TABLE S1: PARTICIPANT CHARACTERISTICS

	HCS (N=35)	PSZ (N=38)	Statistic	*p* value
Maternal Education	14.28 (2.17)	13.30 (2.46)	*t = 1.69*	*0.095*
Paternal Education	14.18 (3.04)	13.86 (3.34)	*t = 0.39*	*0.692*
Neurocognitive Test Results				
WASI-II IQ	118.06 (9.14)	97.03 (13.18)	*t = 3.36*	*0.001*
WRAT 4	110.56 (13.69)	98.87 (10.94)	*t = 6.24*	< *.001*
WTAR	113.12 (10.08)	97.84 (13.63)	*t = 6.51*	< *.001*
MD Processing Speed	53.29 (9.03)	33.45 (13.95)	*t = 6.7*	< *.001*
MD Attention Vigilance	52.7 (7.76)	41.18 (10.79)	*t = 4.87*	< *.001*
MD Working Memory	52.45 (8.99)	37.48 (11.01)	*t = 5.93*	< *.001*
MD Verbal Learning	53.7 (11.35)	39.3 (9.29)	*t = 5.56*	< *.001*
MD Visual Learning	46.32 (10.22)	33.45 (14.7)	*t = 4.03*	< *.001*
MD Reasoning	52.77 (10.87)	40.33 (11.52)	*t = 4.43*	< *.001*
MD Social Cognition	53.58 (9.08)	41.21 (11.1)	*t = 4.85*	< *.001*
MCT Overall	53.19 (8.36)	30.48 (14.18)	*t = 7.73*	< *.001*
k-score	3.21 (0.47)	2.33 (0.57)	*t = 4.46*	< *.001*
Average d-prime	3.71 (0.48)	2.43 (0.72)	*t = 8.12*	< *.001*
Duration of Illness (yrs.)		17.00(11.00)		
Antipsychotic Medication				
Total CPZ		440.68 (365.18)		
Total Haloperidol		9.22 (8.01)		
Clinical Ratings				
BPRS Positive		2.25 (1.24)		
BPRS Negative		1.81 (0.45)		
BPRS Disorganization		1.26 (0.29)		
BPRS Total		35.42 (7.7)		
SANS AA		21.09 (9.12)		
SANS EE		14.42 (8.22)		
SANS Total		27.42 (12.22)		

WASI = Wechsler Abbreviated Scale of Intelligence; WRAT = Wide Range Achievement Test; WTAR = Wechsler Test of Adult Reading; MD = MCCB (MATRICS Consensus Cognitive Battery) Cognitive Domain; MCT = MCCB Composite Total; CPZ = Chlorpromazine equivalent; BPRS=Brief Psychiatric Rating Scale; SANS=Scale for the Assessment of Negative Symptoms; AA = Apathy-Avolition; EE = Emotional Expressivity.

Neuropsychological Measures: All participants completed the Wechsler Abbreviated Scale of Intelligence (WASI, Wechsler, 1999) and the MATRICS Consensus Cognitive Battery (MCCB, Nuechterlein & Green, 2006). The MCCB yields measures of seven cognitive domains: processing speed, working memory, verbal learning, visual learning, attention/vigilance, reasoning/problem solving, and social cognition which are combined in the calculation of an overall composite T score. Consensus diagnosis for the PSZ group was established via detailed psychiatric history and interviews, confirmed using the Structured Clinical Interview for DSM-IV(SCID).

1. Wechsler D. Wechsler Abbreviated Scale of Intelligence. (WASI): Psychological Corporation; 1999.
2. Nuechterlein KH, Green MF. MATRICS Consensus Cognitive Battery, Manual. Los Angeles, CA: MATRICS Assessment Inc; 2006.

I. DETAILED METHODS

Apparatus. The task was programmed in E-Prime *(script available upon request*), and stimuli were presented on a 19-inch cathode ray tube (CRT) monitor (100- Hz refresh rate, resolution 1,024 X 768 pixels) at a distance of 70 cm. A video-based tower-mounted eye tracker (EyeLink1000, SR Research, Mississauga, Ontario, Canada) with a sampling rate of 1000 Hz was used for recording eye movements. The participant's head was stabilized by a chin and forehead rest. Before the experiment commenced, the eye tracker was calibrated using a 9-point calibration procedure.

