BRIEF REPORT

Adolescent Performance on the Allen Cognitive Levels Screen

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OBJECTIVE. The purpose of this study was to provide information regarding the validity of using the Allen Cognitive Levels Screen (ACL-90 version) by comparing functional cognitive performance between adolescents living in the community and adolescents residing in mental health facilities.

METHOD. Sixty-three adolescents were assessed using the ACL-90: 32 adolescents living in the community, and 28 adolescents residing in residential mental health facilities.

RESULTS. Using a one-tailed t test, performance scores for adolescents residing in the community were statistically higher than those for adolescents living in residential mental health facilities ($t(34) = 4.3, p < .001$).

CONCLUSION. This study suggests the validity of the ACL-90 as an assessment to use for screening the cognitive functional performance of adolescents.


Occupational therapists working with adolescents with mental health conditions may focus on occupations involving self-care skills, social skills, coping skills, and life management skills. Cognitive assessments help therapists structure and grade treatment activities appropriate to the individual’s needs (Allen, 1982). Occupational therapists currently lack an assessment that measures functional cognitive performance in adolescents. This lack of an assessment for this age group hinders evidence-based practice of occupational therapy in adolescent mental health because it compromises the therapist’s ability to plan and structure tasks appropriate to the person’s cognitive abilities.

Cognition is a mental process by which a person acquires knowledge (Anderson, 1984). Anderson defined cognition as “all mental activity or states involved in knowing and the mind’s functioning, and includes perception, attention, memory, imagery, language functions, developmental processes, [and] problem solving” (p. 228). Impairments in cognition may affect functional abilities such as activities of daily living and life management skills (Allen, 1985, 1987; Allen & Allen, 1987; Allen & Blue, 1998; Earhart, Allen, & Blue, 1993). Cognitive impairments have particular consequences during adolescence due to the effect cognitive impairments have on socialization (Allen & Allen, 1987), a developmental process that becomes more central during adolescence (Petersen & Leffert, 1995).

Although there is a lack of instruments that measure cognition in adolescents, several measure cognition of adults. The Allen Cognitive Levels Screen (ACLS), (Allen, 1982, 1985), is one assessment that measures an adult’s cognitive functional abilities. The ACLS provides an estimate of the individual’s ability to follow directions, to solve problems, and to learn (Allen, 1982). This screening tool consists of three leather lacing tasks that represent three levels of difficulty. Despite being standardized on adults, occupational therapists use the ACLS with adolescents (S. Grant, personal communication, October 23, 2001).

Three prior studies addressed cognitive performance of adolescents as measured by different versions of the ACLS (Josman & Katz, 1991; Katz, Josman, & Steinmetz, 1992).
1988; Shapiro, 1992). Each study used the version of the ACLS in use at the time of the study. Two of these studies compared ACLS scores of adolescents living in the community to adolescents residing in mental health facilities and found adolescents in the community scored higher (Josman & Katz, 1991; Katz, Josman, & Steinmetz, 1988). Josman and Katz (1991) adapted the ACLS to be used with adolescents. Shapiro (1992) addressed concurrent validity of ACL-E (ACLS expanded version) scores of emotionally disturbed boys ages 8 to 15 years old. The different versions were very similar with slight variations in scoring. These three studies provide minimal research on the validity of using the ACLS with adolescents.

If therapists are to engage in evidence-based practice, they must be able to select and justify treatment based upon research appropriate to the client population (Dubouloz, Egan, Vallerand, & von Zweck, 1999). Holm's Slagle Lecture (2000) identified dilemmas that occupational therapists face when practice is not based on sound evidence. She reminded occupational therapists of their Code of Ethics requirement to "fully inform the service recipients of the nature, risks, and potential outcomes of any interventions" (American Occupational Therapy Association [AOTA], 2000, p. 614). As health care continues to be influenced by managed care, justifying treatment choices based on assessments will continue to be important.

The purpose of this study was to address the validity of using the ACLS with adolescents. The hypothesis of this study was that adolescents living in the community would exhibit statistically higher functional cognitive performance as measured by the ACL-90 (version of the ACLS) than those residing in residential mental health facilities.

Method

Participants

Sixty-one adolescents ranging from 12 to 17 years old participated in the study (M = 14.8, SD = 1.50). The sample consisted of two groups: (1) 28 adolescents who lived in residential mental health facilities and (2) 32 adolescents who lived in the community with a parent, legal guardian, or other family member. Informed consent was obtained from each participant by meeting with mental facility program leaders, parents, participants, and legal guardians. Mean age by group was similar (M = 14.7; SD = 1.51 for the residential group; M = 15.0; SD = 1.50 for the community group). Potential residential participants were identified by the program directors of two residential mental health facilities. Potential community participants were identified through youth group leaders, personal contacts, and snowball sampling.

