

## Supplementary Tables and Figures

**Table S1:** Neuropsychological performance of the groups. Means (SDs) of raw scores are reported. All case-control comparisons were significant ( $p < .001$ ), except for bipolar disorder on visual learning ( $p < .01$ ) and social cognition (no significant difference). HC, healthy controls; BD, bipolar disorder; SAB, schizoaffective disorder – bipolar type; SAD, schizoaffective disorder – depressive type; SZ, schizophrenia; ANCOVA, analysis of covariance; HVLT-R, Hopkins Verbal Learning Test – Revised; NAB, Neuropsychological Assessment Battery; BVMT-R, Brief Visuospatial Memory Test – Revised; MSCEIT: ME, Mayer-Salovey-Caruso Emotional Intelligence Test: Managing Emotions; CPT: IP, Continuous Performance Test: Identical Pairs; TMT, Trail Making Test; BACS, Brief Assessment of Cognition in Schizophrenia; WMS III: SS, Wechsler Memory Scale III: Spatial Span; LNS, Letter Number Span.

**Table S2:** Comparison of cognitive performance in bipolar disorder type I and type II. BD-I – bipolar disorder – type I; BD-II – bipolar disorder – type II. Positive Cohen's  $d$  effect sizes indicate BD-II performed better than BD-I. Marginal means adjusted for age and sex.

**Table S3:** Comparisons of cognitive performance when only bipolar disorder - type I was included. All case-control comparisons were significant ( $p < .001$ ), except for bipolar disorder on social cognition (no significant difference). BD, bipolar disorder; SA, schizoaffective disorder; SZ, schizophrenia; <sup>1</sup> $p < .05$ , <sup>2</sup> $p < .00625$  (Bonferroni-corrected).

**Table S4:** Comparison of cognitive performance in bipolar disorder with and without history of psychosis. BD-P – bipolar disorder with psychosis; BD-NP – bipolar disorder without psychosis. Marginal means adjusted for age and sex.

**Table S5:** The effect of diagnostic group after accounting for duration of antipsychotic exposure. BD, bipolar disorder; SAB, schizoaffective disorder – bipolar type; SAD, schizoaffective disorder – depressive type; SZ, schizophrenia; <sup>1</sup> $p < .05$ , <sup>2</sup> $p < .00625$  (Bonferroni-corrected).

**Table S6:** The effect of diagnostic group after accounting for olanzapine equivalent dose. BD, bipolar disorder; SAB, schizoaffective disorder – bipolar type; SAD, schizoaffective disorder – depressive type; SZ, schizophrenia; <sup>1</sup> $p < .05$ , <sup>2</sup> $p < .00625$  (Bonferroni-corrected).

**Table S7:** The effect of diagnostic group after accounting for total SAPS scores. Total SAPS were calculated by summing the global scores (hallucinations, delusions, bizarre behavior and positive formal thought disorder). BD, bipolar disorder; SAB, schizoaffective disorder – bipolar type; SAD, schizoaffective disorder – depressive type; SZ, schizophrenia; <sup>1</sup> $p < .05$ , <sup>2</sup> $p < .00625$  (Bonferroni-corrected).

**Table S8:** The effect of diagnostic group after accounting for total SANS scores. Total SANS were calculated by summing the global scores (affective flattening, avolition / apathy and anhedonia / asociality). BD, bipolar disorder; SAB, schizoaffective disorder –

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bipolar type; SAD, schizoaffective disorder – depressive type; SZ, schizophrenia; <sup>1</sup>p<.05, <sup>2</sup>p<.00625 (Bonferroni-corrected).

**Table S9:** The effect of diagnosis after accounting for education and parental occupation. Mother's and father's highest occupation were not significant at p=0.00625 for any of the domains. BD, bipolar disorder; SAB, schizoaffective disorder – bipolar type; SAD, schizoaffective disorder – depressive type; SZ, schizophrenia; <sup>1</sup>p<.05, <sup>2</sup>p<.00625 (Bonferroni-corrected).

**Table S10:** Main effect of diagnostic group after accounting for all covariates. BD, bipolar disorder; SAB, schizoaffective disorder – bipolar type; SAD, schizoaffective disorder – depressive type; SZ, schizophrenia; ANCOVA, analysis of covariance; <sup>1</sup>p<.05, <sup>2</sup>p<.00625 (Bonferroni-corrected).

**Table S11:** Effect of each variable on composite cognition

**Table S12:** Ordinal regression results and post hoc comparisons. Model fit: chi-square = 103.57 (p = 2.7 x 10<sup>-22</sup>). Test of parallel lines: chi-square = 4.97 (p = 0.174). Goodness of fit: i) Pearson chi-square = 1636.42 (p=0.527); ii) Deviance chi-square = 903.30 (p=1.00). BD, Bipolar Disorder; SAB, Schizoaffective Disorder – Bipolar Type; SAD, Schizoaffective Disorder – Depressive Type; SZ, Schizophrenia.

