Ann Ig 2025 May-Jun; 37(4): 512-522. doi: 10.7416/ai.2025.2704. Epub 2025 Apr 18.

Measuring Health Literacy among seniors: validation of the European Health Literacy Survey Questionnaire 6 in the Tuscan PASSI sample

Guglielmo Bonaccorsi[1], Patrizio Zanobini[1], Claudia Biagi[1], Michele Volpi[1], Valentina Possenti[2], Valentina Minardi[2], Maria Masocco[2], Giovanna Mereu[3], Rossella Cecconi[3], Giorgio Garofalo[3], Chiara Lorini[1]

Keywords: Health literacy; HLS-EU-Q6; validation process; older adults; seniors
Parole chiave: Alfabetizzazione sanitaria; HLS-EU-Q6; processo di validazione; anziani

Abstract

Background. *The demographic transition has led to an increase in the older population, resulting in a rise in individuals with comorbidities and reduced self-sufficiency. Low health literacy levels are associated with poor health outcomes especially among vulnerable groups (like older individuals). Enhancing health literacy through targeted programs is crucial for improving self-care in chronic conditions. To date, in Italy, there are no validated tools to measure health literacy in older people. Thus, the aim of this study is to validate the European Health Literacy Survey Questionnaire 6 in a Tuscan (Italy) sample of senior individuals.*
Study design. *Cross-sectional.*
Methods. *The sample was drawn from the Surveillance System of Advancements in health of the Italian Local Healthcare Units from 2017 to 2019. Item analysis, Cronbach's alpha and confirmatory factor analysis were used to validate the scale. Additionally, associations between Health Literacy levels and sociodemographic characteristics were analyzed.*
Results. *A total of 11,000 subjects were interviewed, with 1,080 (10%) aged 65-69. Cronbach's alpha was 0.89. In the older subgroup, the percentage of missing responses ranged from 4.54% to 11.85%, with the fourth item having the highest percentage of missing values. The confirmatory factor analysis revealed that the three-factor model showed a better fit to the data compared to the unidimensional model. Similar findings were observed in the 18-65-year-old population. In both groups, individuals with economic difficulties or lower education were at higher risk of having inadequate levels of health literacy. Moreover, in the 18-64 age group, being female reduced the probability of having an inadequate health literacy level, while being inactive/retired or a foreigner increased it.*
Conclusions. *The study provides preliminary evidence supporting the validity and reliability of the European Health Literacy Survey Questionnaire 6 for assessing health literacy in the Italian older population. Further research is necessary to confirm these findings, particularly in samples of individuals aged over 69 years.*

[1] *Department of Health Sciences, University of Florence, Italy*
[2] *Centro Nazionale per la Prevenzione della Malattie e la Promozione della Salute, Istituto Superiore di Sanità, Rome, Italy*
[3] *Department of Prevention, Azienda Unità Sanitaria Locale (AUSL) Toscana Centro, Florence, Italy*

Annali di Igiene : Medicina Preventiva e di Comunità (Ann Ig)
ISSN (print) 1120-9135 ISSN (online) 3035-5559

https://www.annali-igiene.it

Introduction

According to the World Health Organization (WHO), between 2000 and 2050, the population over 65 years old is expected to double (1). The 2022 Annual Report of Italian Statistics confirmed that Italy remains one of the world's oldest countries (2), with Tuscany being one of its oldest regions, with an aging index (the percentage ratio between the population aged 65 and over and the population aged 0-14) increased from 211.4 in 2019 to 214.6 in 2020 (3). While the rise in longevity is one of the most remarkable achievements in human history, increased lifespan is not necessarily synonymous with healthy aging (1).

The demographic transition has led to an increase in the older population and, consequently, in the proportion of non-self-sufficient individuals affected by one or multiple chronic diseases (4). Older patients may be required to manage their complex health conditions within a context marked by the weakening of family and social support networks.

Among the determinants of health, even in old age, health literacy (HL) holds a significant place (5,6). HL has been defined by Sørensen et al. as a multidimensional concept that refers to individual's knowledge, motivation, and skills to access, understand, evaluate, and apply health information in order to make decisions regarding healthcare, disease prevention, and health promotion to maintain or improve quality of life throughout their lifespan (7).

Many studies indicate that socioeconomic status, race, cognitive abilities, educational attainment, and age can impact HL levels. Lower HL levels are associated with adverse health outcomes, increased unhealthy behaviors, reduced utilization of preventive healthcare services, and higher drug consumption (8,9). These effects are even more pronounced among older individuals, as cognitive impairments may hinder understanding and processing of new information, resulting in lower HL (10,11).

Therefore, investing in programs that enhance HL in this vulnerable population segment is key to improving self-care in chronic conditions, providing individuals with effective resources for helping them better manage their health (12).

The first step toward achieving this goal is to ensure that adequate instruments are available to measure HL in this target population. A review of the literature from 1993 to 2021, identified 151 HL measurement instruments: 39 were general health literacy instruments, 90 condition specific (disease or content), and 22 were populations-specific (13). Among those 22, only two focused on older people (a Korean and a Taiwanese scale). Therefore, the review revealed that, while there are validated tools for this target in clinical settings, none exist for the general older adult population. The review also highlights the European Health Literacy Survey Questionnaire (HLS-EU-Q), in its various versions, as one of the most widely used instruments in Europe with potential for universal application. Thus, the purpose of our study is to evaluate the psychometric properties of the HLS-EU-Q6, previously validated in Italian language (14), in a sample of older individuals, aged 65 to 69, within the PASSI (Progressi delle Aziende Sanitarie per la Salute in Italia) surveillance system, in Tuscany.

