An Italian validation of "METER", an easy-to-use Health Literacy (HL) screener

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Abstract

Health Literacy (HL) is the degree to which individuals have the capability to obtain, understand and process basic health information needed to make appropriate health decisions. It affects persons' ability to access and use health care, to interact with providers, and to care for themselves. Established literacy screeners have practical limitations (such as practictioner's attendance, time to complete, etc.): to address these, a short, self-administered measure of HL, the Medical Term Recognition Test (METER) was introduced in USA. In this study an Italian version (IMETER) of this measure has been validated administering it to undergraduate students, attending Medicine, Arts and Engineering faculties. The results of this study show a high degree of reliability and validity of the test when comparing the skills of students educated in medical matters and those of non-biological faculties, indicating the potential capability of the tool to screen low HL levels in larger population. Despite the limits of this pilot study, IMETER's quick and easy administration method seems useful not only in clinical settings, but also to ease the implementation of future larger studies.

Introduction

Health Literacy (HL) is defined as the degree to which individuals have the capability to obtain, understand and process basic health information needed to make appropriate health decisions (1). It affects persons' ability to access and use health care, to interact with providers and to care for themselves. In particular, adults with low HL skills are, among other obstacles to improving health, less likely to use preventive services (2): limited or insufficient literacy is associated with reduced adoption of protective behaviors such as immunization and an inadequate understanding of antibiotics (3). Inadequate HL affects a large part of the population: a high proportion of individuals have low functional HL, accounting for 26% of the population in the United States and between 29% and 62% among the populations of eight European countries (4, 5).

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Well established literacy screeners are the "Test of Functional HL in Adults" (TOFHLA and the shortened S-TOFHLA) and the "Rapid Estimate of Adult Literacy in Medicine" (REALM). The two tests aim to measure reading and recognition abilities of single words. However, they have practical limitations for use in clinical settings: TOFHLA involves self-administered written tests, which require 22 minutes to complete. Although shorter, the S-TOFHLA still requires around 7 minutes. REALM only requires about 2 minutes to complete, but it is not self-administered: patients have to read a list of words aloud, and a practitioner must attend.

To address these limitations, a short, self-administered measure of HL, the Medical Term Recognition (METER) test was introduced in the USA (6).

Aim of the present study is to evaluate the validity of an Italian version of the METER test in assessing HL levels among cohorts of Italian undergraduate students of different learning departments, in order to validate it for an upcoming evaluation of the HL skills in the Italian general population.

Methods

The "Italian Medical Term Recognition" Test (IMETER Test) was translated and adapted from the English METER Test. It is a short, self-administered measure of HL, developed to estimate readers' recognition of medical words, with orientation to common terms regarding prevention and treatment of infectious diseases, such as those printed in the package inserts of marketed vaccines and / or antibiotics. The subjects are given a list of 70 terms (40 medical and 30 non-real medical words – see annex 1) printed on a single page, and they are simply asked to check off those they recognize as actual medical words.

As this pilot study aimed at validation of a new version of the test, sensitivity has been favored, appraising the skills of young educated and informed populations. The study consisted in the administration of the IMETER to undergraduate students of the Sapienza University of Rome, attending different biological, humanistic and technical faculties, such as Medicine (3rd year of the study course), Arts and Engineering (every year of the study course). The questionnaire was administered to the students attending a lesson of whatever matter, in the few minutes previous the start of lectures.

The test was voluntary and anonymous: it had to be completed within 2 minutes and immediately handed back to the attending personnel of the Departments. The existence and pertinence of the Italian medical terms were verified according to web Italian medical dictionaries (7, 8). This kind of tests aims to measure reading and recognition abilities of single words, where sound like and/or similarity of actual and non-actual terms are specific to each single language; therefore, no specific cross-cultural approach was adopted and no backward translation was performed from Italian into English. Still, attention was given to align the Italian version to the original questionnaire.

The average score (mean number of actual words checked-off) and average adjusted score (mean number of words correctly checked minus number of non-actual words checked-off) were evaluated in each group. As for the English version, HL skills were defined as the number of words correctly recognized: 0–20= low, 21–34= marginal, 35–40= functional HL. Few demographic variables were collected (age, sex, faculty and course year, type of secondary school education), avoiding nationality and mother tongue to completely respect anonymity, considering that the population samples were small and ascertained. Moreover, good recognition of actual local language terms is required to

medical doctors and students, regardless their geographical origin.