**Table S13:** Median scores and interquartile ranges for the BADDs dimensions. BADDs, Bipolar Affective Disorder Dimension Scale.

**Table S14:** The associations between BADDs symptom dimensions and cognition after adjusting for age, sex, antipsychotic exposure in months, olanzapine equivalent dose and current negative symptoms. BADDs, Bipolar Affective Disorder Dimension Scale; BD, Bipolar Disorder; SAB, Schizoaffective Disorder – Bipolar Type; SAD, Schizoaffective Disorder – Depressive Type; SZ, Schizophrenia.

**Supplementary Material**

Performance of the diagnostic groups – Main analysis results

**Table S1 Neuropsychological performance of the groups**

Domain	Task	HC	BD	SAB	SAD	SZ	ANCOVA		
							F <sup>df</sup>	p	Partial $\eta^2$
<b>Verbal Learning</b>	HVLT-R	28.81 (3.89)	24.32 (5.76)	22.34 (5.36)	19.85 (6.27)	19.25 (6.11)	F <sup>4, 922</sup> =63.75	p<2.20 x 10 <sup>-16</sup>	0.22
<b>Reasoning &amp; Problem Solving</b>	NAB: Mazes	19.50 (5.56)	14.42 (6.87)	12.49 (7.12)	9.73 (7.02)	11.19 (7.22)	F <sup>4, 922</sup> =43.85	p<2.20 x 10 <sup>-16</sup>	0.16
<b>Visual Learning</b>	BVMT-R	25.92 (6.62)	20.69 (7.50)	18.34 (7.56)	15.75 (8.53)	14.65 (8.29)	F <sup>4, 918</sup> =52.93	p<2.20 x 10 <sup>-16</sup>	0.19
<b>Social Cognition</b>	MSCEIT: ME	95.14 (8.75)	93.23 (10.04)	87.40 (9.62)	87.96 (11.15)	85.06 (10.21)	F <sup>4, 902</sup> =25.07	p<2.20 x 10 <sup>-16</sup>	0.10
<b>Attention / Vigilance</b>	CPT: IP	2.76 (0.66)	2.23 (0.81)	2.15 (0.78)	1.88 (0.78)	1.81 (0.80)	F <sup>4, 867</sup> =35.44	p<2.20 x 10 <sup>-16</sup>	0.14
<b>Speed of Processing</b>	TMT A	28.30 (9.17)	37.32 (13.78)	43.36 (19.15)	49.04 (21.62)	51.03 (26.24)	F <sup>4, 922</sup> =82.52	p<2.20 x 10 <sup>-16</sup>	0.26
	BACS: Symbol Coding	58.02 (11.26)	46.50 (11.87)	43.28 (12.63)	37.28 (12.26)	36.47 (12.84)			
	Category Fluency: Animal Naming	27.70 (7.68)	22.59 (6.59)	21.88 (6.01)	19.33 (6.05)	19.47 (5.96)			

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Means (SDs) of raw scores are reported. All case-control comparisons were significant ( $p < .001$ ), except for bipolar disorder on visual learning ( $p < .01$ ) and social cognition (no significant difference). HC, healthy controls; BD, bipolar disorder; SAB, schizoaffective disorder – bipolar type; SAD, schizoaffective disorder – depressive type; SZ, schizophrenia; ANCOVA, analysis of covariance; HVLTR, Hopkins Verbal Learning Test – Revised; NAB, Neuropsychological Assessment Battery; BVMT-R, Brief Visuospatial Memory Test – Revised; MSCEIT: ME, Mayer-Salovey-Caruso Emotional Intelligence Test: Managing Emotions; CPT: IP, Continuous Performance Test: Identical Pairs; TMT, Trail Making Test; BACS, Brief Assessment of Cognition in Schizophrenia; WMS III: SS, Wechsler Memory Scale III: Spatial Span; LNS, Letter Number Span.

**Table S1 Neuropsychological performance [cont.]**

Domain	Task	HC	BD	SAB	SAD	SZ	$F^{df}$	$p$	ANCOVA Partial $\eta^2$
<b>Working Memory</b>	WMS III:	17.31	14.04	13.50	12.56	12.86 (3.70)	$F^{4,922}=51.42$	$p < 2.20 \times 10^{-16}$	0.18
	SS	(3.10)	(3.12)	(3.08)	(3.45)				
	LNS	15.80	13.31	12.34	10.76	10.58 (4.35)			
		(3.14)	(3.68)	(3.61)	(4.49)				
<b>Composite Cognition Score</b>							$F^{4,921}=94.12$	$p < 2.20 \times 10^{-16}$	0.29
<b>Composite Cognition Score without Social Domain</b>							$F^{4,921}=90.16$	$p < 2.20 \times 10^{-16}$	0.28

Means (SDs) of raw scores are reported. All case-control comparisons were significant ( $p < .001$ ), except for bipolar disorder on visual learning ( $p < .01$ ) and social cognition (no significant difference). HC, healthy controls; BD, bipolar disorder; SAB, schizoaffective disorder – bipolar type; SAD, schizoaffective disorder – depressive type; SZ, schizophrenia; ANCOVA, analysis of covariance; HVLTR, Hopkins Verbal Learning Test – Revised; NAB, Neuropsychological Assessment Battery; BVMT-R, Brief Visuospatial Memory Test – Revised; MSCEIT: ME, Mayer-Salovey-Caruso Emotional Intelligence Test: Managing Emotions; CPT: IP, Continuous Performance Test: Identical Pairs; TMT, Trail Making Test; BACS, Brief Assessment of Cognition in Schizophrenia; WMS III: SS, Wechsler Memory Scale III: Spatial Span; LNS, Letter Number Span.

