

SUPPLEMENTARY DATA

**Supplementary Table S1.** Comparison of Parametric and Nonparametric MRI results

Analysis Type	Groups	Brain Matter	Regions contained in cluster	Volume (mL)	P-value*
Parametric	Unmatched	GMV	Bilateral parietal lobe (postcentral/angular/supramarginal gyri, IPL), bilateral occipital lobe (cuneus, precuneus), left temporal lobe (MTG)	68.1	<0.001
			Left frontal lobe (superior/middle/inferior frontal gyri, precentral gyrus)	33.3	0.001
		Left cingulate (anterior/middle)	26.5	0.002	
	Matched	WMV	Left frontal lobe (SFG, MFG, precentral gyrus), left temporal lobe (STG, MTG), left parietal lobe (postcentral/angular/supramarginal gyri, IPL), left occipital lobe (precuneus), cingulum (anterior, middle), corpus callosum, and near left thalamus, left hippocampus, and left caudate	95.4	<0.001
		GMV	Bilateral parietal lobe (postcentral/angular/supramarginal gyri, IPL), bilateral occipital lobe (cuneus, precuneus) and right lingual gyrus, left temporal lobe (STG, ITG), left frontal lobe (superior/middle/inferior frontal gyri, precentral gyrus), left cingulate (anterior/middle)	150.0	<0.001
		WMV	Left frontal lobe (SFG, MFG, precentral gyrus), bilateral temporal lobe (STG, MTG), bilateral parietal lobe (postcentral/angular/supramarginal gyri) and left IPL, left occipital lobe (precuneus, lingual gyrus), as well as cingulum (anterior/middle/ posterior), corpus callosum, and near left thalamus, left hippocampus, and bilateral caudate	185.2	<0.001
Non-Parametric	Unmatched	GMV	Left parietal lobe (supramarginal gyrus, SPL, IPL) and bilateral postcentral gyrus, bilateral occipital lobe (cuneus, precuneus)	42.3	0.033
		WMV	Left frontal lobe (SFG, MFG, IFG, precentral gyrus), left parietal lobe (postcentral/supramarginal gyri, IPL), as well as cingulum (anterior, middle), corpus callosum, and left caudate	34.6	0.02
	Matched	GMV	Bilateral parietal lobe (postcentral/supramarginal gyri, IPL) and right angular gyrus, bilateral occipital lobe (cuneus, precuneus) and right lingual gyrus, left frontal lobe (SFG, MFG, precentral gyrus), left cingulate (anterior/middle/post)	75.2	0.006
		WMV	Left frontal lobe (SFG, MFG, precentral gyrus), left temporal lobe (STG, MTG), bilateral parietal lobe (postcentral/angular/supramarginal gyri) and left IPL, bilateral occipital lobe (precuneus), cingulum (anterior/middle/ posterior), corpus callosum, and near left thalamus, left hippocampus, and bilateral caudate	104.4	0.004

STG (superior temporal gyrus), MTG (middle temporal gyrus), ITG (inferior temporal gyrus), SFG (superior frontal gyrus), MFG (middle frontal gyrus), IFG (inferior frontal gyrus), IPL (inferior parietal lobule)

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**Supplementary Table S2.** Differences in Cognitive Scores between none/mild vs. moderate/severe DKA groups based on longitudinal mixed effects modeling within matched sample

