

Cognitive Abilities and 50- and 100-msec Paired-Click Processes in Schizophrenia: Online Data Supplement

Subject Selection

Selection criteria for both groups were 1) no history of alcohol or other substance abuse in the 3 months prior to entry into the study or lifetime history of dependence (determined by DSM-IV SCID) and 2) no history of head injury with loss of consciousness for more than 5 minutes (1) or other neurological disease. Additional inclusion criteria for patients were 1) diagnosis of schizophrenia with no other axis I diagnosis, determined by the Structured Clinical Interview for DSM-IV—Patient Edition (SCID-I/P; 2); 2) stable, continuous treatment with one antipsychotic medication for at least 3 months; and 3) no psychiatric hospitalization in the last 3 months. Additional inclusion criteria for the comparison subjects were 1) no history of axis I psychiatric dysfunction as determined by DSM-IV SCID Non-patient Edition (SCID-I/NP; 3) and 2) no family history of a psychotic disorder in first-degree relatives as assessed by self-report. Six comparison subjects and eight patients were left-handed as assessed by the Waterloo Handedness Questionnaire (4). The Positive and Negative Syndrome Scale (PANSS; 5) assessed positive and negative symptoms in the patient group: positive mean = 14.13 (SD = 3.96), negative mean = 16.34 (SD = 5.23), general mean = 30.28, (SD = 6.36). Of the comparison subjects, 68 identified themselves as Caucasian (44 European Americans, 24 Hispanics), two as Asian, one as American Indian, and one as African American. Of the patients, 74 identified themselves as Caucasian (43 European American, 31 as Hispanic), two as American Indian, and three as African American.

Participants signed consent forms approved by the Human Research Review Committee at the University of New Mexico and the New Mexico VA Medical Center

(NMVAMC). Participants were asked to refrain from smoking for at least 1 hour before examination because nicotine can affect P50 paired-click activity for up to 20 minutes after ingestion (6). M50 ratio score results for a subset of the present subjects were given earlier by Thoma et al. (7; 8), and M50 and M100 ratio score results for a subset of the present subjects were reported by Hanlon et al. (9) and Edgar et al. (10). With the exception of a change in the digitization rate when the acquisition computer was upgraded and the addition of the Wisconsin Card Sorting Test to the cognitive battery, inclusion and exclusion criteria and all study procedures remained the same throughout the study.

Data Screening Summary

One-hundred fifty-two subjects entered the study. One schizophrenia subject was excluded from subsequent analyses because EEG/MEG recordings were too noisy due to metal artifact. For P50 and N100 analysis, subjects were excluded if S1 amplitude was less than 0.5 μ V, S1 latency was outside of the stated scoring window, or amplitude or ratio scores were greater than 3 SD above their group mean. Eight schizophrenia subjects and three comparison subjects were excluded from P50 analyses. Five schizophrenia subjects and two comparison subjects were excluded from N100 analyses. To obtain a normal distribution, Cz measures were transformed to a logarithmic scale (all p values >0.05 per Kolmogorov-Smirnov test).

For the M50 and M100 data, subjects were excluded if S1 source strength was below 5.0 nAm, source localizations were greater than 15 mm from Heschel's gyrus, or amplitude or ratio scores were greater than 3 SD above the mean. Subjects were included in the MEG analysis only if criteria were met for both hemispheres. Eight

schizophrenia subjects and six comparison subjects were excluded from the M50 analysis. Nineteen schizophrenia subjects and eleven comparison subjects were excluded from the M100 analysis. To obtain a normal distribution, M50 and M100 amplitude scores were transformed to a logarithmic scale (all p values >0.05 per Kolmogorov-Smirnov test). M50 and M100 ratio scores were normally distributed. Degrees of freedom across cognitive domains differ slightly as valid data were not available for each subject on every measure.

Interrater Reliability (Table 1)

Interrater reliability (two independent raters) for 30% of the MEG data and 40% of the EEG data was estimated by using a two-way random interclass correlation coefficient (ICC) model for consistency (assumes no subject-by-rater interaction). Ranging from negative infinity (negative values scored as zero) to 1, ICCs were generated with p values indicating the probability of a null hypothesis of zero reliability. For all measures, high ICCs were obtained for latency, amplitude/source strength, and ratio scores ($p < 0.001$). For the EEG and MEG analyses, in the cases analyzed by two raters their scores were averaged. In a few cases where there were significant discrepancies, three or more of the raters met to come to a consensus. All raters were blind to subject group at the time of analysis.

