A Norm Revision of CAIT

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1. INTRODUCTION

The *Comprehensive Adult Intelligence Test* (CAIT) is an on-line rendition and expansion of the modern Wechsler scales authored by the Reddit user EqusB. Norms for psychometric tests must be verifiable and interchangeable across similar batteries due to their high importance in the interpretation of one's cognition; in pursuit of this goal, we aim to provide updated, empirical norms for CAIT.

2. NORM DEVELOPMENT

The development of composite scores must be done in a standardized manner to ensure the accuracy and applicability of those scores. The Tellegen & Briggs procedure[1] will be used and outlined for all composite score and reliability calculations.

2.1 Composite Scores

Observed subtest intercorrelations (Table 1) were used in the computation of $\sum r_{ab}$—the sum of the correlations for each combination of subtests.

Table 1. Subtest Intercorrelations

	BD	**VP**	**FW**
BD	1		
VP	.712**(64)	1	
FW	.426**(56)	.436**(55)	1

Note: Numbers in parentheses indicate the n for each correlation. $^{**}p < 0.01$.

The following formula was used to calculate the standard deviation (s_c) of the composite sums of scaled scores, with s_s being the standard deviation of Wechsler scaled scores and n as the number of tests to composite.

$$s_c = s_s\sqrt{n + 2\sum r_{ab}} \tag{1}$$

With this, it is easy to calculate a deviation score (DS) using the next formula with a given sum of scaled scores (X_c) by defining $\bar{x}_c$ as the sum of the means of scaled scores, s_{sc} as the chosen standard deviation of the composite and $\bar{x}_{sc}$ as the desired mean of the composite.

$$\text{DS} = \frac{s_{sc}}{s_c}(X_c - \bar{x}_c) + \bar{x}_{sc} \tag{2}$$

See Appendix A, Tables 3 and 4 for score conversions.

2.1.1 Composite Reliability and Confidence Intervals

Knowledge of a test's reliability allows an investigator to concisely communicate the quality of a test and compute expected ranges for an examinee's ability on that test. As such, the accurate reporting of reliability is necessary; this section outlines the procedures used in calculating the reliability of two CAIT composites and describes the calculation of their respective confidence intervals. Under the assumptions of CAIT's norms, formula 3 applies, where r_{cc} is the composite reliability, $\text{SE} = 15 \times \sqrt{1 - r_{cc}}$ (the standard error), and the other variables are as defined previously.

$$r_{cc} = \frac{\sum r_{aa} + 2\sum r_{ab}}{n + 2\sum r_{ab}} \tag{3}$$

With this reliability, we can now calculate the confidence interval for any score DS using

$$\text{CI}_{95\%} = r_{cc}(DS - \bar{x}_{sc}) \pm 1.96 \times \text{SE} + \bar{x}_{sc} \tag{4}$$

See Appendix A, Table 3 and 4 for confidence intervals.

Table 2. Summary of results in *2.1*

	s_c	r_{aa}	**SE**
BD	3	.865	1.1
VP	3	.892	.99
FW	3	.915	.87
VSI	5.551	.928	4.0
PRI_1	7.439	.947	3.5
PRI_2	5.804	.933	3.9

Note: SEs for BD, VP, and FW are in $\sigma 3$ and VSI, PRI_1, and PRI_2 in $\sigma 15$

2.2 Subtest Raw Score Conversions

Subtest raw score to scaled score conversions were computed using the cumulative percentages of certain raw scores and adjusting by the test sample's known mean. The floors had to be increased dramatically over what might be desired due to poor sampling in that range. See Appendix A, Table 6 for the score conversions and Appendices B and C for corresponding tables and figures.

ACKNOWLEDGMENTS

I am deeply grateful to EqusB for supplying the data required for this norm revision and granting permission to post it to the subreddit.

