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Relationships among functional capacity, cognition, and naturalistic skill performance in people with serious mental illness

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ABSTRACT

There has been increasing interest in understanding real-world outcomes for individuals with serious mental illnesses (SMI). This study examined domain-specific skill knowledge, functional capacity, and neurocognition as predictors of naturalistic grocery shopping skill performance in forty-eight individuals with SMI. Participants completed measures of skill knowledge and general functional capacity (UCSD Performance-Based Skill Assessment – brief) as well as measures of neurocognition and symptoms. The Test of Grocery-Shopping Skills (TOGSS) assessed naturalistic shopping. TOGSS was significantly correlated with functional capacity, shopping skill knowledge, and neurocognition, but not symptoms. Multiple regression analysis was conducted with variables entered in 2 blocks. Skill knowledge and functional capacity were entered in block 1. Neurocognitive measures were entered in block 2 using forward entry. Skill knowledge was not a significant predictor of TOGSS when accounting for functional capacity and neurocognition. Functional capacity predicted TOGSS over and above skill knowledge and remained significant after accounting for the effects of neurocognition. Our findings indicate that functional capacity was associated with skill assessment under naturalistic conditions. Further, there was some, but not complete, overlap between neurocognitive and functional capacity predictors of naturalistic skill performance. Further development of naturalistic assessments may hold promise for interventions targeting real-world function.

1. Introduction

Meaningful functional outcomes and recovery for individuals with schizophrenia and other serious mental illness (SMI) entail more than symptom improvement (e.g., Green et al., 2012; Ventura et al., 2009). To that end, there has been considerable interest in identifying predictors of real world outcomes. While neurocognition predicts functional outcomes (Green, 1996; Green et al., 2000; Ventura et al., 2009), it generally accounts only for a moderate amount of variance (e.g., Bowie et al., 2006;Rempfer, 2003). As a result, models have emerged to examine the pathway between neurocognition and functioning (Bowie et al., 2006; Brown et al., 2006; Green et al., 2000; Green et al., 2012), many of which highlight the role of functional capacity. Functional capacity measurement emerged in the SMI literature in an effort to assess everyday life skills with objective, performance-based methods (e.g., McKibbin et al., 2004; Patterson et al., 2001) and is defined as the ability to perform skills under optimal conditions (Best et al., 2014; Bowie et al., 2006; Menendez-Miranda et al., 2015). In terms of measurement, functional capacity is generally assessed with simulated role-play situations in which individuals execute daily life skills in laboratory or clinical settings. Although functional capacity measures have been associated with real world functioning (Bowie et al., 2006; Cardenas et al., 2013; Menendez-Miranda et al., 2015), they are considered distinct from real world functioning and more research is needed to refine current models. Two issues pose challenges in how functional capacity is conceptualized and measured. First, there is uncertainty regarding how well existing functional capacity measures capture the complexity of real life (Bromley and Brekke, 2010; McDermid Vaz, et al., 2013). Indeed, there appears to be a gap in the functional capacity—real world functioning relationship such that functional capacity measures alone do not fully explain variance in real world functioning (Aubin et al., 2009; Gupta et al., 2012; Harvey et al., 2007). Hence, studies have begun to identify additional factors that help predict outcomes, including motivational factors (Cardenas et al., 2013; Green et al., 2012; Racette et al., 2016), task experience (Aubin et al., 2009; Holshausen et al., 2014) as well as symptom and illness factors (Bowie et al., 2006; Gupta et al., 2012). A second issue is whether functional capacity measures are distinct from neurocognition

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(Green et al., 2012; McDermid Vaz et al., 2013), as both appear to account for similar variance in real world outcomes (e.g., Bowie et al., 2006). In terms of face validity, functional capacity measures share many characteristics with cognitive assessment methods and therefore have been viewed as ecological or practical cognitive measures (McDermid Vaz et al., 2013).

To address these considerations, there is a need for further delineation of how functioning is conceptualized. Current functional measurement focuses on two assessment levels, i.e., simulated functional capacity and real world functioning, which is generally assessed with rating scales of functioning (e.g., Harvey et al., 2011) or pragmatic functioning variables, such as educational, vocational or independent living status (e.g., Menendez-Miranda et al., 2015). There may be value in addressing an intermediate measurement level: the assessment of skills under naturalistic conditions (Robertson and Schmitter-Edgecombe, 2017). In previous research, we have utilized the Test of Grocery Shopping Skills (TOGSS; Brown et al., 2009) as an ecologically-focused, performance-based skill assessment. In this task, examinees are provided with a standardized list of grocery items, and are asked to select the designated items at the lowest possible price within a real grocery store. Thus, simulated and standardized aspects of the task involve provision of a shopping list and the instruction of finding lower priced items. Yet, because the TOGSS is administered in the natural setting of a grocery store, it reflects many parameters of 'real' shopping (Hamera et al., 2005). For instance, the task requires the same behavioral and cognitive sequences as typical shopping, such as the ability to maneuver through the store, locate and select from an array of choices, etc. In addition, ecological assessment within naturalistic physical and social environments provides supports and obstacles (noise, distractions, etc.) present in real life. Indeed, in TOGSS development, shopping was chosen as the target behavioral domain because of the opportunity to utilize a naturalistic environment for in vivo assessment, thereby addressing ecological validity while balancing psychometric concerns such as standardization (Hamera and Brown, 2000; Brown et al., 2009). Thus, this level of measurement differs from simulated measures on the one hand (functional capacity) and approaches to real world assessment that utilize rating scales or status variables on the other, as it entails the assessment of everyday functional behavior under real world performance demands. With that distinction in mind, this type of in vivo measure can be viewed as a *performance-based naturalistic task* assessing "naturalistic skill performance" (Robertson and Schmitter-Edgecombe, 2017). Prior studies have indicated that naturalistic skill performance on the TOGSS is associated with neurocognition in persons with schizophrenia and other SMIs (Rempfer et al., 2003; Zayat et al., 2011) and distinguishes persons with and without SMI (Hamera et al., 2002)