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Differences between bipolar disorder – type I and bipolar disorder – type II

**Table S2 Comparison of cognitive performance in bipolar disorder type I and type II**

Domain	Marginal Means		Cohen's d	p
	BD-I	BD-II		
<b>Verbal learning</b>	-1.14	-1.86	-0.479	0.146
<b>Reasoning &amp; Problem Solving</b>	-0.81	-1.25	-0.335	0.313
<b>Visual Learning</b>	-0.88	-0.45	0.36	0.274
<b>Social Cognition</b>	-0.21	-0.36	-0.121	0.706
<b>Attention</b>	-0.76	-0.81	-0.039	0.908
<b>Speed of Processing</b>	-1.12	-1.06	0.054	0.859
<b>Working Memory</b>	-1.06	-0.66	0.356	0.292
<b>Composite</b>	-1.22	-1.31	-0.073	0.834

BD-I – bipolar disorder – type I; BD-II – bipolar disorder – type II. Positive Cohen's d effect sizes indicate BD-II performed better than BD-I. Marginal means adjusted for age and sex.

Comparisons when only bipolar disorder – type I is included

**Table S3 Comparisons of cognitive performance when only bipolar disorder - type I was included**

Domain	Effect of Diagnosis			Pairwise Comparisons
	F <sup>df</sup>	p	Partial η <sup>2</sup>	
<b>Verbal Learning</b>	F <sup>4, 912</sup> =64.25	<2.2 x 10 <sup>-16</sup>	0.22	SAD < BD <sup>2</sup> SZ < BD <sup>2</sup> SAD < SAB <sup>1</sup> SZ < SAB <sup>2</sup>
<b>Reasoning &amp; Problem Solving</b>	F <sup>4, 912</sup> =43.74	<2.2 x 10 <sup>-16</sup>	0.16	SAD < BD <sup>2</sup> SZ < BD <sup>2</sup> SAD < SAB <sup>1</sup>
<b>Visual Learning</b>	F <sup>4, 912</sup> =51.13	<2.2 x 10 <sup>-16</sup>	0.18	SAD < BD <sup>2</sup> SZ < BD <sup>2</sup> SZ < SAB <sup>2</sup>
<b>Social Cognition</b>	F <sup>4, 892</sup> =24.65	<2.2 x 10 <sup>-16</sup>	0.10	SAB < BD <sup>2</sup> SAD < BD <sup>2</sup> SZ < BD <sup>2</sup>
<b>Attention / Vigilance</b>	F <sup>4, 857</sup> =35.22	<2.2 x 10 <sup>-16</sup>	0.14	SAD < BD <sup>1</sup> SZ < BD <sup>2</sup> SZ < SAB <sup>2</sup>
<b>Speed of Processing</b>	F <sup>4, 912</sup> =81.39	<2.2 x 10 <sup>-16</sup>	0.26	SAD < BD <sup>2</sup> SZ < BD <sup>2</sup> SAD < SAB <sup>2</sup> SZ < SAB <sup>2</sup>
<b>Working Memory</b>	F <sup>4, 912</sup> =49.91	<2.2 x 10 <sup>-16</sup>	0.18	SAD < BD <sup>2</sup> SZ < BD <sup>2</sup> SZ < SAB <sup>2</sup>
<b>Composite Score</b>	F <sup>4, 911</sup> =92.74	<2.2 x 10 <sup>-16</sup>	0.29	SAB < BD <sup>1</sup> SAD < BD <sup>2</sup> SZ < BD <sup>2</sup>

SAD < SAB<sup>1</sup>  
SZ < SAB<sup>2</sup>

All case-control comparisons were significant ( $p < .001$ ), except for bipolar disorder on social cognition (no significant difference). BD, bipolar disorder; SA, schizoaffective disorder; SZ, schizophrenia; <sup>1</sup> $p < .05$ , <sup>2</sup> $p < .00625$  (Bonferroni-corrected)

Differences between bipolar disorder with and without lifetime psychosis

**Table S4 Comparison of cognitive performance in bipolar disorder with and without history of psychosis**

Domain	Marginal Means		Cohen's d	p
	BD-P	BD-NP		
<b>Verbal learning</b>	-1.12	-1.63	0.34	0.193
<b>Reasoning &amp; Problem Solving</b>	-0.82	-1.12	0.23	0.380
<b>Visual Learning</b>	-0.78	-0.95	0.14	0.602
<b>Social Cognition</b>	-0.14	-0.54	0.33	0.220
<b>Attention</b>	-0.69	-1.12	0.34	0.194
<b>Speed of Processing</b>	-1.06	-1.30	0.23	0.387
<b>Working Memory</b>	-0.98	-1.07	0.08	0.770
<b>Composite</b>	-1.15	-1.56	0.34	0.200

BD-P – bipolar disorder with psychosis; BD-NP – bipolar disorder without psychosis. Marginal means adjusted for age and sex.