Materials and Methods

Since 2008, PASSI has been collecting data on the prevalence of some major modifiable risk factors among the adult population living in Italy (15-17). This system involves Local Health Units (LHUs) under the supervision and coordination of the Italian National Institute of Health, known as the Istituto Superiore di Sanità (ISS), that ensure technical-scientific support and methodological rigor in every phase of the survey. PASSI implements the "behavioral risk factor surveillance" (BRFS) model, developed by the US Centers for Disease Control and Prevention (18).

The BRFS approach focuses on near-continuous data collection and aims to support health promotion and public health decision-making by providing relevant information on behavioral risk factors. To gather this information, a standardized questionnaire is used, consisting of over one hundred questions grouped into 12 modules. These modules investigate the lifestyles of adults aged 18 to 69 and their adherence to preventive measures and programs.

Over the years, additional modules have been proposed by various regions or institutions such as ministries or universities to address specific public health information needs. One such example is the introduction of a module to measure HL in 2017 (19,20). This module was added to the core PASSI questionnaire administered to the Tuscan population, building on experiences from other countries with similar surveillance systems or health surveys.

The inclusion of the HL module reflects the growing importance of HL in addressing public health challenges. By collecting data on HL levels, PASSI can provide valuable insights into the population's ability to access, understand, and utilize health

information. This data can inform the development of targeted health promotion strategies and interventions to improve health outcomes in Italy.

Study population, sampling criteria and data collection

Data was collected between 2017 and 2019 from a population-based sample of the PASSI system in Tuscany. In each participating LHU, a monthly random sample was drawn from the list of residents aged 18 to 69, stratified by gender and age to be proportional to the distribution in the general population. Exclusion criteria were unavailability of a phone number, inability to communicate in Italian, and being institutionalized during the survey period.

Once the sample had been selected, individuals were sent a letter outlining the purpose of the surveillance system and personal data processing. The letter invited individuals to provide the phone number where they wished to be contacted to schedule the interview or, alternatively, to express their refusal to participate. Trained personnel from the public health departments of each LHU conducted the interviews, with the option to use the CATI (computer-assisted telephone interview) method. To ensure contact, a minimum of six attempts were made on different days of the week, including weekends, and at various times throughout the day. If a person could not be reached, a replacement from the same gender and age group was randomly chosen. Since the interviews were conducted by phone, obtaining and storing the consent for personal data processing was not feasible. Afterward, the data were anonymized and electronically stored in a national database, and interviews conducted throughout each calendar year were then compiled into an annual dataset.

Measures

Data collection included socio-demographic determinants, such as gender (male or female), age, which we categorized as "adults" (18-64 years) and "young seniors" (over 65 years), education level, which was dichotomized into "low" (secondary school diploma or lower) and "high" (high school diploma or higher). Nationality (Italian or foreign) and occupational status were also recorded, with the latter divided into three categories: employed, looking for work, and inactive. Finally, financial status was assessed by asking respondents about their ability to manage personal or familial financial resources at the end of the month; responses were grouped into "good" (comprising "very easily" and "quite easily") and "poor" (consisting of "with some difficulties" and "with many difficulties") for analytical purposes.

The HL level of participants was assessed using the HLS-EU-Q6, a shortened version of the HLS-EU-Q47 questionnaire, developed by selecting 6 items and already used both in general and specific populations (14,21). The HLS-EU-Q6 is a self-reported tool with Likert-type responses, where participants indicate their perceived ease or difficulty in understanding (item 1), appraising (item 2), accessing (item 3) health-related information and applying (item 4,5,6) the knowledge gained to address or solve a health problem. The response options are: "very easy," "fairly easy," "fairly difficult," and "very difficult." Each response option is assigned a score: "very easy" = 4, "fairly easy" = 3, "fairly difficult" = 2, and "very difficult" = 1. Response of "don't know" or refusal to answer was recorded as missing, as suggested by other authors (22,14). To calculate the final scale score for each participant, the mean value of their responses is computed. The scale score can range from 1 to 4, with higher scores indicating better HL. To be included in the analysis, respondents had to answer at least five of the six items. Based on the final scale scores, the following levels of HL are defined: Inadequate HL ($1 \leq x \leq 2$); Problematic HL ($2 < x < 3$); Sufficient HL ($3 \leq x \leq 4$).

Statistical analysis

We divided our sample into 2 subgroups: the first consisting of adults aged 18-64 and the second consisting of young seniors aged 65-69. For each subgroup we proceeded with the HLS-EU-Q6 scale evaluation. First, we performed item analysis to examine the distribution of the responses, determine the percentage of missing items (that is, a proxy of item difficulties and comprehensibility) and assess the presence of ceiling or floor effects (i.e., limits in variability due to an excess of at least 20% of responses in the highest or lowest category, respectively). Second, we tested reliability using Cronbach's α. Third, we explored the dimensional structure of the HLS-EU-Q6 using confirmatory factor analysis (CFA). Three models were fitted: a one-factor model, a three-factor model according to the 3 domains of the HLS-EU-Q6 - health promotion (items 1 and 2), disease prevention (items 3 and 4) and health care (items 5 and 6) - and a two-order model theorized by Pelikan et al. (23). Fit indices used included the comparative fit index (CFI) and Tucker-Lewis index (TLI), with a good fit indicated by values >0.95, a poor fit by values <0.90, and acceptable fit falling between these thresholds. The

root mean square error approximation (RMSEA) was also used, with a good fit indicated by values <0.06, a poor fit by values >0.10, and an acceptable fit by values in between (24). Finally, to assess the convergent and discriminant validity of the HLS-EU-Q6, a multivariate logistic regression model was created for each subgroup to investigate predictors of inadequate HL levels. According to literature, lower HL was expected to be predicted by lower education levels, poorer perceived financial situations, unemployment, and foreign nationality (25-27). For each analysis, an alpha level of 0.05 was considered significant. The analyses were conducted using STATA 18 Now.

