Neurocognition, functional capacity, and functional outcomes: The cost of inexperience

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ABSTRACT

Background: Neurocognitive impairments are the strongest predictor of functional deficits in schizophrenia, but adaptive (i.e., functional) capacity, typically measured with performance-based assessments, yields an objective index of current abilities, whereas real-world functional performance relies on observations of community activity. However, limited experiences in the community may limit the acquisition, retention, or expression of these skills.

Methods: We examined the frequency of engagement in behaviors that are assessed in the current "gold standard" in person functional capacity assessment. The UCSD Performance-Based Skills Assessment (i.e., UPSA) examines skills associated with recreational engagement, handling money, scheduling appointments, and navigating public transportation. We used neurocognition, experience, and UPSA performance as predictors of the relationships among cognition and real-world functioning variables.

Results: Neurocognition was a significant correlate of UPSA scores regardless of whether it was forced into the model before or after prior experience, whereas experience was only a significant predictor of UPSA scores when entered before neurocognition. Further, functional capacity, neurocognition, and experience were significant predictors of real-world outcomes and experience remained a significant predictor regardless of the order it was entered into the model.

Conclusions: The amount of current experience with functional tasks is not a rate-limiter of the relationships between neurocognition and functional capacity but does account for some previously unexplained variance in the functional capacity–everyday functioning relationship. These findings underscore the importance of neurocognitive deficits as they relate to functional capacity in schizophrenia, and suggest an incremental functional cost of limited experience with independent living.

1. Introduction

Schizophrenia is a debilitating disorder associated with deficits spanning domains of neuropsychological, social and adaptive functioning (Bowie and Harvey, 2005). While pharmacotherapy reduces positive symptoms, these improvements do not typically translate to gains in other domains of functioning (e.g., community involvement, interpersonal behavior; Bellack et al., 2004). As more individuals with schizophrenia reside in the community outside of institutional settings (Goering et al., 2000), independent living and adaptive functioning have emerged as factors pivotal to defining treatment success. These changes in health care delivery put the identification of variables that predict functional impairment at a premium.

Neurocognitive deficits are the most robust predictor of functional status in both cross-sectional (Green, 1996) and longitudinal studies (Harvey et al., 1999). Most findings suggest that the decrement in functioning associated with neurocognitive dysfunction supersedes that of symptom severity (Kurtz et al., 2005). Yet, composite measures of cognitive performance maximally account for 25–50% of the variance in real-world functioning (e.g., Harvey et al., 1998). Thus, in order to more fully understand the predictors of real-world functioning, we need to identify additional rate-limiting factors.

One mediator of the relationship between neurocognition and everyday functioning is functional capacity, which refers to the ability to perform the skilled acts required in everyday functioning in a neutral environment. These performance-based assessments are tools to identify abilities required for functioning (Harvey et al., 2007), while third party rating scales based on the observations of certain informants are optimal measures of everyday functioning (Harvey et al., 2011). A study by Bowie et al. (2006) evaluating the determinants of real-world functional performance replicated the strong relationship

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between neuropsychological functioning and functional outcome, but found that this relationship was significantly mediated by functional capacity.

While the correlation between capacity and performance is consistently moderate to large in magnitude (Leifker et al., 2011), multiple factors predict the discrepancy between what a person can do and what that person actually does. Limiters of functional performance include depression (Bowie et al., 2006; Sabbag et al., 2012) positive and negative symptoms (Smith et al., 2002), chronicity and severity of illness (Stefanopoulou et al., 2011), lower pre-morbid IQ (van Winkel et al., 2007), and lower levels of education (Sakai et al., 2009). In addition to the importance of symptoms a considerable number of variables not specific to a patient's abilities or symptoms predict actual performance of skilled acts.

Gupta et al. (2012) recently examined factors associated with the capacity–performance discrepancy and found that living in supportive housing, more severe depressive symptoms, earlier age of illness onset, and greater total time hospitalized predicted classification of individuals who demonstrated sufficient capacity to perform everyday behaviors but failed to do so in the real world. Factors such as self-efficacy and intrinsic motivation also play an important role in the deployment of functional skills even in cases where capacity remains relatively intact (Cardenas et al., 2013). Non-symptom related factors, including financial and social support (Harvey et al., 2009) and proximity to relatives, are linked to better functional outcomes (Bowie et al., 2007; Harvey et al., 2007; Leung et al., 2008).