Secondary Analyses

Lifetime duration of antipsychotic exposure (in months)

**Table S5** The effect of diagnostic group after accounting for duration of antipsychotic exposure

Domain	Effect of Diagnosis			Effect of Duration of Antipsychotic Exposure			Pairwise Comparisons
	F <sup>df</sup>	p	Partial $\eta^2$	F <sup>df</sup>	p	Partial $\eta^2$	
<b>Verbal Learning</b>	F <sup>3, 766</sup> =8.84	9.2 x 10 <sup>-6</sup>	0.03	F <sup>1, 766</sup> =28.50	1.2 x 10 <sup>-7</sup>	0.04	SAD < BD <sup>2</sup> SZ < BD <sup>2</sup> SAD < SAB <sup>1</sup> SZ < SAB <sup>1</sup>
<b>Reasoning &amp; Problem Solving</b>	F <sup>3, 766</sup> =5.90	6.0 x 10 <sup>-4</sup>	0.02	F <sup>1, 766</sup> =17.10	3.9 x 10 <sup>-5</sup>	0.02	SAD < BD <sup>2</sup> SZ < BD <sup>1</sup> SAD < SAB <sup>1</sup>
<b>Visual Learning</b>	F <sup>3, 762</sup> =12.29	7.4 x 10 <sup>-8</sup>	0.05	F <sup>1, 762</sup> =23.96	1.2 x 10 <sup>-6</sup>	0.03	SAD < BD <sup>2</sup> SZ < BD <sup>2</sup> SZ < SAB <sup>2</sup>
<b>Social Cognition</b>	F <sup>3, 750</sup> =8.48	1.5 x 10 <sup>-5</sup>	0.03	F <sup>1, 750</sup> =8.57	0.004	0.01	SAB < BD <sup>1</sup> SAD < BD <sup>1</sup> SZ < BD <sup>2</sup>
<b>Attention / Vigilance</b>	F <sup>3, 715</sup> =6.00	4.8 x 10 <sup>-4</sup>	0.03	F <sup>1, 715</sup> =11.86	6.1 x 10 <sup>-4</sup>	0.02	SZ < BD <sup>2</sup> SZ < SAB <sup>1</sup>
<b>Speed of Processing</b>	F <sup>3, 766</sup> =14.57	3.1 x 10 <sup>-9</sup>	0.05	F <sup>1, 766</sup> =12.71	3.9 x 10 <sup>-4</sup>	0.02	SAD < BD <sup>2</sup> SZ < BD <sup>2</sup> SAD < SAB <sup>2</sup> SZ < SAB <sup>2</sup>
<b>Working Memory</b>	F <sup>3, 766</sup> =8.62	1.3 x 10 <sup>-5</sup>	0.03	F <sup>1, 766</sup> =14.90	1.2 x 10 <sup>-4</sup>	0.02	SAD < BD <sup>2</sup> SZ < BD <sup>2</sup> SZ < SAB <sup>1</sup>
<b>Composite Score</b>	F <sup>3, 765</sup> =16.18	3.4 x 10 <sup>-10</sup>	0.06	F <sup>1, 765</sup> =33.69	9.5 x 10 <sup>-9</sup>	0.04	SAD < BD <sup>2</sup> SZ < BD <sup>2</sup>

**Appendix 1** to Lynham AJ, Hubbard L, Tansey KE, et al. Examining cognition across the bipolar/schizophrenia diagnostic spectrum. *J Psychiatry Neurosci* 2018.

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SZ < SAB<sup>2</sup>  
SAD < SAB<sup>1</sup>

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BD, bipolar disorder; SAB, schizoaffective disorder – bipolar type; SAD, schizoaffective disorder – depressive type; SZ, schizophrenia; <sup>1</sup>p<.05, <sup>2</sup>p<.00625 (Bonferroni-corrected)



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Current antipsychotic dose (olanzapine equivalents)