Results

Sample description

A total of 11,000 subjects were interviewed by PASSI Surveillance System in the Tuscany region. Of these, 9,654 were aged 18-64 (49.04% male; 42.17% with poor economic status; 28.01% with low educational attainments; 28.55% not employed; 7.52% with foreign citizenship) and 1,080 were aged 65 and older (51.36% male; 41.23% with poor economic status; 53.76% with low education level; 2.22% with foreign citizenship). Both age groups had comparable levels of HL. Specifically, 64.21% of adults and 56.51% of young seniors had sufficient HL, 27.49% and 30.21% faced problematic HL and 8.30% and 13.28% had inadequate HL, achieving a total average score of 2.07 (SD 0.53) and of 2.21 (SD 0.56), respectively (Table 1). Considering the mean HL scores within each domain - healthcare, disease prevention and health promotion - similar values were observed between the two groups: 2.04, 2.16 and 2.03 respectively in the adult group and 2.11, 2.32 and 2.19 in the young senior group.

Item analysis

Table 2 reports the item responses. The percentage of missing responses ranged from 3.21% to 8.66% for adult respondents, and from 4.54% to 11.85% for young seniors. For both subgroups, the highest percentage of missing values was for the third item: "Find information on how to manage mental health problems like stress or depression". Neither ceiling nor floor effects were observed.

Table 1 - Sample characteristics.

Variables	Age (years)			
	18-64 (N=9,654)		65+ (N=1,080)	
	%	CI	%	CI
Gender				
Male	49.04	48.63 - 49.46	51.36	48.71 - 54
Female	50.96	50.54 - 51.37	48.64	46.0 - 51.29
Education				
High	71.99	71.08 - 72.88	46.24	43.24 - 49.26
Low	28.01	27.12 - 28.92	53.76	50.74 - 56.76
Nationality				
Italian	92.48	91.91 – 93.0	97.77	96.63 - 98.53
Foreign	7.52	6.99 - 8.09	2.22	1.47 - 3.37
Financial status				
Poor	42.17	41.16 - 43.18	41.23	38.26 - 44.26
Good	57.83	56.82 - 58.84	58.77	55.74 - 61.74
Employment status				
Employed	71.45	70.57 - 72.32	14.44	12.45 - 16.69
Looking for work	7.68	7.16 - 8.23	0.57	.25 - 1.23
Inactive	20.87	20.08 - 21.67	84.99	82.71 - 87.01
Health Literacy				
Inadequate	8.3	7.73 – 8.9	13.28	11.24 – 15.62
Problematic	27.49	26.55 – 28.46	30.21	27.34 – 33.25
Sufficient	64.21	63.18 – 65.22	56.51	53.3 – 59.66

Table 2. Percentages of item responses for HLS-EU-Q6.

Domains	ITEM	18-64 (n. 9654)						65+ (n. 1080)					
		Very difficult	Fairly difficult	Fairly Easy	Very easy	Missing	Domain mean	Very difficult	Fairly Difficult	Fairly Easy	Very easy	Missing	Domain mean
Health promotion	1. Understand information in the media on how to get healthier?	16.88	64.59	12.45	2.86	3.21	2.03	10.19	61.76	17.59	4.63	5.83	2.19
	2. Find out about activities that are good for your mental well-being?	16.05	59.96	14.91	3.19	5.89		10.28	57.59	18.80	5.74	7.59	
Disease prevention	3. Judge if the information on health risks in the media is reliable?	11.90	59.70	20.39	4.11	3.91	2.16	7.50	53.24	25.46	6.57	7.22	2.32
	4. Find information on how to manage mental health problems like stress or depression?	11.87	56.69	18.41	4.37	8.66		6.76	52.31	22.69	6.39	11.85	
Healthcare	5. Use information the doctor gives you to make decisions about your illness?	17.03	64.35	12.40	2.21	4.02	2.04	14.26	64.07	14.44	2.69	4.54	2.11
	6. Judge when you may need to get a second opinion from another doctor?	14.46	58.06	18.07	3.41	6.01		11.67	58.61	19.07	4.07	6.57	

Reliability and confirmatory factor analysis (CFA)

Cronbach's alpha coefficients for the adult and young senior questionnaires were calculated to assess internal consistency, yielding values of 0.88 and 0.89, respectively (Table 3). These results indicate a high level of reliability for both subgroups.

The results indicated that for both subgroups, the three-factor model provided a better fit to the data than the unidimensional model (Table 4). However, computational issues (specifically, a non-positive information matrix) precluded a reliable assessment of fit indices for the two-order CFA model.

According to the multivariate logistic regression analysis, both subgroups with good economic status and higher education levels had significantly lower adjusted odds ratios for inadequate HL levels. Conversely, being a foreign citizen significantly increased the likelihood of having inadequate HL. Additionally, in the 18-64 population, being female reduced the likelihood of inadequate HL, while being unemployed or retired increased the likelihood of having an inadequate HL (Table 5).

Table 3 - Reliability by item and age group.