	Battery	Subscale	Group effect at T <sub>b</sub> (moderate/severe vs. none/mild)			Group effect at T <sub>18</sub> (moderate/severe vs. none/mild)			Group effect at T <sub>18</sub> vs. Group effect at T <sub>b</sub> (slope difference)			
			Estimate	P-value	Cohen's d*	Estimate	P-value	Cohen's d*	Estimate	P-value	Cohen's d*	
IQ	WPPSI3/WASI	Full Scale IQ Child Standard Score	-4.418	0.130	-0.394	<b>-6.162</b>	<b>0.035</b>	<b>-0.550</b>	-1.744	0.424	-0.156	
		Verbal IQ Child Standard Score	-5.026	0.162	-0.375	-2.866	0.435	-0.214	2.160	0.505	0.161	
		Performance IQ Child Standard Score	-3.840	0.225	-0.302	<b>-6.814</b>	<b>0.035</b>	<b>-0.535</b>	-2.974	0.303	-0.234	
		Vocabulary Child Scaled Score	-1.306	0.063	-0.531	-0.132	0.850	-0.054	1.174	0.061	0.477	
		Block Design Child Scaled Score	-0.870	0.220	-0.310	<b>-1.567</b>	<b>0.027</b>	<b>-0.559</b>	-0.697	0.338	-0.248	
		Similarities Child Scaled Score	-0.335	0.625	-0.128	-0.870	0.204	-0.333	-0.535	0.481	-0.205	
		Matrix Reasoning Child Scaled Score	-0.330	0.636	-0.123	-1.065	0.126	-0.395	-0.735	0.282	-0.273	
Executive functions	CPT2	Detectability T-Score	2.418	0.340	0.235	<b>6.595</b>	<b>0.008</b>	<b>0.640</b>	4.177	0.125	0.406	
		Commissions T-Score	3.269	0.194	0.318	<b>6.578</b>	<b>0.008</b>	<b>0.640</b>	3.309	0.186	0.322	
	NEPSYII	Auditory Attention Total Corrected Scaled Score	-0.308	0.726	-0.100	-0.302	0.694	-0.098	0.006	0.996	0.002	
	WJIII Cognitive	Concept Formation Standard Score	-0.816	0.795	-0.074	-2.651	0.397	-0.241	-1.835	0.591	-0.167	
Processing Speed	CMS	Numbers Total Scaled Score	0.057	0.945	0.021	0.397	0.583	0.145	0.340	0.656	0.125	
		WJIII Cognitive	Decision Speed Standard Score	-1.236	0.740	-0.078	-1.465	0.689	-0.092	-0.229	0.955	-0.014
		Visual Match II Standard Score	-4.329	0.227	-0.312	-0.291	0.931	-0.021	4.038	0.172	0.291	
Learning & Memory	CMS	Processing Speed Standard Score	-4.834	0.173	-0.330	-0.594	0.866	-0.041	4.240	0.138	0.289	
		Word List Total Learning Raw Score	0.262	0.862	0.043	1.160	0.438	0.191	0.898	0.641	0.148	
		Word List Imm Recall Raw Score	0.098	0.870	0.040	0.371	0.531	0.151	0.273	0.707	0.111	
		Word List Delayed Raw Score	-0.411	0.462	-0.185	0.203	0.712	0.091	0.615	0.316	0.276	
		Word List Delayed Recognition Raw Score	<b>-2.063</b>	<b>0.034</b>	<b>-0.556</b>	-0.482	0.611	-0.130	1.581	0.245	0.426	
		Dots Location Learning Raw Score	-1.253	0.077	-0.354	-0.544	0.446	-0.153	0.710	0.459	0.200	
		Dots Location Total Score Raw Score	-1.539	0.106	-0.323	-1.381	0.153	-0.290	0.158	0.895	0.033	
		Dots Location Imm Raw Score	-0.296	0.383	-0.180	-0.672	0.051	-0.409	-0.376	0.350	-0.229	
Dots Location Delayed Raw Score	0.068	0.842	0.046	<b>-0.989</b>	<b>0.004</b>	<b>-0.670</b>	<b>-1.057</b>	<b>0.021</b>	<b>-0.716</b>			

\* Cohen's d is calculated based on observed standard deviation at T18 pooled across the two groups.

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**Supplementary Table S3.** Correlation between GMV/WMV & Cognitive Scores change

Battery	Subscale	Correlation				Correlation Controlling for Baseline Age				
		Correlation between GMV change & Cognitive Scores change		Correlation between WMV change & Cognitive Scores change		Correlation between GMV change & Cognitive Scores change		Correlation between WMV change & Cognitive Scores change		
		r	p-value	r	p-value	r	p-value	r	p-value	
IQ	WPPSI3/WASI	Full Scale IQ Child Standard Score	-0.023	0.803	-0.044	0.624	-0.061	0.505	-0.070	0.439
		Verbal IQ Child Standard Score	-0.016	0.865	-0.016	0.862	-0.060	0.525	-0.044	0.640
		Performance IQ Child Standard Score	-0.103	0.267	-0.101	0.274	-0.042	0.653	-0.056	0.548
		Vocabulary Child Scaled Score	-0.093	0.300	0.000	0.998	-0.104	0.252	0.010	0.908
		Block Design Child Scaled Score	-0.108	0.226	-0.114	0.203	-0.047	0.605	-0.069	0.441
		Similarities Child Scaled Score	0.078	0.384	0.003	0.975	0.004	0.960	-0.058	0.518
		Matrix Reasoning Child Scaled Score	-0.063	0.484	-0.084	0.350	-0.077	0.392	-0.092	0.307
Executive functions	CPT2	Detectability T-Score	-0.024	0.799	-0.104	0.260	0.021	0.825	-0.085	0.360
		Commissions T-Score	-0.029	0.754	-0.021	0.823	0.081	0.384	0.051	0.581
	NEPSYII	Auditory Attention Total Corrected Scaled Score	<b>-0.240</b>	<b>0.013</b>	-0.189	0.051	-0.120	0.221	-0.103	0.295
		WJIII Cognitive	Concept Formation Standard Score	-0.041	0.656	-0.144	0.114	0.050	0.582	-0.096
	CMS	Numbers Total Scaled Score	0.085	0.440	-0.200	0.066	0.032	0.769	<b>-0.239</b>	<b>0.028</b>
Processing Speed	WJIII Cognitive	Decision Speed Standard Score	-0.046	0.611	-0.002	0.981	0.015	0.866	0.045	0.622
		Visual Match II Standard Score	-0.004	0.967	-0.002	0.988	0.060	0.544	0.039	0.690
		Processing Speed Standard Score	-0.042	0.653	-0.067	0.469	0.031	0.735	-0.020	0.829
Learning & Memory	CMS	Word List Total Learning Raw Score	<b>0.212</b>	<b>0.018</b>	0.157	0.079	0.080	0.375	0.057	0.527
		Word List Imm Recall Raw Score	<b>0.304</b>	<b>0.001</b>	<b>0.268</b>	<b>0.003</b>	0.098	0.281	0.122	0.178
		Word List Delayed Raw Score	<b>0.273</b>	<b>0.002</b>	0.170	0.059	0.127	0.161	0.046	0.612
		Word List Delayed Recognition Raw Score	0.044	0.637	0.121	0.186	-0.011	0.907	0.093	0.312
		Dots Location Learning Raw Score	-0.083	0.363	0.084	0.357	-0.163	0.075	0.058	0.532
		Dots Location Total Score Raw Score	-0.100	0.277	0.071	0.444	<b>-0.200</b>	<b>0.030</b>	0.032	0.728
		Dots Location Imm Raw Score	-0.132	0.148	0.000	1.000	<b>-0.220</b>	<b>0.016</b>	-0.033	0.717
Dots Location Delayed Raw Score	-0.025	0.787	0.017	0.853	-0.118	0.199	-0.036	0.692		

