



Technical Report #5

Expanded General Ability Index

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**Susan Engi Raiford, PhD¹, Linda Silverman, PhD²,
Barbara J. Gilman, MS², and Troy Courville, PhD³**

1 Pearson Clinical Assessment 2 Gifted Development Center 3 Georgia Tech Professional Education

Overview

This technical report provides information about a new ancillary WISC–V index score: the Expanded General Ability Index (EGAI). The EGAI is derived using eight subtests from the Verbal Comprehension, Visual Spatial, and Fluid Reasoning scales; it does not include working memory or processing speed subtests. The EGAI is designed to be used in situations for which an expanded measure of general intellectual ability that does not include Working Memory or Processing Speed subtests addresses a practical or clinical need. The EGAI does not replace any existing WISC–V composite score, but expands the options that are already available.

Background

Children with intellectual giftedness typically show strengths in higher-order reasoning domains such as verbal comprehension, visual spatial ability, and fluid reasoning (Raiford, Holdnack, Drozdick, & Zhang, 2014; Raiford et al., 2016; Rimm, Gilman, & Silverman, 2008; Wechsler, 2003, 2014; Wechsler & Kaplan, 2015). Their working memory and processing speed performance is typically higher than in the general population but lower than their performance in higher-order reasoning domains (Elliot, 2007; Kaufman & Kaufman, 2004; Raiford et al., 2014, 2016; Rimm et al., 2008; Rowe, Kingsley, & Thompson, 2010; Wechsler, 2003, 2014; Wechsler & Kaplan, 2015). Because of the evidence that children who are intellectually gifted show intrapersonal weaknesses in the areas of working memory and processing speed, giftedness experts have advocated that either the FSIQ or General Ability Index (GAI) be used for gifted admissions evaluations if cognitive ability scores are used as an admission criteria (National Association for Gifted Children [NAGC], 2008; Rimm et al., 2008). According to the NAGC, advanced reasoning is more relevant to a child's need for gifted programming, and weaknesses among gifted children in areas less related to advanced academic programming (e.g., slower speed on timed paper and pencil tasks) may lower the Full Scale IQ (FSIQ) score below cutoffs for gifted identification (NAGC, 2018). Furthermore, working memory

and processing speed are commonly observed weaknesses in children with conditions such as attention-deficit/hyperactivity disorder, autism, or learning disorders (Wechsler, 2003, 2014; Wechsler & Kaplan, 2015). Intellectually gifted children are at times diagnosed with one or more of these conditions, and these are valid diagnoses among children with high levels of intelligence (Antshel et al., 2007; Barnard-Brak, Johnsen, Hannig, & Wei, 2015; Cain, Kaboski, & Gilger, in press; Mullet & Rinn, 2015).

The NAGC continues to monitor assessment options and to provide guidance to the states regarding use of psychological assessments in gifted identification and services. The NAGC addresses methods for documenting giftedness by comprehensively clarifying patterns of strengths and needs for twice-exceptional children (e.g., gifted *and* diagnosed with neurodevelopmental conditions such as ADHD, learning disorder, or autism) and other children with asynchronous development. The NAGC provides the guidance in order to ensure that gifted education is accessible to gifted children who are twice-exceptional, culturally diverse, disadvantaged, highly gifted, or bilingual; or who experience asynchronous development in other ways and may exhibit striking patterns of strengths in higher-order reasoning and weaknesses in working memory and processing speed.

For the WISC–V, the NAGC (2018) has broadened the recommended scores to include other composites beyond the FSIQ and the GAI to include other ancillary or expanded index scores that emphasize reasoning (Raiford, Drozdick, Zhang, & Zhou, 2015). The group of scores recommended by the NAGC also includes the newly created Expanded General Ability Index (EGAI; Silverman & Raiford, 2017).