		18-64		65+	
		Cronbach's Alpha	Covariance	Cronbach's Alpha	Covariance
Test (all items)		0.88	0.25	0.90	0.29
Excluded Item	1. Understand	0.86	0.26	0.88	0.29
	2. Find out	0.86	0.25	0.88	0.28
	3. Judge	0.86	0.25	0.88	0.28
	4. Find	0.85	0.24	0.87	0.27
	5. Use	0.87	0.27	0.89	0.30
	6. Judge a second opinion	0.87	0.26	0.89	0.30

Table 4 - Fit statistics of the confirmatory factor analysis.

Fit Statistics	18-64		65+	
	1 Factor Model	3 Factors Model	1 Factor Model	3 Factors Model
Chi2	1837.168	808.678	238.688	63.433
RMSEA (90% CI)	0.157 (0.151-0.163)	0.127 (0.120-0.130)	0.171 (0.152-0.190)	0.105 (0.082-0.129)
SRMR	0.047	0.026	0.050	0.020
CFI	0.929	0.969	0.929	0.982
TLI	0.882	0.922	0.881	0.956

Table 5 - Multiple logistic regression analysis: association of sociodemographic factors with inadequate HL.

Variables	18-64				65+			
	Adjusted Odds Ratio	P	[95% Conf. Interval]		Adjusted Odds Ratio	P	[95% Conf. Interval]	
Gender								
Female	0.79	0.00	0.67	0.93	1.02	0.90	0.69	1.50
Financial status								
Good	0.39	0.00	0.33	0.47	0.49	0.00	0.33	0.74
Employment status								
Unemployed	1.30	0.04	1.00	1.67	2.82	0.28	0.42	1.90
Inactive/retired	1.29	0.00	1.07	1.56	1.35	0.32	0.73	2.51
Education								
High	0.52	0.00	0.44	0.61	0.57	0.01	0.37	0.88
Nationality								
Foreign	3.24	0.00	2.64	3.99	3.89	0.00	1.46	10.35

Discussion

The psychometric properties of measurement tools are generally sample- and population-dependent (28). Given the absence of a psychometric evaluation of the HLS-EU-Q6 among seniors, this study aimed to demonstrate its suitability and applicability for use in this specific population from a public health perspective.

According to our findings, in the two age groups: (i) HL levels differed but not by a large margin; (ii) the distribution of responses and the psychometric properties of the HLS-EU-Q6 (structural model, reliability, convergent, and discriminant validity) were largely similar between the two groups, with few exceptions.

Particularly, while neither group showed a ceiling or floor effect, the percentage of missing items was slightly higher in the young senior group. In line with the results of the EU survey (29) and other studies (14,30), one of the items related to mental health ("Find information on how to manage mental health problems like stress or depression?") showed the highest percentage of "don't know/ refuse" responses in both age groups. This could be due, in part, to respondents' unfamiliarity with mental health problems and, on the other hand, to the stigma still associated with these conditions, which induces people to keep them hidden for fear of judgment (31). The HLS_{19} International Report of Measuring Population and Organizational Health Literacy (M-POHL) network identified a specific recommendation on this issue (Recommendations 6), in fact "Supporting mental HL in the fields of promotion and prevention may help reduce the burden of disease in this field. Mental HL around treatment may encourage people to seek treatment in a timely way and add to the effectiveness of services" (29).

Particularly, the HLS-EU-Q6 showed good internal validity in both subgroups with a Cronbach's alpha of 0.90 for young seniors and 0.88 for adults. This was in line with the original scale (21) and other validation studies conducted in Europe, which reported values between $\alpha = 0.80$ and $\alpha = 0.98$ (14,32-38).

In both subgroups, CFA suggested that the three-factor structure, comprising health promotion, disease prevention and healthcare domains, fit better than the unidimensional model. However, we were unable to estimate the fit of a two-order CFA model, theorized by Pelikan et al. (23), due to computational issues.

Concerning HL levels, our results are in line with those of other studies conducted in Europe that used the HLS-EU-Q16 to measure HL in the general population. For example, in Poland, results from a research in a nationally representative sample of the Polish general adult population (18 years or older) showed that 10.2% had inadequate HL, 34.4% had problematic HL, and 55.4% had a sufficient level of HL (39). In Romania, findings from a similar sample "show that most of the participants (59.2%) have a sufficient level of HL, while 33.2% have a problematic level and 7.5% an inadequate level of HL" (30). A large study conducted in Denmark among adults aged ≥25 years reported 60.9% sufficient HL, 30.9% problematic HL and 8.2% inadequate HL (40). As expected, a higher percentage of inadequate HL level can be observed in the young senior group (13.3% vs 8.3%), despite their age being relatively close to the adult group. Research indicates that older adults often exhibit lower HL levels (41,42). Cognitive decline, prevalent in older populations, further exacerbates this issue, as it is a key factor driving the inverse relationship between age and HL (42). A 2018 German study (43), using HLS-EU-Q47 to investigate HL among older adults (aged 65 years or above), stratified by age groups, showed that inadequate HL was nearly three times more prevalent in the oldest age group, consistent with our findings. Additionally, older adults are at a higher risk of inadequate HL due to factors such as education and socioeconomic status (44).