Internal consistency of IMETER was evaluated through the Cronbach (alpha) test. Statistical analyses were performed comparing average scores between groups and the frequency of "good" scores (35-40 = functional HL) in each group. The "zero" hypothesis to test was that no significant differences existed in HL skills between students attending different faculties, using two-tailed testing. Evaluations were performed using the GraphPad InStat version 3.10 for Windows 10 (GraphPad Software, San Diego California USA, www.graphpad.com) and MedCalc Statistical Software version 14.8.1 (MedCalc Software bvba, Ostend, Belgium; http://www.medcalc.org).

The Chairpersons of the Departments of Sapienza University of Rome involved in the survey have been informed in advance about the execution of the survey.

Results

Significantly different average scores and different average adjusted scores were observed between Medicine and Arts students and between Medicine and Engineering students (Dunn's Multiple Comparisons Test p<0.001), while no difference was detected between Arts and Engineering (p>0.05): therefore the last two were merged into one single Group, corresponding to "non-medical" Faculties.

Sixty-four medical (Group A) and 160 non-medical students (Group B) completed the form. No difference was observed between the two Groups, regarding gender; while mean age showed differences due to few aged subjects in Group B (Table 1).

IMETER showed a high degree of reliability in both groups A and B (Cronbach's alpha = 0.93 and 0.86, respectively). Frequency of subjects with functional HL (score ≥ 35) was significantly higher among the medicine students (p<0.0001 – Table 1 - Figure 1), as well as the average score and the average adjusted score (p<0.0001 – Table 1). Also, the mean score of wrong, non-actual words checked-off by medical students was much lower than in group B (p<0.0001).

No differences were observed in terms of functional HL (subjects with score ≥35) between genders (two-sided p = 1.0000), nor with respect to secondary education (p = 0.6916). No significant correlation was observed between score and age (Spearman r = 0.01333; 95% CI: -0.1221 to 0.1483; p = 0.843).

The sensitivity of the IMETER score in detecting subjects with low HL skills (non-medical students) was 89% and the specificity was 69%, with an area under the Receiver Operating Characteristics Curve (ROC) of 0.81 [95% CI: 0.76, 0.86 – p=<0,0001] – Figure 2.

Percentages for each actual word recognized by both groups are shown in Figure 3. Some usual terms, normally printed in medical materials (e.g. package inserts), such as "posologia" (posology), "parenterale" (parenteral), "ittero" (jaundice) were not identified frequently by subjects of group B. The same for common words related to infectious diseases, such as "zoster". Even less checked-off were specific, yet widespread words related to immunization (such as "calendario", referred to vaccination schedule) and to resistance ("resistenza", associated with antibiotic). Not all specifically "technical" medical terms (asplenia, impetigo,…) were recognized very frequently even by medical students.

Discussion

Four dimensions of HL competencies have been described: "access" refers to the ability to find health information;

Table 1 - Demographic Characteristics of the Samples and Performance on Measures of Interest

	Group A Medicine	Group B Arts & Engine- ering	Two-sided P-value 95% CI
Total n	64	160	-
Gender (F/M)	41 / 23	106 / 54	Fisher's Exact Test P 0.7578
Age (mean ± SD)	21.69 ± 1.52	24.31 ± 6.63	Mann-Whitney Test P 0.0020 §
Score ≥35 / total (%)	44 / 64 (69%)	18 / 160 (11 %)	Fisher's Exact Test P < 0.0001
Score actual words (mean ± SD)	33.86 ± 6.61	28.79 ± 5.60	Mann-Whitney Test P < 0.0001 §
Score non-actual words (mean ± SD)	1.66 ± 2.63	3.73 ± 3.63	Mann-Whitney Test P < 0.0001 §
Score, adjusted* (mean ± SD)	32.20 ± 8.23	25.08 ± 6.42	Mann-Whitney Test P < 0.0001 §