Stimuli and Design. Each search array contained 12 or 24 Landolt-C items against a light-gray background (Figure 1 displays the task procedure and sample search arrays). Each item was 0.67° in diameter, with a gap measuring 0.07°. The target was defined as the one item in the array with a gap on the top or the bottom. Each of the 11 or 23 distractors had a gap on the left or right side. It was very difficult to perceive the gap position without fixating near the item. Each item was drawn in black (<0.001 cd/m^2) or gray (38.42 cd/m^2) on a lighter-gray background (57.22 cd/m^2). The black items were therefore high in contrast (Michelson contrast ratio = 1.00) and very salient, whereas the gray items were low in contrast (Michelson contrast ratio = 0.20) and low in salience. We used luminance contrast to manipulate salience because high-contrast stimuli elicit earlier and larger neuronal responses than low-contrast stimuli and are difficult to ignore (e.g., Lee et al., 2010).

The experiment consisted of four trial types: (a) Cued high-contrast target with 11 high-contrast distractors; (b) Cued low-contrast target with 11 low-contrast distractors; (c) Cued high-contrast target with 11 high-contrast distractors and 12 low-contrast distractors; and (d) Cued low-contrast target with 11 low-contrast distractors and 12 high-contrast distractors. Thus, the cued target was equally likely to be low- or high-contrast, and there were always 12 items of the target contrast (the target and 11 distractors). We added 12 items of the other contrast on trial types (c) and (d). We call (a) and (b) *single-contrast trials*, and we call (c) and (d) *mixed-contrast trials*. On single-contrast trials, there is no need to select some items and suppress others (because the gap cannot be perceived without fixating an item, and all items are therefore potential targets on these trials). On mixed-contrast trials, a perfectly selective participant would confine eye movements to the distractors with same contrast level as the cue, never fixating items of the other contrast level, and performance would be identical to that on trial types (a) and (b). Any impairment on mixed-contrast trials relative to single-contrast trials can therefore be used to quantify the difficulty of the selection process. On mixed-contrast trials with a high-contrast target, (trial type (c)), bottom-up salience will tend to drive fixations toward the high-contrast items and away from the low-contrast items, requiring minimal top-down control to achieve high levels of selectivity. However, to perform visual search efficiently when searching for a low-contrast target on mixed-contrast trials (trial type (d)), participants must use top-down control to refrain from making eye movements to the high-salience distractors.