As described in the European survey (9), confirmed in the HLS_{19} (29), and reported in other key studies (45), a social gradient for HL exists and has also been observed in our study, confirming the external validity of the HLS-EU-Q6 for both age subsets. However, we found differences regarding gender and employment status. A significant positive association between HL and female gender was observed in the adult group but not in the young senior group. Women were less likely to have limited HL, which is consistent with the HLS_{19} findings, where "men tend to have slightly lower health literacy". However, other studies have found no significant gender differences in HL (9,46-49), and the relationship between gender and HL remains a topic of debate. Consequently, it is difficult to explain these results, and we currently lack a theory to interpret them. Finally, regarding employment status, logistic regression analysis showed that being inactive or unemployed were positively associated with limited HL, though this association was only statistically significant in the adult group. This is somewhat expected due to the differences in the job market between younger and older adults. While employment can significantly influence the socioeconomic status

of an adult (50), for seniors, being employed loses its predictive significance (51). Based on the results of this study, we can conclude that the HLS-EU-Q6 instrument is suitable for measuring health literacy in the general older population belonging to the 65-69 age group.

The main limitation of this study is the age range of the young senior sample, which includes individuals aged 65 to 69 years (as the PASSI system covers a population aged 18 to 69 years). This range focuses on older adults who are generally in good health and-hopefully-in a pre-fragility stage, where health promotion interventions are still feasible. Future research should explore the instrument's validity in older segments of the population.

The study's main strength is its large, representative sample of the Italian population, along with its rigorous study design.

Conclusions

The results of the study provide initial support for the validity and reliability of the HLS-EU-Q6 questionnaire among Italian older adults. Although the sample size is relatively large, it is not fully representative of the entire older population, due to the age limit of 69 years; therefore, further research is needed to confirm these findings. For instance, integrating this HL module into the PASSI d'ARGENTO surveillance system (52), which includes individuals aged 65 and older but does not currently assess this dimension, would facilitate broader generalization of the results. Assessing health literacy is crucial for understanding the needs of both the general and vulnerable population subgroups, identifying their potential difficulties in interacting with health services, while providing information to design-and-plan-appropriate health interventions.

Acknowledgments: The authors are grateful to all the coordinators and interviewers of the PASSI surveillance system who contributed to data collection.

Funding: We acknowledge co-funding from Next Generation EU, in the context of the National Recovery and Resilience Plan, Investment PE8—Project Age-It: "Ageing Well in an Ageing Society". This resource was co-financed by the Next Generation EU [DM 1557 11.10.2022]. The views and opinions expressed are only those of the Authors and do not necessarily reflect those of the European Union or the European Commission. Neither the European Union nor the European Commission can be held responsible for them.

Riassunto

Misurare l'alfabetizzazione sanitaria negli anziani: validazione dello European Health Literacy Survey Questionnaire 6 nel campione toscano di PASSI

Introduzione. La transizione demografica ha portato a un aumento della popolazione anziana, con un conseguente incremento di individui con comorbilità e ridotta autosufficienza. Bassi livelli di alfabetizzazione sanitaria sono associati a esiti negativi per la salute, soprattutto tra i gruppi vulnerabili (come gli anziani). Migliorare l'alfabetizzazione sanitaria attraverso programmi mirati è fondamentale per migliorare l'autogestione delle condizioni croniche. Attualmente, in Italia non esistono strumenti validati per misurare l'alfabetizzazione sanitaria nella popolazione anziana italiana, pertanto lo scopo di questo studio è validare il Questionario 6 per la Sorveglianza Europea dell'Alfabetizzazione Sanitaria in un campione di anziani toscani.

Disegno di studio. Trasversale.

Metodi. Il campione è stato selezionato dal sistema di sorveglianza "Progressi delle Aziende Sanitarie per la Salute in Italia" nel triennio 2017-2019. Per validare la scala sono stati utilizzati l'analisi degli item, l'alfa di Cronbach e l'analisi fattoriale confermativa. Inoltre, sono state analizzate le associazioni tra livelli di alfabetizzazione sanitaria e caratteristiche socio-demografiche.

Risultati. Sono stati intervistati 11.000 soggetti, di cui 1.080 (10%) di età compresa tra 65 e 69 anni. L'alfa di Cronbach è risultata pari a 0,89. Tra gli anziani, la percentuale di risposte mancanti variava dal 4,54% all'11,85%, con il quarto item che mostrava la percentuale più alta di valori mancanti. L'analisi fattoriale confermativa ha rivelato che il modello a tre fattori mostrava un miglior adattamento ai dati rispetto al modello unidimensionale. Risultati simili sono emersi nella popolazione di 18-64 anni. In entrambi i gruppi, le persone con difficoltà economiche o con un basso livello di istruzione erano maggiormente a rischio di avere un livello inadeguato di alfabetizzazione sanitaria. Inoltre, nel gruppo 18-64 anni, il sesso femminile riduceva la probabilità di un livello inadeguato di alfabetizzazione sanitaria, mentre essere inattivi/pensionati o stranieri ne aumentava la probabilità.

Conclusioni. Lo studio fornisce evidenze preliminari a supporto della validità e dell'affidabilità del Questionario 6 per la Sorveglianza Europea dell'Alfabetizzazione Sanitaria, per valutare l'alfabetizzazione sanitaria nella popolazione anziana italiana. Sono necessarie ulteriori ricerche per confermare questi risultati, in particolare su campioni di individui di età superiore ai 69 anni.

References

1. Beard JR, Officer A, De Carvalho IA, Sadana R, Pot AM, Michel JP, et al. The World report on ageing and health: a policy framework for healthy ageing. Lancet. 2016 May 21;**387**(10033):2145-54. doi: 10.1016/S0140-6736-(15)00516-4. Epub 2015 Oct 29. PMID: 26520231; PMCID: PMC4848186.
2. Annuario Statistico Italiano. Rome: Istituto Nazionale di Statistica; 2022. Available from: https://www.istat.it/storage/ASI/2022/ASI_2022.pdf [Last accessed: 2025 Mar 6].

