

SCIENTIFIC ARTICLE

Implications of literacy for health for body mass index

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KEYWORDS

Literacy for health;
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Abstract

Introduction: Literacy for health (LH) may be considered a set of skills that people appropriate, understand, evaluate and use information and knowledge of health to make informed choices, reduce risks to their health, maintain a healthy nutritional status and enhance quality of life.

Objectives: To assess the level of literacy for health; analyse the relationship of socio-demographic variables with LH; to classify the Body Mass Index (BMI) and to determine the effect of LH on BMI.

Design: a quantitative study with a descriptive and cross-sectional approach conducted in the centre and north of Portugal.

Participants: a non-probabilistic sample of 508 Portuguese participants with a mean age 44.48 years (SD = 21 years).

Measuring instruments: LH was assessed by the European Questionnaire on Literacy for Health (LHS-EU-PT) validated in Portuguese by Saboga-Nunes and Sorensen (2013) and BMI classification followed the WHO reference accepted by Portugal, DGS (2013).

Results: It was found that overall, 73.62% of the participants have an inappropriate and problematic level of literacy for health; this was significantly lower in women ($P = .000$). Participants with inadequate LH, are those with higher BMI ($\chi^2 = 78.09$; $P = .000$), so are at risk of a sub-optimal state of health.

Conclusions: The results suggest a significant relationship between the LH and BMI. It is found that, the better the LH, the more appropriate is the BMI. This evidence reinforces the importance of promoting literacy for health to the Portuguese population.

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Introduction

Literacy for health (LH) is defined as the awareness of an active learner in developing their comprehension, management and investment skills favourably towards promoting health.¹ Thus, people can go from learners to actors with a set of skills they appropriate, aiding to their understanding, assessment and use of information and knowledge of health to make informed choices, reduce risks to their health and enhance quality of life.

LH is linked to educational level and implies knowledge, motivation, skills that people develop to access, understand and evaluate information in the field of health so they can make decisions about health and its promotion while preventing diseases and seeking to maintain or improve the standard of their quality of life.²

LH cannot be separated from general literacy itself. Education is vital to health, so as to be a major factor in terms of public health. People with low education levels are more likely to have lower levels of health when they reach adulthood. Thus, education is a way to maximize health equity.³

An individual's level of LH is affected by their conditions of life, such as education, individual capability, early childhood development, aging, living and working conditions, gender differences, culture and language.³

LH can also significantly influence a person's weight.⁴ Therefore, measures aimed at increasing LH are important, because only then can overweight individuals be empowered socially and personally so that they are able to identify and become aware of their needs, developing appropriate skills that can generate lifestyle changes. All of this will have a positive impact on their body mass index (BMI).⁵

Obesity is a major public health issue and a risk factor for several chronic diseases.⁶

The WHO considers excess weight when the BMI is ≥ 25 and obesity when BMI is ≥ 30 . BMI was adopted to classify obesity internationally.⁷ However, despite being a useful measure for classifying an individual quickly and easily (for excess weight and/or obesity), this measure is merely indicative, as BMI does not measure the same order of magnitude as the degree of fat among individuals.

LH is considered a mediator in health gains in the context of promoting health and may be enhanced by health education. The aims this study proposes can thus be seen to

be relevant. They are: to assess the level of literacy for health (LH); to analyse the relationship of socio-demographic variables with LH; to classify BMI and to determine the effect of LH on BMI.

Material and methods

Study type

Descriptive, cross-sectional study with 508 Portuguese participants aged between 18 and 93 years (mean age 44.48 years \pm 21 SD), residing in central and northern Portugal (Fig. 1).

Participants

The non-probability, convenience sample is made up of 508 participants (52.2% men and 47.8% women), who volunteered to complete the questionnaire and to be measured and weighed.

The following are inclusion criteria were considered for the sample's participant selection: not having a chronic disease besides potential excessive weight.

Mostly had completed secondary education (41.93%), had a monthly household income between €500 and €800 (34.45%) and were in the intermediate level/level 5 of the social stratum (28.74%).

