

Impact of Health Literacy on Depressive Symptoms and Mental Health-related Quality of Life Among Adults with Addiction

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BACKGROUND: Health literacy has been linked to health status in a variety of chronic diseases. However, evidence for a relationship between health literacy and mental health outcomes is sparse.

OBJECTIVE: We hypothesized that low literacy would be associated with higher addiction severity, higher levels of depressive symptoms, and worse mental health functioning compared with those with higher literacy in adults with alcohol and drug dependence.

METHODS: The association of literacy with multiple mental health outcomes was assessed using multivariable analyses. Measurement instruments included the Rapid Estimate of Adult Literacy in Medicine (REALM), the Center for Epidemiologic Studies-Depression (CES-D) scale, the Mental Component Summary scale of the Short Form Health Survey, and the Addiction Severity Index for drug and alcohol addiction. Subjects included 380 adults recruited during detoxification treatment and followed prospectively at 6-month intervals for 2 years. Based on the REALM, subjects were classified as having either low (\leq 8th grade) or higher (\geq 9th grade) literacy levels.

RESULTS: In longitudinal analyses, low literacy was associated with more depressive symptoms. The adjusted mean difference in CES-D scores between low and high literacy levels was 4 ($P < .01$). Literacy was not significantly associated with mental health-related quality of life or addiction severity.

CONCLUSIONS: In people with alcohol and drug dependence, low literacy is associated with worse depressive symptoms. The mechanisms underlying the relationship between literacy and mental health outcomes should be explored to inform future intervention efforts.

KEY WORDS: literacy, alcohol dependence, drug dependence, addiction, mental health, depressive symptoms.

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Approximately 90 million American adults have low health literacy and lack the basic literacy skills to function in society.¹⁻³ A growing body of work exists linking low literacy with an array of negative outcomes.⁴ These outcomes include more frequent hospitalization,^{5,6} higher rates of health services utilization, and worse prevention practices in people with diabetes,^{7,8} asthma,^{9,10} cancer,¹¹⁻¹³ and other chronic illnesses.^{14,15} To date, few studies have examined the role of health literacy in addiction and mental illness.

Several studies have evaluated the association between low literacy and mental illness. While most of these studies demonstrate associations between low literacy and depression, all of them relied on cross-sectional analyses and are thus limited in terms of causal inferences. Research on health literacy and substance abuse has been similarly limited, with cross-sectional studies suggesting a high prevalence of low literacy in people with addiction. Understanding mechanisms responsible for the relationship between limited literacy and mental health outcomes is critical in informing the development of future interventions for mental health and addictive disorders. We examined the relationship between health literacy and addiction severity, depressive symptoms, and mental health functioning among people with drug and alcohol dependence over a 2-year period. We hypothesized that low health literacy would be associated with higher addiction severity, more depressive symptoms, and lower mental health-related quality of life (MHQOL). A secondary hypothesis was that utilization of mental health services would be a mediator of these relationships.

METHODS

This study was a prospective cohort analysis of data collected in the Health Evaluation and Linkage to Primary care (HELP) study. The HELP study, conducted in a 35-bed inner-city short-term inpatient detoxification unit, was a randomized-controlled trial of a multidisciplinary clinical assessment designed to link substance abusing persons to primary medical care. The results of this intervention have been reported elsewhere.¹⁶ Subjects randomized to the HELP intervention from 6/97 through 3/99 received a 90-minute clinical session with a physician, nurse, and social worker, along with an appointment and referral letter for primary care, before leaving the detoxification unit. Control subjects did not receive this intervention but were treated similarly in all other respects. The usual length of stay for a detoxification admission was 6 days for heroin dependence and 4 days for alcohol dependence. The HELP trial eligibility criteria included inpatient detoxification admission, age greater than 17 years, and report of alcohol, heroin, or cocaine as the substances of first or second choice. Exclusion criteria were as follows: having a primary care provider and having seen that provider on at least 1 occasion in the preceding 2 years; pregnancy; Mini-Mental State examination¹⁷ score less than 21; lack of fluency in either English or Spanish; less than 3 contacts available to facilitate follow-up; or specific plans to leave the Boston area within 24 months.

