The Relationship of the Allen Cognitive Level Test to Cognitive Abilities and Psychopathology

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The cognitive factors measured by the Allen Cognitive Level Test (ACL) (Allen, 1982) as well as the test’s relationship to level of psychopathology were examined through a retrospective study of 71 patients from a general hospital psychiatry unit. Pearson correlations, computed for the ACL score with the Shipley Institute of Living Scale (Shipley, 1940), a general measure of intellectual functioning, were significant. A strong correlation was found between the ACL and the Symbol-Digit Modalities Test (Smith, 1982), a measure of motor speed and concentration often used as a neurological screening instrument. This suggests the potential usefulness of the ACL to screen for cognitive dysfunctions associated with organicity. Contrary to hypothesis, there was no significant correlation between the ACL and measures of psychopathology such as the Beck Depression Inventory (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) and the Minnesota Multiphasic Personality Inventory (Hathaway & McKinley, 1940). The relationship of the ACL to other recognized measures of cognitive functioning increases its usefulness as a valid measure of day-to-day limitations in the functioning of psychiatric patients. Effective communication of the implications of these cognitive levels to a multidisciplinary treatment team is enhanced by knowledge of the relationship of the ACL to measures of cognitive functioning and psychopathology used by other disciplines.

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Occupational therapists assess cognitive ability as it relates to a person's independent functioning in daily activities. The assessment of functional capacity is a critical aspect of the multidisciplinary evaluation of the psychiatric patient. In recent years, the assessment of functional capacity through such objective measures of activity as the Bay Area Functional Performance Evaluation (Bloomer & Williams, 1979) has increased. One area of increased research and clinical interest has been the measurement of cognitive functioning and disability through the use of objective observations of sensorimotor activities (Allen & Allen, 1987). Cognitive abilities are routinely evaluated by psychologists and others using tests with established psychometric properties, such as the Wechsler Adult Intelligence Scale–Revised (WAIS–R)(Wechsler, 1981) and the Shipley Institute of Living Scale (Shipley, 1940). Psychology and other disciplines address the person's functional abilities in broad terms but often fail to specifically address functioning in day-to-day activities.

Allen's Cognitive Disability Model (1988) included a cognitive scale comprising six cognitive levels and corresponding functional capacities or limitations that are used to evaluate a person's current functional cognitive ability. Cognitive levels are ascertained by "the complexity of sensorimotor association that may be formed during the process of doing a task and the amount of assistance required for completion of the task" (Allen & Allen, 1987, p. 185). Allen (1987) defined capacity as present abilities plus the power to receive and develop new physical or cognitive abilities. These cognitive levels are based on research involving extensive observation and testing of psychiatric patients. Allen maintained that the patients' responses to the results of unintentional consequences of actions reflected cognitive functioning. These responses can be observed in the clinical setting and may be helpful in predicting how a patient will function in the community. As a test of cognitive ability, the Allen Cognitive Level Test (ACL) (Allen, 1982) should correlate with standardized cognitive evaluations used by other members of a multidisciplinary team.

Recent studies have begun to establish the validity of the ACL to other measures of cognitive functioning. Katz (1985) reported a robust correlation (.908) between the ACL and the Block Design subtest of the Wechsler Adult Intelligence Scale in a sample of depressed patients. Heying (1985) found a significant relationship ($r_s = .656$) between the ACL and the Mini-Mental Status Exam (Folstein, Folstein, & McHugh, 1975) in patients with dementia. Mayer (1988) found that the ACL correlated (.46) with the Full-Scale IQ test from the WAIS–R. The patterns of correlations with the WAIS–R subtests suggested that...
the ACL measures predominantly fluid or perceptual–integrative cognitive abilities. Therefore, one purpose of this study was to replicate Mayer’s findings with other measures of intellectual functioning and thus further identify the cognitive factors measured by the ACL.

A second purpose of this study was to determine the relationship between the ACL and level of psychopathology. Allen developed the ACL to measure not only cognitive disabilities but also the social consequences that impairments have on functioning. Williams and Allen (1981) found significant differences between schizophrenic, depressed, and normal subjects on the ACL, and Moore (cited in Allen, 1985, pp. 287–294) reported a significant relationship to the Brief Psychiatric Rating Scale. Other findings, however, have failed to support a relationship between the ACL and severity of psychopathology in a sample of depressed patients (Katz, 1985). We sought to clarify this relationship in a diverse psychiatric sample using multidimensional measures of psychiatric disturbance.