Data collection instrument

Data collection was conducted by the European Questionnaire on Literacy for Health LHS-EU-PT validated in Portuguese.^{1,8} Operationalization of the literacy for health variable was based on the cohort values of proposed by the authors of the questionnaire in line with international practice of the European Literacy for Health Survey (LHS-EU-PT) consortium (Fig. 2). BMI was based on WHO cut-offs which were adopted by Portugal, DGS (2013).⁷

Application of the LH questionnaire was by self-report by 311 individuals and whenever the level of functional literacy of citizens was very low, researchers asked the question and wrote down the answer, a process used in 197 cases.

The LH assessment matrix includes 3 dimensions operationalized by 47 items: "Curative and palliative care of disease" (the first 16 items), "Disease prevention" (the following 16 items) and "Promoting health" (the last 15 items). A 5-point, self-report scale (very easy, easy, difficult, very difficult, do not know/no answer) assesses the difficulty experienced in preselected health indicators/tasks. This index is a standardized scale scored with a minimum value of 0 and a maximum of 50, where 0 represents the absence of LH, and 50 represents excellent LH.

Internal consistency evaluated in this study, based on Cronbach's α , showed that the highest dimension is the "Promoting Health" ($\alpha = 0.95$) and the lowest is "Curative and palliative care of disease" and "Disease prevention," which corresponds to Cronbach's $\alpha = 0.94$, with the overall $\alpha = 0.98$. We may conclude that this instrument has a high degree of fidelity ($\alpha > 0.9$), confirming this investigation's relevance.⁹

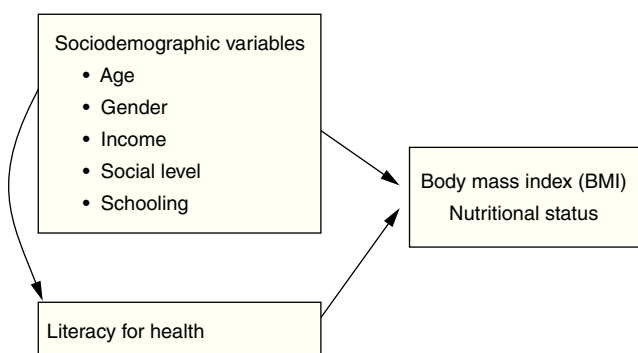


Figure 1 Design of the study.

