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Measuring health literacy in Italy: a validation study of the HLS-EU-Q16 and of the HLS-EU-Q6 in Italian language, conducted in Florence and its surroundings

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Abstract
Health literacy (HL) is the capacity of individuals, families, and communities to make sound health decisions in the context of everyday life: at home, at the workplace, and in the community, marketplace, healthcare sector, and political arena. The aim of this study, as a part of a research conducted in Florence (Italy) and its surrounding, is to validate the Italian version of the short form (HLS-EU-Q16) and of the short-short form (HLS-EU-Q6) of the HLS-EU-Q47, as a part of a research conducted to assess the level of HL in a population-based sample in Florence. Two-hundred twenty-three subjects (57% females; age: 53.7 ± 11.8 years) were interviewed. The results provided the first evidence for the reliability and validity of the HLS-EU-Q instruments (HLS-EU-Q16, HLS-EU-Q6, General-HL Index) in Italian general population. The differences in some of the results with respect to other published studies lay for specific cultural characteristics, that affect HL level and the relationships between HL, antecedents, and outcomes.

Key words
- public health literacy
- HLS-EU-Q16
- HLS-EU-Q6
- Italian language
- validation process

INTRODUCTION

Health literacy (HL) is the capacity of individuals, families, and communities to make sound health decisions in the context of everyday life: at home, at the workplace, in the community, marketplace, health care system, and political arena [1]. The concept of HL was originally limited to functional skills (i.e. basic reading, writing, and literacy skills) [2] that are needed to obtain, process, and understand health related information, but has been expanded to cover broader competences that are needed to communicate, navigate, and actively participate within modern health care systems [3]. Public health literacy can be viewed as an additional level, where individuals understand not only how health information affects them, but also the community and society [4], and where the acquisition of health knowledge is an integral part of HL, rather than a separate outcome [5]. Sørensen *et al.*'s integrated definition encompasses the public health perspective: "Health literacy is linked to literacy and entails people's knowledge, motivation, and competences to access, understand, appraise, and apply health information in order to make judgments and take decisions in everyday life concerning healthcare, disease prevention, and health promotion to maintain or improve quality of life during the course of life" [6].

Several instruments have been developed to measure HL and explore how health outcomes relate to HL, but only a few of them have the purpose or have been used to measure HL at the population level [7-11], although the measure of HL in the general population is considered an important step for achieving a more public health-literate society [4]. To measure HL in an adequate way for public health-oriented surveys of general population in Europe, the Health Literacy Survey (HLS-EU) was conducted in 2012 [12] using a new measurement tool developed from the conceptual model of Sørensen *et al.* [6]: the "47-item European Health Literacy Survey Questionnaire" (HLS-EU-Q47) [13]. Since 47 items were excessively time-consuming for some HL research-

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es, two short forms have been validated in seven languages to be used in the European Health Literacy Survey (English, Bulgarian, Dutch, German, Greek, Polish, and Spanish) to be used for efficient studies with some possibility to benchmark with researches that use the long form of the instrument [11, 14].

The aim of this study, as a part of a research conducted in Florence (Italy) and its surrounding, is to validate an Italian version of the short form (HLS-EU-Q16) and of the short-short form (HLS-EU-Q6) of the HLS-EU-Q47.

MATERIALS AND METHODS

Study design and sampling procedures

This study is a part of a research conducted to assess the level of HL in a population-based sample in Florence, and to validate some other HL measures in Italian language. The study protocol was published elsewhere [15]. Briefly, it adopted a cross-sectional design and was conducted in Florence, Italy, and its surroundings. The population-based sample was randomly selected from the registries of eleven general practitioners (GPs) working in primary healthcare centres of the municipality of Florence. The GPs were recruited using convenience criteria: according to the study protocol, the first eight to voluntarily join the study were included and were asked to randomly select 80 subjects among those registered as one of his/her patients [15]. Since oversampling was not enough to reach the sample size of 480, three more GPs were included, with a second random sample for the first eight. Overall, 984 subjects were selected.

Inclusion criteria were the following: 18-69 years of age, and Italian speaking (since the survey is conducted in Italian). Exclusion criteria included cognitive impairment, severe psychiatric diseases and end-stage diseases. Each GP verified the inclusion and exclusion criteria when selecting the sample.