**Table S6** The effect of diagnostic group after accounting for olanzapine equivalent dose

Domain	Effect of Diagnosis			Effect of Olanzapine Equivalent Dose			Pairwise Comparisons
	F <sup>df</sup>	p	Partial $\eta^2$	F <sup>df</sup>	p	Partial $\eta^2$	
<b>Verbal Learning</b>	F <sup>3, 774</sup> =13.03	2.6 x 10 <sup>-8</sup>	0.05	F <sup>1, 774</sup> =26.61	3.2 x 10 <sup>-7</sup>	0.03	SAD < BD <sup>2</sup> SZ < BD <sup>2</sup> SAD < SAB <sup>1</sup> SZ < SAB <sup>2</sup>
<b>Reasoning &amp; Problem Solving</b>	F <sup>3, 774</sup> =9.23	5.3 x 10 <sup>-6</sup>	0.03	F <sup>1, 774</sup> =10.13	0.002	0.01	SAD < BD <sup>2</sup> SZ < BD <sup>2</sup> SAD < SAB <sup>1</sup>
<b>Visual Learning</b>	F <sup>3, 770</sup> =15.90	4.9 x 10 <sup>-10</sup>	0.06	F <sup>1, 770</sup> =24.19	1.1 x 10 <sup>-6</sup>	0.03	SAD < BD <sup>2</sup> SZ < BD <sup>2</sup> SZ < SAB <sup>2</sup>
<b>Social Cognition</b>	F <sup>3, 757</sup> =9.72	2.7 x 10 <sup>-6</sup>	0.04	F <sup>1, 757</sup> =4.22	0.04	0.01	SAB < BD <sup>1</sup> SAD < BD <sup>1</sup> SZ < BD <sup>2</sup>
<b>Attention / Vigilance</b>	F <sup>3, 722</sup> =7.31	7.8 x 10 <sup>-5</sup>	0.03	F <sup>1, 722</sup> =25.69	5.1 x 10 <sup>-7</sup>	0.03	SZ < BD <sup>2</sup> SZ < SAB <sup>2</sup>
<b>Speed of Processing</b>	F <sup>3, 774</sup> =18.43	1.5 x 10 <sup>-11</sup>	0.07	F <sup>1, 774</sup> =12.83	3.6 x 10 <sup>-4</sup>	0.02	SAD < BD <sup>2</sup> SZ < BD <sup>2</sup> SAD < SAB <sup>1</sup> SZ < SAB <sup>2</sup>
<b>Working Memory</b>	F <sup>3, 774</sup> =10.33	1.1 x 10 <sup>-6</sup>	0.04	F <sup>1, 774</sup> =14.38	1.6 x 10 <sup>-4</sup>	0.02	SAD < BD <sup>2</sup> SZ < BD <sup>2</sup> SZ < SAB <sup>1</sup>
<b>Composite Score</b>	F <sup>3, 773</sup> =21.42	2.5 x 10 <sup>-13</sup>	0.08	F <sup>1, 773</sup> =31.85	2.3 x 10 <sup>-8</sup>	0.04	SAD < BD <sup>2</sup> SZ < BD <sup>2</sup> SZ < SAB <sup>2</sup> SAD < SAB <sup>1</sup>

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BD, bipolar disorder; SAB, schizoaffective disorder – bipolar type; SAD, schizoaffective disorder – depressive type; SZ, schizophrenia; <sup>1</sup>p<.05, <sup>2</sup>p<.00625 (Bonferroni-corrected)

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Current positive symptoms (total SAPS score)

**Table S7** The effect of diagnostic group after accounting for total SAPS scores

Domain	Effect of Diagnosis			Effect of Current Positive Symptoms			Pairwise Comparisons
	F <sup>df</sup>	p	Partial $\eta^2$	F <sup>df</sup>	p	Partial $\eta^2$	
<b>Verbal Learning</b>	F <sup>3, 807</sup> =17.58	4.6 x 10 <sup>-11</sup>	0.06	F <sup>1, 807</sup> =1.29	0.26	0.002	SAD < BD <sup>2</sup> SZ < BD <sup>2</sup> SAD < SAB <sup>1</sup> SZ < SAB <sup>2</sup>
<b>Reasoning &amp; Problem Solving</b>	F <sup>3, 807</sup> =12.06	9.9 x 10 <sup>-8</sup>	0.04	F <sup>1, 807</sup> =1.51	0.22	0.002	SAD < BD <sup>2</sup> SZ < BD <sup>2</sup> SAD < SAB <sup>1</sup>
<b>Visual Learning</b>	F <sup>3, 804</sup> =18.61	1.1 x 10 <sup>-11</sup>	0.07	F <sup>1, 804</sup> =0.19	0.67	2.6 x 10 <sup>-4</sup>	SAD < BD <sup>2</sup> SZ < BD <sup>2</sup> SZ < SAB <sup>2</sup>
<b>Social Cognition</b>	F <sup>3, 790</sup> =9.90	2.1 x 10 <sup>-6</sup>	0.04	F <sup>1, 790</sup> =5.31	0.02	0.01	SAB < BD <sup>1</sup> SAD < BD <sup>1</sup> SZ < BD <sup>2</sup>
<b>Attention / Vigilance</b>	F <sup>3, 755</sup> =7.79	4.0 x 10 <sup>-5</sup>	0.03	F <sup>1, 755</sup> =2.05	0.15	0.003	SZ < BD <sup>2</sup> SZ < SAB <sup>2</sup> SAD < BD <sup>1</sup>
<b>Speed of Processing</b>	F <sup>3, 807</sup> =19.55	3.1 x 10 <sup>-12</sup>	0.07	F <sup>1, 807</sup> =2.17	0.14	0.003	SAD < BD <sup>2</sup> SZ < BD <sup>2</sup> SAD < SAB <sup>2</sup> SZ < SAB <sup>2</sup>
<b>Working Memory</b>	F <sup>3, 807</sup> =11.10	3.8 x 10 <sup>-7</sup>	0.04	F <sup>1, 807</sup> =1.20	0.28	0.001	SAD < BD <sup>2</sup> SZ < BD <sup>2</sup> SZ < SAB <sup>1</sup>
<b>Composite Score</b>	F <sup>3, 807</sup> =24.52	3.4 x 10 <sup>-15</sup>	0.08	F <sup>1, 807</sup> =0.46	0.50	4.8 x 10 <sup>-4</sup>	SAB < BD <sup>1</sup> SAD < BD <sup>2</sup> SZ < BD <sup>2</sup>