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Trained research associates identified 642 trial-eligible subjects within 24 to 48 hours of admission for detoxification, of whom 470 (73%) consented to be in the HELP trial (see Fig. 1). Research associates performed a 60 to 90 minutes interview with all subjects before their discharge. Follow-up interviews were conducted with subjects every 6 months after the baseline interview for up to 24 months. Follow-up rates, computed as the proportion of the original cohort alive at each follow-up period, were 54% at 6 months, 46% at 12 months, 54% at 18 months, and 59% at 24 months. During these interviews, depressive symptoms, mental health-related quality of life, and addiction severity were evaluated. Interviews were conducted in English or Spanish; however, only subjects who completed the English version of the interview were included in these analyses, as the Rapid Estimate of Adult Literacy in Medicine (REALM) instrument is only available in English ($n=453$). Of these, 3 subjects refused to complete the REALM instrument. Thus, baseline analyses were conducted on the final sample of 450 subjects who completed the interview, including the REALM, in English. Of these subjects, 380 (84%) completed at least 1 follow-up interview. Longitudinal analyses are based on this subset of 380 subjects. Subjects were compensated in the form of supermarket certificates for their time, \$20 for the initial interview, and \$30 for subsequent ones. The Boston University Medical Campus Institutional Review Board approved this research. A certificate of confidentiality from the federal government provided additional protection for subjects' privacy.

Primary Independent Variable

Health literacy was measured at study entry using the REALM. The REALM is a screening test used in public health and primary care and other settings to assess a patient's reading level.¹⁸ This instrument was chosen for its validity and brevity. It provides reading grade estimates for patients who read below the 9th-grade level, and thus is particularly useful at helping to identify potential problems with reading among a population hypothesized to have low levels of health literacy. Two health literacy categories were defined based on the REALM: low (≤ 8 th grade: REALM score 0 to 60) versus higher (≥ 9 th grade: REALM score 61 to 66).

Outcome Variables

There were 4 outcomes of interest measured at study entry (baseline), 6, 12, 18, and 24 months. The Addiction Severity Index drug scale (ASI-Drug) and the Addiction Severity Index alcohol scale (ASI-Alc) assess drug and alcohol addiction severity, respectively, with composite scores for each ranging from 0 to 1, higher scores indicating greater severity.¹⁹ The Mental Component Summary (MCS) of the Short Form Health Survey (SF-36) assesses mental health-related quality of life, scores ranging from 0 to 100, with higher scores indicating better quality of life.^{20,21} Finally, the Centers for Epidemiologic Studies-Depression (CES-D) scale measures depressive symptoms with higher CES-D scores indicating greater levels of distress. Scores range from 0 to 60 with a score ≥ 16 traditionally interpreted as a clinically significant level of distress.²²

Analyses

Baseline characteristics of subjects ($n=380$) with at least 1 follow-up interview were compared between the low and higher health literacy groups. Preliminary analyses were conducted to assess the baseline cross-sectional associations between health literacy and mental health and addiction severity measures. For the primary analyses, generalized linear models for longitudinal data were used to model each outcome variable. The longitudinal regression models account for the correlation due to repeated observations on the same subject. An unstructured covariance structure was used to fit the longitudinal regression models. The primary analyses controlled for factors known to be related to both literacy and mental health and addiction outcomes by including them as covariates in the regression models. The covariates included in all regression models were as follows: gender, age, race (black, white, Hispanic, or other), years of formal education, income ($\leq \$19,000$, $\$20,000$ to $\$49,000$, or $\geq \$50,000$), primary language (English vs other), primary substance of choice (alcohol, cocaine, or heroin), cognitive functioning measured using the Mini-mental Status Examination (MMSE), time of follow-up interview (number of months since baseline), and randomization group. The baseline values for addiction severity, MHQOL,