3. Available from: https://www.istat.it/it/files/2022/03/Il-Censimento-permanente-della-popolazione-in-Toscana_focus-2.pdf [Last accessed: 2025 Mar 6].
4. Fried LP, Ferrucci L, Darer J, Williamson JD, Anderson G. Untangling the Concepts of Disability, Frailty, and Comorbidity: Implications for Improved Targeting and Care. J Gerontol A Biol Sci Med Sci. 2004 Mar;**59**(3):M255-63. doi: 10.1093/gerona/59.3.m255. PMID: 15031310.
5. Paasche-Orlow MK, Wolf MS. The Causal Pathways Linking Health Literacy to Health Outcomes. Am J Health Behav. 2007 Sep-Oct;**31**(Suppl 1):S19-26. doi: 10.5555/ajhb.2007.31.supp.S19. PMID: 17931132.
6. Berkman ND, Sheridan SL, Donahue KE, Halpern DJ, Crotty K. Low Health Literacy and Health Outcomes: An Updated Systematic Review. Ann Intern Med. 2011 Jul 19;**155**(2):97-107. doi: 10.7326/0003-4819-155-2-201107190-00005. PMID: 21768583.
7. Sørensen K, Van Den Broucke S, Fullam J, Doyle G, Pelikan J, Slonska Z, et al. Health literacy and public health: A systematic review and integration of definitions and models. BMC Public Health. 2012 Jan 25;**12**(1):80. doi: 10.1186/1471-2458-12-80. PMID: 22276600; PMCID: PMC3292515.
8. Kickbusch I, Pelikan JM, Apfel F, Tsouros AD, World Health Organization. Health literacy: the solid facts. Copenhagen: World Health Organization Regional Office for Europe; 2013. 73 p.
9. Sørensen K, Pelikan JM, Röthlin F, Ganahl K, Slonska Z, Doyle G, et al. Health literacy in Europe: comparative results of the European health literacy survey (HLS-EU). Eur J Public Health. 2015 Dec;**25**(6):1053-8. doi: 10.1093/eurpub/ckv043. Epub 2015 Apr 5. PMID: 25843827; PMCID: PMC4668324.
10. Chesser AK, Keene Woods N, Smothers K, Rogers N. Health Literacy and Older Adults: A Systematic Review. Gerontol Geriatr Med. 2016 Mar 15;**2**:233372141663049. doi: 10.1177/2333721416630492. PMID: 28138488; PMCID: PMC5119904.
11. McGilton KS, Vellani S, Yeung L, Chishtie J, Commisso E, Ploeg J, et al. Identifying and understanding the health and social care needs of older adults with multiple chronic conditions and their caregivers: a scoping review. BMC Geriatr. 2018 Oct 1;**18**(1):231. doi: 10.1186/s12877-018-0925-x. PMID: 30285641; PMCID: PMC6167839.
12. Bröder J, Chang P, Kickbusch I, Levin-Zamir D, McElhinney E, Nutbeam D, et al. IUHPE Position Statement on Health Literacy: a practical vision for a health literate world. Glob Health Promot. 2018 Dec 11;**25**(4):79-88. https://doi.org/10.1177/1757975918814421.
13. Tavousi M, Mohammadi S, Sadighi J, Zarei F, Kermani RM, Rostami R, et al. Measuring health literacy: A systematic review and bibliometric analysis of instruments from 1993 to 2021. Rios-González CM, curatore. PLoS One. 2022 Jul 15;**17**(7):e0271524. doi: 10.1371/journal.pone.0271524. PMID: 35839272; PMCID: PMC9286266.
14. Lorini C, Lastrucci V, Mantwill S, Vettori V, Bonaccorsi G; Florence Health Literacy Research Group. 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. Ann Ist Super Sanita. 2019 Jan-Mar;**55**(1):10-8. doi: 10.4415/ANN_19_01_04. PMID: 30968831.
15. Epicentro. Available from: https://www.epicentro.iss.it/passi/en/english [Last accessed: 2025 Mar 6].
16. Baldissera S, Ferrante G, Quarchioni E, Minardi V, Possenti V, Carrozzi G, et al. Field substitution of nonresponders can maintain sample size and structure without altering survey estimates—the experience of the Italian behavioral risk factors surveillance system (PASSI). Ann Epidemiol. 2014 Apr;**24**(4):241-5. doi: 10.1016/j.annepidem.2013.12.003. Epub 2013 Dec 28. PMID: 24461932.
17. Unim B, De Vito C, Massimi A, D'Andrea E, Rosso A, Villari P, et al. The need to improve implementation and use of lifestyle surveillance systems for planning prevention activities: an analysis of the Italian Regions. Public Health. 2016 Jan;**130**:51-8. doi: 10.1016/j.puhe.2015.08.009. Epub 2015 Oct 1. PMID: 26427315.
18. Available from: https://www.oxfordbibliographies.com/display/document/obo-9780199756797/obo-9780199756797-0065.xml [Last accessed: 2025 Mar 6].
19. Zanobini P, Lorini C, Caini S, Lastrucci V, Masocco M, Minardi V, et al. Health Literacy, Socioeconomic Status and Vaccination Uptake: A Study on Influenza Vaccination in a Population-Based Sample. Int J Environ Public Health. 2022 Jun 6;**19**(11):6925. doi: 10.3390/ijerph19116925. PMID: 35682508; PMCID: PMC9180363.
20. Zanobini P, Lorini C, Lastrucci V, Minardi V, Possenti V, Masocco M, et al. Health Literacy, Socio-Economic Determinants, and Healthy Behaviours: Results from a Large Representative Sample of Tuscany Region, Italy. Int J Environ Res Public Health. 2021 Nov 26;**18**(23):12432. doi: 10.3390/ijerph182312432. PMID: 34886157; PMCID: PMC8656600.
21. Pelikan JM, Ganahl K. Measuring Health Literacy in General Populations: Primary Findings from the HLS-EU Consortium's Health Literacy Assessment Effort. Stud Health Technol Inform. 2017;**240**:34-59. PMID: 28972508.
22. Pander Maat H, Essink-Bot ML, Leenaars KE, Fransen MP. A short assessment of health literacy (SAHL) in the Netherlands. BMC Public Health. 2014 Sep 23;**14**(1):990. doi: 10.1186/1471-2458-14-990. PMID: 25246170; PMCID: PMC4190424.
23. Pelikan JM, Röthlin F, Ganahl K. Measuring comprehensive health literacy in general populations: validation of instrument, indices and scales of the HLS-EU study. 6th Annual Health Literacy Research Conference. Bethesda, Maryland: November 3-4, 2014. Available from: www. bumc.bu.edu/healthliteracyconference/files/2014/06/ Pelikan-et-al-HARC-2014-fin.pdf [Last accessed: 2025 Mar 6].
24. Hu L, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural Equation Modeling: A Multidisciplinary Journal. 1999 Jan;**6**(1):1-55. https://doi.org/10.1080/10705519909540118.