*= number of actual words checked-off minus number of non-actual words checked-off
§= As input data didn't pass the normality KS test, a non-parametric test was preferred
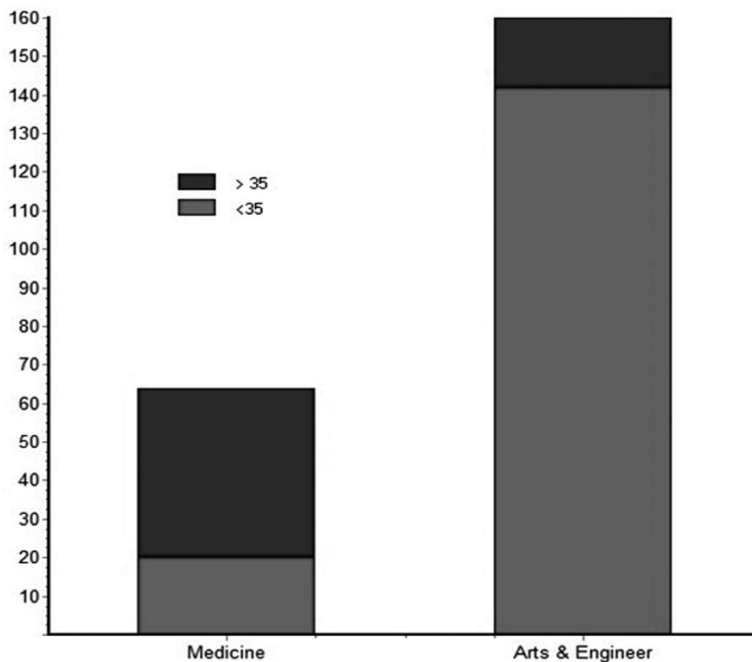

Figure 1 - Difference of distribution of functional HL (score ≥ 35 – dark bars) in Group A (Medicine) and Group B (Arts & Engineering) - Fisher's Exact Test: two-sided P value < 0.0001
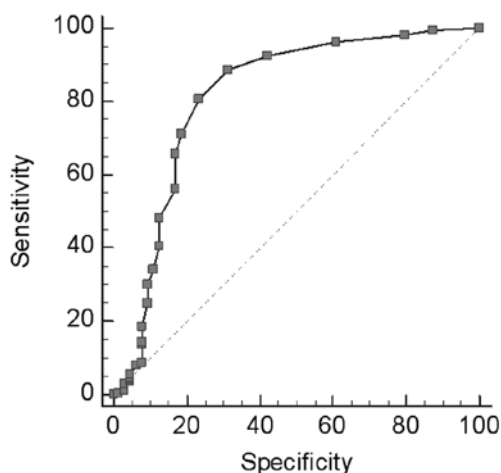
Figure 2 - Receiver Operating Characteristics Curve (ROC) for IMETER score in non-medical students. Area under the curve: 0.81 [95% CI: 0.76, 0.86 – P=<0,0001]

"understand" concerns the comprehension of the accessed information; "appraise" is the capability to interpret the information; "apply" represents the skill to use the information to make a decision to improve health (9).

Thus, the tools developed to measure HL skills vary from simple screening items to performance based measures. These instruments use either a direct testing of individuals' abilities (objective measurement) or the elicitation of self-reported abilities (subjective measurement). In studies using the objective measurement approach, patient abilities are assessed by solving tasks dealing with print literacy, numeracy or oral literacy, whereas the subjective approach is characterized by the self-report of perceived abilities in multiple domains. The combination of both measurement modes (objective and subjective) can be found in some instruments (10).

Most of the available tools have been validated in the United States. Some of them have been translated into other languages: the Newest Vital Sign (NVS) and S-TOHFLA tests have been translated into Italian and validated (11, 12) although not yet used in large studies or clinical settings. A European HL Survey (HLS-EU) has been carried out in eight countries measuring functional HL using a self-report survey. This measure was administered also to a sample of Italian citizens. Findings suggested that inadequate HL is problematic in Italy, as well as in other European countries (13).

The new Italian test, IMETER, like the originating English measure, can be categorized into the objective measurement approach. It is a brief self-administered screening tool (two minutes administration time) including 40 medical words and 30 words without an actual medical significance (non-words), aiming at the identification of the medical terms. The results of this study show a high degree of reliability and good validity of the test when ascertaining the skills of students educated in medical matters and those of non-biological faculties, indicating the potential capability of the tool to screen low HL in larger populations. Actually, although inadequate HL skills have been already documented in Italy, it is advisable that investigators continue measuring and reporting literacy skills to confirm previous observation, using both subjective and objective instruments.