Each subject was randomly allocated to one of the two arms of the research project (A and B), according to the questionnaires used during the interview (type I and type II questionnaires, respectively). To meet the specific aims of the present study, only B arm of the research were considered as only in this arm the HLS-EU-Q16 was administered [15].

Data collection

Data collection started in February 2017 and finished on 31st December 2017. Each selected subject was contacted via postal mail. Subjects received an information sheet signed by the GP and the person in-charge of the study, which included a short description of the study, an invitation to participate, and a consent form. Participants were asked to sign the consent form and return it via mail to the researchers in charge. The mail also contained the nutritional label of the Italian version of the Newest Vital Sign (NVS-IT). After receipt of the signed consent forms, the subjects were contacted for the computer-assisted telephone interview. Nine interviewers, who were part of the research group, made the phone calls. Written instructions on how to conduct the interview were drawn up and shared within the research team to standardize the procedure and limit interviewer bias. Each subject was randomly assigned to one of the nine interviewers and contacted a maximum of six times before being considered unreachable [15].

The questionnaire had a general section that includes questions on sociodemographic, familial data (antecedents), and health-related outcomes (consequences), as described in the previous paper [15].

In addition, the questionnaire included the NVS-IT and the HLS-EU-Q16 tools.

Health literacy measures

The HLS-EU-Q16 and the HLS-EU-Q6 are, respectively, the short form and the short-short form of the HLS-EU-Q47 [11, 14], developed by selecting 16 and 6 items, respectively, and already used both in general and specific populations [16-32]. The HLS-EU-Q47 includes 47 items covering 12 subdomains (including domains such as accessing and obtaining, understanding or appraising information relevant to healthcare, disease prevention, and health promotion), grouped in three sub-indices according to the domains of application of HL (healthcare, disease prevention, and health promotion) [13]. It is a self-reported tool with Likert-type responses ("very easy", "fairly easy", "fairly difficult", "very difficult") and an associated final score that measures interaction, comprehension, information seeking, application/function, decision-making/critical thinking, evaluation, responsibility, confidence, and navigation skills.

Correlations of both the HLS-EU-Q16 and the HLS-EU-Q6 with the index of the long form HLS-EU-Q47 were very high in the HLS-EU [11].

To generate the score of the HLS-EU-Q16, the items are dichotomized into two categories with two scores, "easy" ("fairly" or "very" easy = 1) and "difficult" ("fairly" and "very" difficult = 0). In this study, "don't know/refusal" answer was recoded as missing, as suggested by other Authors [22, 28, 30, 31, 33]. The scale score is calculated as the sum of the scores of each item and varied between 0 and 16. Only respondents who answered at least 14 items were considered, according to other studies [26, 28]. Considering the HLS-EUQ16 score, three levels of HL were defined: inadequate HL (0-8), problematic HL (9-12) and adequate HL (13-16). Moreover, according to Gele [30] and similarly to HLS-EU-Q47 score analysis, a General HL index (G-HL Index) was calculated as follows: G-HL Index = (mean-1) * (50/3) where "mean" is the mean of all participating items for everyone. For index calculation, only subjects who answered at least 14 items were considered as well.

Considering the score of the HL index (range: 0-50), four levels of HL were defined as for HLS-EUQ47: inadequate HL (0-25), problematic HL (25.1-33), sufficient HL (33.1-42), and excellent (42.1-50).

To generate the score of the HLS-EU-Q6, the categories and scores of the HLS-EU-Q47 were considered: "very easy" = 4; "fairly easy" = 3; "fairly difficult" = 2; "very difficult" = 1; "don't know/refusal" = missing. The scale score was the mean value and varied between 1 and 4. Only respondents who answered at least 5 items were considered [28].

The English versions of the HLS-EU-Q16 and the HLS-EU-Q6 have been translated in the Italian lan-

guage and adapted using standard procedures, including forward and backward translation (performed by Italian and English native speakers). A final Italian version was drafted and then shared and discussed with the members of the research group [34]. A previous paper reports the Italian versions of the tools adopted [15].

For the European Survey, the NVS was included in the study for comparison. It is a commonly used objective measure of functional HL. It was originally developed in the USA for English speakers and Spanish speakers and NVS has seen increased application in other countries including Italy (NVS-IT) [35, 36].