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SZ < SAB<sup>2</sup>  
SAD < SAB<sup>1</sup>

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Total SAPS were calculated by summing the global scores (hallucinations, delusions, bizarre behavior and positive formal thought disorder). BD, bipolar disorder; SAB, schizoaffective disorder – bipolar type; SAD, schizoaffective disorder – depressive type; SZ, schizophrenia; <sup>1</sup>p<.05, <sup>2</sup>p<.00625 (Bonferroni-corrected)

Current negative symptoms (total SANS score)

**Table S8** The effect of diagnostic group after accounting for total SANS scores

Domain	Effect of Diagnosis			Effect of Current Negative Symptoms			Pairwise Comparisons
	F <sup>df</sup>	p	Partial $\eta^2$	F <sup>df</sup>	p	Partial $\eta^2$	
<b>Verbal Learning</b>	F <sup>3, 805</sup> =10.88	5.2 x 10 <sup>-7</sup>	0.04	F <sup>1, 805</sup> =35.82	3.3 x 10 <sup>-9</sup>	0.04	SAD < BD <sup>2</sup> SZ < BD <sup>2</sup> SAD < SAB <sup>1</sup> SZ < SAB <sup>2</sup>
<b>Reasoning &amp; Problem Solving</b>	F <sup>3, 805</sup> =6.09	4.2 x 10 <sup>-4</sup>	0.02	F <sup>1, 805</sup> =29.74	6.6 x 10 <sup>-8</sup>	0.04	SAD < BD <sup>2</sup> SZ < BD <sup>2</sup>
<b>Visual Learning</b>	F <sup>3, 802</sup> =13.86	8.1 x 10 <sup>-9</sup>	0.05	F <sup>1, 802</sup> =14.89	1.2 x 10 <sup>-4</sup>	0.02	SAD < BD <sup>2</sup> SZ < BD <sup>2</sup> SZ < SAB <sup>2</sup>
<b>Social Cognition</b>	F <sup>3, 789</sup> =8.77	1.0 x 10 <sup>-5</sup>	0.03	F <sup>1, 789</sup> =32.80	1.5 x 10 <sup>-8</sup>	0.04	SAB < BD <sup>1</sup> SAD < BD <sup>1</sup> SZ < BD <sup>2</sup>
<b>Attention / Vigilance</b>	F <sup>3, 755</sup> =5.49	9.8 x 10 <sup>-4</sup>	0.02	F <sup>1, 755</sup> =28.20	1.5 x 10 <sup>-7</sup>	0.04	SZ < BD <sup>1</sup> SZ < SAB <sup>1</sup>
<b>Speed of Processing</b>	F <sup>3, 805</sup> =13.51	1.3 x 10 <sup>-8</sup>	0.05	F <sup>1, 805</sup> =60.42	2.4 x 10 <sup>-14</sup>	0.07	SAD < BD <sup>2</sup> SZ < BD <sup>2</sup> SAD < SAB <sup>1</sup> SZ < SAB <sup>2</sup>
<b>Working Memory</b>	F <sup>3, 805</sup> =7.16	9.5 x 10 <sup>-5</sup>	0.03	F <sup>1, 805</sup> =33.60	9.7 x 10 <sup>-9</sup>	0.04	SAD < BD <sup>2</sup> SZ < BD <sup>2</sup> SZ < SAB <sup>1</sup>
<b>Composite Score</b>	F <sup>3, 805</sup> =16.71	1.6 x 10 <sup>-10</sup>	0.06	F <sup>1, 805</sup> =64.75	3.1 x 10 <sup>-15</sup>	0.07	SAD < BD <sup>2</sup> SZ < BD <sup>2</sup> SZ < SAB <sup>2</sup> SAD < SAB <sup>1</sup>

**Appendix 1** to Lynham AJ, Hubbard L, Tansey KE, et al. Examining cognition across the bipolar/schizophrenia diagnostic spectrum. *J Psychiatry Neurosci* 2018.