25. Paasche-Orlow MK, Parker RM, Gazmararian JA, Nielsen-Bohlman LT, Rudd RR. The prevalence of limited health literacy. J Gen Intern Med. 2005 Feb;**20**(2):175-84. doi: 10.1111/j.1525-1497.2005.40245.x. PMID: 15836552; PMCID: PMC1490053.
26. Rikard RV, Thompson MS, McKinney J, Beauchamp A. Examining health literacy disparities in the United States: a third look at the National Assessment of Adult Literacy (NAAL). BMC Public Health. September 2016 Sep 13;**16**(1):975. doi: 10.1186/s12889-016-3621-9. PMID: 27624540; PMCID: PMC5022195.
27. Mantwill S, Monestel-Umaña S, Schulz PJ. The Relationship between Health Literacy and Health Disparities: A Systematic Review. PLoS One. 2015 Dec 23;**10**(12):e0145455. doi: 10.1371/journal.pone.0145455. PMID: 26698310; PMCID: PMC4689381.
28. Nguyen TH, Paasche-Orlow MK, McCormack LA. The State of the Science of Health Literacy Measurement. Stud Health Technol Inform. 2017;**240**:17-33. PMID: 28972507; PMCID: PMC6082165.
29. The HLS19 Consortium of the WHO Action Network M-POHL. International Report on the Methodology, Results, and Recommendations of the European Health Literacy Population Survey 2019-2021 (HLS19) of M-POHL. Vienna, December 2021.
30. Coman MA, Forray AI, Van Den Broucke S, Chereches RM. Measuring Health Literacy in Romania: Validation of the HLS-EU-Q16 Survey Questionnaire. Int J Public Health. 2022 Feb 4;**67**:1604272. doi: 10.3389/ijph.2022.1604272. PMID: 35185446; PMCID: PMC8855985.
31. Carozza P. Contrastare lo stigma della malattia mentale: obiettivo dei servizi di salute mentale di comunità. Journal of Health Care Education in Practice. 2021 Nov;**3**(2):15-26. doi: 10.14658/PUPJ-jhcep-2021-2-3.
32. Gele AA, Pettersen KS, Torheim LE, Kumar B. Health literacy: the missing link in improving the health of Somali immigrant women in Oslo. BMC Public Health. 2016 Nov 3;**16**(1):1134. doi: 10.1186/s12889-016-3790-6. PMID: 27809815; PMCID: PMC5093985.
33. Gustafsdottir SS, Sigurdardottir AK, Arnadottir SA, Heimisson GT, Mårtensson L. Translation and cross-cultural adaptation of the European Health Literacy Survey Questionnaire, HLS-EU-Q16: the Icelandic version. BMC Public Health. 2020 Jan 14;**20**(1):61. doi: 10.1186/s12889-020-8162-6. PMID: 31937293; PMCID: PMC6961374.
34. Rouquette A, Nadot T, Labitrie P, Van den Broucke S, Mancini J, Rigal L, et al. Validity and measurement invariance across sex, age, and education level of the French short versions of the European Health Literacy Survey Questionnaire. PLoS One. 2018 Dec 6;**13**(12):e0208091. doi: 10.1371/journal.pone.0208091. PMID: 30521552; PMCID: PMC6283623.
35. Dsouza JP, Van Den Broucke S, Pattanshetty S. Validity and Reliability of the Indian Version of the HLS-EU-Q16 Questionnaire. Int J Environ Rea Public Health. 2021 Jan 9;**18**(2):495. doi: 10.3390/ijerph18020495. PMID: 33435372; PMCID: PMC7827499.
36. Levin-Zamir D, Baron-Epel OB, Cohen V, Elhayany A. The Association of Health Literacy with Health Behavior, Socioeconomic Indicators, and Self-Assessed Health From a National Adult Survey in Israel. Journal of Health Communication. August 2016;21(Suppl 2):61-8. doi: 10.1080/10810730.2016.1207115. Epub 2016 Sep 26. PMID: 27669363.
37. Tiller D, Herzog B, Kluttig A, Haerting J. Health literacy in an urban elderly East-German population – results from the population-based CARLA study. BMC Public Health. 2015 Sep 10;**15**(1):883. doi: 10.1186/s12889-015-2210-7. PMID: 26357978; PMCID: PMC4566302.
38. Bergman L, Nilsson U, Dahlberg K, Jaensson M, Wångdahl J. Validity and reliability of the swedish versions of the HLS-EU-Q16 and HLS-EU-Q6 questionnaires. BMC Public Health. 2023 Apr 20;**23**(1):724. doi: 10.1186/s12889-023-15519-9. PMID: 37081538; PMCID: PMC10117247.
39. Duplaga M. Determinants and Consequences of Limited Health Literacy in Polish Society. Int J Environ Res Public Heath. 2020 Jan 19;**17**(2):642. doi: 10.3390/ijerph17020642. PMID: 31963834; PMCID: PMC7014389.
40. Svendsen MT, Bak CK, Sørensen K, Pelikan J, Riddersholm SJ, Skals RK, et al. Associations of health literacy with socioeconomic position, health risk behavior, and health status: a large national population-based survey among Danish adults. BMC Public Health. 2020 Apr 28;**20**(1):565. doi: 10.1186/s12889-020-08498-8. PMID: 32345275; PMCID: PMC7187482.
41. Wu JR, Moser DK, DeWalt DA, Rayens MK, Dracup K. Health Literacy Mediates the Relationship Between Age and Health Outcomes in Patients With Heart Failure. Circ Heart Fail. 2016 Jan;**9**(1):e002250. doi: 10.1161/CIRCHEARTFAILURE.115.002250. PMID: 26721913; PMCID: PMC4698978.
42. Kaphingst KA, Goodman MS, MacMillan WD, Carpenter CR, Griffey RT. Effect of cognitive dysfunction on the relationship between age and health literacy. Patient Educ Couns. 2014 May;**95**(2):218-25. doi: 10.1016/j.pec.2014.02.005. Epub 2014 Feb 22. PMID: 24629836; PMCID: PMC4172373.
43. Vogt D, Schaeffer D, Messer M, Berens EM, Hurrelmann K. Health literacy in old age: results of a German cross-sectional study. Health Promot Int. 2018 Oct 1;**33**(5):739-47. doi: 10.1093/heapro/dax012. PMID: 28369348.
44. Cutilli CC. Health Literacy in Geriatric Patients: An Integrative Review of the Literature. Orthop Nurs. 2007 Jan-Feb;**26**(1):43-48. doi: 10.1097/00006416-200701000-00014. PMID: 17273109.
45. Nutbeam D, Lloyd JE. Understanding and Responding to Health Literacy as a Social Determinant of Health. Annu Rev Public Health. 2021 Apr 1;**42**(1):159-73. doi: 10.1146/annurev-publhealth-090419-102529. Epub 2021 Oct 9. PMID: 33035427.
46. Estrela M, Semedo G, Roque F, Ferreira PL, Herdeiro MT. Sociodemographic determinants of digital health literacy: A systematic review and meta-analysis. Internat J Med Inform. 2023 Sep;**177**:105124. doi: 10.1016/j.ijmedinf.2023.105124.