Review of Allen’s Theory of Cognitive Levels

Allen’s cognitive levels are used as guidelines for predicting a person’s ability to do familiar activities and learn new ones (Allen, 1985, 1987). Effective communication of the implications of Allen’s cognitive levels to a multidisciplinary team requires use of relevant and understandable terms that then provide clear information on the occupational functioning of the individual. Terms that seem clear to the occupational therapist are often not understood by other professionals or are used differently in other disciplines. The following is a summary of Allen’s cognitive levels that reflects the translation of terms to more effectively bridge the terminology gap. (For further descriptions, see Allen, 1982, 1985, 1987, & 1988.)

Level 1: Automatic actions. The person is conscious, and cooperation with vital tasks can be elicited through the use of sharp commands. Allen (1987) used the term arousal to describe the limited ability of the person functioning at Level 1 to respond to external cues. A change in level of arousal can be elicited and sustained for a few seconds. The person’s behavior is largely habitual or reflexive. Other automatic actions appear to be in response to internal or subliminal cues. Much skilled nursing care is required for persons functioning at this level.

Level 2: Postural actions. The person’s actions seem to be related to a feeling of comfort or discomfort and are sustained for only a few minutes. Imitation of the postural actions can be elicited; cooperation in gross motor activities can usually be elicited. People functioning at Level 2 can often be observed aimlessly pacing or wandering. Allen (1987) used the term discernment to describe a limited ability to perceive the external environment and to recognize the external as separate from the self. Twenty-four hour care is required for persons functioning at Level 2.

Level 3: Manual actions. Tactile cues capture the person’s attention and are associated with manual actions. “Actions frequently are repetitive and often seem inappropriate, pointless, or destructive to others” (Allen, 1987, p. 567). Although the person is not goal-directed, attention is sustained by interest in the effect the action has on an external object; the person must be guided through the sequence of a task for it to be completed successfully. Long-term repetitive training is the term Allen (1987) used to describe the ability to acquire a limited awareness of routine activities that are monitored by caregivers. Long-term repetitive training is how new behaviors are acquired at this level. Twenty-four hour supervisor is recommended for persons functioning at Level 3.

Level 4: Goal-directed actions. At this level, the person relies on visible cues that are associated with his or her goal-directed actions. Reliance on visible cues can produce misinterpretations of reality. Features of objects with sharp contrast such as color and shape are dealt with successfully, while other details are ignored. Invisible properties of objects (e.g., electricity, heat, and chemical reactions) do not capture the attention; direct supervision (Allen, 1985) is necessary to avoid injuries. Allen (1987) used the term training for persons functioning at Level 4 to describe a limited capacity for learning that is situation-specific. Training does not carry over to other environments or activities. Many day-to-day activities are successfully performed, which may conceal disability, but support is needed to cope successfully with changes in the environment. Monitoring by a support person is recommended for these persons.

Level 5: Exploratory actions. The person explores the effect of his or her actions on the physical properties of the environment. These people learn by doing or by being shown what to do. Overt trial-and-error learning carries over to other activities and the environment. These persons have difficulty understanding explanations that use symbolic concepts (e.g., letting food stand to complete microwave cooking; medicinal side effects that go away). They do not organize in order to plan or anticipate future events. Therefore, situations that require planning, organization, and deductive reasoning are not handled effectively (Allen, 1985).

Level 6: Planned actions. The person uses symbolic cues to formulate plans. Through the use of these cues, self-observation of behavior enables him or her to select a preferred course of action while engaged in the activity. This is considered the normal
adult functional level. Future events are anticipated, behavior is organized, and satisfactory results are produced independently. By being able to anticipate, the person can foresee and prevent unsatisfactory results, thereby avoiding unnecessary steps.

Method

Subjects

Seventy-one patients admitted to a general hospital psychiatric unit during a 13-month period were randomly selected for this study. The average age of the sample was 36.99 (SD = 12.18), and 70.4\% of the patients were women. Patients were excluded from the study if they were unable to read and respond to the self-report data. The diagnoses of these patients were mood disorder, 54\%; schizophrenia, 13\%; adjustment disorder, 11\%; anxiety disorder, 6\%; impulse control disorder, 4\%; somatoform disorder, 4\%; psychoactive substance use disorder, 4\%; organic mental disorder, 1\%; and various other diagnoses, 3\%.

