Social Perception subtests among children with Asperger's Disorder.

Correlations With the BASC–2 PRS

The WPPSI–IV was administered to 37 children with Asperger's Disorder, aged 3:10–7:6, and their caregiver completed selected scales from the BASC–2 PRS on the same day. Due to the executive function deficits involved in autism spectrum disorders, it was expected that the WMI and Working Memory subtests would show low inverse correlations with the BASC–2 PRS Attention and Executive Function scales. Table 15 presents the means, *SD*s, and correlation coefficients for this study.

Table 15 Correlations Between the WPPSI–IV and the BASC–2 PRS for the Asperger's Disorder Group

WPPSI–IV Subtest/Process/ Composite Score	BASC–2 PRS Scale			WPPSI–IV		
	Attention Problems	Executive Functioning	Emotional Self-Control	Mean	*SD*	*n*
IN	.03	.13	.11	10.8	2.8	37
SI	–.02	–.03	–.03	10.6	3.1	36
VC	–.10	–.15	–.20	8.3	3.4	36
CO	–.03	–.06	–.13	7.3	3.0	36
RV	–.06	.02	.09	9.6	3.7	37
PN	.00	.08	.04	10.9	3.7	37
BD	–.07	–.02	.07	10.8	3.1	36
OA	–.18	–.09	.01	10.0	3.0	37
MR	–.20	–.22	–.08	10.5	2.8	36
PC	–.06	–.14	–.09	9.6	2.3	36
PM	–.24	–.06	–.16	9.7	3.1	37
ZL	–.05	–.02	–.14	9.5	2.9	37
BS	–.27	–.10	–.09	8.7	3.2	36
CA	–.06	–.10	.13	8.9	3.6	36
AC	–.37	–.20	–.10	9.2	2.8	36
CAR	–.09	–.10	.11	8.9	3.4	36
CAS	–.04	–.05	.14	8.9	3.6	36
VCI	.06	.09	.09	103.3	15.5	37
VSI	–.19	–.10	.01	102.8	16.0	36
FRI	–.16	–.21	–.10	100.1	13.6	36
WMI	–.16	–.05	–.18	97.5	15.1	37
PSI	–.17	–.11	.02	93.5	17.3	36
FSIQ	–.18	–.06	–.05	101.4	15.1	36
VAI	–.03	.05	.07	101.5	18.5	37
NVI	–.25	–.15	–.10	98.9	14.4	36
GAI	–.09	–.05	.01	104.1	15.0	36
CPI	–.26	–.14	–.14	94.6	16.0	36
BASC–2 PRS						
Mean	61.7	63.6	66.9			
SD	8.7	11.4	12.8			
n	37	37	37			

All mean WPPSI–IV composite scores are in the average range. The BASC–2 PRS scores are in the at-risk range.

As expected, the WMI and Working Memory subtests generally show low inverse correlations with the BASC–2 PRS Attention scales. However, the WMI is unrelated to the Executive Functioning scale. These results are not unexpected although some working memory models conceptualize working memory as an executive function, because there is also widespread agreement that executive function is a heterogeneous construct (Schneider, Schumann-Hengsteler, & Sodian, 2005). The VSI shares low inverse relations with the BASC–2 PRS Attention Problems and Executive Functioning scales.

As with the Autistic Disorder group, the PSI, FSIQ, NVI, GAI, and CPI are all inversely and most closely related to Attention Problems in this sample. Attention problems, an associated feature of autism spectrum disorder, appear to be predictive of cognitive abilities in this sample.

Results at the subtest level are consistent with those at the composite level. Notably, Bug Search and Animal Coding show relatively strong correlations with Attention Problems. Prior studies

indicate that individuals with Asperger's Disorder have weaknesses in processing speed performance relative to children without clinical conditions (Mayes & Calhoun, 2008; Mayes et al., 2012). Because the Processing Speed subtests are thought to involve attention to some extent (Sattler, 2008), this result is not entirely unexpected. Overall, these results are consistent with previous evidence suggesting that cognitive proficiency (e.g., working memory and processing speed abilities) and attentional problems are related in children with autism spectrum disorders.

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