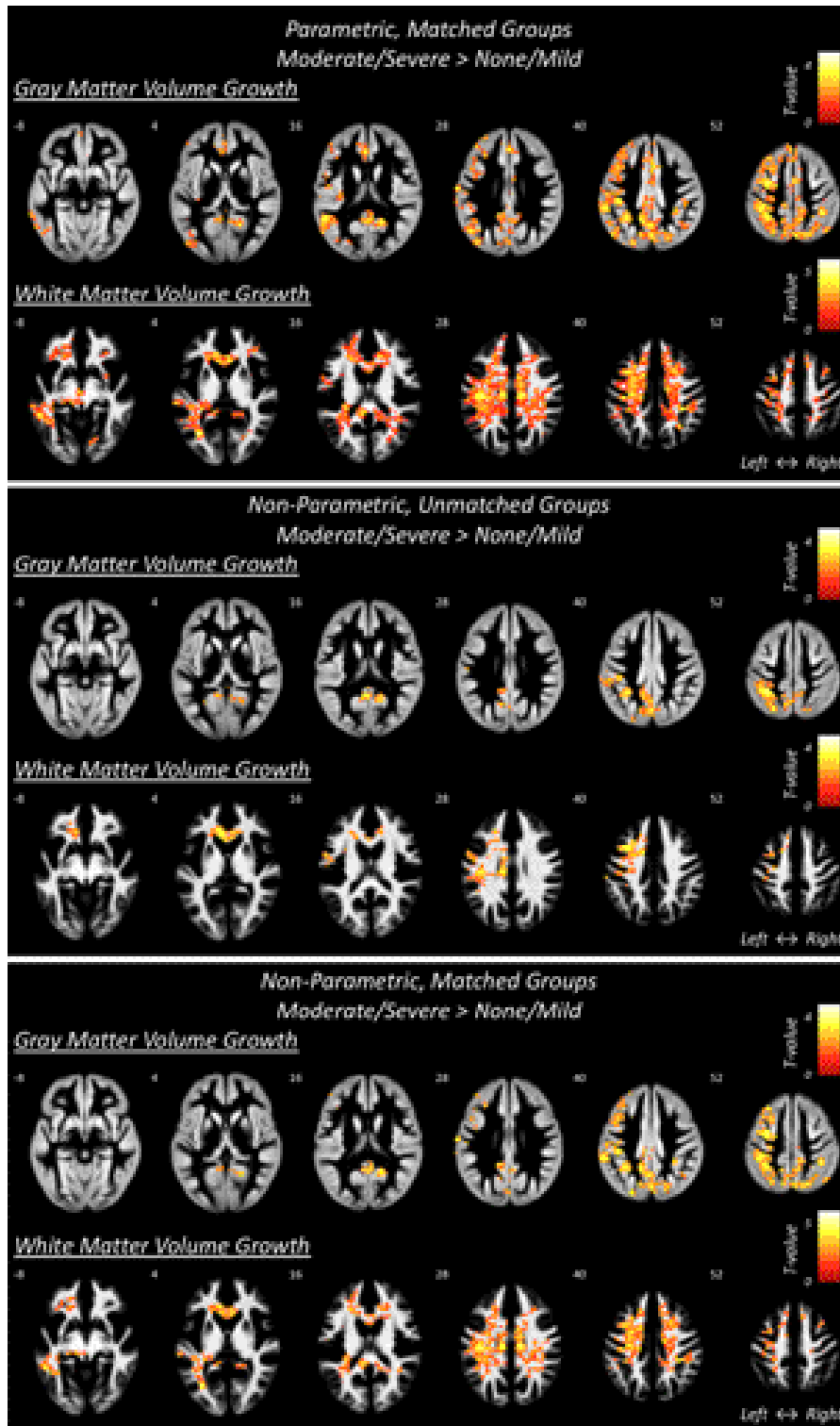
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**Supplementary Table S4.** Raw Cognitive Scores at T<sub>b</sub> and T<sub>18</sub>