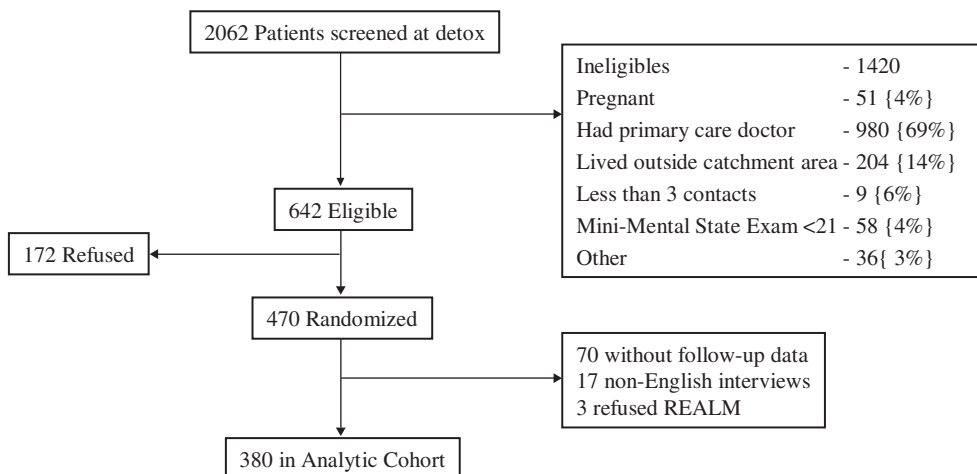


FIG. 1. Selection of study subjects.

Table 1. Description of Study Cohort at Baseline (N=380)

	Total Sample	Low Literacy, N=174 (46%)	Higher Literacy, N=206 (54%)
Mean age (SD)	36 (7.64)	36 (7.84)	36 (7.48)
Race/ethnicity, N (%)			
Black	201 (53)	122 (70)	79 (38)
White	132 (35)	21 (12)	111(54)
Hispanic	5 (6)	18 (10)	5 (2)
Other	11 (6)	13 (8)	11 (5)
Male, N (%)	287 (76)	135 (78)	152 (74)
Primary language, N (%)			
English	354 (93)	150 (86)	204 (99)
Other language	26 (7)	24 (14)	2 (1)
Mean years of formal education (SD)	11.98 (1.98)	11.43 (1.94)	12.44 (1.90)
Income, N (%)			
<\$19,000	211 (58)	104 (62)	107 (54)
\$20,000 to \$49,000	123 (34)	54 (32)	69 (35)
>\$50,000	33 (9)	9 (5)	24 (73)
Mean CES-D (SD)	33.03 (12.56)	30.91 (11.26)	34.82 (13.32)
Mean ASI-Alc (SD)	0.47 (.34)	0.46 (.34)	0.48 (.34)
Mean ASI-Drug (SD)	0.26 (.14)	0.26 (.13)	0.26 (.15)
Mean MCS (SD)	31.19 (12.75)	33.02 (12.97)	29.67 (12.39)
Primary substance of choice, N (%)			
Alcohol	141 (37)	51 (30)	90 (44)
Cocaine	135 (36)	76 (44)	59 (29)
Heroin	103 (27)	46 (27)	57 (28)

ASI, Addiction Severity Index drug scale; ASI-Alc, Addiction Severity Index alcohol scale; CES-D, Center for Epidemiologic Studies-Depression; MCS, Mental Component Summary.

and depressive symptoms were also included as covariates in regression models.

Finally, we assessed whether service utilization mediated the relationships between low literacy and outcome measures, by including it as an additional covariate in regression models and assessing whether the association between literacy and mental health outcomes changed. Service utilization was defined as any self-reported use of either medical services or behavioral health services (mental health and addiction services) in the past 6 months before the study interview. These variables, assessed at baseline and every 6 months during follow-up, were included in the regression model as a time-varying covariate. All analyses were conducted using 2-sided tests and a significance level of .05. Analyses were completed using SAS/STAT software, Version 8.2.

RESULTS

Subjects' demographic characteristics reflect the nature of the population served in a public urban residential detoxification

unit (Table 1). Among the 174 subjects with low literacy, 52 (30%) had REALM scores indicating a reading level \leq 6th grade, while 122 (70%) had a 7th to 8th-grade reading level. In unadjusted analyses of baseline data, low literacy was associated with higher MCS ($P=.02$) and lower CES-D ($P=.004$) scores but was not significantly associated with ASI-Drug ($P=.98$) or ASI-Alc ($P=.38$) (Table 2). In adjusted analyses of baseline data, no associations were detected between health literacy and ASI-Drug, ASI-Alc, MCS, or CES-D.