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Total SANS were calculated by summing the global scores (affective flattening, alogia, avolition / apathy and anhedonia / asociality). BD, bipolar disorder; SAB, schizoaffective disorder – bipolar type; SAD, schizoaffective disorder – depressive type; SZ, schizophrenia; <sup>1</sup>p<.05, <sup>2</sup>p<.00625 (Bonferroni-corrected)

**Table S9** The effect of diagnosis after accounting for education and parental occupation

Domain	Effect of Diagnosis			Highest Education			Pairwise Comparisons
	F <sup>df</sup>	p	Partial $\eta^2$	F <sup>df</sup>	p	Partial $\eta^2$	
<b>Verbal Learning</b>	F <sup>3, 687</sup> =4.92	0.002	0.02	F <sup>6, 687</sup> =10.14	9.7 x 10 <sup>-11</sup>	0.09	SAD < BD <sup>1</sup> SZ < BD <sup>2</sup>
<b>Reasoning &amp; Problem Solving</b>	F <sup>3, 687</sup> =4.06	0.007	0.02	F <sup>6, 687</sup> =8.58	5.4 x 10 <sup>-9</sup>	0.07	SAD < BD <sup>2</sup> SZ < BD <sup>1</sup>
<b>Visual Learning</b>	F <sup>3, 685</sup> =7.67	4.8 x 10 <sup>-5</sup>	0.03	F <sup>6, 685</sup> =11.64	2.1 x 10 <sup>-12</sup>	0.10	SAD < BD <sup>1</sup> SZ < BD <sup>2</sup>
<b>Social Cognition</b>	F <sup>3, 673</sup> =6.51	2.4 x 10 <sup>-4</sup>	0.03	F <sup>6, 673</sup> =2.38	0.03	0.02	SAB < BD <sup>1</sup> SZ < BD <sup>2</sup>
<b>Attention / Vigilance</b>	F <sup>3, 645</sup> =2.39	0.07	0.01	F <sup>6, 645</sup> =10.95	1.3 x 10 <sup>-11</sup>	0.10	N.S.
<b>Speed of Processing</b>	F <sup>3, 687</sup> =7.56	5.6 x 10 <sup>-5</sup>	0.03	F <sup>6, 687</sup> =12.37	3.2 x 10 <sup>-13</sup>	0.10	SAD < BD <sup>2</sup> SZ < BD <sup>2</sup>
<b>Working Memory</b>	F <sup>3, 687</sup> =2.14	0.09	0.01	F <sup>6, 687</sup> =24.56	<2.2 x 10 <sup>-16</sup>	0.19	N.S.
<b>Composite Score</b>	F <sup>3, 687</sup> =9.21	5.7 x 10 <sup>-6</sup>	0.04	F <sup>6, 687</sup> =21.75	<2.2 x 10 <sup>-16</sup>	0.17	SAB < BD <sup>1</sup> SAD < BD <sup>2</sup> SZ < BD <sup>2</sup>

Mother's and father's highest occupation were not significant at p=0.00625 for any of the domains. BD, bipolar disorder; SAB, schizoaffective disorder – bipolar type; SAD, schizoaffective disorder – depressive type; SZ, schizophrenia; <sup>1</sup>p<.05, <sup>2</sup>p<.00625 (Bonferroni-corrected)

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All Covariates

**Table S10 Main effect of diagnostic group after accounting for all covariates**

Domain	Effect of Diagnosis			Pairwise Comparisons
	F <sup>df</sup>	p	Partial $\eta^2$	
<b>Verbal Learning</b>	F <sup>3, 694</sup> =4.65	0.003	0.02	SZ < BD <sup>1</sup> SAD < BD <sup>1</sup>
<b>Reasoning &amp; Problem Solving</b>	F <sup>3, 694</sup> =3.67	0.01	0.02	SAD < BD <sup>1</sup>
<b>Visual Learning</b>	F <sup>3, 691</sup> =8.02	2.9 x 10 <sup>-5</sup>	0.03	SAD < BD <sup>2</sup> SZ < BD <sup>2</sup> SZ < SAB <sup>1</sup>
<b>Social Cognition</b>	F <sup>3, 683</sup> =3.26	0.02	0.01	SZ < BD <sup>1</sup>
<b>Attention / Vigilance</b>	F <sup>3, 651</sup> =2.24	0.08	0.01	NS
<b>Speed of Processing</b>	F <sup>3, 694</sup> =7.58	5.4 x 10 <sup>-5</sup>	0.03	SAD < BD <sup>2</sup> SZ < BD <sup>2</sup> SAD < SAB <sup>1</sup> SZ < SAB <sup>2</sup>
<b>Working Memory</b>	F <sup>3, 694</sup> =4.27	0.005	0.02	SAD < BD <sup>1</sup> SZ < BD <sup>1</sup>
<b>Composite Score</b>	F <sup>3, 694</sup> =8.33	1.9 x 10 <sup>-5</sup>	0.04	SAD < BD <sup>2</sup> SZ < BD <sup>2</sup> SZ < SAB <sup>1</sup> SAD < SAB <sup>1</sup>