Battery	Subscale	Moderate/Severe at T <sub>b</sub>		None/Mild at T <sub>b</sub>		Moderate/Severe at T <sub>18</sub>		None/Mild at T <sub>18</sub>		
		Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)	
IQ	WPPSI3/WASI	Full Scale IQ Child Standard Score	105.77	(9.94)	110.53	(14.22)	107.68	(10.15)	114.22	(12.86)
		Verbal IQ Child Standard Score	103.84	(11.80)	110.07	(14.81)	108.60	(9.70)	113.06	(13.90)
		Performance IQ Child Standard Score	107.26	(12.26)	109.47	(15.76)	106.57	(12.53)	112.09	(14.70)
		Vocabulary Child Scaled Score	10.16	(2.70)	11.64	(2.92)	11.29	(2.15)	12.03	(2.66)
		Block Design Child Scaled Score	10.84	(2.65)	11.44	(3.41)	10.71	(2.56)	11.83	(3.40)
		Similarities Child Scaled Score	11.26	(2.58)	11.94	(2.76)	11.90	(2.34)	12.75	(2.45)
		Matrix Reasoning Child Scaled Score	11.81	(2.87)	11.71	(2.76)	11.39	(2.68)	12.35	(2.81)
Executive functions	CPT2	Detectability T-Score	54.02	(9.38)	53.22	(8.18)	54.62	(8.42)	50.65	(9.74)
		Commissions T-Score	54.91	(9.11)	52.97	(7.96)	54.27	(8.77)	49.40	(9.42)
	NEPSYII	Auditory Attention Total Corrected Scaled Score	9.39	(2.92)	9.47	(2.75)	9.77	(3.46)	10.38	(2.74)
	WJIII Cognitive	Concept Formation Standard Score	105.57	(13.77)	108.47	(13.45)	108.32	(9.77)	111.87	(13.20)
	CMS	Numbers Total Scaled Score	10.00	(2.85)	10.41	(2.71)	10.58	(2.86)	10.44	(2.54)
Processing Speed	WJIII Cognitive	Decision Speed Standard Score	107.13	(13.29)	107.13	(13.93)	105.68	(15.74)	108.76	(15.05)
		Visual Match II Standard Score	103.92	(13.76)	107.37	(13.00)	102.61	(13.89)	104.05	(15.11)
		Processing Speed Standard Score	105.33	(13.38)	108.33	(13.98)	104.55	(14.61)	106.68	(15.20)
Learning & Memory	CMS	Word List Total Learning Raw Score	20.37	(7.33)	23.18	(7.73)	28.58	(6.22)	30.47	(7.85)
		Word List Imm Recall Raw Score	4.67	(2.58)	5.58	(2.86)	7.68	(2.47)	7.96	(2.47)
		Word List Delayed Raw Score	4.27	(2.39)	5.54	(2.77)	7.29	(2.07)	7.73	(2.56)
		Word List Delayed Recognition Raw Score	25.21	(4.69)	27.83	(2.88)	37.83	(4.34)	38.91	(3.14)
		Dots Location Learning Raw Score	13.60	(3.01)	14.76	(2.93)	17.60	(3.38)	18.60	(3.46)
		Dots Location Total Score Raw Score	18.30	(4.25)	19.74	(4.05)	23.00	(4.43)	25.09	(4.61)
		Dots Location Imm Raw Score	4.70	(1.51)	4.98	(1.29)	5.59	(1.57)	6.46	(1.63)
Dots Location Delayed Raw Score	4.87	(1.41)	4.92	(1.38)	5.57	(1.57)	6.43	(1.64)		

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**Supplementary Figure 1.** analysis of VBM Regions of increased volume growth in gray and white matter regions where we performed 1) a parametric comparison of participants with a history of mod/sev DKA compared to those matched in age at enrollment and HbA1c who experienced none/mild DKA; 2) a nonparametric comparison of participants with a history of mod/sev DKA compared to those not matched and 3) matched in age at enrollment and HbA1c who experienced none/mild DKA.



## SUPPLEMENTARY DATA

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