Treatment environments for schizophrenia over the past 30 years have placed much emphasis on custodial or rehabilitative care (Durbin et al., 2004). In custodial care there is a typical lack of opportunities to function independently, whereas rehabilitative care is predicated on the idea that restoration to one's former optimal functional level is sufficient for true functional recovery. However, the trajectory for schizophrenia is that pre-morbid deficits in neurocognition, intellectual functioning, and interpersonal skills (Davidson et al., 1999) are evident prior to the onset of psychotic symptoms possibly hampering early opportunity for the acquisition and subsequent utilization of instrumental functional skills. Further, normative milestones that require the development and maintenance of these skills are often not achieved (Harvey et al., 2012). Even as most patients now live outside of institutional settings, their status is often not truly independent and they frequently rely on financial assistance and support (Bowie and Harvey, 2006). Thus, these skills are neither acquired at demographically normative time points nor are they made use of in every day environments.

Previous research has yet to evaluate the impact of limited prior experience with the skills required for independent living. In this study, we evaluated the impact of prior experience with performing functionally skilled acts on real-world functional outcomes. We hypothesized that experience in the performance of skilled acts would significantly predict scores on performance-based assessments of functional capacity but that neurocognition would still emerge as the strongest predictor of impairments in functional capacity. Further, we hypothesized that prior experience and functional capacity would be significant predictors of real-world functioning, regardless of other influences.

2. Methods

2.1. Participants

Participants were 148 older outpatients with a diagnosis of schizophrenia or schizoaffective disorder (M_{age} = 55.53, SD = 7.55), who were all living in the community, either alone in a private residence (28%), with family in a private residence (28%), or in a supported housing situation (44%). Results reported here reflect participants' performance at the baseline of a longitudinal study of the course of cognitive and functional status. Exclusion criteria included any DSM-IV (APA, 1994) Axis I disorder other than schizophrenia or schizoaffective disorder, a Mini-Mental State Examination (Folstein et al., 1975) score below 18, Wide Range Achievement Test (WRAT; Wilkinson, 1993) reading equivalent of grade 6 or less, or any medical illnesses that affect cognitive functioning (e.g., traumatic brain injury, epilepsy, cerebrovascular accident, multiple sclerosis). A trained research assistant completed the Comprehensive Assessment of Symptoms and History (CASH; Andreasen et al., 1992) with each participant and a senior clinician confirmed the diagnosis.

At the time of recruitment participants were required to demonstrate evidence of continued illness whereby they met at least one of three criteria: (1) inpatient admission for psychosis in the past two years; (2) emergency room visit for psychosis in the past two years; or, (3) a score on the Positive and Negative Syndrome Scale (PANSS) positive symptom items delusions, hallucinations, or conceptual disorganization of 4 (*moderate*) or more. All patients were on antipsychotic medication at the time of assessment. Written informed consent was obtained from all participants before participation in any aspect of the study. The Institutional Review Boards at each site approved the experimental procedures and consent forms.

2.2. Measures

All participants completed the tests in the following fixed order: Experience with functionally skilled acts questionnaire, estimated pre-morbid functioning with the WRAT, 3rd edition, Reading Recognition subtest (Wilkinson, 1993), adaptive functional skills assessment, a neurocognitive battery, and a symptom interview. All raters received extensive training and were subject to evaluations of their performance every three months at which point they re-rated training tapes, participated in dual ratings of functional status members with C.R. Bowie, and engaged in other quality assurance assessments of testing. Raters were trained to adequate reliability on symptom ratings yielding intra-class correlation coefficients (ICC) ranging from .86 to .92.

2.2.1. Experience with functionally skilled acts

A novel scale tapping prior experience with skills related to UPSA domains was employed in this study. Questions were written to match the content of the UPSA domains and assess the frequency of engagement (never, less than once per month, more than once per month, more than once per week, everyday) in the behaviors. The questions asked for the current frequency of the following behaviors during the most recent month are: a) going on recreational outings to places like the park, the beach, the library, or the zoo, b) handling money, c) using the telephone, and d) taking public transportation by yourself. Participants circled the items on a questionnaire. Internal consistency of the scale was good (Cronbach's Alpha = .73).

2.2.2. Performance-based functional capacity

The UCSD Performance-Based Skills Assessment Battery (UPSA; Patterson et al., 2001) is designed to assess functional skill capacity among older outpatients with severe mental illness. The UPSA measures performance in a number of everyday functional domains through the use of props and standardized skill performance situations. In this study, four derived domains (comprehension/planning, finance, communication, and transportation) were used for analyses. The comprehension/planning domain measures the participants' ability to understand a written material that describes recreational outings, plan the activities and list the appropriate items necessary to bring to the outings. The finance domain requires the participants to demonstrate their ability to use money by counting out given amounts from real currency, make change, and fill out a check to pay a utility bill. In the communication domain, participants engage in a series of role-plays requiring them to make emergency phone calls, call directory assistance to request a telephone number, call the number, and then reschedule a medical appointment. The transportation domain involves participants using information from bus schedules and maps to determine appropriate