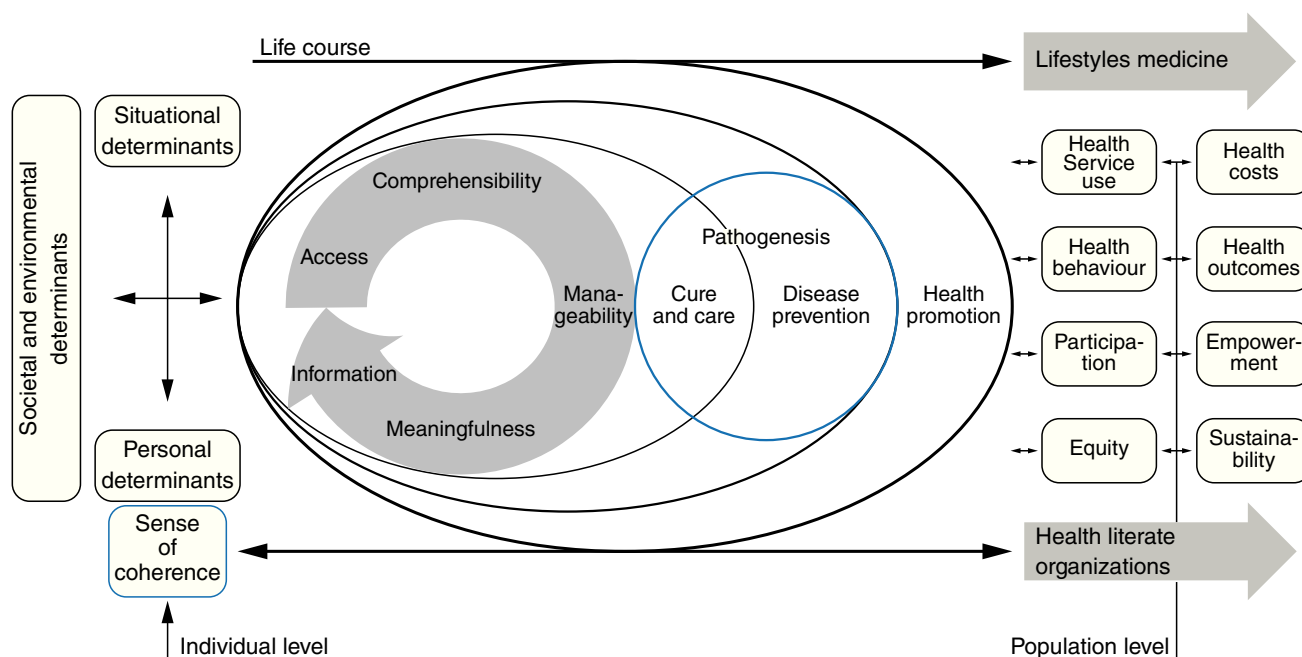


Figure 2 Dimensions underpinning the operationalization of the concept of literacy for health assessed by the European questionnaire on literacy for health indicators (HLS-EU-PT) www.literacia-saude.info. Source: Saboga Nunes L. Literacia para a saúde e a consciencialização da cidadania positiva. Revista Referência. 2014;III Série Supl:95-9.

Ethical-legal, formal and statistical procedures

Before collecting the data, permission was obtained from the ESSV Ethics Committee. After that, the authors requested permission to use the European Questionnaire on Literacy for Health (LHS-EU-PT) which was also granted.

Later we proceeded to contact each participant personally and provided *Informed Consent Form*, where detailed information was offered about the study and confidentiality was assured.

Statistical analysis of data was performed with SPSS – Statistical Package for Social Sciences (Version 21.0 for Windows).

Various techniques related to descriptive and inferential statistics were used, including determining frequency, calculating Pearson's correlation test, Linear Regression, ANOVA, Chi-Square test and Kruskal-Wallis.

The study of item homogeneity was performed by determining Cronbach's alpha coefficient. The cut-off and classification points were found, and its sensitivity was also tested for the sample.

Results

Values for literacy for health ranged between 0.00 and 48.94, with a mean of 26.88 (SD=9.45). Men have a higher LH ($\bar{x}=29.19 \pm 7.85$ SD) compared to women in each of the dimensions and the overall value ($\bar{x}=24.35 \pm 10.37$ SD; $t=5.88$; $P=.000$) (Table 1).

In scoring by level the trend remains with males scoring a higher level of LH than females (Chi-square test $\chi^2=47.748$; $P=.000$) (Table 2).

Through the Vital Sign Test (VST), only a minority (19.3%) have adequate literacy and 32% have a limited literacy (Table 3).

Literacy to health as a function of age, education, income and social stratum

Negative and significant correlations were inferred between LH and age ($r=-0.717$; $P=.000$). Thus, the higher the age, the worse is LH, with an explained variance of 51.4%. The value t and F are explanatory ($t=-23.122$; ANOVA $F=534.610$; $P=.000$) (Table 4).

Young adults demonstrated better LH ($\bar{x}=32.75 \pm 5.88$ SD), followed by adults ($\bar{x}=25.91 \pm 7.24$ SD) and finally the elderly ($\bar{x}=16.99 \pm 8.33$ SD). The differences between groups are significant ($F=215.87$; $P=.000$), from which we may infer that LH changes depending on the life cycle.

Participants with higher education show better LH ($\chi^2=237.723$; $P=.000$). Also, holders of a medium-high income show higher LH ($P=.000$). In the same sense those in a higher social stratum have better a level of LH (mean ranking, $MR=356.44$), unlike those who occupy middle ($MR=164.49$) or low ($MR=164.49$) strata, who have lower LH. The differences between the groups are significant (Kruskal-Wallis $P=.000$), situated between *low vs. middle*, *low vs. high* and *middle vs. high* levels.

Results of the relationship between literacy for health with body mass index

The majority (62.6%) of the participants have excess weight; 45.28% are in a pre-obese state and 37.4% had normal a BMI (Table 5).