The EGAI was created to provide a broader measure of higher-order reasoning abilities relative to the General Ability Index (GAI). It measures crystallized and fluid intelligence; verbal concept formation and conceptualization; categorical and associative thinking; learning; practical judgment; and visual, visual-spatial, verbal, and quantitative reasoning. It is drawn from three cognitive domains (i.e., verbal comprehension, fluid reasoning, visual spatial) that load highly on a general intelligence factor (i.e., *g*) and show clinical utility with children who are gifted.

The EGAI is derived using the sum of eight subtest scaled scores. These subtests are drawn from the following scales: Verbal Comprehension (Similarities, Vocabulary, Information, and Comprehension), Visual Spatial (Block Design), and Fluid Reasoning (Matrix Reasoning, Figure Weights, and Arithmetic). The EGAI does not include Working Memory or Processing Speed subtests. Verbal Comprehension and Fluid Reasoning subtests are sampled heavily because from clinical, neurodevelopmental, theoretical, and statistical perspectives, crystallized and fluid reasoning abilities play a central role in cognitive development, intellectual ability, and academic achievement (Colom et al., 2013; Gregoire, 2013; Kaufman, Raiford, & Coalson, 2016; Langeslag et al., 2013; Schneider & McGrew, 2018; Wechsler, 2014; Weiss, Saklofske, Holdnack, & Prifitera, 2019) and are generally acknowledged to be the cornerstones of intelligence (Flanagan & Alfonso, 2017).

Purpose

The EGAI is one of the composite scores that the NAGC recommends for use in the selection process for gifted programs. The other recommended options include the FSIQ, the Nonverbal Index (NVI), the General Ability Index (GAI), the Quantitative Reasoning Index (QRI), and two other expanded index scores: the Verbal (Expanded Crystallized) Index and the Expanded Fluid Index (VECI and EFI; Raiford et al., 2015). The Quantitative Reasoning Index, although based on fewer subtests, is helpful to document mathematical talent.

Supporting Information

Standardization and Norms Development

The EGAI was developed using the WISC–V normative sample described in chapter 3 of the *WISC–V Technical and Interpretive Manual*. The procedures used to derive the normative information also are described in that chapter.

Deriving the Expanded General Ability Index

To obtain the sum of scaled scores used to derive the EGAI, sum the scaled scores for Similarities, Vocabulary, Information, Comprehension, Block Design, Matrix Reasoning, Figure Weights, and Arithmetic. Table 1 presents the EGAI equivalents of sums of scaled scores. The table also includes percentile ranks and confidence intervals.

