



## **A Psychometric Assessment of Health Literacy Measures among Youth in a Residential Treatment Setting**

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**Abstract.** Minimal research has focused on the health literacy status of adolescents, and few measures have been validated among specific subgroups of youth. One such group is youth living in residential treatment centers. It is currently unknown how well this group is able to read, understand, and use health-related information. The purpose of this study was to assess the psychometric properties of three widely-used health literacy measures among a group of youth at a large residential care facility located in Omaha, NE. Results indicate that all measures are psychometrically adequate for use among this population. Study limitations and implications are provided.

**Keywords:** health literacy, youth, adolescents, residential care

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As defined by the US Department of Health and Human Services (US DHHS, 2000), health literacy is the ability of individuals to obtain, process, and understand basic health information and services needed to make sound decisions regarding their health. While the health literacy status of adults in the US has received much attention over the past two decades (US DHHS Office of Disease Prevention and Health Promotion [US DHHS ODPHP], 2000), the health literacy status of youth is understudied (Chisolm & Buchanan, 2007; Davis et al., 2006). This lack of research on adolescent health literacy is unfortunate because youth have the potential to understand much about health and how to access health-related information (Keil, 2006). Indeed, it is of increasing importance that the health literacy status of youth be understood because adolescents are becoming more involved with their own health care, frequently accessing health information through mass media, and often have a primary responsibility for managing a chronic illness (e.g., asthma, diabetes; Manganello, 2008).

Although the available research is scarce, preliminary efforts to understand the health literacy status of youth include: a) the development of health literacy measures for adolescents (Chisolm & Buchanan, 2007; Davis et al., 2006), b) research demonstrating a connection between adolescent health literacy and health outcomes (Brown, Teufel, & Birch, 2007; Fortenberry et al., 2001), c) the creation of a health literacy development program for youth (Diamond, Saintonge, August & Azrack, 2011), and d) a recognition of the need for additional research (US DHHS, 2000; US DHHS ODPHP, 2000). The initial studies aimed at understanding adolescent health literacy suggest that youth who have difficulty understanding health information are less likely to follow what they are taught about health (Brown et al., 2007). It is also asserted that low health literacy may pose a barrier to care for certain types of health issues such as sexually transmitted infections (Fortenberry et al., 2001). These research efforts, however, have been focused on the health literacy status among youth in general, and many subgroups within the

adolescent population have not been studied, including youth living in residential treatment settings.

There are approximately 200,000 youth served by residential care organizations each year (Child Welfare League of America [CWLA], 2006). Many of the characteristics evidenced by youth in residential programs suggest that they may be at risk of having low health literacy. For example, previously identified risk factors for low health literacy such as low socioeconomic and minority status are common within this population (US DHHS, 2000; US DHHS ODPHP, 2000). However, even more concerning are two challenges that are prevalent among youth in residential care that may impact their health literacy: poor educational performance and high rates of physical health problems.

A literature review of the academic status of adolescents in residential care revealed that most youth have below grade level performance on academic measures (Trout, Hagaman, Casey, Reid, & Epstein, 2008). Researchers have noted that almost 60% of youth in residential programs perform below average (Dubowitz et al., 1994) and approximately 30% of youth are more than two years below grade level (Blair, 1992). Trout and colleagues (2008) also found that these youth have lower average IQ scores, are nearly three times as likely to be receiving special education services, and teachers typically identify them as academically at-risk. Further research has found that a majority of children entering care have significant delays in at least one subject area, with the most problematic areas being reading and math (Trout, Hagaman, Chmelka, et al., 2008) - two subjects that greatly influence health literacy (US DHHS, 2000; US DHHS ODPHP, 2000). When one considers that more than a third of the US *adult* population with a typical educational background has less than proficient health literacy (US Department of Education, 2003), the substandard educational performance of adolescents in residential care suggests that these youth may have serious challenges in reading, understanding, and applying basic health information.