In longitudinal regression analyses, baseline health literacy was not significantly associated with mental health-related quality of life (MCS) or alcohol or drug addiction severity (ASI). However, low health literacy was associated with higher levels of depressive symptoms, consistent with the study hypotheses. In a longitudinal model adjusting for the full set of potential confounders, the adjusted mean CES-D was 26.7 for the low as compared with 22.7 for the higher health literacy group ($P\leq.01$) (Table 3). For both low and higher health literacy groups, the level of depressive symptoms appeared to improve following the baseline interview. Higher levels of depression for

Table 2. Baseline Relationship of Literacy and Mental Health Outcomes (N=380)

	ASI-Drug* (Range =0 to 1)		ASI-Alc* (Range =0 to 1)		CES-D† (Range =0 to 60)		MCS‡ (Range =0 to 100)	
	Unadjusted	Fully Adjusted§	Unadjusted	Fully Adjusted§	Unadjusted	Fully Adjusted§	Unadjusted	Fully Adjusted§
Low (\leq 8th grade)	0.25	0.25	0.46	0.47	30.9	31.4	32.9	30.4
Higher (\geq 9th grade)	0.25	0.28	0.49	0.48	34.3	33.8	30.1	29.2
P-value	.98	.11	.38	.88	.004	.09	.02	.42

*Higher scores indicate greater severity.

†Higher scores indicate greater depressive symptoms.

‡Higher scores indicate greater quality of life.

§Models adjusted for sex, age, race, education, income, primary language, primary substance of choice, randomization group, and mini-mental status examination.

ASI, Addiction Severity Index drug scale; ASI-Alc, Addiction Severity Index alcohol scale; CES-D, Center for Epidemiologic Studies-Depression; MCS, Mental Component Summary.

Table 3. Longitudinal Models of Literacy and Mental Health Outcomes (N=380)

	ASI-Drug*		ASI-Alc*		CESD†		MCS‡	
	Minimally Adjusted§	Fully Adjusted	Minimally Adjusted§	Fully Adjusted	Minimally Adjusted§	Fully Adjusted	Minimally Adjusted§	Fully Adjusted
Low (<= 8th grade)	0.13	0.13	0.23	0.26	24.3	26.7	40.7	39.1
Higher (>= 9th grade)	0.12	0.12	0.26	0.25	21.0	22.7	42.0	41.2
P-value	.28	.35	.18	.86	.01	<.01	.22	.14

*Higher scores indicate greater severity.

†Higher scores indicate greater depressive symptoms.

‡Higher scores indicate greater quality of life.

§Models adjusted for baseline measure of outcome variable.

||Models adjusted for time, sex, age, race, education, income, primary language, primary substance of choice, randomization group, mini-mental status examination, and baseline measure of outcome variable.

ASI, Addiction Severity Index drug scale; ASI-Alc, Addiction Severity Index alcohol scale; CES-D, Center for Epidemiologic Studies-Depression; MCS, Mental Component Summary.

the low literacy group compared with the higher literacy group were observed only after the initial assessment (see Fig. 2).

We examined reported service utilization for both low and higher literacy groups at each time point and found no significant differences between groups, with an average of 78% of low-literacy and 82% of higher-literacy subjects using any health or addiction services over a 6-month period. Accordingly, the addition of service utilization to the other covariates listed in Table 3 did not attenuate the association between health literacy and depressive symptoms. The mean CES-D scores were 26.6 and 22.8 for the low and higher health literacy groups, respectively, after adjusting for self-reported service utilization ($P < .01$).

DISCUSSION

The recent AHRQ evidence review, "Literacy and Health Outcomes: Evidence Report/Technology Assessment,"²³ cites 5 studies that evaluate the association between a marker of health literacy and a marker of mental illness. Four of these studies report statistically significant associations between low literacy and higher prevalence of depression; however, not all of these associations remained significant in adjusted analyses. Each of these studies and more recent work by Wolf et al.²⁴ have relied on cross-sectional analyses, and thus do not allow for consideration of causal inferences. For example, Gazmarian et al.²⁵ found that 13% of new Medicare recipients had depression according to the geriatric depression scale. Subjects with low health literacy were 3 times more likely to have depression. However, after controlling for demographics, social support,

health behavior, and health status, health literacy did not remain an independent risk factor for depressive symptoms.

In this study, we examined the relationship between health literacy and several behavioral health outcomes over time. These data provide evidence supporting an important longitudinal relationship between literacy skills and depressive symptoms among adults with addiction. We did not detect an association between health literacy and addiction severity or mental health-related quality of life. These are some of the first data to examine prospectively and longitudinally the relationship of health literacy and mental health outcomes.