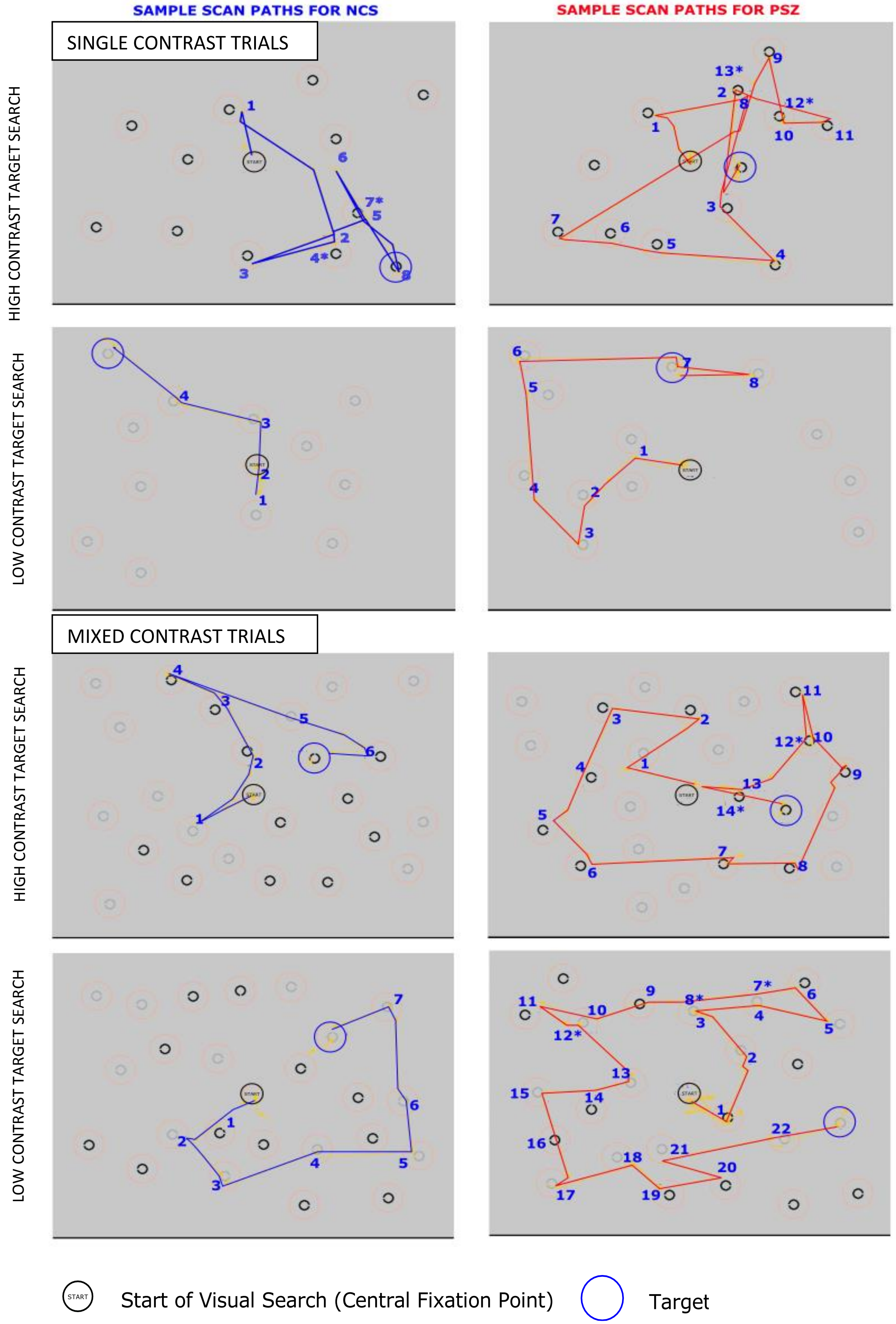
Procedure. Each trial began with a fixation screen containing a solid circle appearing at the center. Participants were required to maintain steady fixation for a period of 300 ms, after which the fixation circle was replaced with a cue circle presented for 500 ms. The target was a circle with a gap on the top or bottom, and distractors were circles with a gap on the left or right. The participant was informed with a cue whether the target would be low- or high-contrast on each trial (with 100% validity). The screen was then blank for 500 ms, followed by the search display (with trial types as described above) which remained visible until a manual response was made. Participants indicated the presence of the gap at the top or bottom of the target item by pushing one of two buttons on a game controller. A 500-ms blank interval was interposed between the response and the onset of the next trial. Each participant underwent 160 trials with all four trial types randomized.

Data Analysis:

Manual response data. Accuracy and Mean RTs (for correct trials only) were computed for each subject. Additionally, the total gaze dwell time (time from presentation of array, to end of first fixation on the target before button press response was made) was derived. Trials on which the manual RT was higher than 3 standard deviations above the participant's mean were eliminated.

Eye movement analyses. Raw eye position data were parsed by the eye tracker's standard experimental setting which uses a speed threshold (30°/s) and an acceleration threshold ($9000°/s^2$) to detect saccades. Areas of interest (AOIs) were defined as circles centered on each item subtending 2°, which allowed for natural variation of gaze accuracy while also defining non-overlapping regions. An item was considered to be fixated when a fixation occurred nearest to or within the defined interest area for that item. (Figure S1 displays sample scan paths indicating AOIs). We obtained measures of mean dwell time per item and mean number of items fixated (and refixated) per trial type and contrast condition.

