

# Health Literacy May Help to Explain Heterogeneous Treatment Effect in Psychosocial Depression Care for Older Adults

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## Abstract

This study aimed to examine whether older adults with higher levels of health literacy exhibited greater reduction in depression symptoms after participating in the Positive Minds-Strong Bodies Program (PMSB). Presently, there is limited clinical data on how low health literacy contributes to health disparities in older adults' mental health. This study hypothesized that the health literacy level of older adults would moderate the benefits obtained from participating in the PMSB program. It was expected that participants with higher health literacy levels at baseline would exhibit greater depression reduction after PMSB program completion than those with lower health literacy scores at baseline. Participants' data were obtained from a larger multi-center randomized trial that demonstrated PMSB effectiveness across participants who spoke English, Spanish, or Chinese languages. The intervention group ( $n = 153$ ) and the control group ( $n = 154$ ) were recruited from community clinics and health centers serving predominantly under-served communities in Boston, New York City, Miami, and Puerto Rico. The sample population was ages 60+ years. Data regarding self-report measures of health literacy, education level, and depression symptoms were obtained through clinical interviews by trained interviewers. Analyses focused on additional understanding of the PMSB program effectiveness at the six-month follow-up, as a function of health literacy. Chi-square tests and t-tests were conducted among all study variables comparing differences between the intervention and control group. A multivariate linear regression model was used for data analyses with a plotted marginal effect graph illustrating linear trends. In contrast to our hypothesis, there was no significant average statistical relationship between health literacy level and depression change, after participating in the PMSB program. Exploratory analyses, however, found a linear trend relationship which neared significance ( $t[269.388] = -1.539, P = .125$ ). Although on average health literacy did not influence the effect of the PMSB program on depression, the intervention appeared more effective in reducing depression symptoms for participants with health literacy scores of 12 and above.

## Background

Do older adults with higher levels of health literacy (as compared to those with lower levels) exhibit greater reduction in depression symptoms after participating in the Positive Minds-Strong Bodies Program (PMSB)?

There is limited clinical data on how low health literacy contributes to amplify or attenuate the effects of depression interventions for older adults. Health Literacy (HL)<sup>1</sup> is defined as "the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions". In one of the few studies assessing longitudinal data in the relationship between health literacy and depression, it was found that over time, both depressed patients with high and low health literacy showed improved depression, but those with low health literacy had more depressive symptoms that persisted than those with high health literacy<sup>2</sup>. Low HL scores have been found to be a risk factor in older adult's depression by being associated with more severe depression symptoms, and worse functional and physical health<sup>3,4</sup>. Heterogeneous treatment effects (HTE) in psychosocial intervention programs<sup>5,6</sup> could be due to differences in health literacy among the target populations. HTE is the effect of subject nonrandom differences in responding to treatment interventions<sup>5</sup>. It is necessary to look beyond an average of participants' responses to treatment, to understand who, specifically, was least or most likely to benefit from it. This study is one of the early attempts to incorporate health literacy into clinical science health disparities depression intervention trials in the growingly diverse geriatric population of the US.

## Methods

The MGH Disparities Research Unit, Positive Minds - Strong Bodies (PMSB) Trial participant's data was used for this project. This was a culturally adapted clinical psychosocial combined Cognitive Behavioral Therapy-Physical Exercise multi-center randomized trial that demonstrated PMSB effectiveness<sup>7</sup>. The independent variable was the PMSB program completion, and the control group was Enhanced Usual Care. The Moderator variable was Health Literacy (HL). Health literacy was measured by an adapted HL scale. The model design accounted for the Education level of participants. The dependent variable was Depression, as measured by the Hopkins Symptom Checklist depression subset and the Patient Health Questionnaire-9. The intervention group was ( $n = 153$ ) and the control group was ( $n = 154$ )<sup>7</sup>. Patients were recruited from community clinics and health centers, serving predominantly under-served communities in Boston (e.g., Chelsea, Revere, Lynn, etc), New York City, Miami, and Puerto Rico. The sample population<sup>1</sup> ages were 60+.

## Analyses

Chi-square tests and t-tests demonstrated effective randomization. Cronbach alpha levels were satisfactory, demonstrating reliability. A multi-level linear regression model was used for the analyses. This model accounted for the repeated measures structure of the longitudinal design. A plotted marginal effect graph was used to visualize linear trends.