The NVS-IT consists of an ice cream nutrition label, with seven associated questions that measure literacy and numeracy. It produces a final score ranging from 0 to 6, allowing subjects to be classified in three categories-high likelihood of limited HL (score: 0-1), possibility of limited HL (score: 2-3) and adequate HL (score: 4-6). This instrument takes 3-5 min to be administered. Since the information needed to answer the questions had to be derived from the nutritional label, the label was included in the postal mail to be sent to the GP-assisted participants.

Statistical analysis

Data are presented as percentages or as means ± standard deviations. HLS-EU-Q16, HLS-EU-Q6, G-HL Index and NVS-IT scores were tested for normality using the Kolmogorov-Smirnov test.

Correlation analysis (Pearson or Spearman, depending on normality) between the single items, and between the scales scores were performed.

Cronbach's alphas for HLS-EU-Q16 and HLS-EU-Q6 score, as well as for G-HL Index were calculated as measures of reliability (internal consistence).

For comparison, associations between the HL scores (HLS-EU-Q16, HLS-EU-Q6, G-HL Index and NVS-IT), antecedents, and consequences were assessed using $\chi 2$ test or correlation analysis (Pearson or Spearman, depending on normality).

Statistical analysis has been performed using IBM SPSS Statistics for Windows, V.25.0 (IBM). For each analysis, an alpha level of 0.05 has been considered as significant.

RESULTS

A total of 452 subjects were interviewed (compliance equalled to 46.1%) considering both arms of the research project. The refusal rate was 15.6% while 38.2% was the rate for those unreachable. Two-hundred twenty-three subjects (57% females; age: 53.7 ± 11.8 years) were interviewed in the B arm of the study and the majority (96.9%) were Italian with high school (36.3%) or university (44.4%) degree, with a paid job (61%), made ends months quite or very easily with financial resources available (68.6%), and did not have any chronic diseases or long-term illnesses (50.7%) or had only one of them (32.3%).

Items responses

Table 1 reports the responses to the HLS-EU-Q items. The percentages of "don't know/refuse" responses varied from 0% to 14.3%. Item 8 (*…find information on how to manage mental health problems like stress or depression*) presented the highest percentages of "don't know/refuse" responses; for most of the other items the percentages of "don't know/refuse" responses were very low.

Items 12 (*…decide how you can protect yourself from illness based on information in the media*), 8 (*…find information on how to manage mental health problems like stress or depression?*) and 11 (*…judge if the information on health risks in the media is reliable*) reported the highest percentages of "very difficult" responses (19.7%, 19.3%, and 15.2%, respectively), while items 10 (*…understand why you need health screenings*), 9 (*…understand health warnings about behaviour such as smoking, low physical activity and drinking too much*), and 4 (*…understand your doctor's or pharmacist's instruction on how to take a prescribed medicine*) the highest percentages of "very easy" responses (68.6%, 65%, and 50.7%, respectively).

Most of the items was significantly correlated *(Table 2)*.

HLS-EUQ16, HLS-EUQ6 and G-HL Index

Cronbach's alphas for HLS-EU-Q16, G-HL Index, and HLS-EU-Q6 were 0.799, 0.769, and 0.672, respectively.

Eleven (5%) and 20 (9%) participants were excluded from generating the score of HLS-EU-Q16 and HLS-EU-Q6, respectively, due to excess of "don't know/refusal" responses.

HLS-EU-Q16, HLS-EU-Q6 and NVS-IT scores, and G-HL Index were not normally distributed. *Table 3* reports the descriptive analysis of the scores. NVS-IT score was J-shaped, with ceiling effect for higher HL, while HLS-EU-Q16 score, HLS-EU-Q6 score and G-HL Index were more like normal distribution *(Figure 1)*.

HLS-EU-Q16 and HLS-EU-Q6 were strongly correlated (Spearman rho: 0.861; $p < 0.05$). G-HL Index was strongly correlated with both HLS-EU-Q16 and HLS-EU-Q6 (respectively, Spearman rho: 0.856, $p < 0.05$; 0.881, $p < 0.05$). NVS-IT score was significantly correlated only with G-HL Index, with a low correlation coefficient (Spearman rho: 0.169; $p < 0.05$).

According to HLS-EU-Q16, 11.8% presented inadequate HL, 55.2% problematic HL%, and 33.0% enough HL; according to HLS-EU-Q6, 8.9% presented inadequate HL, 66.5% problematic HL%, and 24.6% enough HL. The concurrent classification between the two tests was 72.6%.