Figure S1. Sample Scan paths



II. ADDITIONAL RESULTS

1. **Manual Response Error Rates.** Manual response accuracy was uniformly high for both groups for the high and low salience trial types when only target-matched distractors (12-item array) were present (uncued absent) (PSZ=96.2±1.5%, NCS=97.7±1.3%). For trials in which the 24-item mixed array consisted of both salient and non-salient distractors, PSZ (91.2±1.3%), were slightly less accurate than NCS (95.3±0.9%), but this effect of Group did not reach significance [$F(1,71) = 1.41$, $p = 0.13$, η^2_p=0.02 (95% CI: [0.00,0.12])]. Similarly, there was no main effect of salience [$F(1,71) = 1.54$, $p = 0.32$, η^2_p=0.02 (95% CI: [0.00,0.12])], nor a Group by Saliency by Trial Type interaction [$F(1,71) = 1.23$, $p = 0.21$, η^2_p=0.02 (95% CI: [0.00,0.11])].

2. **Fixation Measures**

Unique Items visited. For mixed-contrast trials, in order to investigate search and target identification efficiency we broke down the mean number of items scanned by the type of distractor item fixated: Target-Matched versus Target-mismatched. For each type of distractor item, two separate repeated-measures ANOVAs was applied to mean number of items scanned with Target contrast (low-contrast vs. high-contrast) as within-subjects factor and Group (PSZ, NCS) as between-subjects factor. Supplementary Figure S2 displays the mean number of Target-matched items fixated. Here, we observe that for high-contrast target trials, similar to the single-contrast condition, NCS needed to scan a higher number of target-matched items when searching for low-contrast targets than for high-contrast trials. In contrast, for PSZ, the number of items visited per trial when searching for high vs low-contrast targets was slightly higher. As with the single-contrast condition, PSZ fixated a higher number of items overall. These observations were corroborated by significant main effects of target contrast and group, as well as a target contrast by group interaction [Table S2]. Further, as seen in Figure S2, for NCS, the mean number of target-mismatched items fixated in both low-contrast and high-contrast trials was almost identical, whereas PSZ fixated a higher number of target-mismatched distractors in the low-contrast (vs high-contrast condition). This led to a significant main effect of Target contrast and group, as well as a significant Target contrast by group interaction for mean number of target-mismatched items fixated [Table 3.I.B (ii)].

Revisits. We computed the proportion of refixations that were directed to the target-mismatched distractor type (target-mismatched÷ (target-matched+ target-mismatched)). We found that, in trials with a low-contrast target, the proportion of revisits to the target-mismatched (salient, high-contrast) distractors was higher in PSZ (25.13 ± 3.53%) than in NCS (13.29 ± 2.40%), [$t(1,71) = 2.37$, $p < 0.02$, Cohen's d=0.64)], whereas this was not the case for trials with a high-contrast target [NCS=13.78 ± 3.40%; PSZ= 14.92 ± 2.78%; $t(1,71) = 0.27$, $p = 0.82$, Cohen's d=0.06)].

Dwell times. First run dwell times were derived as the sum of fixation durations during the first continuous visit to each of the items. This measure serves as a reasonable summative indicator of the time spent on processing the item, as it collapses single long fixations and multiple, smaller fixations occurring sequentially on the item. Figure 5 displays the mean dwell times.

For single-contrast trials, mean dwell times (Figure S2) were on an average 9.88 ms shorter on high-contrast trials than on low-contrast target trials for PSZ, and 7.65 ms shorter for NCS (main effect of Target contrast), with PSZ fixating each item for ~31 ms longer overall (significant main effect of Group). For mixed-contrast trials, to investigate search and target identification efficiency we broke down the dwell times by the type of distractor item fixated: Target-Matched versus Target-mismatched. For each distractor item type, two separate repeated-measures ANOVAs were used with Target contrast (low-contrast vs. high-contrast) as within-subjects factor and Group (PSZ, NCS) as between-subjects factor. Figure S2 displays the dwell times for Target-matched items fixated. There was no effect of contrast for either group on the amount of time spent processing target-matched distractors that were fixated. (no main effect of group, nor target contrast or target contrast by group interaction, Table S2). However, as seen in Figure S2, PSZ tended to fixate on target-mismatched distractors for longer than NCS (main effect of Group, [Table S2. II. B (ii)]), and particularly more so when searching for a Low-contrast target (significant Target contrast by Group interaction, [Table S2. II. B (ii)]).