Table 1 Expanded General Ability Index Equivalents of Sums of Scaled Scores

Sum of Scaled Scores	90% Confidence Interval				95% Confidence Interval				Sum of Scaled Scores	90% Confidence Interval				95% Confidence Interval			
	EGAI	Percentile Rank	Confidence Interval	Confidence Interval	EGAI	Percentile Rank	Confidence Interval	Confidence Interval		EGAI	Percentile Rank	Confidence Interval	Confidence Interval	EGAI	Percentile Rank	Confidence Interval	Confidence Interval
8	40	<0.1	38-46	37-47	34	64	1	61-69	60-70	60	82	12	78-87	78-87			
9	40	<0.1	38-46	37-47	35	65	1	62-70	61-71	61	83	13	79-88	79-88			
10	41	<0.1	39-47	38-48	36	66	1	63-71	62-72	62	84	14	80-89	80-89			
11	42	<0.1	40-48	39-49	37	67	1	64-72	63-73	63	85	16	81-90	81-90			
12	43	<0.1	41-49	40-50	38	68	2	65-73	64-74	64	86	18	82-91	81-91			
13	44	<0.1	42-50	41-51	39	69	2	66-74	65-75	65	87	19	83-92	82-92			
14	45	<0.1	43-51	42-52	40	69	2	66-74	65-75	66	87	19	83-92	82-92			
15	46	<0.1	43-52	43-53	41	70	2	67-75	66-76	67	88	21	84-93	83-93			
16	47	<0.1	44-53	44-54	42	71	3	68-76	67-77	68	89	23	85-93	84-94			
17	48	<0.1	45-54	45-54	43	71	3	68-76	67-77	69	90	25	86-94	85-95			
18	49	<0.1	46-55	46-55	44	72	3	69-77	68-78	70	91	27	87-95	86-96			
19	50	<0.1	47-56	47-56	45	72	3	69-77	68-78	71	92	30	88-96	87-97			
20	51	0.1	48-57	48-57	46	73	4	70-78	69-79	72	93	32	89-97	88-98			
21	52	0.1	49-58	49-58	47	74	4	71-79	70-80	73	94	34	90-98	89-99			
22	53	0.1	50-59	49-59	48	74	4	71-79	70-80	74	95	37	91-99	90-100			
23	54	0.1	51-60	50-60	49	75	5	72-80	71-81	75	96	39	92-100	91-101			
24	55	0.1	52-60	51-61	50	76	5	73-81	72-82	76	97	42	93-101	92-102			
25	56	0.2	53-61	52-62	51	76	5	73-81	72-82	77	97	42	93-101	92-102			
26	57	0.2	54-62	53-63	52	77	6	74-82	73-83	78	98	45	94-102	93-103			
27	58	0.3	55-63	54-64	53	77	6	74-82	73-83	79	99	47	95-103	94-104			
28	59	0.3	56-64	55-65	54	78	7	75-83	74-84	80	100	50	96-104	95-105			
29	60	0.4	57-65	56-66	55	78	7	75-83	74-84	81	101	53	97-105	96-106			
30	60	0.4	57-65	56-66	56	79	8	75-84	75-85	82	102	55	98-106	97-107			
31	61	0.5	58-66	57-67	57	80	9	76-85	76-86	83	103	58	99-107	98-108			
32	62	1	59-67	58-68	58	81	10	77-86	77-87	84	104	61	100-108	99-109			
33	63	1	60-68	59-69	59	81	10	77-86	77-87	85	104	61	100-108	99-109			

Table 1 Expanded General Ability Index Equivalents of Sums of Scaled Scores (continued)

Sum of Scaled Scores	90%			95%			Sum of Scaled Scores	90%			95%			
	EGAI	Percentile Rank	Confidence Interval	EGAI	Percentile Rank	Confidence Interval		EGAI	Percentile Rank	Confidence Interval	EGAI	Percentile Rank	Confidence Interval	
86	105	63	101-109	100-110	116	130	98	125-133	124-134	146	153	>99.9	147-156	146-156
87	106	66	102-110	101-111	117	130	98	125-133	124-134	147	154	>99.9	148-157	147-157
88	107	68	103-111	102-112	118	131	98	126-134	125-135	148	155	>99.9	149-157	148-158
89	108	70	104-112	103-113	119	132	98	127-135	126-136	149	156	>99.9	150-158	149-159
90	109	73	105-113	104-114	120	132	98	127-135	126-136	150	157	>99.9	151-159	150-160
91	110	75	106-114	105-115	121	133	99	128-136	127-137	151	158	>99.9	152-160	151-161
92	111	77	107-115	106-116	122	134	99	129-137	128-138	152	160	>99.9	154-162	153-163
93	111	77	107-115	106-116	123	135	99	130-138	129-139					
94	112	79	107-116	107-117	124	136	99	131-139	130-140					
95	113	81	108-117	108-118	125	136	99	131-139	130-140					
96	114	82	109-118	109-119	126	137	99	132-140	131-141					
97	115	84	110-119	110-119	127	138	99	133-141	132-142					
98	116	86	111-120	111-120	128	139	99.5	134-142	133-143					
99	116	86	111-120	111-120	129	140	99.6	135-143	134-144					
100	117	87	112-121	112-121	130	140	99.6	135-143	134-144					
101	118	88	113-122	113-122	131	141	99.7	136-144	135-145					
102	119	90	114-123	113-123	132	141	99.7	136-144	135-145					
103	120	91	115-124	114-124	133	142	99.7	137-145	136-146					
104	121	92	116-125	115-125	134	142	99.7	137-145	136-146					
105	122	93	117-125	116-126	135	143	99.8	138-146	137-147					
106	123	94	118-126	117-127	136	143	99.8	138-146	137-147					
107	123	94	118-126	117-127	137	144	99.8	139-147	138-148					
108	124	95	119-127	118-128	138	145	99.9	140-148	139-149					
109	124	95	119-127	118-128	139	146	99.9	140-149	140-150					
110	125	95	120-128	119-129	140	147	99.9	141-150	141-151					
111	126	96	121-129	120-130	141	148	99.9	142-151	142-151					
112	127	96	122-130	121-131	142	149	99.9	143-152	143-152					
113	127	96	122-130	121-131	143	150	>99.9	144-153	144-153					
114	128	97	123-131	122-132	144	151	>99.9	145-154	145-154					
115	129	97	124-132	123-133	145	152	>99.9	146-155	146-155					