Considering G-HL Index, 13.2% presented inadequate HL, 42.9% problematic HL, 36.3% enough HL, 7.5% excellent HL.

According to NVS-IT, 11.7% presented high likelihood of limited HL, 28.7% possibility of limited HL, high 59.6% likelihood of adequate HL.

Comparison of predictors and outcomes

As far as antecedents are concerned, many differences emerged between the scores *(Table 4)*. The differences emerged between functional objective HL tool (NVS-IT) and self-reported tools (HLS-EU-Q16,

Table 1
Responses to the HLS-EUQ-16/6 items (percentages)

Area	On a scale from very easy to very difficult, how easy would you say it is to	Very easy	Fairly easy	Fairly difficult	Very difficult	Don't know/ refusal
HC	1. find information on treatments of illnesses that concern you?	13.0	61.0	19.7	4.5	1.8
HC	2. find out where to get professional help when you are ill?	23.3	47.1	22.0	6.3	1.3
HC	3. understand what your doctor says to you?	38.1	53.8	6.7	1.3	0.0
HC	4. understand your doctor's or pharmacist's instruction on how to take a prescribed medicine?	50.7	46.6	2.7	0.0	0.0
HC	5. judge when you may need to get a second opinion from another doctor?*	11.2	39.0	35.9	9.0	4.9
HC	6. use information the doctor gives you to make decisions about your illness?*	20.6	60.5	14.8	2.2	1.8
HC	7. follow instructions from your doctor or pharmacist?	36.3	60.1	2.7	0.9	0.0
DP	8. find information on how to manage mental health problems like stress or depression?*	9.4	18.4	38.6	19.3	14.3
DP	9. understand health warnings about behaviour such as smoking, low physical activity and drinking too much?	65.0	30.9	2.2	0.9	0.9
DP	10. understand why you need health screenings?	68.6	28.3	2.2	0.4	0.4
DP	11. judge if the information on health risks in the media is reliable?*	9.9	27.4	45.7	15.2	1.8
DP	12. decide how you can protect yourself from illness based on information in the media?	6.7	21.1	49.3	19.7	3.1
HP	13. find out about activities that are good for your mental well-being?*	18.4	48.0	22.9	4.5	6.3
HP	14. understand advice on health from family members or friends?	26.5	44.4	19.3	5.4	4.5
HP	15. understand information in the media on how to get healthier?*	14.8	38.6	37.2	8.1	1.3
HP	16. judge which everyday behaviour is related to your health?	37.2	43.5	15.7	2.2	1.3

*Items included in the HLS-EU-Q6. HC: Health Care; DP: Disease Prevention; HP: Health Promotion.

Table 2
Spearman correlation analysis of the HLS-EU-Q16/6 items

	Item 1	Item 2	Item 3	Item 4	Item 5°	Item 6°	Item 7	Item 8°	Item 9	Item 10	Item 11°	Item 12	Item 13°	Item 14	Item 15°	Item 16
Item 1	1.000															
Item 2	0.092	1.000														
Item 3	**0.207***	0.029	1.000													
Item 4	**0.159***	**0.200***	0.154*	1.000												
Item 5°	0.031	0.123	0.102	0.113	1.000											
Item 6°	**0.222***	0.123	**0.278***	0.062	**0.280***	1.000										
Item 7	0.054	0.036	**0.208***	**0.415***	0.098	0.215*	1.000									
Item 8°	**0.154***	**0.211***	**0.150***	0.046	0.177*	**0.212***	0.072	1.000								
Item 9	0.132	**0.169***	0.041	-0.030	0.078	-0.022	-0.035	0.002	1.000							
Item 10°	0.030	0.079	-0.050	-0.028	0.112	-0.010	-0.032	0.046	0.129	1.000						
Item 11	0.020	**0.166***	**0.155***	0.073	**0.307***	**0.187***	0.101	**0.230***	0.036	0.073	1.000					
Item 12	0.037	0.114	**0.142***	0.042	**0.156***	0.046	0.013	**0.266***	0.057	-0.019	**0.576***	1.000				
Item 13°	0.027	-0.045	**0.135***	0.067	**0.231***	0.120	0.025	**0.281***	-0.010	0.128	**0.172***	**0.153***	1.000			
Item 14	0.114	0.090	0.048	-0.042	**0.296***	0.060	-0.067	**0.149***	0.060	-0.042	0.069	0.060	0.096	1.000		
Item 15°	0.032	0.080	0.128	0.126	**0.233***	0.040	0.162*	**0.233***	0.043	0.013	**0.477***	**0.415***	**0.211***	**0.255***	1.000	
Item 16	0.073	0.078	0.081	-0.008	0.114	0.125	-0.092	**0.223***	0.112	-0.007	0.142*	0.112	0.194*	0.118	0.015	1.000

°Items included in the HLS-EU-Q6 test. *$p < 0.05$.

