

The Impact of Contextual Factors on Performance of a Smartphone-Based Word List Test

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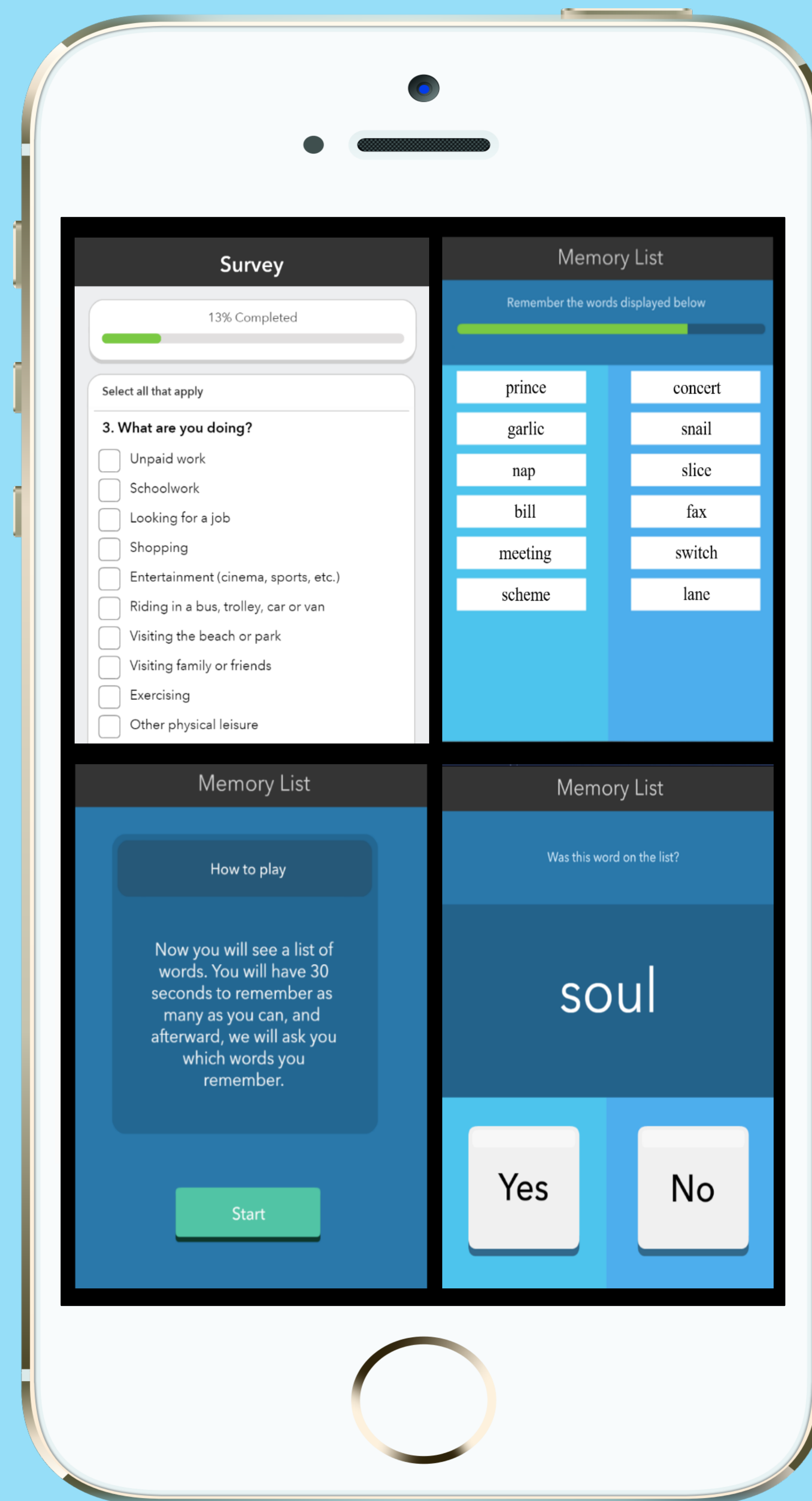
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Introduction

- Smartphone-based cognitive tests can be used to measure cognitive abilities in the real world and may complement traditional neuropsychological tests¹
- There is little research examining how contextual factors such as distractions, interruptions, a person's environment, and who a person is with impact performance and validity²
- In this study, we aim to understand how contextual factors impact performance on a mobile learning and recognition memory test, the Mobile Variable Difficulty List Memory Test (VLMT), designed for use with people with serious mental illness
- We also examined how context may impact convergent validity of the VLMT with measures of lab-based verbal learning and performance-based everyday functioning

