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The role of executive functions and psychiatric symptom severity in the Allen Cognitive Levels

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ABSTRACT

This study examined the relationship between Allen Cognitive Level (ACL) and psychiatric symptom severity, level of nursing support required to complete activities of daily living (ADLs), and post-hospitalization discharge disposition in a sample of 193 acute psychiatric inpatients. A subsample of 31 participants with acute psychotic disorders were administered three measures of executive functioning in order to examine the convergent validity between ACL and basic sequencing and shifting, phonemic fluency, and visuospatial construction. Findings indicated significant moderate positive correlations between ACL and motor processing speed, basic sequencing and shifting, and phonemic fluency, and a nonsignificant relationship with visuospatial construction. A subsample of 166 participants were administered the Brief Psychiatric Rating Scale-Expanded (BPRS-E) to assess psychiatric symptom severity. Results indicated a significant weak negative correlation between ACL and total psychiatric symptomatology, as well as significant weak negative correlations with specific symptoms. In contrast with prior research, there was no significant correlation between ACL and level of nursing assistance required to complete ADLs. A logistic regression did not identify ACL as a contributing factor to post-hospitalization discharge disposition. These findings call into question the clinical utility of the ACLS-5 as an assessment of functional cognition for those experiencing acute psychiatric illness.

1. Introduction

The Allen Cognitive Level Screen-5 (ACLS-5), a criterion-referenced visuomotor screening task and assessment of functional cognition, is used by occupational therapists to assess cognitive and adaptive functioning among psychiatric inpatients and to guide recommendations regarding community placement. The ACLS-5 requires examinees to reproduce three lacing stitches of increasing complexity and yields an Allen Cognitive Level (ACL), a score that organizes functional cognition into six levels which are in turn subdivided into ordinal modes of functioning. The ACL is based on Allen's Cognitive Disabilities Model, a theory and treatment approach informed by cognitive level in conjunction with diagnosis, functional history, environmental supports and complexity, treatment goals, and criteria for referral and discharge (Allen, 1985, 1988). Although the ACLS-5 is an assessment of functional cognition, an occupational therapy construct which joins cognitive functioning and functional performance, it is often used as an alternative to cognitive screeners that do not simultaneously assess functional ability. Cognitive screeners are used to assess for the presence and degree of cognitive impairment (Streiner, 2003), but vary in terms of reliability, measurement error, temporal stability, sensitivity, specificity, and predictive validity. Despite its widespread use, the ACLS-5 has not been well validated as an assessment of cognitive functioning or functional ability, nor has its predictive validity for informing community placement after discharge been established. This study examines the role of specific executive functions in ACL performance and examines the relationships between ACL and psychiatric symptom severity, level of nursing support required to complete activities of daily living, and community placement after discharge in a sample of acute psychiatric inpatients.

Many factors influence performance on the two constructs underlying functional cognition. Functional performance, defined as the capacity to complete tasks of daily living (Kielhofner, 2009), or as the ability to attend to the activity demands of specific tasks (Allen et al., 2007), can be affected by deficits in cognitive functioning and by peripheral factors such as physical disability. Similarly, cognitive functioning is not a unitary construct, but a composite of multiple discrete yet interconnected cognitive abilities. Researchers have sought to

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identify the neurocognitive abilities that contribute to variance within ACL scores, and Velligan et al. (1998) called for further examination of the underlying aspects of executive functioning captured by ACL. Executive functions are a related set of cognitive abilities that enable the self-regulation of goal directed behaviors (Barkley, 2012), which involve neurocognitive processes including aspects of attention and working memory, self-monitoring, initiation, inhibition, discrepancy detection, sequencing, and cognitive flexibility (Suchy, 2009). Allen et al. (2007) hypothesized that the ACLS-5 involves integration between attention, sensory cues, motor functioning, and the ability to incorporate verbal feedback. Completion of the final stitching task of the ACLS-5 may require volition, planning, purposive action, and effective performance, capacities that Lezak, Howieson, Bigler, and Tranel (2012) identified as aspects of executive functioning. At this time, no published studies report findings on the relationship between ACL and two aspects of executive functioning: phonemic fluency, which involves verbal response generation and inhibition, and basic sequencing and shifting.

Research on the convergent validity of the ACL has focused on the relationship between ACL and measures of cognitive abilities. ACL has demonstrated adequate convergent validity with the Mini-Mental Status Exam (MMSE), a screener for major neurocognitive disorder, in older adults with neurocognitive disorders (Heying, 1985; Kehrberg, Kuskowski, Mortimer and Shoberg, 1993). Findings on the strength of the correlation between ACL and measures of general intellectual functioning range from adequate to weak (David and Riley, 1990; Mayer, 1988) and are stronger in samples of older adults with neurocognitive disorder than in samples of psychiatric inpatients. Velligan et al. (1998) found that ACL was correlated with higher level executive functions, including manipulation of information in working memory, ability to inhibit inappropriate responses, perceptual organization, and problem solving. Several additional studies have reported findings on the convergent validity of the ACL and measures of executive functions, including a modest correlation with verbal abstraction (David and Riley, 1990), a moderate correlation between category development and perseverative errors on the Wisconsin Card Sort (Secrest et al., 2000), an assessment of novel problem solving and set shifting, and a moderate correlation with Block Design (Mayer, 1988), a visuospatial construction task that assesses ability to analyze and synthesize abstract visual information. Kwon and Oh (2015) examined the relationship between the Rey Complex Figure Test and ACL, however a small sample size (n = 11) limited their ability to report clinically or statistically significant findings. Table 1 includes a comprehensive overview of peer-reviewed findings on the convergent validity of ACL with neuropsychological measures.