Table 3
Distributions of HLS-EU-Q16, HLS-EU-Q6, G-HL Index and NVS scores

		HLS-EU-Q16* (n = 212)	HLS-EU-Q6° (n = 203)	G-HL Index^ (n = 212)	NVS-IT# (n = 223)
Mean		11.3	2.6	32.3	4.0
Standard deviation		2.6	0.5	6.2	1.9
Skewness		-0.161	0.233	0.261	-0.518
Kurtosis		-0.479	-0.136	-0.044	-0.938
Range		5.0-16.0	1.33-4.00	16.67-48.96	0-6
Centiles	25	9.0	2.3	28.1	2.0
	50	11.0	2.6	32.3	4.0
	75	13.0	2.8	36.5	6.0

*°^#Kolmogorov-Smirnov test for normality: $p < 0.05$.

HLS-EU-Q6, and G-HL Index). Gender was associated with G-HL Index; age with NVS-IT; educational level was associated with all the HL scores except for G-HL Index; chronic diseases with HLS-EU-Q16 and G-HL Index. Income (financial resources and employment status) was associated with NVS-IT; having received training or is/has been employed in the field of healthcare was associated with HLS-EU-Q scores. Nationality and marital status were not associated with any HL scores.

Considering HL consequences, self-perceived health status was associated with each score, while BMI and health services used in the last 12 months were not associated with any HL scores.

DISCUSSION

According to Gazmararian *et al.* [4], an important step for achieving a more public health-literate society is to develop measures of public HL, to obtain baseline data on the magnitude of the problem, and to assess the impact of public health efforts to improve public HL. Considering this, a population-based study was conducted in Florence, to assess the level of HL using an already validated measurement tool (the NVS-IT), and to validate some HL measures in Italian language.

The HLS-EU-Q16 and the HLS-EU-Q6 versions that have been used in the study have shown a low percentage of "don't know/refuse" responses, aspects that give evidence on people's acceptance and understanding of the items.

Differently from the EU survey [37], the items regarding mental health (number 8 and 13) present the higher percentage of "don't know/refuse" responses (14.3% *vs* 5.6% for item 8, 6.3% *vs* 3.9% for item 13). As suggested by other Authors [11], the difficulty of item proposes instrument sensitivity, which should be country (and area) specific. Considering this, the high percentage of "don't know/refuse" responses for mental well-being and health problems highlights critical issues that should be due, on the one hand, to the lack