Technical Properties

Reliability and Standard Errors of Measurement

The methods and the samples used to obtain the reliability information and *SEMs* for the EGAI are the same as those described in chapters 3 and 4 of the *WISC–V Technical and Interpretive Manual*. Table 2 presents the reliability coefficients and *SEMs* of the EGAI. The reliability coefficients are shown by age group and overall sample. The *SEMs* are shown by age group and averaged across all ages.

Table 2 EGAI Reliability Coefficients and *SEMs*

	Age Group											Overall Average ^{a, b}
	6	7	8	9	10	11	12	13	14	15	16	
Reliability	.96	.97	.97	.97	.97	.96	.98	.97	.97	.97	.98	.97
<i>SEM</i>	3.02	2.62	2.62	2.62	2.62	3.02	2.14	2.62	2.62	2.62	2.14	2.62

^a Average reliability coefficients were calculated with Fisher’s *z* transformation.

^b The average *SEMs* were calculated by averaging the squared *SEMs* for each age group and obtaining the square root of the result.

As the data in Table 2 indicate, the overall average reliability coefficient for the EGAI is excellent. The value is comparable to that of the WISC–V FSIQ and to other WISC–V composite scores that provide global estimates of ability (shown in Table 4.1 of the *WISC–V Technical and Interpretive Manual*): the WISC–V FSIQ (.96), NVI (.95), and GAI (.96).

Reporting and Describing the Expanded General Ability Index

The EGAI is an age-corrected standard score. It can be interpreted similarly to other composite scores, as outlined in chapter 6 of the *WISC–V Technical and Interpretive Manual*. Age-based percentile ranks are provided for the EGAI and indicate a child’s standing relative to other children the same age. Percentile ranks reflect points on a scale at or below which a given percentage of scores lie, based on the normative sample. The percentile ranks for the EGAI are interpreted as are other percentile ranks, as described in chapter 6 of the *WISC–V Technical and Interpretive Manual*.

Scores on measures of cognitive ability are based on observational data and represent estimates of a child’s true scores. They reflect a child’s true abilities combined with some degree of measurement error. Confidence intervals provide another means of expressing score precision and serve as a reminder that measurement error is inherent in all scores. Refer to chapter 6 of the *WISC–V Technical and Interpretive Manual* for additional information about confidence intervals and their use in interpretation.

The EGAI can be described in qualitative terms according to the child’s level of performance. Refer to chapter 6 of the *WISC–V Technical and Interpretive Manual* for qualitative descriptors to describe the EGAI.

The EGAI provides a broad measure of the child’s higher-order abstract reasoning drawn from verbal, visual, visual-spatial, and quantitative tasks, with less emphasis on working memory and processing speed relative to the FSIQ. The application of these reasoning abilities involves crystallized and fluid intelligence, verbal concept formation and expression, categorical and associative thinking, learning ability, practical judgment, and long-term retrieval. The EGAI relies on a broad sample of the cognitive domains that load most highly on *g* and on abilities that are sensitive to intellectual giftedness.

High EGAI scores indicate well-developed higher-order reasoning skills. Low EGAI scores may occur for a number of reasons, including language deficits; generally poor reasoning skills; or verbal, visual, or quantitative processing difficulties.

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