Youth in out-of-home care also have high rates of physical health problems. A study conducted with a large sample ( $N = 1744$ ) of youth entering a residential setting found that approximately one-third of them had a diagnosable medical condition - the most prevalent being asthma, eczema, and migraines (Nelson et al., 2011). Other studies have found that up to 76% of youth in residential care are taking psychotropic medication upon entering care (Connor, Ozbayrak, Harrison, & Melloni, 1998), that as many as 80% of those taking such medications have at least three concurrent prescriptions (Connor & McLaughlin, 2005), and that higher levels of psychopathology are associated with increased risk of comorbid physical health problems (Nelson et al., in press). These serious health problems are complicated by the fact that many youth living in residential care are expected to understand and manage complex health information, and that upon discharge these youth often lack a reliable caregiver and doctor to assist them in this process.

While understanding the health literacy of typical youth in family homes and community settings is important, the aforementioned academic and health challenges faced by many youth in residential care, in addition to their high rates of behavioral and familial problems (Connor et al., 1998; Hagaman, Trout, DeSalvo, Gehringer, & Epstein, 2010), make understanding their health literacy status critical. Of particular concern are the high rates of chronic conditions, health problems, and medication use among these youth because research has found that individuals with poor health literacy struggle to manage chronic conditions and follow instructions for prescription medication use (US DHHS ODPHP, 2000). Unfortunately, since no research has been conducted on the health literacy status of youth in residential care, researchers and treatment providers may be unaware of a significant barrier limiting their ability to apply health-related information and achieve healthy outcomes. As a first step in this line of research, the purpose of this study was to assess the psychometric properties of commonly used health literacy measures among a group of adolescents in a residential treatment setting.

## Methods

### Participants

This project and all its procedures were approved by the Institutional Review Boards of the University of Nebraska-Lincoln and the participating residential treatment organization located in Omaha, NE. The residential treatment provider uses a modified Treatment Family Home (TFH) model to deliver comprehensive behavioral, educational, and mental/physical health services to a diverse population of adolescents from all over the US. Youth (ages 14-19) were recruited from the private high school housed on the residential care provider's campus. Participants were recruited for one-time, in-person assessments that would take place during a regular school day. All youth attending the high school ( $N = 333$ ) were eligible to participate. Interested youth ( $N = 240$ ) signed a flyer giving the research team permission to seek consent from their family teacher. Family teachers were then contacted by staff members of the residential treatment facility, and permission was granted by 100% of those contacted. The final sample consisted of 229 youth (due to discharge from the treatment center 11 interested youth were not able to participate).

### Measures

The definition of health literacy is complex, and encompasses the ability of individuals to *obtain*, *process*, and *understand* basic health information and services needed to make sound decisions regarding their health (US DHHS, 2000). No currently available instrument has been designed to comprehensively assess the full definition of health literacy (Davis et al., 2006; Jordan et al., 2011); however, measures are available that focus on the reading recognition, reading comprehension, and numeracy aspects of the definition. A search of the literature indicated that three of the most widely used health literacy tests are the Rapid Estimate of Adult Literacy (REALM), the Test of Functional Health Literacy in Adults (TOFHLA), and the Newest Vital Sign (NVS). For this study we chose to assess the versions of these instruments that have been adapted or validated among

youth populations (Chisolm & Buchanan, 2007; Davis et al., 2006; Warsh, Badaczewski, & Sharif, 2011).

The REALM-Teen is a word recognition test that assesses the ability of an individual to pronounce 66 health-related words (e.g., weight, prescription, tetanus). It was originally validated among a large population of youth ( $N = 1533$ ) attending public schools in Louisiana and North Carolina (Davis et al., 2006), and has been used in establishing the validity of other health literacy measures (Chisolm & Buchanan, 2007). The initial psychometric study reported a Cronbach's alpha of .94 and a correlation with the Word Recognition Achievement Test (WRAT) of .83 (Davis et al., 2006). The REALM-Teen is scored by adding up the total number of words pronounced correctly ( $Range = 0 - 66$ ).