Group 1 (Residential). Participants in Group 1 (n = 28) were drawn from two residential mental health facilities (A and B), within 50 miles of each other. The facilities provided similar services including 24-hour residential care, diagnostic and assessment services, medication management, classroom instruction, vocational training, therapeutic outings, and home-based aftercare services following discharge. Participants represented a wide spectrum of socioeconomic backgrounds, diagnoses, and medication regimes. Diagnoses of residential participants included depression, oppositional defiant disorder, conduct disorder, and post-traumatic stress disorder.

Group 2 (Community). Youth group leaders of youth clubs, worship groups, and organized sports teams provided referrals for potential community participants to the researchers. Participants (n = 32) were selected from one urban and one rural location to diversify the sample based on cultural and socioeconomic backgrounds. Participants were from medium to high socioeconomic backgrounds. Potential participants were excluded if it was known that they had resided in a mental health facility at any time prior to testing.

Instrument

The ACLS is a standardized screening tool designed to assess a person's functional cognitive level (Allen, 1985). Based upon a hierarchical view of cognitive ability, Allen (1982, 1985, 1987) described cognitive behavior on six levels ranging from one (automatic actions) to six (planned activities). Each level of behavior includes a description of a person's abilities, disabilities, level of supervision needed, ability for new learning, and recommendations for giving instructions. Cognitive level one, the lowest level, can be described as a state at which a person ignores much of the stimuli from the external environment. Cognitive level six, the highest level, theoretically indicates normal cognitive functioning. The person performing at this cognitive level is able to detect and understand symbolic cues and adapt to challenges from the environment. The ACL-90 used in this study is the fifth version of this assessment following the ACL-O, original, the ACL-PS, problem solving, the ACL-E, expanded, and the LACL, large version (Allen, 1985; Allen & Blue, 1998; Josman & Katz, 1991).

Examination of cognitive levels assesses a person's ability to problem solve and to identify and correct errors. Knowing a person's cognitive functional level may assist occupational therapists who work with adolescents to determine ways to address limitations in functioning and structure the demands of activities and environments to best meet the person's level of cognitive functioning (Allen, 1982, 1985, 1987; Allen & Allen, 1987).

Inter-rater reliability for the ACL-90 has ranged from .70 to .98 (Allen & Blue, 1998). Concurrent validity was found between the ACL-90 and the Social Interaction Test (SIT) (r = -.27 to -.32, n = 55, p < .05) (Penney, Mueser, & North, 1995), the Life Skills Profile (LSP) (r = .53 to .54, n = 58, p < .05) (Keller & Hayes, 1998), and the Routine Task Inventory Assessments (RTI–2) (r = .35, n = 40, p < .05) (McAnanama, Rogosin-Rose, Scott, Joffe, & Kelner, 1999). Henry, Moore, Quinlivan, and Triggs (1998) found the ACL-90 had significant predictive validity for discharge living situation (r = .34, p < .05, n = 100).

Procedure

Researchers obtained Human Subjects Approval through an Institutional Review Board in order to test human participants. Once Human Subjects Approval was obtained, researchers met with residential mental health facility program leaders, parents, caregivers, and legal guardians to
receive informed consent and obtain names of potential participants. Researchers met with each participant prior to testing to establish rapport, explain the purpose of the research, and obtain informed consent from the adolescent. Testing was conducted in locations convenient for the participants including mental health facilities, adolescent club meeting locations, and some participants’ homes. The testing environment for each participant was quiet with adequate lighting.

Researchers provided scores to the staff of the mental health facilities for the residential participants and to the parent or legal guardian for the community participants with the participants’ permissions. Researchers provided an overview of the research results and measures to each mental health facility to enable staff to understand and apply the information provided by the scoring.

The researchers attempted to control for extraneous variables by establishing consistent administration and interpretation of the ACL-90 by following testing protocol. Four graduate student researchers performed all interviewing and testing. They established inter-rater reliability of 95% prior to the study by videotaping the testing of five adolescents not included in the study and independently scored each test. In addition, an occupational therapy faculty member peer reviewed the process of establishing inter-rater reliability prior to the study. During data collection, inter-rater reliability of 100% was established by having two researchers independently rate 20% of the tests. Other methods to attempt to control extraneous variables included researcher review of demographic data of participants only after test administration and analyzing all data after testing was completed to control for researcher bias. Researchers attempted to have a diverse participant sample for age, gender, diagnosis, and acuity of disease partly through the use of two residential mental health facilities. The researchers agreed on acceptable cues to be given during test administration and used the same brief interview format to establish rapport.