The main limit of the present study is the restricted sample size (undergraduate students). Additional work will be useful to confirm the results and establish the adequacy of the cutoff points of the test and its correlation with the results of widespread measurement tools should be evaluated, although these are not yet diffused in Italy. However, IMETER's quick and easy administration method can be useful not only in clinical settings, but also to ease the implementation of future larger studies. The concentration of medical terms related to infectious diseases (prevention and treatment) may represent another limit

Arts & Eng	Med	Actual words		p
156	62	Polmonite	Pneumonia	0.5299
44	49	Zoster	Zoster	0.0001
67	44	Posologia	Posology	0.0284
149	62	Sifilide	Syphilis	0.4676
126	55	Controindicazioni	Controindication	0.3858
18	4	Calendario	Schedule	0.2187
40	59	Antibiogramma	Antibiogram	0.0001
130	61	Meningococco	Meningococcus	0.2617
130	52	Pustola	Pustule	0.5446
153	58	Batterio	Bacterium	0.4427
108	59	Anafilassi	Anaphylaxis	0.0947
141	58	Gravidanza	Pregnancy	0.4906
153	60	Diagnosi	Diagnosis	0.5053
100	62	Ittero	Jaundice	0.0292
154	61	Linfonodi	Lymph nodes	0.5238
22	30	Asplenia	Asplenia	0.0001
156	63	Epatite	Hepatitis	0.5237
155	61	Asma	Asthma	0.5116
144	61	Infiammatorio	Inflammatory	0.4349
153	63	Anemia	Anemia	0.4869
120	55	Stress	Stress	0.3050
93	44	Disinfezione	Disinfection	0.2750
142	62	Papillomavirus	Papillomavirus	0.3794
156	60	Antibiotici	Antibiotics	0.4686
29	47	Parenterale	Parenteral	0.0001
155	62	Chemioterapia	Chemotherapy	0.5421
24	38	Impetigine	Impetigo	0.0001
131	57	Prescrizione	Prescription	0.3896
148	61	Convulsioni	Seizures	0.4858
116	52	Avvertenze	Warnings	0.3442
131	54	Dose	Dose	0.4884
114	49	Orale	Oral	0.4179
149	61	Varicella	Smallpox	0.4984
140	55	Somministrazione	Administration	0.5107
47	53	Resistenza	Resistance	0.0001
96	55	Eruzione	Rash	0.0686
144	50	Germi	Germs	0.2982
139	60	Gonorrea	Gonorrhoea	0.4013
101	61	Immunizzazione	Immunization	0.0385
89	47	Fungo	Fungus	0.1413

Figure 3 - Percentages (bars) and absolute numbers of actual medical terms (and English translation) checked-off by students from group A (Medicine, n=64) and group B (Arts and Engineering, n=160); Fisher's exact test one-tailed

of this study. Actually, this approach was adopted to focus the measurement on two main current topics of Public Health, such as vaccination and antibiotics use.

General education not necessarily matches with HL, whose improvement is a crucial requirement to enhance the empowerment of the population and the functioning of future health care organizations. In view of this, institutions, scholars and practitioners should consider to a much greater extent the relevance and the opportunity of its measures.

Riassunto

Validazione in lingua italiana di METER: uno "screener" semplice di Health Literacy (HL)

L'alfabetizzazione sanitaria corrisponde alla capacità individuale di ottenere, capire e trattare le informazioni di salute necessarie per prendere decisioni adatte alla propria salute. Essa condiziona la capacità delle persone di accedere ed utilizzare il sistema sanitario, interagire con gli operatori e prendersi cura di se stessi. Esistono test consolidati, in grado di misurare i livelli di alfabetizzazione sanitaria, che hanno però limitazioni pratiche nella pratica clinica (necessità della presenza

Annex 1 - Medical actual and non actual terms included in the IMETER test

1		Antitetranico
2		Polmonite
3		Zoster
4		Posologia
5		Polmomielite
6		Sifilide
7		Controindicazioni
8		Calendario
9		Antibiogramma
10		Allegoria
11		Parentale
12		Pandomico
13		Testino
14		Meningococco
15		Pustola
16		Cerpes
17		Batterio
18		Anafilassi
19		Poziente
20		Gravidanza
21		Diagnosi
22		Limpociti
23		Ittero
24		Linfonodi
25		Asplenia
26		Epatite
27		Respingente
28		Dittero
29		Asma
30		Infiammatorio
31		Anemia
32		Allegrene
33		Gravidismo
34		Stress
35		Ellargico