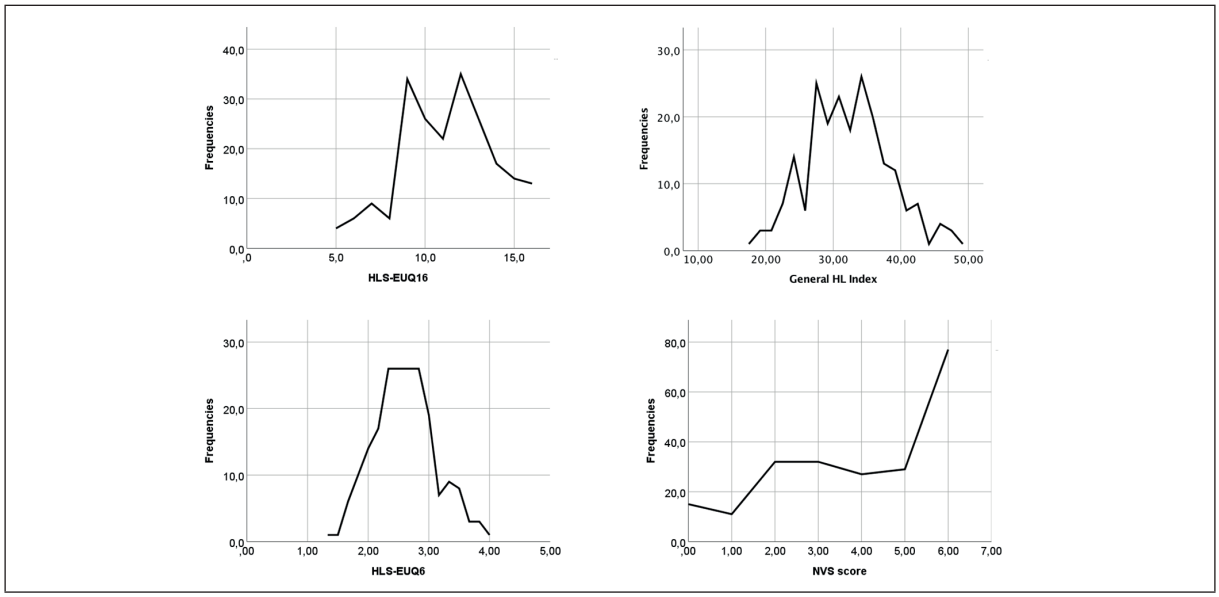

Figure 1
Distributions of HLS-EU-Q16, HLS-EU-Q6 and NVS scores.

Table 4
Antecedents and consequences of HL: association with different HL measures (Chi² test)

Variables		HLS-EU-Q16 (n = 212)	HLS-EU-Q6 (n = 203)	G-HL Index (n = 212)	NVS-IT (n = 223)
Antecedents	Gender	p ≥ 0.05	p ≥ 0.05	**p < 0.05**	p ≥ 0.05
	Age*	p ≥ 0.05	p ≥ 0.05	p ≥ 0.05	**p < 0.05**
	Nationality	p ≥ 0.05	p ≥ 0.05	p ≥ 0.05	p ≥ 0.05
	Educational level	**p < 0.05**	**p < 0.05**	p ≥ 0.05	**p < 0.05**
	Financial resources	p ≥ 0.05	p = 0.05	p ≥ 0.05	**p < 0.05**
	Training or employed in the field of healthcare	**p < 0.05**	**p < 0.05**	**p < 0.05**	p ≥ 0.05
	Employment status	p ≥ 0.05	p ≥ 0.05	p ≥ 0.05	**p < 0.05**
	Long-term illnesses (yes/not)	**p < 0.05**	p ≥ 0.05	**p < 0.05**	p ≥ 0.05
	Marital status	p ≥ 0.05	p ≥ 0.05	p ≥ 0.05	p ≥ 0.05
Consequences	Self-perceived Health status	**p < 0.05**	**p < 0.05**	**p < 0.05**	**p < 0.05**
	BMI class	p ≥ 0.05	p ≥0.05	p ≥ 0.05	p ≥ 0.05
	Doctor visits	p ≥ 0.05	p ≥0.05	p ≥ 0.05	p ≥ 0.05
	Emergency department admissions	p ≥ 0.05	p ≥0.05	p ≥ 0.05	p ≥ 0.05
	Hospitalizations	p ≥ 0.05	p ≥0.05	p ≥ 0.05	p ≥ 0.05
	Outpatients specialist care access	p ≥ 0.05	p ≥0.05	p ≥ 0.05	p ≥ 0.05

*Spearman correlation analysis.

of experience on mental problems by the interviewed subjects, and, on the other hand, to the prejudice and denial that still surrounds these issues.

The items were partly significantly correlated with each other. This datum, as well as the responses to each single item, present a good diagnostic opportunity to identify topics where citizens have difficulties with specific health-related tasks, to plan specific interventions to improve HL. For example, for the health care area, almost all the items present a percentage of very/fairly easy response greater than 70% (with the exception of item 5 "*…judge when you may need to get a second opinion from another doctor?*"), indicating a good relationship, trust and understanding between the subjects and their doctors or other health personnel. Instead, in our sample it resulted more difficult to understand and process advice and information reported by the media, friends and family (items 11, 12, 14, 15). As far as the media were concerned, data also portrays difficulties in judging the reliability of the information on health risks provided, and that item (number 11) is significantly correlated (r = 0.576) with those related to the understanding of the information in the media on how to get healthier (item number 15). This result raised criticism in the information on health provided by the media, as perceived by people included in the research, that must be investigated with specific studies on Media HL [38].