REFERENCES

[1] Tellegen, A., & Briggs, P. F. (1967). Old wine in new skins: grouping Wechsler subtests into new scales. *Journal of consulting psychology*, 31(5), 499–506. doi:10.1037/h0024963

3. APPENDIX A

Table 3. CAIT VSI Equivalents of Sums of Scaled Scores

SSS	VSI	95% CI	SSS	VSI	95% CI
10	73	67-83	28	122	113-128
11	76	70-86	29	124	114-130
12	78	72-87	30	127	117-133
13	81	74-90	31	130	120-136
14	84	77-93	32	132	122-138
15	86	79-95	33	135	125-140
16	89	82-98	34	138	127-143
17	92	85-100	35	141	130-146
18	95	87-103	36	143	132-148
19	97	89-105	37	146	135-151
20	100	92-108	38	149	138-153
21	103	95-111	39	151	139-155
22	105	97-113	40	154	142-158
23	108	100-115	41	157	145-161
24	111	102-118	42	159	147-163
25	114	105-121	43	162	150-165
26	116	107-123	44	165	152-168
27	119	110-126	45	168	155-171

CAIT VSI is comprised of VP and BD

Table 4. CAIT PRI_1 Equivalents of Sums of Scaled Scores

SSS	PRI_1	95% CI	SSS	PRI_1	95% CI
11	62	57-71	40	120	112-126
12	64	59-73	41	122	114-128
13	66	61-75	42	124	116-129
14	68	63-76	43	126	118-131
15	70	65-78	44	128	120-133
16	72	67-80	45	130	122-135
17	74	69-82	46	132	124-137
18	76	71-84	47	134	125-139
19	78	72-86	48	136	127-141
20	80	74-88	49	138	129-143
21	82	76-90	50	140	131-145
22	84	78-92	51	142	133-147
23	86	80-94	52	144	135-148
24	88	82-95	53	146	137-150
25	90	84-97	54	148	139-152
26	92	86-99	55	150	141-154
27	94	88-101	56	152	142-156
28	96	89-103	57	154	144-158
29	98	91-105	58	156	146-160
30	100	93-107	59	158	148-162
31	102	95-109	60	160	150-164
32	104	97-111	61	163	153-166
33	106	99-112	62	165	155-168
34	108	101-114	63	167	157-170
35	110	103-116	64	169	159-172
36	112	105-118	65	171	160-174
37	114	106-120	66	173	162-176
38	116	108-122	67	175	164-178
39	118	110-124			

CAIT PRI_1 is comprised of VP, BD, and FW

Table 5. CAIT PRI_2 Equivalents of Sums of Scaled Scores

SSS	PRI_2	95% CI	SSS	PRI_2	95% CI
5	56	51-67	26	118	109-124
6	59	54-69	27	121	112-127
7	62	57-72	28	124	115-130
8	65	60-75	29	127	118-133
9	68	63-78	30	130	120-136
10	70	64-80	31	132	122-137
11	73	67-82	32	135	125-140
12	76	70-85	33	138	128-143
13	79	73-88	34	141	131-146
14	82	76-91	35	144	133-149
15	85	78-94	36	147	136-151
16	88	81-96	37	150	139-154
17	91	84-99	38	153	142-157
18	94	87-102	39	156	145-160
19	97	90-105	40	159	147-163
20	100	92-108	41	162	150-165
21	103	95-110	42	165	153-168
22	106	98-113	43	168	156-171
23	109	101-116	44	171	159-174
24	112	104-119	45	174	161-177
25	115	106-122			

CAIT PRI_2 is comprised of VP and FW

Note that the ceiling and floor of this index are unduly extreme due to the relatively low correlation between FW and VP

Table 6. Scaled Score Equivalents of CAIT Subtest Raw Scores

SS	BD	VP	FW	SS
1			0-5	1
2				2
3			6	3
4		6	7	4
5		7	8	5
6	6-7	8-9	9-10	6
7	8	10	11	7
8	9	11-12	12	8
9	10	13-14	13	9
10	11-12	15-16	14	10
11	13	17-18	15	11
12	14-15	19	16	12
13	16	20	17	13
14	17	21	18	14
15	18-19	22	19	15
16	20	23	20	16
17	21	24	21	17
18	22	25	22	18
19	23	26-27	23	19
20		28	24	20
21	24	29	25	21
22	25-26	30	26	22
23		31		23