TABLE S2: STATISTICS FOR INDIVIDUAL ITEM MEASURES

I. # of Unique Items scanned				
	F	**p**	**η^2_p**	**95% CI for Effect Size**
A. Single Contrast Trials (Fig 2B in main manuscript, Top)				
Target Contrast	27.56	<.001***	0.28	[0.12,0.43]
Target Contrast X Group	0.05	0.82	0.001	[0.00,0.05]
Group	51.28	<.001***	0.34	[0.24,0.55]
B. Mixed-Contrast Trials ((Supplementary Figure S2, B)				
(i) Target-Matched Distractors				
Target Contrast	7.65	0.01**	0.09	[0.01,0.24]
Target Contrast X Group	22.13	<.001***	0.24	[0.08,0.39]
Group	7.41	0.01**	0.09	[0.01,0.23]
(ii) Target-Mismatched Distractors				
Target Contrast	22.01	<.001***	0.24	[0.08,0.39]
Target Contrast X Group	20.75	<.001***	0.23	[0.08,0.38]
Group	41.56	<.001***	0.37	[0.19,0.51]
(iii) Difference in Proportion of target mismatched items visited (High-contrast target search vs Low Contrast target search) *(Fig 2B, Bottom)*				
	Paired t	***p***	***Cohen's d***	
NCS Group	-1.63	0.11	-0.28	[-0.61,0.06]
PSZ Group	5.85	<.001***	0.95	[0.56,1.33]
II. Average Dwell Time per item				
A. Single Contrast Trials	**F**	**p**	**η^2_p**	**95% CI for Effect Size**
Target Contrast	4.12	0.046*	0.06	[0.00,0.18]
Target Contrast X Group	0.07	0.8	0.001	[0.00,0.06]
Group	10.61	0.002**	0.13	[0.02,0.28]
(i) Target-Matched Distractors				
Target Contrast	0.7	0.41	0.01	[0.00,0.10]
Target Contrast X Group	0.03	0.87	0	[0.00,0.04]
Group	1.74	0.91	0.02	[0.00,0.13]
(ii) Target-Mismatched Distractors				
Target Contrast	1.31	0.26	0.01	[0.00,0.12]
Target Contrast X Group	8.29	0.005**	0.11	[0.01,0.25]
Group	13.12	<.001***	0.16	[0.03,0.30]

*** Significant at <0.001 **Significant at <0.01 *Significant at <0.05*

Figure S2. Individual Item Measures for Mixed Contrast Trials.