Another area of research has focused on the relationship between ACL and functional capacities, including performance of activities of daily living and level of independence in living situation. Studies examining the relationship between ACL and structured measures of performance on activities of daily living have reported variable findings, with some reporting significant associations (Heying, 1985; Keller and Hayes, 1998; Marom, Jarus, and Josman, 2006; Secrest, Wood, and Tapp, 2000; Velligan, True, Lefton, Moore, and Flores, 1995; Velligan et al., 1998; and Ziv, Roitman, and Katz, 1999) but not others (Ho and Sturgess, 1990). Scanlan and Still (2013) reviewed functional assessments completed by trained occupational therapists and reported a moderate relationship between ACL and ability to perform basic activities of daily living. Table 2 provides an overview of peer-reviewed research on the relationship between ACL and functional abilities, including measures of adaptive behaviors, living situation, psychiatric hospital readmission, and social competence.

Several studies have evaluated the predictive validity of ACL. Henry, Moore, Quinlivan, and Triggs (1998) reported a significant difference in mean ACL between participants discharged to live independently and participants who required additional support, while Velligan (1998) reported a nonsignificant trend relating ACL and level of independence in living situation 1–3.5 years after assessment. Velligan et al.'s (1998) study examined psychiatric inpatients at discharge, during the subacute phase of psychiatric illness. However, ACL scores are known to improve during psychiatric hospitalization (Odes et al., 2011). In addition, ACL is primarily used in clinical practice to inform treatment and discharge planning and is therefore often administered at the onset of inpatient hospitalization. Psychometric researchers have noted that the precision of cognitive assessments varies across populations and testing contexts. Thus, evaluations of validity, or the extent to which a test measures what it aims to measure (Strauss, Sherman, and Spreen, 2006), should be conducted in the context in which a measurement is applied (Nunnally and Bernstein, 1994). There remains a need to evaluate the predictive validity of ACL captured during the acute phase of psychiatric hospitalization.

While ACLS-5 is not a measure of psychiatric symptom severity, researchers have investigated the relationship between functional cognition and psychiatric symptomatology. Davidhizar, Cosgray, Smith, and Fawley (1991) reported a moderate negative correlation between ACL and the Nurses Observation Scale for Inpatient Evaluation-30 Manifest Psychosis Scale. Other researchers reported no relationship between ACL and self-report measures of depression (David and Riley, 1990; Ziv et al., 1999), although the use of self-report measures with significant reading comprehension demands may have limited the applicability of these findings to populations with greater cognitive impairment and lower ACL.

To further assess the relationships between ACL, executive functioning, and psychiatric symptomatology, the following hypotheses were tested: i) In a sample of participants experiencing acute psychosis, lower ACL will correlate with poorer performance on specific executive functions, including basic multitasking, as assessed by Trail Making Test Part B (TMT-B); phonemic fluency, as assessed by Controlled Word Association Test FAS (COWA); and visuospatial construction, as assessed by the Block Design subtest of the Wechsler Adult Intelligence Scale-Fourth Edition (WAIS-IV BD; Wechsler, 2008). ii) In a sample of participants experiencing acute psychiatric illness, there will be a negative correlation between ACL and overall psychiatric symptomatology, as assessed by the Brief Psychiatric Rating Scale-Expanded (BPRS-E) total score. iii) There will be a negative correlation between ACL and the degree of nursing support required to complete two activities of daily living, showering and dressing, during inpatient hospitalization.

2. Methods

2.1. Participants

Study participants between the ages of 18 and 75 years old were recruited from inpatient units at a psychiatric hospital in California. Exclusion criteria were inability to provide informed consent due to cognitive impairment or psychiatric symptom severity and inability to complete the assessment battery due to language, motor, vision, or hearing deficits. All 193 participants were diagnosed with a psychiatric illness by a psychiatrist in accordance with ICD-10 criteria and were assessed to be in the acute phase of psychiatric illness. Participants in the cognitive measures subsample were consecutively admitted to inpatient units, and the remainder of the full sample was a sample of convenience.

2.2. Measures

In accordance with standard treatment at the study site, the ACLS-5 was administered by occupational therapists to participants within three days of psychiatric hospitalization. Archival data on ACL, level of nursing support required to complete activities of daily living, diagnosis, and sociodemographic factors, including level of independence in living situation prior to and following hospitalization, was collected