**Data Analysis**

A one-tailed t test was performed for testing for a difference in means of ACL-90 scores by group. Researchers chose to conduct a one-tailed t test because prior research indicated that scores of the community participants would more likely be higher than scores of those living in residential mental health facilities (Josman & Katz, 1991; Katz, Josman, & Steinmetz, 1988). As part of inferential analyses, linear regression and univariate analysis of variance were performed to determine if there were differences in scores based on gender, age, and time to complete ACL-90. Descriptive statistics were calculated to further define the characteristics of the participants. Researchers determined the mean ACL-90 score and standard deviation based upon age groupings (ages 12–13, 14–15, and 16–17).

**Results**

A statistically significant difference was found between ACL-90 scores of the adolescents in the community and the adolescents in the residential mental health facilities (t (34) = 4.3, p < .001) using a one-tailed t test. This finding supports the study’s hypothesis that adolescents in the community would demonstrate higher functional cognitive performance. Unlike Shapiro’s study (1992), no significant correlation was found between age and ACL-90 scores or between length of stay for adolescents living in mental health facilities and ACL-90 scores based on a linear regression analysis. Frequencies, means, ranges, and standard deviations on the ACL-90 scores for all participants are presented in Tables 1 and 2.

Although the ACL-90 is not a timed test, researchers recorded time to complete the assessment. Descriptive analyses indicate that the average length of time to complete the test for residential participants ranged from 7 to 48 minutes (M = 18.4, SD = 8.57). Time to complete the ACL-90 for community participants ranged from 6 to 30 minutes (M = 13.9, SD = 7.19). Shorter amounts of time to complete the ACL-90 were associated with higher scores.

Based upon a univariate analysis of variance, time was found to be a statistically significant indicator of ACL-90 scores. Results of this analysis indicated that there is a reciprocal relationship between time and ACL-90 scores. Participants who required less time to complete the test generally scored higher on the ACL-90. This may have been because the person needed fewer demonstrations, fewer instructions repeated, or fewer trial and error attempts. When accounting for time, researchers found a statistically significant difference in

### Table 1. Descriptive Statistics of All Adolescent Participants’ ACL-90 Scores (n = 60).

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>M</th>
<th>SD</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>28</td>
<td>5.3</td>
<td>.38</td>
<td>4.3</td>
<td>5.8</td>
</tr>
<tr>
<td>Community</td>
<td>32</td>
<td>5.6</td>
<td>.15</td>
<td>5.4</td>
<td>5.8</td>
</tr>
</tbody>
</table>

*Note. ACL-90 = Allen Cognitive Levels Screen 1990 Version; possible range of scores = 3.0 (lower cognitive level)–5.8 (highest cognitive level). M = Mean SD = Standard Deviation n = number of participants*

### Table 2. Descriptive Statistics of All Adolescent Participants’ ACL-90 Scores by Variable and Group (n = 60).

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Residential</th>
<th>Community</th>
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<tbody>
<tr>
<td>12-13</td>
<td>5.2</td>
<td>5.5</td>
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<tr>
<td>14-15</td>
<td>5.4</td>
<td>5.6</td>
</tr>
<tr>
<td>16-17</td>
<td>5.3</td>
<td>5.7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gender</th>
<th>Residential</th>
<th>Community</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>5.4</td>
<td>5.7</td>
</tr>
<tr>
<td>Male</td>
<td>5.3</td>
<td>5.6</td>
</tr>
</tbody>
</table>

*Note. ACL-90 = Allen Cognitive Levels Screen 1990 Version; possible range of scores = 3.0 (lower cognitive level)–5.8 (highest cognitive level). M = Mean SD = Standard Deviation n = number of participants*
ACL-90 scores across groups ($F = 16, p < .01$). This difference further supported this study’s hypothesis (Table 3).

**Discussion**

The results of this study indicate statistically significant higher functional cognitive performance as measured by the ACL-90 in adolescents living in the community compared to those residing in mental health facilities ($t(34) = 4.3, p < .001$). The results provide support for the validity of the ACL-90 as a measure of cognition in adolescents. The results from this current study concur with previous studies (Josman & Katz, 1991; Katz, Josman, & Steinmetz, 1988) that found that a statistically significant difference exists between the test scores of adolescents who live in the community and those who live in mental health facilities.