The current study was intended to address the challenges in functional measurement by examining skill performance under simulated and naturalistic conditions. To explore how well functional capacity measurement reflects the demands of real world performance, we examined relationships among three measures capturing different aspects of skill performance. Naturalistic (in vivo) skill performance was assessed by the TOGSS. Simulated skill performance was assessed with two measures administered in a laboratory setting: a brief version of the UCSD Performance Based Skill Assessment (Mausbach et al., 2007) and the Knowledge of Grocery Shopping Skills test (KOGSS; Brown et al., 2006). We hypothesized significant, but moderate associations among functional measures, with the strongest associations between the two grocery shopping measures due to their shared skill domain. Second, with regard to the known overlap in cognitive and functional capacity measurement, we examined the added value of cognitive measurement in predicting naturalistic skill performance.

Table 1
Descriptive statistics for demographic, functional, clinical, and cognitive variables for SMI Sample.

Participants (N = 49)			
Age	45.73 ± 10.69 years		
Gender *N*(%)			
Female	24(48.90%)		
Male	25(51.10%)		
Ethnicity *N*(%)			
African American/Black	30(61.20%)		
Caucasian/White	12(24.50%)		
Multi-Racial	4(8.20%)		
Other Racial/Ethnic Group	1(2.00%)		
Missing	2(4.10%)		
SMI Diagnosis *N*(%)			
Bipolar Disorder	6(12.20%)		
Major Depressive Disorder	14(28.60%)		
Schizoaffective Disorder	7(14.30%)		
Schizophrenia	22(44.90%)		
Primary measures		*F/H* (3, 44)**	*p*
Functional assessment measures			
*KOGSS	34.00, 32.00–35.00	3.76	0.59
TOGSS	24.00 ± 3.99	2.22	0.10
UPSA-B	70.09 ± 14.63	2.18	0.10
Cognitive measures			
CVLT-II – Trial 1	4.56 ± 1.78	2.78	0.06
COWAT	28.75 ± 10.81	0.47	0.70
D2 – Concentration performance	99.61 ± 48.41	1.59	0.21
LNS	6.73 ± 3.19	2.09	0.12
Trails B	141.55 ± 71.45	0.76	0.52
WCST	36.53 ± 12.30	0.33	0.81
Clinical psychiatric symptom measures	8.00, 6.00–10.00	4.20	0.24
*BPRS-E – Negative Symptoms	1.00, 1.00–2.00	7.08	0.06
*BPRS-E – Positive Symptoms	19.63 ± 11.22	0.17	0.92
HAMD			

Note. Mean and standard deviation (M ± SD) reported for continuous variables. For skewed variables, median and interquartile range are reported prior to transformation.

* Indicates a skewed variable.

** One-way ANOVAs were used to test for diagnostic differences between normally-distributed variables and Kruskal-Wallis H Test for skewed variables.

2. Methods

2.1. Participants

Forty-nine individuals with serious mental illness (48.90% female) participated in this study. Participants were between 23–63 years of age (M = 45.73, SD = 10.69) and participating in community-based mental health services that required the participants met local state/federal criteria for SMI (i.e., all participants had a diagnosis of a major mental disorder and accompanying functional disability). The Structured Clinical Interview for DSM-IV (First et al., 2002) was utilized for diagnostic confirmation of schizophrenia (N = 22; 44.90%), schizoaffective (N = 7; 14.30%), major depressive (N = 14; 28.60%), and bipolar disorders (N = 6; 12.20%). Racial and ethnic composition is as follows: African American/Black (N = 30; 61.20%), Caucasian/White (N = 12; 24.50%), multi-racial (N = 4; 8.20%), and other (N = 1; 2.00%). Two participants (4.10%) had missing data in this category. Information for demographic and study variables is presented in Table 1. The study was approved by relevant institutional review boards and participants provided written informed consent. Exclusionary criteria for enrollment in the study included participant or clinician report of: substance abuse/dependence in the past 30 days, sensory or physical impairments interfering with task performance, history of developmental disability or serious neurological disease/disability (e.g., stroke). One participant was identified as a multivariate outlier and excluded from final analyses. The final sample included 48