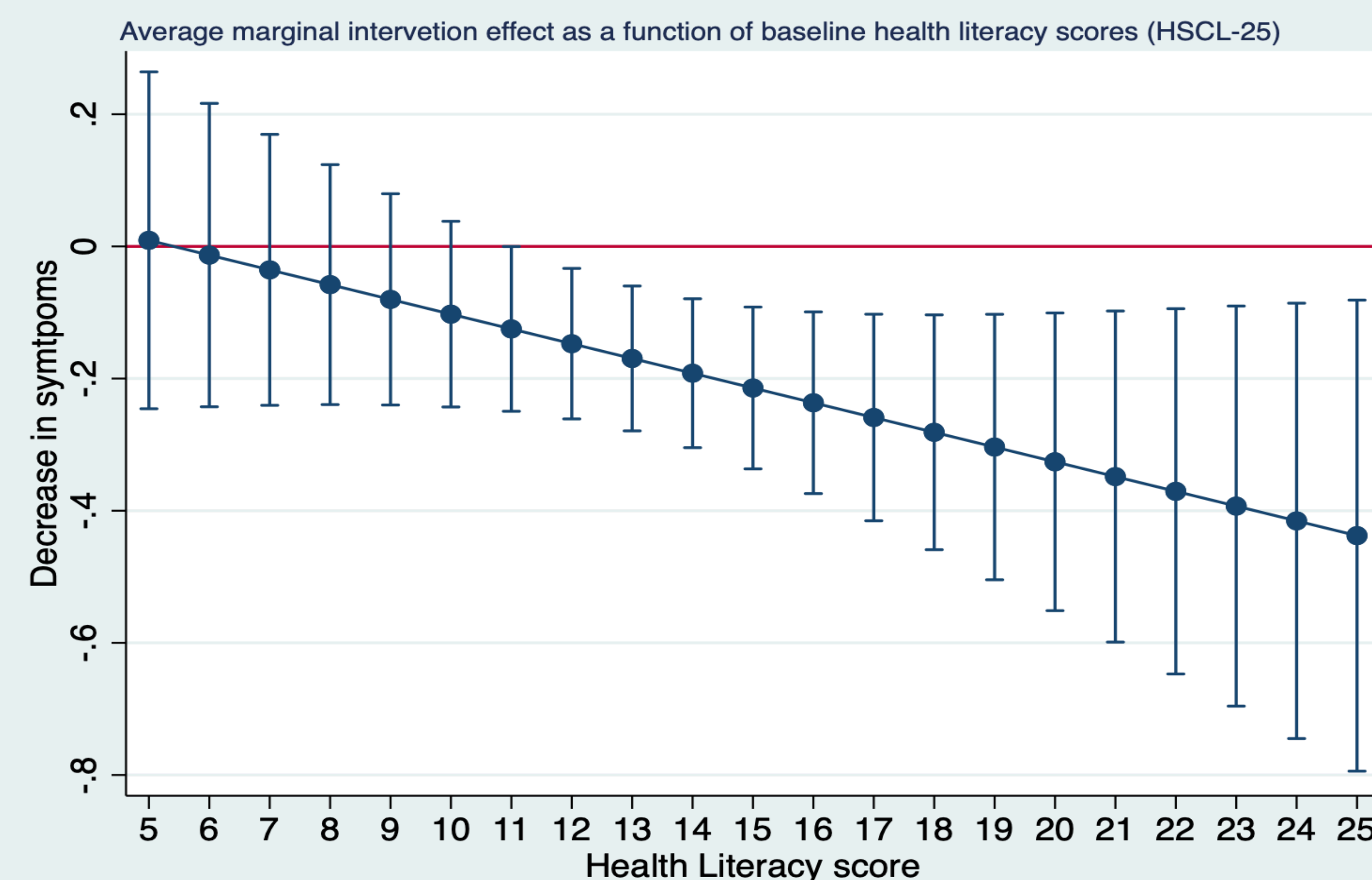
## Results

There was no average significant statistical relationship ( $t[269.388] = -1.539, P = .125, ns$ )

### Effectiveness of the PMSB Intervention at 6-month follow-up as a function of health literacy scores at baseline<sup>a</sup>

	PHQ-9			HSCL-25 (15 depression items only)		
	b (SE)	t (df)	p-value	b (SE)	t (df)	p-value
Intervention (control reference)	-.024 (2.003)	-.012 (277.107)	.991	.121 (.198)	.611 (279.664)	.542
Health literacy at baseline	.229 (.106)	2.162 (265.299)	.032	.022 (.010)	2.131 (269.001)	.034
Health literacy at baseline x Intervention	-.080 (.147)	-.546 (266.370)	.585	-.022 (.015)	-1.539 (269.388)	.125
Education at baseline (< high school reference)						
High school and above	.358 (.508)	.705 (266.486)	.482	.068 (.050)	1.345 (268.359)	.180

<sup>a</sup> Analyses on mental health (PHQ-9, HSCL-25 Depression Subset) outcomes use longitudinal data of 307 participants, with three follow-up assessments per participant. Each outcome variable was measured three times at 2-month, 6-month, and 12-month follow-up. The unit observation is a specific follow-up assessment.



## Conclusions

It was hypothesized that HL affected depression outcome in the PMSB trial, even after controlling for education level. There was no average significant statistical relationship ( $t[269.388] = -1.539, P = .125$ ). However, further exploratory analyses discovered a non-significant linear trend relationship, specifically around higher levels of health literacy. A linear trend relationship for HL scores 12 and above, meaning intervention appeared more effective in reducing depression symptoms for participants with health literacy scores of 12 and above; the greater the HL score, the greater the reduction of depressive symptoms. HL scores lower than 12 did not show a linear trend relationship related to the hypothesis.

Why not such significant impact on average level of health literacy: Potentially because PMSB intervention was adapted to a sixth-grade reading level.<sup>8</sup> Health literacy, overall literacy, and education level have been found to often be related. Some of the limitations were that there was a weak measure of health literacy. This measure has not been validated categorically and it has not been validated in Spanish or Chinese. Also, the education level was formatted as post high school and less than high school, but a 7<sup>th</sup> grade education is drastically different from a 12<sup>th</sup> grade education, potentially affecting HL effect on the results. Lastly, data on whether participants received education overseas or in America was not collected, which may have also affected the results. In conclusion, the intervention appeared to have a more pronounced effect on participants with higher HL scores than 12. Thus, higher levels of health literacy of 12 or more might show greater reductions of depression symptoms in alike psychosocial programs designed for depression.

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