The Short TOFHLA (S-TOFHLA) assesses reading comprehension by having individuals fill in the missing words found in narratives about health and health-related services (e.g., Your doctor has sent you to have a \_\_\_\_\_ X-ray; Options = (a) stomach, (b) diabetes, (c) stitches, (d) germs). A validation of the full TOFHLA among a population of 50 youth ages 13-17 reported that the reading portion of the instrument had a .59 correlation with the WRAT, while the numeracy section had only a .11 correlation with the WRAT (Chisolm & Buchanan, 2007). Thus, for this study we used the S-TOFHLA, a short form of the instrument which does not include the numeracy component. The internal reliability of the S-TOFHLA was not reported in the youth validation study (Chisolm & Buchanan, 2007), but when used among an adult population the Cronbach's alpha was .97 (Jordan et al., 2011). The S-TOFHLA is scored by adding up the total number of correct selections ( $Range = 0 - 36$ ).

The NVS assesses reading comprehension and numeracy by giving individuals a specially designed ice cream nutrition label and asking them six questions about the label (e.g., If you eat the entire container, how many calories will you eat?). It was validated among a cross-sectional convenience sample of school-age children ( $N = 58$ ) from pediatric outpatient clinics (Warsh et al., 2011).

Among that population its correlation with the Gray Silent Reading Test (GSRT) was .71 (internal reliability not reported). The NVS is scored by adding up the total number of correct answers (*Range* = 0 - 6).

For this study we used the TerraNova standardized reading assessment to establish the criterion validity of the aforementioned health literacy measures. The TerraNova assessment is a standardized norm-referenced achievement test. Its internal consistency for total scores and all subtests range from .80 - .90, and based on studies of its construct and criterion-related validity it is considered to be one of the most valid of all academic achievement tests (Rouse & Fantuzzo, 2006). The TerraNova assessment was chosen by the research team because it is given twice a year to all high school students at the residential treatment center where this study took place. All participants in this study took the TerraNova during the school's spring semester testing, which was within one month of when they completed the health literacy assessments.

### **Procedures**

All data collectors ( $N = 3$ ) were trained by the principal investigators (PIs) at the University of Nebraska-Lincoln. Training activities included an overview of the study's purpose, an introduction to the assessment instruments, detailed instructions on working with participants, and role plays of administering the tests. After completing their training, data collectors were tested by the PIs on key data collection protocol. All data collectors were required to pass the test with a score of 95% or higher. Those who did not initially pass were retrained and retested.

At the residential treatment center youth were individually removed from class, read an assent form, and given an opportunity to ask questions. Assenting youth then completed one of three assessment packets (each packet was the same, but the order of the assessments was randomized to counterbalance any order testing effects). On average, it took students 21 minutes to complete the packet.

## Results

Descriptive statistics were generated to provide an overview of the sample (see Table 1). Internal reliability was then examined for each measure by calculating Cronbach's alpha, and criterion validity was assessed by using Pearson's  $r$  to correlate the reading score of the TerraNova with the assessment scores. Hopkin's (2002) recommendations were used to determine the magnitudes of correlation coefficients (i.e., 0.10 - 0.29 = small; 0.30 - 0.49 = moderate; > 0.5 = large). This analysis plan follows the pattern used in previous studies to validate these instruments among other populations (see Measures section; Chisolm & Buchanan, 2007; Davis et al., 2006; Weiss et al., 2005).

**Table 1 Demographics**

Variable	<i>N</i>	Mean ( <i>SD</i> ) or %
Age	229	17 (1.16)
Female	229	38.4%
<i>Race</i>		
White	102	44.5%
Black	67	29.3%
Hispanic or Latino	25	10.9%
American Indian/ Alaska Native	11	4.8%
Multiracial	21	9.2%
<i>Grade Level</i>		
9th	51	22.3%
10th	51	22.3%
11th	65	28.4%
12th	62	27.1%

Results reveal that the internal reliability of the measures, as determined by Cronbach's Alpha, was .92 for the REALM-Teen, .89 for the S-TOFHLA, and .67 for the NVS. The criterion validity assessments, as determined by Pearson's  $r$  correlations between the health literacy measures and the reading portion of the



TerraNova, were all significant ( $p < .01$ ). Of them, the NVS was most strongly correlated (.49), followed by the REALM-Teen (.40) and the S-TOFHLA (.28).