BD, bipolar disorder; SAB, schizoaffective disorder – bipolar type; SAD, schizoaffective disorder – depressive type; SZ, schizophrenia; ANCOVA, analysis of covariance; <sup>1</sup>p<.05, <sup>2</sup>p<.00625 (Bonferroni-corrected)

The Contributions of Clinical Variables

**Table S11 Effect of each variable on composite cognition**

	F <sup>df</sup>	p	Partial $\eta^2$
<b>Diagnosis</b>	F <sup>3, 694</sup> =8.33	1.9 x 10 <sup>-5</sup>	0.04
<b>Sex</b>	F <sup>1, 694</sup> = 0.17	0.68	2.5 x 10 <sup>-4</sup>
<b>Age</b>	F <sup>1, 694</sup> = 43.55	8.3 x 10 <sup>-11</sup>	0.06
<b>Olanzapine Equivalents</b>	F <sup>1, 694</sup> = 18.74	1.7 x 10 <sup>-5</sup>	0.03
<b>Antipsychotic Exposure in Months</b>	F <sup>1, 694</sup> = 19.29	1.3 x 10 <sup>-5</sup>	0.03
<b>Current SAPS Total</b>	F <sup>1, 694</sup> = 0.33	0.57	4.8 x 10 <sup>-4</sup>
<b>Current SANS Total</b>	F <sup>1, 694</sup> = 47.07	1.5 x 10 <sup>-11</sup>	0.06
<b>BADDS Depression</b>	F <sup>1, 694</sup> = 1.05	0.31	0.002



### Ordinal Logistic Regression Results

**Table S12 Ordinal regression results and post hoc comparisons**

	<b>Logistic Coefficient</b>	<b>Standard Error</b>	<b>Odds Ratio</b>	<b>95% Confidence Intervals</b>	<b>P value</b>
Cognition score*	0.69	0.08	1.98	1.68 to 2.33	$2.4 \times 10^{-16}$
<i>Post hoc tests</i>					
BD vs. SAB	0.50	0.16	1.65	1.19 to 2.26	0.002
SAB vs. SAD / SZ	0.45	0.11	1.56	1.27 to 1.92	$2.6 \times 10^{-5}$
BD vs. SAD / SZ	0.88	0.12	2.41	1.91 to 3.05	$2.5 \times 10^{-13}$

\*Model fit: chi-square = 103.57 ( $p = 2.7 \times 10^{-22}$ ). Test of parallel lines: chi-square = 4.97 ( $p = 0.174$ ). Goodness of fit: i) Pearson chi-square = 1636.42 ( $p=0.527$ ); ii) Deviance chi-square = 903.30 ( $p=1.00$ ). BD, Bipolar Disorder; SAB, Schizoaffective Disorder – Bipolar Type; SAD, Schizoaffective Disorder – Depressive Type; SZ, Schizophrenia.

### Lifetime Symptom Dimensions (BADDS) and Cognition

**Table S13 Median scores and interquartile ranges for the BADDS dimensions**

	<b>Bipolar Disorder</b>	<b>Schizoaffective Disorder – Bipolar Type</b>	<b>Schizoaffective Disorder – Depressive Type</b>	<b>Schizophrenia</b>
<b>BADDS Mania</b>	82 (21.5)	82 (5)	0 (1)	0 (0)
<b>BADDS Depression</b>	69.5 (22.25)	81 (7.5)	85 (11)	60 (72)
<b>BADDS Psychosis</b>	22.5 (40)	75 (40)	80 (40)	100 (10)

BADDS, Bipolar Affective Disorder Dimension Scale.

**Table S14 The associations between BADDS symptom dimensions and cognition after adjusting for age, sex, antipsychotic exposure in months, olanzapine equivalent dose and current negative symptoms**

	<b>All Groups</b>			<b>BD and SAB</b>			<b>SAD and SZ</b>		
	<b>B</b>	<b>SE</b>	<b>p</b>	<b>B</b>	<b>SE</b>	<b>p</b>	<b>B</b>	<b>SE</b>	<b>p</b>
<b>BADDS Depression</b>	0.002	0.001	0.07	-0.004	0.004	0.33	0.002	0.001	0.11
<b>BADDS Mania</b>	0.007	0.001	$5.8 \times 10^{-7}$	0.002	0.006	0.78	0.005	0.003	0.09
<b>BADDS Psychosis</b>	-0.011	0.002	$9.2 \times 10^{-8}$	-0.010	0.003	0.003	-0.006	0.003	0.04

BADDS, Bipolar Affective Disorder Dimension Scale; BD, Bipolar Disorder; SAB, Schizoaffective Disorder – Bipolar Type; SAD, Schizoaffective Disorder – Depressive Type; SZ, Schizophrenia