Methods

- Participants were diagnosed with schizophrenia, schizoaffective disorder, and bipolar disorder
- In-lab assessments of verbal learning (Hopkins Verbal Learning Test, HVLТ) and functional capacity (UCSD Performance-Based Skills Assessment-Brief, UPSA-B)
- VLMT
 - During each VLMT administration, participants were presented with three trials where the list was shown for 30 seconds per trial
 - List lengths varied between 6-, 12-, or 18-items and were distributed across the 15 days so that each list length was used 5 times
 - Immediately following each exposure to the list, participants were shown target and recognition foil words one-by-one and asked to indicate whether the word appeared on the list
 - Dependent variables were the overall score combining percentage of correct identifications of targets and correct rejections of foils
- Smartphone EMA prompts 3 times per day for 30 days with one VLMT session/day (3 trials/session). Participants self-reported if they were distracted or interrupted, where they were, and who was around them after each VLMT
- Linear mixed models were used to understand the impact of context (distractions, interruptions, location, social environment) on VLMT performance (percentage correct), and Spearman correlations were used to understand how context impacted convergent validity



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References available upon request.



	Schizophrenia Spectrum (n = 98)	Bipolar Disorder (n = 70)	T or X ² , p
Age; years; M(SD)	42.0 (10.2)	39.1 (11.9)	1.68 (p = .095)
Gender; N (% F)	47 (48%)	49 (70%)	8.10 (p = .004)
Race (%)	Caucasian 32.7% African American 55.1% Other 12.2%	Caucasian 58.6% African American 25.7% Other 15.7%	17.54 (p = .007)
Ethnicity (% Hispanic or Latino)	23.5%	30%	.901 (p = .343)
Education; years; M(SD)	12.5 (2.4)	14.3 (2.6)	-4.51 (p < .001)**
HVLТ Total Score; M(SD)	20.8 (5.5)	24.0 (6.4)	-3.43 (p = .001)**
UPSA-B Total; M(SD)	68.3 (15.0)	75.7 (12.5)	-3.31 (p = .001)**
VLMT Percent Adherence; M(SD)	74.7 (23.6)	76.1 (22.5)	-0.39 (p = .699)

Results

- Participants (combined both diagnostic groups) reported distractions during 37% of the VLMT assessments and interruptions during 25%. They reported they were away from home in 33% of VLMT assessments and with others during 56%.
- Distractions, interruptions, and being away from home had a small but significant impact on performance (see table 2)

Table 2. Linear Mixed Models – Impact of Context on VLMT Performance (Overall Performance, Lists 12, and 18)

	Estimate (%)	S.E.	T	P	Cohen's D
Distracted	-3.8	.84	4.5	< .001**	0.11
Interrupted	-6.3	.91	6.9	< .001**	0.18
Away from Home	-2.8	.88	3.2	.001**	0.09
With Others	0.55	.83	-0.7	.506	0.02

- Performance was similarly correlated with the HVLТ when participants were not distracted ($\rho=.498$ vs. distracted $\rho=.462$), were not interrupted ($\rho=.467$ vs. interrupted $\rho=.473$), were alone ($\rho=.468$, vs. with others $\rho=.400$), and at home ($\rho=.487$, vs. away $\rho=.433$). These differences were not significantly different using an R to Z transformation ($p's > .108$)
- A more pronounced pattern emerged with the UPSA-B, wherein performance was more correlated with the UPSA-B when participants were not distracted ($\rho=.512$ vs. distracted $\rho=.390$, $Z=2.1$, $p=.017$), were not interrupted ($\rho=.448$ vs. interrupted $\rho=.459$, $Z=1.70$, $p=.045$), and were alone ($\rho=.449$ vs. with others $\rho=.397$, $Z=1.10$, $p=.132$).
- The correlation was in the opposite direction for home ($\rho=.386$) vs. away ($\rho=.448$, $Z=-1.06$, $p=.144$), wherein the difference was such that though participants performed better on the VLMT when they were at home, performance away from home was more highly correlated with UPSA-B scores

Discussion

- The impact of contextual and environmental factors on VLMT performance is significant but small
- Context had a greater impact on convergent validity of the VLMT with the UPSA-B than the HVLТ. However, even if participants were distracted, interrupted, or away from home, performance was still highly correlated with both in-person measures
- Cognitive performance in different environments (e.g., home vs. away) may provide information about cognition that can translate to real-world functioning