The elderly participants are those with the highest BMI (mean = 28.75; $P = .000$) and there is a positive correlation between the variables ($r = 0.474$, $P = .000$). BMI varies inversely with the level of education, with the illiterate up to the 1st cycle of schooling [up to the 4th year] being those with the highest BMI (MR = 349.98; $P = .000$). Participants with the lowest social levels (MR = 301.61; $P = .000$) and

lowest incomes (MR = 256.07; $P = .000$) had higher BMI values, whereby a worse nutritional status is inferred.

Participants with an inadequate level of LH (MR = 322.62; $P = .000$) are those with higher BMI, whereas participants with an excellent level of LH have lower BMI (MR = 139.13; $P = .000$) with significant differences between the groups (Kruskal-Wallis 78.092; $P = .000$).

Table 1 Literacy for health by gender, for each dimension and overall score

	n	Min	Max	\bar{x}	SD	CV (%)	Sk	K	t	P
<i>Dimension 1.</i>										
<i>Health score 16 and 64</i>										
Male	265	18	63	44.55	7.38	16.56	-0.641	1.664	5.54	.000
Female	243	16	64	40.25	9.80	24.34	-0.019	-0.276		
Total	508	16	64	42.49	8.88	20.89	-0.396	0.249		
<i>Dimension 2.</i>										
<i>Disease prevention score 15 and 60</i>										
Male	265	16	60	40.91	7.28	17.79	-0.357	0.694	5.077	.000
Female	243	15	60	36.96	9.89	26.75	0.110	-0.231		
Total	508	15	60	39.02	8.84	22.65	-0.223	0.075		
<i>Dimension 3.</i>										
<i>Promoting health score 16 and 64</i>										
Male	265	17	64	43.87	8.53	19.44	-0.438	0.890	6.294	.000
Female	243	16	64	38.47	10.59	27.52	-0.057	-0.366		
Total	508	16	64	41.29	9.94	24.07	-0.341	0.019		
<i>Literacy overall score</i>										
Male	265	1.42	48.58	29.19	7.85	26.89	-0.533	1.206	5.88	.000
Female	243	0.00	48.94	24.35	10.37	42.58	0.003	-0.381		
Total	508	0.00	48.94	26.88	9.45	35.15	-0.356	0.065		

Table 2 Levels of literacy for health by gender

Literacy for health overall score	Male		Female		Total		Male	Female	χ^2	P
	n	%	n	%	n	%				
Inadequate [0-25]	68	25.66	131	53.04	199	39.17	-6.5	6.5	47.748	.000
Problematic [25-33]	114	43.02	65	26.32	175	34.45	4.2	-4.2		
Sufficient [33-42]	72	27.17	36	14.57	108	21.26	3.4	-3.4		
Excellent [42-50]	11	4.15	15	6.07	26	5.12	-1.0	1.0		
Total	265	52.2	243	47.8	508	100				

Table 3 Vital sign test by gender

Functional Literacy for health	Male		Female		Total		χ^2 test and residual values	
	n	%	n	%	n	%	Male	Female
Does not know or does not respond	122	46.0	125	51.4	247	48.6	-6	6
Strong possibility of limited literacy	44	16.6	39	16.0	83	16.3	0.1	-0.1
Possibility of limited literacy	45	17.0	35	14.4	80	15.7	0.5	-0.5
Possibility of adequate literacy	54	20.4	44	18.1	98	19.3	0.4	-0.4
Total	265	52.2	243	47.8	508	100		

Discussion

This study sought to examine the effect of LH on BMI, assessed from a non-probability, convenience sample of 508 Portuguese people. Considering the limitations in selecting the participants, these results cannot be extrapolated to other populations. Thus, although they are indicators of a situation deserving consideration in terms of public health, it is vital to develop other research which will be more representative of the Portuguese population.

The issue of LH was studied based on the *LHS-EU-PT*, measured for the Portuguese population and BMI according to the WHO reference accepted in Portugal. The values obtained had a good internal consistency, at a single observation time. It is worth noting the limitation inherent in its application because, due to the educational level of the sample being low, assistance by the researchers was indispensable to completing the instrument in some cases.