36		Disinfezione
37		Equipollente
38		Maloria
39		Papillomavirus
40		Alcolioso
41		Antibiotici
42		Antiregressivo
43		Parenterale
44		Chemioterapia
45		Occitanica
46		Nausia
47		Impetigine
48		Prescrizione
49		Aborigeno
50		Convulsioni
51		Avvertenze
52		Amoxacellina
53		Rottovirus
54		Dose
55		Orale
56		Varicella
57		Somministrazione
58		Locazione
59		Insonniaco
60		Autista
61		Resistenza
62		Pelvice
63		Vaccillaneo
64		Eruzione
65		Germi
66		Gonorrea
67		Tumico
68		Immunizzazione
69		Fungo
70		Contrapazione

di un operatore, tempo per completare il test, ecc.): per limitare questi limiti in USA è stato introdotto un test breve, auto-somministrabile, il Medical Term Recognition Test (METER). In questo studio una versione italiana di questo test (IMETER) è stata validata somministrandolo a studenti universitari iscritti alle facoltà di Medicina e a quella di Lettere ed Ingegneria. I risultati mostrano un alto grado di affidabilità e validità del test nel confrontare il livello di alfabetizzazione sanitaria degli studenti educati in materie mediche rispetto alle materie non biologiche, indicandone la capacità potenziale di selezionare bassi livelli di alfabetizzazione sanitaria nella popolazione generale. Malgrado i limiti dello studio (pilota), la somministrazione rapida e semplice dell'IMETER sembra essere utile non solo nella pratica clinica, ma anche per facilitare l'esecuzione di studi più ampi.

References

1. Ratzan SC. Health Literacy: communication for the public good. Health Promot Int 2001; **16**(2): 207-14. PMID:11356759; http://dx. doi. org/10.1093/heapro/16.2.207

2. Institute of Medicine of the National Academies (IOM). Nielsen-Bohlman L, Panzer AM, Kindig DA, Eds; Committee on Health Literacy, Board of Neuroscience and Bahaviotal Health. Health Literacy: a prescription to end confusion. Washington, DC: The National Academies Press, 2004: 97.

3. Castro-Sanchez E, Chang PW, Vila-Candel R, Escobedo AA, Holmes AH. Health Literacy and infectious diseases: why does it matter? Int J Infect Dis 2016; **43**: 103-10. PMID:26751238; http://dx.doi.org/10.1016/j.ijid.2015.12.019

4. Paasche-Orlow MK, Parker RM, Gazmararian JA, Nielsen-Bohlman LT, Rudd RR. The prevalence of limited Health Literature. J Gen Intern Med 2005, **20**(2): 175-84. PMID:15836552; doi:10.1111/j.1525-1497.2005.40245.x

5. HLS-EU Consortium: Comparative report of HL in eight EU member states. The European HL Survey HLS-EU. 2012. Available at: http://www.health-literacy.eu [Last accessed: 2017, Feb 13].

6. Rawson KA, Gunstad J, Hughes J, et al. The METER: A Brief, Self-Administered Measure of Health Literacy. J Gen Intern Med **25**(1): 67-71. PMID:19885705; doi:10.1007/s11606-009-1158-7

7. http://www.sapere.it/sapere/medicina-e-salute/enciclopedia-medica.html [Last accessed: 2017, Feb 13].

8. http://www.treccani.it/enciclopedia/medicina_(Dizionario-di-Medicina)/ [Last accessed 2017, Feb 13].

9. Sørensen K, Van den Broucke S, Fullam J, et al. Health Literacy and public health: A systematic review and integration of definitions and models. BMC Public Health 2012, **12**: 80. PMID:22276600; doi:10.1186/1471-2458-12-80

10. Altin SV, Finke I, Kautz-Freimuth S, Stock S. The evolution of Helath Literacy assessment tools: a systematic review. BMC Public Health 2014, **14**:1207. PMID:25418011; doi:10.1186/1471-2458-14-1207

11. Capecchi L, Guazzini A, Lorini C, Santomauro F, Bonaccorsi G. The first italian validation of the most widespread Health Literacy assessment tool: the Newest Vital Sign. Epidemiol Prev 2015; **39**(4 Suppl 1): 124-8. PMID:26499429

12. Connor M, Mantwill S, Schulz PJ. Functional Health Literacy in Switzerland—Validation of a German, Italian, and French Health Literacy test. Patient Educ Couns 2013; **90**(1): 12-7. PMID:23089240; doi:10.1016/j.pec.2012.08.018

13. Palumbo R, Annarumma C, Adinolfi P, Musella M, Piscopo G. The Italian Health Literacy Project: Insights from the assessment of Health Literacy skills in Italy. Health Policy 2016; **120**(9):1087-94. PMID:27593949; doi:10.1016/j.healthpol.2016.08.007

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