Zero-Order Correlations (Table 2)

Zero-order correlations between the ratio scores and the individual cognitive tests are shown in Table 2.

Supplement References

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Table 1: Inter-rater reliability measures for independent raters

	N	ICC	F value
P50			
S1 lat	61	0.78	4.65
S1 amp	61	0.99	66.70
S2 amp	61	0.95	19.14
S2/S1 Ratio			
Score	61	0.97	38.56
N100			
S1 lat	61	0.80	4.99
S1 amp	61	0.95	18.72
S2 amp	61	0.94	15.53
S2/S1 Ratio			
Score	61	0.97	35.57
LM50			
S1 lat	43	0.99	89.98
S1 amp	43	0.99	123.76
S2 amp	43	0.98	53.61
S2/S1 Ratio			
Score	43	0.97	32.24
RM50			
S1 lat	43	0.83	6.03
S1 amp	43	0.88	8.47
S2 amp	43	0.86	6.95
S2/S1 Ratio			
Score	43	0.95	20.72
LM100			
S1 lat	38	0.93	13.71
S1 amp	38	0.99	84.19
S2 amp	38	0.94	17.32
S2/S1 Ratio			
Score	38	0.81	5.31
RM100			
S1 lat	43	0.88	8.66
S1 amp	43	0.97	29.65
S2 amp	43	0.87	7.68
S2/S1 Ratio			
Score	43	0.97	33.30

All p-values were <0.0001.

Table 2: Pearson correlation coefficients for cognition and ratio scores

Test		Group	P50	N100	M50		M100	
					Left	Right	Left	Right
Attention	Trails A time	Comparison subject	0.00	-0.18	0.20	0.10	0.01	0.17
		Patient	-0.33*	-0.30*	-0.11	-0.18	-0.26	-0.17
	Continuous Performance Test hit rate	Comparison subject	-0.07	0.16	-0.21	0.08	-0.15	-0.02
		Patient	-0.18	-0.14	-0.29*	-0.22	-0.47**	-0.40**
	Continuous Performance Test d'	Comparison subject	-0.10	0.12	-0.29*	0.05	-0.09	0.06
		Patient	-0.16	-0.05	-0.29*	-0.23	-0.24	-0.41**
Composite	Comparison subject	-0.08	0.05	-0.13	0.12	-0.10	0.14	
	Patient	-0.30*	-0.22	-0.28*	-0.27*	-0.38**	-0.39**	
Working Memory	WAIS-III digit span backward	Comparison subject	-0.06	-0.21	-0.20	-0.08	-0.47**	0.24
		Patient	-0.02	-0.17	-0.17	-0.16	-0.21	-0.10
	Wisconsin Card Sorting Test perseverative errors	Comparison subject	-0.16	-0.13	-0.14	-0.25	-0.15	0.02
		Patient	-0.36**	-0.12	-0.28*	-0.26	-0.33*	-0.28*
	Composite	Comparison subject	-0.15	-0.13	-0.23	-0.21	-0.43**	0.18
		Patient	-0.30*	-0.20	-0.29*	-0.27*	-0.34*	-0.26
Long Delay Memory	Rey Auditory-Verbal Learning Test long delay	Comparison subject	-0.13	0.13	-0.14	-0.32	0.05	-0.08
		Patient	-0.10	0.05	0.03	-0.07	-0.31*	-0.20
	Wechsler Memory Scale visual long delay	Comparison subject	0.02	-0.01	-0.21	-0.26	-0.16	-0.05
		Patient	-0.06	-0.22	-0.04	-0.08	-0.19	-0.09
	Composite	Comparison subject	-0.09	0.10	-0.15	-0.37*	-0.08	-0.08
		Patient	-0.08	-0.14	-0.04	-0.09	-0.30*	-0.17
IQ	Shipley estimated IQ	Comparison subject	-0.07	-0.20	-0.30*	-0.21	-0.41**	0.01
		Patient	-0.26*	-0.13	-0.06	-0.11	-0.24	-0.01

* significant at ≤ 0.05 ; ** significant at ≤ 0.01

Figure 1: Scatterplots of M50 and M100 ratio scores and working memory composite measure in each group. In patients, 50-msec STG activity was associated with working memory measures.