Measures and Procedure

Within 1 week of admission, all subjects were given the following tests. The first three instruments used represent measures of cognitive functioning; the final two are measures of psychopathology.

1. The expanded version of the ACL (Earhart & Allen, 1988) involves three leather stitches that increase in complexity. The test measures the level of reasoning needed to successfully imitate each stitch. The assessment of cognitive level is based on the complexity of the stitch that the patient is able to imitate and observations of the patient's behavior in the execution of this task. The average administration time for the ACL is 5 to 10 min. As noted previously, the ACL was shown by Mayer (1988) to correlate with specific WAIS-R subtests and IQ scores.

2. The Shipley Institute of Living Scale (Shipley, 1940) measures intellectual ability or impairment and consists of two sections: Vocabulary (general verbal intelligence) and Abstraction (novel learning and abstract reasoning). It is a pencil-and-paper test requiring the person to choose synonyms from a multiple-choice format and write responses to sequences of terms. It has been shown to be a reliable and valid measure of overall intellectual functioning (Zachary, 1986). Recent studies have shown the Shipley scale to have a strong correlation (.74 to .85) to the Full-Scale IQ test of the WAIS (Zachary, Crumpton, & Spiegel, 1985).

3. The Symbol-Digit Modalities Test (Smith, 1982) is a timed performance test involving the conversion of novel geometric designs into written responses. This test measures predominantly fine-motor speed and concentration as well as incidental memory. Its reliability and validity as a screening measure of cerebral brain impairment have been documented (see Smith, 1982, for a review). The Symbol-Digit Modalities Test has been shown to be one of the most sensitive single measures of neurological dysfunction in psychiatric populations (Riley, Mabe, & Schear, 1987; Smith, 1968, 1969; Watson, Gasser, Schaef, Buranen, & Wold, 1981).

4. The Beck Depression Inventory (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) is a 21-item scale that measures attitudes and symptoms associated with depression. Adequate reliability has been reported (Beck & Beamesderfer, 1974). Concurrent validity with clinicians' ratings and other measures of depression has also been established (Beck et al., 1961; Nussbaum, Wittig, Hanlon, & Kurland, 1963).

5. The Minnesota Multiphasic Personality Inventory (Hathaway & McKinley, 1940) has been used frequently in clinical samples and is well represented in the literature on the validity of various scales and profiles (e.g., Greene, 1980). The basic clinical scales measure the following levels of psychopathology: hypochondriasis, depression, hysteria, psychopathic deviance, paranoia, psychasthenia, schizophrenia, mania, and social introversion.

Results

The mean ACL score for this psychiatric sample was 4.9 (SD = .85). The mean IQ computed from the Shipley Institute of Living Scale was 88.7 (SD = 15.17).

Pearson correlations were computed for the ACL score with the Symbol-Digit Modalities Test, the vocabulary, abstraction, and estimated IQ scores of the Shipley Institute of Living Scale; the patient's age; the Beck Depression Inventory; and the validity and clinical scales of the Minnesota Multiphasic Personality Inventory. No significant correlations (p < .05) were found between the ACL, the Beck Depression Inventory, and the Minnesota Multiphasic Personality Inventory scales. Significant correlations, however, were found between the ACL and the Symbol-Digit Modalities Test (r = .521, p < .001), the patient's age (r = -.424, p < .001), and the following sections of the Shipley Institute of Living Scale: Vocabulary (r = .252, p < .02), Abstraction (r = .355, p < .001), and IQ (r = .311, p < .005).

Partial correlations were computed with age controlled for to determine whether the relationship between the ACL and other cognitive measures was due to a general deterioration in perceptual motor performance with age or to cognitive factors unrelated to age. As with the zero-order correlations, when age was controlled for, no significant relationship was found between the ACL, the Beck Depression Inven-
Test With Other Measures of Cognitive Ability

Table 1
Multiple Regression Analysis of the Allen Cognitive Level Test With Other Measures of Cognitive Ability

<table>
<thead>
<tr>
<th>Variable</th>
<th>r</th>
<th>β</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symbol-Digit Modalities</td>
<td>.521</td>
<td>.507</td>
<td>3.81</td>
<td>.0003</td>
</tr>
<tr>
<td>Shipley Vocabulary scale</td>
<td>.252</td>
<td>-.143</td>
<td>-0.94</td>
<td>ns</td>
</tr>
<tr>
<td>Shipley Abstraction scale</td>
<td>.355</td>
<td>.163</td>
<td>1.05</td>
<td>ns</td>
</tr>
</tbody>
</table>

Note. ns = not significant. \( R = .53, R^2 = .29, \text{adjusted } R^2 = .25 \).