4. APPENDIX B

Table 7. Smoothed Table for BD

Raw	Scaled	Percentile
6	3	0.70
7	3	1.50
8	4	2.90
9	5	5.30
10	6	8.70
11	7	13.30
12	7	19.20
13	8	26.30
14	9	34.40
15	9	43.20
16	10	52.50
17	11	61.70
18	12	70.40
19	12	78.40
20	13	85.30
21	14	91.00
22	15	95.20
23	16	98.10
24	18	99.60
25-26	19	99.80

Note: Scaled scores were linearly transformed by +3.4 in final norms.

Table 8. Smoothed Table for VP

Raw	Scaled	Percentile
6	1	0.10
7	2	0.30
8	3	0.70
9	3	1.30
10	4	2.30
11	5	3.60
12	5	5.40
13	6	7.80
14	6	11.00
15	7	15.10
16	7	16.00
17	8	26.50
18	8	27.40
19	9	42.90
20	10	52.90
21	11	64.70
22	12	74.60
23	13	84.40
24	14	90.70
25	15	96.00
26	16	98.10
27	16	98.40
28	17	99.00
29	18	99.60
30	19	99.90
31	20	>99.90

Note: Scaled scores were linearly transformed by +3.4 in final norms.

Table 9. Smoothed Table for FW

Raw	Scaled	Percentile
4	-2	<.01
5	-2	<.01
6	0	<.01
7	1	0.10
8	2	0.20
9	3	0.50
10	3	1.00
11	4	2.10
12	5	4.00
13	6	7.20
14	7	12.10
15	8	19.20
16	9	28.70
17	10	40.50
18	11	53.70
19	12	67.20
20	13	79.10
21	14	88.30
22	15	94.20
23	16	97.50
24	17	99.00
25	18	99.60
26	19	99.90

Note: Scaled scores were linearly transformed by +3.4 in final norms.

5. APPENDIX C

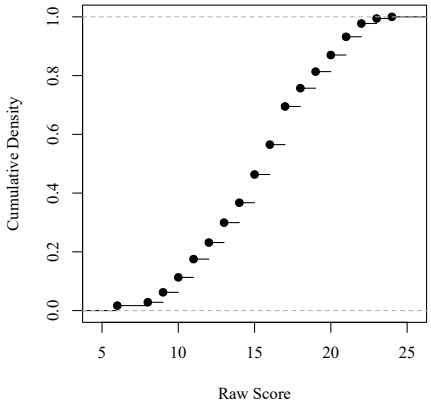

Fig. 1. Cumulative distribution plot for BD

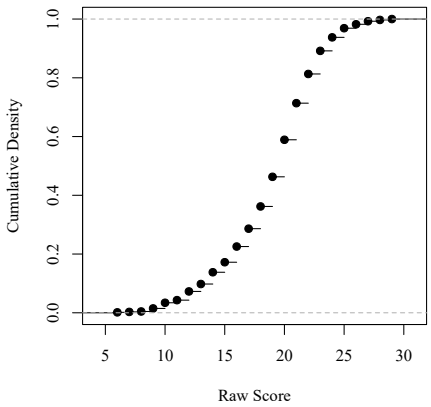

Fig. 2. Cumulative distribution plot for VP

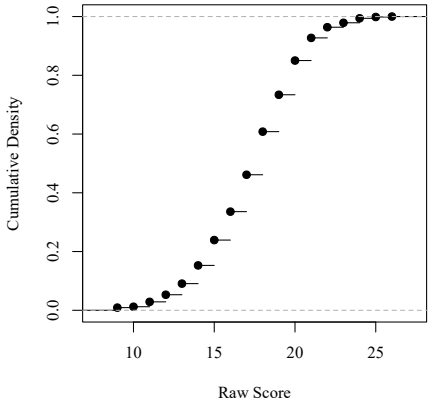

Fig. 3. Cumulative distribution plot for FW