### Discussion

Characteristics that are common among youth in residential care distinguish them from children raised in traditional family and community settings. Some of these characteristics have been identified as risk factors for low health literacy (US DHHS, 2000; US DHHS ODPHP, 2000). As a first step towards determining the health literacy status of adolescents in residential settings, the purpose of this study was to assess the psychometric properties of widely-used health literacy measures among a sizeable sample of youth in a large residential treatment facility in Omaha, Nebraska. This was done by testing the internal reliability and criterion validity of the REALM-Teen, S-TOFHLA, and NVS.

According to Field (2005), an acceptable reliability coefficient for a scale assessed by Cronbach's alpha is roughly .7. A recent literature review of health literacy measures conducted by Jordan et al. (2011) reported the alphas of the health literacy measures used in our study to be as follows: REALM-Teen = .98; S-TOFHLA = .97; and NVS = .76. Our findings indicate that although these measures were somewhat less reliable among youth in residential care (REALM-Teen = .92; S-TOFHLA = .89; NVS = .67), they were still acceptable. While the alpha of the NVS was below .7, Field (2005) notes that alpha scores are heavily influenced by a scale's total number of items, and that scales with limited items may still be reliable (the NVS has only six questions).

As with previous validation studies among other populations, the correlations between the REALM-Teen, S-TOFHLA, NVS, and the standardized reading test were all significant (Chisolm & Buchanan, 2007; Davis et al., 2006; Warsh et al., 2011; Weiss et al., 2005). Based on Hopkin's (2002) recommendations for interpreting the magnitude of correlation coefficients, the correlation between the TerraNova reading score and the S-TOFHLA was small ( $r = .28$ ), and its correlations with the REALM-Teen and NVS were moderate (REALM-Teen  $r = .40$ ;

NVS  $r = .49$ ). Although significantly correlated and within acceptable magnitude ranges, the correlations were not as strong as previous researchers have reported between these measures and reading tests used among other youth populations (Chisolm & Buchanan, 2007; Davis et al., 2006; Warsh et al., 2011; Weiss et al., 2005). However, comparing correlation magnitudes between this study and previous studies is difficult. The TerraNova, which was used in this study, assesses more aspects of reading than are captured by the assessments used in previous studies (i.e., the GSRT and the WRAT). More specifically, the reading portion of the TerraNova has six subcategories that include analyzing text, evaluating and extending meaning, and oral comprehension. Because the WRAT, GRST, and TerraNova reading tests emphasize different aspects of reading recognition and comprehension, a direct comparison of correlation magnitudes would be misleading.

There are limitations to this study that are important to note. First, all participants were residents of the same residential treatment center. While it is a large residential campus that serves youth from all parts of the US, the generalizability of the results is limited by not having multiple data collection sites. Future studies can improve generalizability by recruiting participants from several treatment centers in different locations. Second, only 240 of the 333 potential participants expressed interest in participating, leading to an initial response rate of 72%. Then, 11 youth were discharged from the program prior to data collection, which reduced the final sample to 229 individuals. This modest response rate could have produced a biased sample, thus limiting the generalizability of the results. Third, we established criterion validity by using a standardized reading assessment tool that had not been used in previous health literacy validation studies. While the reading portion of the TerraNova standardized assessment is a comprehensive indicator of reading aptitude, it did limit our ability to directly compare our correlation magnitudes with previous validation studies among youth. Future researchers may consider using the WRAT or GSRT so their results can be more easily compared to previous findings.

In sum, each of the three measures of health literacy that were used in this study is psychometrically adequate for use among youth in residential care. All of them are brief and assess at least one dimension of health literacy. The NVS takes the least amount of time to complete (~3 minutes), has the least number of items (6), and is the only measure that assesses both reading comprehension and functional literacy. For residential treatment administrators, doctors, and mental health professionals who are looking for a brief, comprehensive assessment, the NVS should be considered. The REALM-Teen, which measures reading recognition, and the S-TOFHLA, which measures reading comprehension, both take longer to complete than the NVS. However, both were found to be adequately valid and reliable, and should be considered for use by those interested in evaluating specific aspects of health literacy. As these measures are used to assess the health literacy status of youth in residential care, treatment providers and researchers will gather vital information that can help ensure that this at-risk population is able to obtain, process, and understand basic health information and services needed to make sound decisions regarding their health.

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