As for the issue of LH, a deficit in LH was detected in 73.62% of the participants, while 26.38% reveal a positive level of LH. Moreover, 37.17% of the participants show a high probability of inadequate LH. These results are higher than those found in eight European countries, where 21% of participants scored with a strong possibility of limited literacy.¹⁰

It was also found that gender (men have higher levels of LH than women), education, monthly household income, social strata and age (younger people have a higher level of LH than the elderly) are factors that significantly influence the participants' level of LH.

The results of this study are consistent with those of other researchers who attributed the prevalence of inadequate LH to low levels of education,^{4,5} social inequality,¹¹ low-income¹² and most pronouncedly in the elderly population.^{13,14}

Unlike other Portuguese studies, those conducted with other measuring instruments maintain that gender does not influence the level of literacy.^{7,15}

Table 4 Results of simple linear regression between age and literacy for health

<i>Dependent variable = Literacy for health</i>					
R = 0.717 R ² = 0.514 R ² adjusted = 0.513 Standard estimation error = 6.59 F = 534.610 P = .000					
<i>Regression summary</i>					
Independent variables	Standardized coefficient	Regression coefficient	R ² R increment	t	P
Constant	41.115	0.717	0.514	-23.122	.000
Age	-0.717				
<i>Variance analysis</i>					
Source	Sum squares	gl	Mean squares	F	P
Regression	23,264.637	1	23,264.637	534.610	.000
Residual	22,019.601	506	43.517		
Total	45,284.238	507			

Table 5 Body mass index (BMI) values by gender and total

BMI		Male		Female		Total	
		n	%	n	%	n	%
<i>Low weight</i>	< 18.5	—	—	—	—	—	—
<i>Normal weight</i>	18.5-24.9	100	37.74	90	37.04	190	37.4
<i>Pre-obesity</i>	25.0-29.9	132	49.81	98	40.33	230	45.28
<i>Obesity</i>	≥ 30						
Grade 1 obesity	30.0-34.9	25	9.43	41	16.87	66	12.99
Grade 2 obesity	35.9-39.9	7	2.64	12	4.94	19	3.74
Grade 3 obesity	≥ 40.0	1	0.38	2	0.82	3	0.59
Total		265	52.2	243	47.8	508	100

BMI: ratio between weight (kg) and height (m²) (Quetelet Index)

As for the relationship between LH and BMI, it was found that the LH was associated with BMI, i.e., the better the level of LH, the better the BMI, suggesting a significant relationship between both.

Given that the increase in literacy for health represents a decrease in BMI values, we may infer that better literacy for health also corresponds to a better nutritional status.

These results contradict those of another study, in which only 3.2% of individuals have an inappropriate level, 5.6% have a borderline level and 91.2% have an adequate level of literacy for health.¹⁵ Despite these differences, those who have an inadequate level of literacy for health had a higher BMI, and participants with excellent level of literacy had a lower BMI. This is also documented in other research,¹⁶⁻¹⁸ which indicated there was a significant negative correlation between literacy for health and BMI.

People with excess weight can benefit from LH to control and reduce their weight load. Low LH was identified as a risk factor for various diseases, such as obesity. Appropriate levels of LH appear to result in improvements to health and a higher quality of life. On the other hand, lower levels of LH are associated with poorer health and even higher mortality.¹⁶

As guidelines for practice, we suggest training health professionals in strategies for promoting literacy for health and adherence to monitoring BMI. It is further suggested to integrate the less literate, the elderly and socially vulnerable people in education and research-action programmes to support active lifestyles, enabling them to effectively manage their nutritional status.

With regard to lines of future research, there is a need for more comprehensive research to clarify the strength of the relationship between LH and BMI.

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What we know about the theme

Health literature is considered a mediator in health gains and can significantly influence people's lifestyles and weight.

What we get out the study

- The study shows that in the sample of Portuguese participants, literacy for health was associated with BMI, that is, the participants with better literacy, possessed a more suitable body mass index.
- Favourable factors for better literacy for health were: male gender, higher education, higher income, higher social stratum and lower age.
- Considering these results for monitoring and preventive intervention proves to be a window of opportunity for promoting and protecting health, with great relevance and timeliness in public health.

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Conflicts of interest

The authors declare that there are no conflicts of interest.

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