Discussion

The results of this study indicate that the ACL is a valid measure of cognitive functioning. Specifically, the ACL appears to be more related to a task of visual-motor speed and concentration (Symbol-Digit Modalities Test) than to measures of abstract reasoning (Shipley Abstraction scale) or verbal skills (Shipley Vocabulary scale). These findings are consistent with those of Mayer (1988) and Katz (1985) and support the theoretical assumption of the ACL as a measure of sensorimotor cognitive functioning. Although both the ACL and Symbol-Digit Modalities Test were negatively associated with age, their correlation was independent of this factor. The ACL seems to measure novel learning of perceptual-motor tasks. These learning abilities may be predictive of a person’s capacity to make effective behavioral adaptive responses.

Our results do not support a relationship between the ACL and psychopathology as measured by the clinical scales of the Minnesota Multiphasic Personality Inventory and the Beck Depression Inventory. The cognitive functional level measured by the ACL, therefore, appears to be unaffected by the level or dimensions of the patient’s psychiatric symptomatology. Although we found no associations between the ACL and level or type of psychopathology among patients, a single person’s ACL level may vary with changes in level of psychopathology. In addition, this sample comprised mostly depressed patients, similar to the Katz (1985) sample that produced no relationship between the ACL and psychopathology. Perhaps the cognitive capacities measured by the ACL are affected more by the level of schizophrenic symptomatology than by the level of depressive symptomatology, as found by Moore (cited in Allen, 1985, pp. 287–294) and Williams and Allen (1981). Furthermore, low ACL scores were limited by the criterion that all subjects had to be able to complete the psychological self-report measures. It may be that the restricted range for these measures contributed to the lack of significant association. The ACL seems to require a lower basal cognitive capacity to obtain scoreable results than does the psychological self-report or other cognitive performance measures. In addition, the self-report measures may be limited to patients with an Allen cognitive level of 4 or higher due to the reading performance required (e.g., sufficient attention to task, selective responding). Further study is needed to determine the relationship, if any, between the ACL and measures of psychiatric disturbance.

The ACL’s apparent lack of association with level of psychopathology and strong association with the Symbol-Digit Modalities Test suggests that the ACL may be related to cognitive dysfunction associated with organicity. As noted previously, the Symbol-Digit Modalities Test is sensitive to neurological sequelae. Although this is speculative, the ACL may be a useful measure to screen for possible neurological involvement in psychiatric patients. Study of the ACL with neuropsychological measures of cognitive dysfunction and with neurological tests (e.g., computed tomography scans) is warranted.

The association of the ACL to other measures of cognitive function increases its usefulness in the specification of possible day-to-day limitations of function in psychiatric patients. Each cognitive level has capacities and limitations associated with it. Functional independence requires learning, the use of constructive properties of activities (additive steps, such as painting, gluing, sewing, grooving) and deconstructive properties of activities (subtractive steps, such as sanding, peeling, cutting, scraping), and the recognition of safety hazards and prevention of acci-
students. Assistance by others and compensatory strategies are beyond the scope of this paper (for further information, see Allen, 1985). The education of family members regarding the patient's capacities and regarding environmental hazards and precautions can help maximize the patient's functional independence. Varying levels of community support (e.g., supported living situations) can be recommended with the patient's independent functioning in mind. These interactions result in an environment that consists of activities graded to match the person's capacity, thus maximizing independence.

The ACL provides an efficient means to determine a patient's current functional cognitive status. The results of the ACL can be a useful part of a multidisciplinary assessment of the psychiatric patient, offering corroborative data to the mental status examination and intellectual test findings while elucidating a unique perspective of the patient's functional cognitive capacity. Continued research on the relationship of occupational therapy evaluations to other professions' measures of functional ability and functional capacity increases the credibility and validity of occupational therapists' assessments, treatments, and recommendations in a multidisciplinary setting. This article seeks to encourage occupational therapists to translate our terminology into terms that are relevant and understandable to members of a team. The better we become at reducing the barriers to communication through bridging the terminology gap between professions, the more valuable the information provided by the ACL and our profession will become.

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References