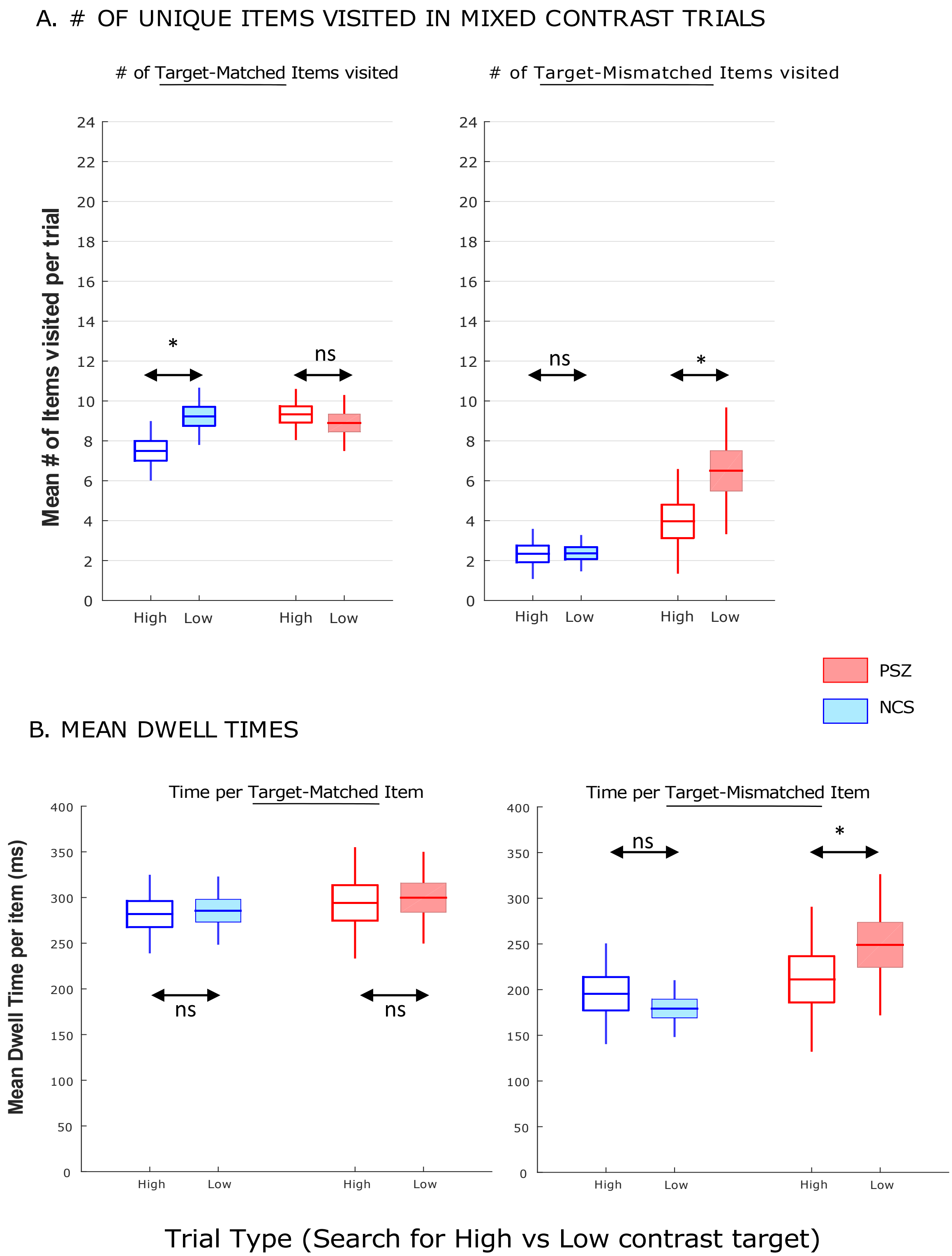


TABLE S3: Regression Analysis for Manual Reaction Times in Low-contrast Trials

A. With Group Membership as a predictor

Variables	**Models**					
	1		**2**		**3**	
	Standardized beta value (ß)	***VIF***	**Standardized beta value (ß)**	***VIF***	**Standardized beta value (ß)**	***VIF***
Group membership	-0.02	*2.59*	-	-	-	-
Response Activation (Acquisition to Manual Response Delay)	0.48***	*1.62*	0.47***	*1.139*	0.48***	*1.13*
# of target-mismatched items fixated	0.27*	*2.36*	0.27**	*1.83*	0.28**	*1.78*
# of target-matched items fixated	-0.14	*1.07*	-0.14	*1.071*	-0.15	*1.03*
Mean Dwell time on target-mismatched items fixated	0.20*	*1.71*	0.20*	*1.673*	0.20*	*1.67*
Mean Dwell time on target-matched items fixated	0.10	*1.13*	0.10	*1.12*	-	-