Figure 1: Working Memory and Left Hemisphere Ratio Scores

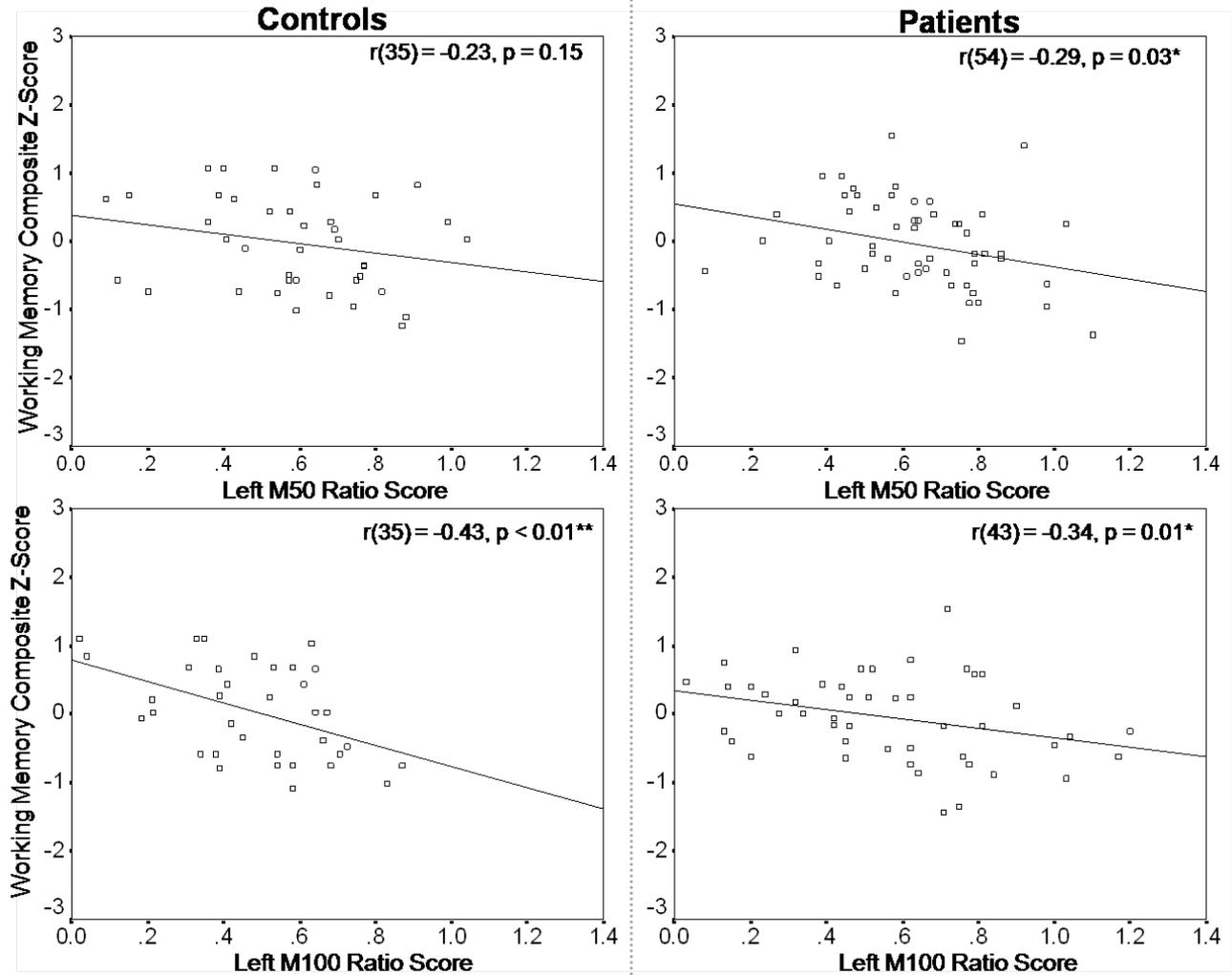


Figure 2: Scatterplots of M100 ratio scores and long-term memory measures. In patients, 100-msec left STG activity was associated with long-term memory measures.

Figure 2: Long Delay Memory and Left M100 Ratio Scores