Subjects in this study were recruited at a residential detoxification unit and accordingly had severe symptoms, at a nadir for both addiction and mental health. Depressive symptoms improved for both the low and higher health literacy groups over time; however, subjects with low health literacy had higher levels of depressive symptoms during follow-up. Prior research provides evidence that the differences in CES-D scores found in our study are clinically significant. Pandya et al.²⁶ reported an increase of approximately 6% in the prevalence of major depressive disorder among people with multiple sclerosis when CES-D scores increased from 22 to 26.

These data do not allow adequate examination of potential mechanisms to understand the relationship between health literacy and depressive symptoms. We explored health literacy as a barrier to service utilization, as this has been suggested as an important possible mechanism for the relationship between health literacy and chronic disease outcomes,²⁷ but did not find this to explain the observed association. Although service utilization can offer important insights into the relationship

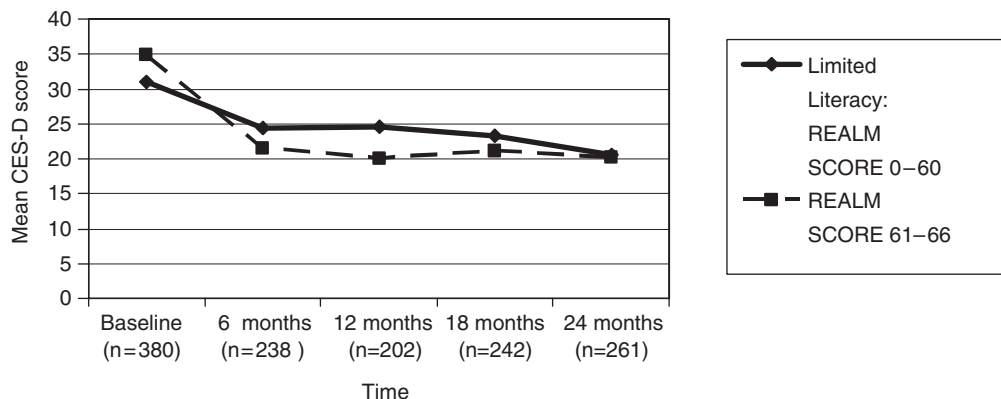


FIG. 2. Literacy and depressive symptoms across time.

between health literacy and chronic disease outcomes, other potential mechanisms remain to be explored. One of these, which may be especially salient in examining mental health outcomes, is the high levels of shame associated with limited reading ability.²⁸ This shame may be in the causal chain of increased depressive symptomatology.

There are several limitations of this study. First, the generalizability of these results is limited by the specific nature of the population studied, a cohort of patients recruited during inpatient detoxification. In addition, we cannot assess the extent to which the level of literacy or depressive symptoms may have influenced study participation. Second, this secondary analysis of prospectively collected data only allowed the use of CES-D, MCS, and ASI as measures of mental health and addiction outcomes. While CES-D is a good measure of depressive symptoms, future work should examine a broader spectrum of mental health and addiction outcomes.

Also, the REALM was only administered at baseline and we are unable to evaluate changes in literacy over time. While it is certainly possible that subjects may have acquired additional literacy skills through adult education, it is unlikely that significant changes occurred in literacy scores over time in our cohort. While the REALM is merely a test of word-recognition, it had been shown to correlate highly with tests that evaluate other domains of literacy such as numeracy, reading comprehension, and document literacy.²⁹

Finally, our preliminary analyses indicate that level of mental health service utilization does not explain the influence of health literacy on depressive symptoms. These findings are limited by our use of a single dichotomous, self-report measure of health or addiction service use and should be interpreted cautiously.

CONCLUSION

Little attention has been paid to health literacy in substance abuse and mental health care settings. These data indicate that health literacy may be an important factor in the course and outcomes of depressive symptoms. While health literacy was not found to be a predictor of mental health functioning or addiction outcomes, clearly this study represents an initial exploration of this area, one that merits further investigation.

The important role of low health literacy in people's lives has been inadequately addressed. Future work should examine the role of low health literacy among subjects with a full range of psychiatric and addiction disorders. In addition, potential mechanisms to explain these relationships should be examined in order to inform the development of interventions designed to reduce the burden of low health literacy among people with addictive and mental health diseases.

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