*p ≤ .05, **p ≤ .01, ***p ≤ .001   (shaded) Target-mismatched variables

B. Regression analysis conducted separately for each group: Blue values for NCS, Red values for PSZ

Variables	Models									
	1		2		3		4		5	
	Standardized beta value (ß)	***VIF***	**Standardized beta value (ß)**	***VIF***	**Standardized beta value (ß)**	***VIF***	**Standardized beta value (ß)**	***VIF***	**Standardized beta value (ß)**	***VIF***
Response Activation (Acquisition to Manual Response Delay)	0.36* 0.51***	*1.06* *1.06*	0.37* 0.53***	*1.04* 1.04	0.37* 0.54***	*1.03* 1.03	0.40* -	*1.00* -	0.39 -	*1.00* -
# of target-mismatched items fixated	0.04 1.73	*1.17* *1.47*	- 0.28	- 1.45	- 0.34*	- 1.31	- -	- -	- -	- -
# of target-matched items fixated	-0.19 -0.11	*1.10* *1.12*	-0.19 -	*1.07* -	-0.21 -	*1.02* -	-0.23 -	*1.00* -	- -	- -
Mean Dwell time on target-mismatched items fixated	-0.10 0.28	*1.39* *1.33*	-0.09 0.28	*1.28* 1.33	- 0.26*	- 1.30	- -	- -	- -	- -
Mean Dwell time on target-matched items fixated	0.20 *0.15*	*1.34* *1.17*	0.19 0.17	*1.30* 1.11	0.16 -	*1.05* -	- -	- -	- -	- -

Target-mismatched variables *p ≤ .05, **p ≤ .01, ***p ≤ .001

For both groups, delay between visual acquisition of target and manual button press emerged as the strongest predictor of reaction time. However, in the PSZ group, significant predictors also included mean number of target-mismatched items, followed by dwell time on target mismatched distractors. This was not the case for the NCS group.