Some participants in both groups scored the highest possible score on the ACL-90. This may indicate that the ACL-90 may still not be sensitive enough to detect discreet cognitive impairments related to maturation, social interaction, and cognitive development in adolescents as outlined by Piaget (1970). Although the mean ACL-90 scores between the residential and community group differed, there was wide variance within each group. This suggests that therapists using the ACL-90 as a tool in treatment planning should individualize the treatment to the person’s needs and not strictly according to the ACL-90 score. This further emphasizes the need to treat each person as an individual.

The ACL-90 is being used with adolescents (S. Grant, personal communication, October 23, 2001). The further evidence of the validity of using the ACL-90 with adolescents provided by this study enables therapists to be better able to use evidenced-based practice when developing treatment plans.

**Limitations**

One limitation of the study is that community participants were drawn from mainly middle to high socioeconomic backgrounds. This limits the ability to generalize results to adolescents from low socioeconomic backgrounds. A second limitation of the study is that the test environment and the time of administration may not have been the most ideal for each participant.

**Recommendations for Future Research**

The primary implication of these findings for future research is to further establish validity of using the ACL-90 with adolescents and to develop normative data on adolescents’ performance on this test. Establishing validity is particularly important because this instrument is already being used with adolescents. As normative data are established, future researchers may elect to compare ACL-90 scores to other standardized test scores to determine construct and concurrent validity. This would allow occupational therapists to determine how this instrument compares to other assessments and to choose the appropriate assessment.

This study does not statistically support age as a predictor of ACL-90 score as was found to be the case in the Shapiro (1992) study. Within this study’s sample, however, the researchers noticed a trend that mean ACL-90 scores increased by age group in the community participants (Table 2). Further research is needed to examine the relationship between age and ACL-90 scores to determine if the ACL-90 is sensitive enough to detect changes in cognitive performance at different ages in adolescents.

To test for concurrent validity, future researchers may choose to correlate the ACL-90 with adolescent performance as measured by other assessments such as the Comprehensive Occupational Therapy Evaluation Scale (COTE) or the Wechsler Intelligence Scale for Children (WISC). Other researchers may want to consider replicating this study with a larger sample of adolescents or with adolescents from diverse geographical areas, ethnic backgrounds, diagnoses, and socioeconomic backgrounds to increase the ability to generalize results by studying more representative samples.

Another consideration for future research is that there were also two instances in this study in which participants had sustained head injuries prior to admission into the mental health facility. These adolescents were admitted to the facility based on their mental illness. The history of head injuries, however, may have influenced the individuals’ scores on the ACL-90 and may be another factor to be considered as an exclusion criterion for future research. In this study, head injury was not a primary diagnosis in these two participants, therefore it was not considered in the data analyses.

**Conclusion**

In conclusion, the purpose of this study was to provide further evidence for the validity of using the ACLS with adolescents. The results of this study support the researchers’ hypothesis that adolescents living in the community demonstrate statistically higher cognitive performance as measured by the ACL-90 than those who live in residential mental health facilities. This study contributes to occupational therapy by providing support for the validity of using the ACL-90 with adolescents. Establishing validity of the ACL-90 as a measure of cognitive performance of adolescents may allow broader application of the ACL-90, which may assist in gathering research evidence for establishing evidence-based practice in adolescent mental health.

**Acknowledgments**

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**Table 3. Univariate Analysis of Variance for ACL-90 Scores.**

<table>
<thead>
<tr>
<th></th>
<th>df</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time (T)</td>
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<td>2.01</td>
<td>.162</td>
</tr>
<tr>
<td>Group (G)</td>
<td>1</td>
<td>16.00</td>
<td>.000</td>
</tr>
<tr>
<td>T × G</td>
<td>1</td>
<td>4531.32</td>
<td>.000</td>
</tr>
<tr>
<td>error</td>
<td>57</td>
<td>(.08)</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Values enclosed in parenthesis represent mean square error.

ACL-90 = Allen Cognitive Levels Screen 1990

Version; possible range of scores = 3.0 (lower cognitive level)–5.8 (highest cognitive level).

$df =$ degrees of freedom

$F =$ variation among sample means/variation among individuals in the same sample

$p =$ probability
occupational therapy at Brenau University, Gainesville, Georgia.

References