Epub 2023 Jun 10. PMID: 37329766.
47. Lorini C, Lastrucci V, Paolini D, Bonaccorsi G. Measuring health literacy combining performance-based and self-assessed measures: the roles of age, educational level and financial resources in predicting health literacy skills. A cross-sectional study conducted in Florence (Italy). BMJ Open. October 2020 Oct 5;**10**(10):e035987. 2020 Oct 5;10(10):e035987. doi: 10.1136/bmjopen-2019-035987. PMID: 33020080; PMCID: PMC7537461.
48. Jordan S, Hoebel J. Gesundheitskompetenz von Erwachsenen in Deutschland: Ergebnisse der Studie "Gesundheit in Deutschland aktuell" (GEDA). [Health literacy of adults in Germany: Findings from the German Health Update (GEDA) study]. Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz. 2015 Sep;**58**(9):942-50. German. doi: 10.1007/s00103-015-2200-z. PMID: 26227894.
49. Schaeffer D, Berens EM, Vogt D. Health Literacy in the German Population. Dtsch Arztebl Int. 2017 Jan 27;**114**(4):53-60. doi: 10.3238/arztebl.2017.0053. PMID: 28211318; PMCID: PMC5319379.
50. Warr P. Work, Well-Being, and Mental Health. In: Barling J, Kelloway EK, Frone MR, Eds. Handbook of Work Stress [Internet]. Thousand Oaks, CA (US): SAGE Publications, Inc.; 2005 [cited 20 September 2024]. p. 547-74. Available from: https://sk.sagepub.com/reference/hdbk_workstress/n23.xml [Last accessed: 2025 Mar 6].
51. Calvo E, Haverstick K, Sass SA. Gradual Retirement, Sense of Control, and Retirees' Happiness. Res Aging. 2009 Jan 1;**31**(1):112-35. https://doi.org/10.1177/0164027508324704.
52. Epicentro. Available from: https://www.epicentro.iss.it/en/passi-argento/ [Last accessed: 2025 Mar 6].

Corresponding author: Claudia Biagi, Department of Health Sciences, University of Florence, Viale Morgagni 48, 50134 Florence, Italy
e-mail: claudia.biagi@unifi.it