On the other hand, two items were poorly correlated with the others: the item 9 (*"…understand health warnings about behaviour such as smoking, low physical activity and drinking too much?*) was significantly correlated only with one item, and the number 10 ("*…understand why you need health screenings?*") with none, probably due to ceiling effect linked to the high percentages of "very easy" responses.

Considering the HLS scores, the number of participants that were excluded from the analysis due to excess of "don't know/refusal" responses were very low (11 and 20 for the HLS-EU-Q16 and the HLS-EU-Q6, respectively), confirming people's good acceptance of the test.

The results of the study present many differences with respect to other published researches. First of all, the level of HL measured using the HLS-EU-Q tools was lower than those observed in other population-based researches [11, 14, 20], while considering the NVS-IT there was the opposite situation [37]: it seems that, in our sample, there is a high objective functional HL, and a low subjective HL. Moreover, the distribution of the scores results quite different than those observed in the European Survey [11, 14]: in our study, the HLS-EU-Q16 and HLS-EU-Q6 scores are well shaped (similar to normal distribution) while in the HLS-EU survey the HLS-EU-Q16 score was J-shaped (as for the NVS-IT in this study) and the HLS-EU-Q6 score was well shaped. The difference in the HLS-EU-Q16 score distribution is due to the percentage of subjects classified as with problematic HL (score: 9-12), while in the European survey there is a ceiling effect for better HL. On the other hand, the same ceiling effect for better HL was observed in this study for what concerns NVS-IT differently from the European data. Furthermore, HLS-EU-Q scores do not significantly correlate with NVS-IT, while in the European Survey a significant – but low – positive correlation was observed [37]. Finally, the association between HL, antecedents and outcomes presents different results with respect to published data [12, 20].

The observed differences should be due to dissimilarities in the characteristics of the sample: although a population-based sample was investigated, the high percentage of unreachable subjects could have introduced a selection bias – a limitation of the study. Moreover, to

have conducted the study on subjects recruited through the GPs may have added a bias in the responses to the HLS-EU-Q items due to social desirability, embarrassment or reverence. The NVS-IT, as an objective measure, could have been less influenced by those biases.

Part of the differences could also be due to cultural aspects, peculiar of the Italian population – and of the Florentine one. Since HL is a dynamic construct and the cumulative outcome is a combination of cognitive capacities, life experiences, knowledge, opportunities, and the context [38, 39], so the culture, the setting (i.e. healthcare, education welfare, social and market systems, the cultural norms, the role of the family, and the usability of media sources), and the history of a country – and that of a specific area in the country – could also contribute to explain the differences across geographical areas and populations in the distribution of HL as a whole and of its different domains (functional, critical and interactive, in Nutbeam's perspective), as well as in the relationship between HL, its antecedents and consequences. As a matter of fact, the Florentine population has higher life expectancy, as well as educational level, employment rate, and financial resources than those observed in the rest of the Tuscan and Italian population [40], probably as a result of a better general context (i.e. healthcare, education welfare, social and market systems).

For these reasons, local studies must be encouraged, using different measurement tools.

In conclusion, the results provide the first evidence for the reliability and validity of the HLS-EU-Q instruments (HLS-EU-Q16, HLS-EU-Q6, General-HL Index) in Italian general population, which should be confirmed with larger samples. Since HLS-EU-Q6 has been included in 2017 in the Italian lifestyle surveillance systems (PASSI – Progress by local health units towards a healthier Italy), limited to the Tuscan sample as a pilot test, the first confirmation of the reliability and applicability of this instrument will come in the next months by analysing PASSI data. Moreover, the differences in antecedents and consequences of HL with respect to other published studies and the scores itself lay for specific cultural relationships between HL, antecedents and outcome.

Author's contribution statement

Chiara Lorini: conception and design of the study; analysis and interpretation of data; drafting and revision of the manuscript. Vieri Lastrucci: conception and design of the study; generation, collection, assembly and interpretation of data; drafting and revision of the manuscript. Sarah Mantwill: conception and design of the study; drafting and revision of the manuscript.Virginia Vettori: conception and design of the study; generation, collection, assembly of data; drafting and revision of the manuscript. Guglielmo Bonaccorsi: conception and design of the study; interpretation of data; drafting and revision of the manuscript. Other component of the Florence Health Literacy Research Group: conception and design of the study; generation, collection, assembly of data; drafting and revision of the manuscript.

Conflict of interest statement

The authors declare no conflict of interest.

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