Figure S3. Manual RT Associations

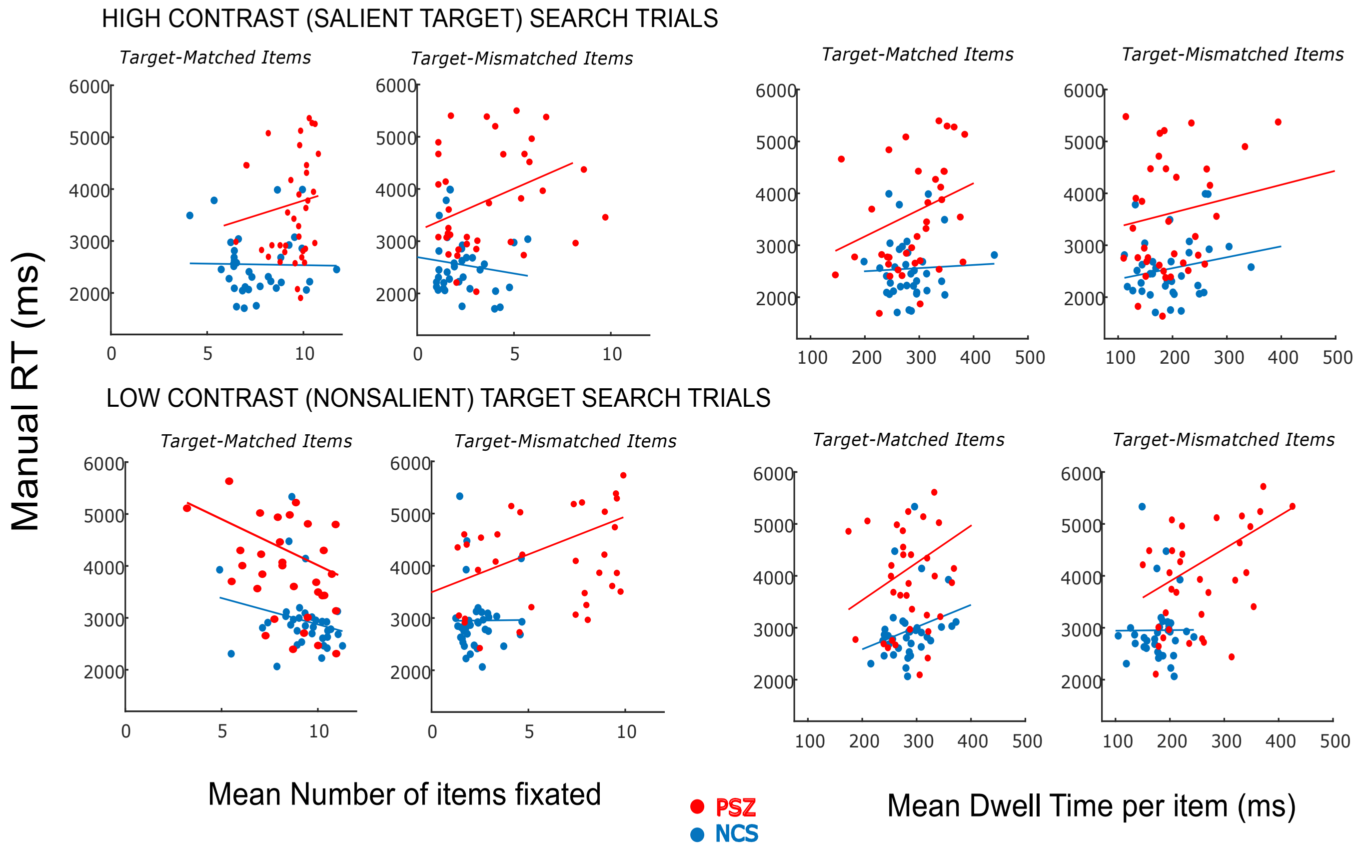


TABLE S4. CORRELATIONS BETWEEN NEUROCOGNITIVE AND VISUAL SEARCH PERFORMANCE MEASURES

Cognitive Measure		Overall mean Selection Latency (Time to first fixation on Target)	Overall Mean Dwell Time on target-mismatched distractors (ms)	Overall Mean Dwell Time on target-matched distractors (ms)	Mean Proportion of target-mismatched distractors (ms) (%) during salient search	Mean Proportion of target-mismatched distractors (ms) (%) during non-salient search
BACS Symbol Coding	Pearson's r p-value 95% CI [Lower, Upper]	*-0.33* *0.05*[a] [-0.52,0.12]	*-0.37* *0.03*[a] [-0.11,0.52]	0.23 0.19 [-0.62,-0.03]	*-0.36* *0.035*[a] [-0.71,-0.2]	-0.52 0.001* [-0.52,0.12]
CPT average d-prime	Pearson's r p-value 95% CI [Lower, Upper]	*-0.39* *0.022*[a] [-0.26,0.41]	-0.04 0.81 [-0.21,0.46]	0.39 0.02 [-0.01,0.6]	*-0.36* *0.035*[a] [-0.23,0.44]	-0.59 < .001* [-0.12,0.53]
k-score	Pearson's r p-value 95% CI [Lower, Upper]	0.08 0.64 [-0.61,-0.01]	0.14 0.43 [-0.58,0.03]	0.33 0.06 [-0.15,0.49]	0.11 0.52 [-0.61,-0.02]	0.23 0.19 [-0.66,-0.09]
MCT Overall	Pearson's r p-value 95% CI [Lower, Upper]	*-0.34* *0.045*[a] [-0.64,-0.06]	-0.31 0.07 [-0.37,0.3]	0.19 0.28 [0.07,0.64]	*-0.35* *0.038*[a] [-0.62,-0.03]	*-0.42* *0.013*[a] [-0.77,-0.32]
WRAT 4	Pearson's r p-value 95% CI [Lower, Upper]	-0.25 0.16 [-0.53,0.1]	-0.08 0.67 [-0.4,0.27]	0.17 0.32 [-0.17,0.48]	-0.24 0.17 [-0.53,0.11]	-0.31 0.07 [-0.58,0.03]

Red values are correlations that were significant (at a Bonferroni corrected α of 0.002) for PSZ group

[a] Correlations significant at an uncorrected α of 0.05

CPT- Continuous Performance Test; BACS- Brief Assessment of Cognition in Schizophrenia; WRAT 4- Wide Range Achievement Test 4; MCT Overall- MATRICS Consensus Cognitive Battery Overall Score