

Concurrent validation of two key health literacy instruments in a South Eastern European population

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Background: Public health practice has come to increasing recognition of health promotion and the central role of knowledge, attitude, beliefs and practices in achieving health promotion. Health literacy (HL) is an under-explored topic in South Eastern European countries. There are no HL reports from Albania to date. The aim of this study was to assess the concurrent validity of the European Health Literacy Survey Questionnaire (HLS-EU-Q) and the Test of Functional Health Literacy in Adults (TOFHLA) in a population-based sample of adults in Albania. **Methods:** A cross-sectional study was conducted in 2013 in Tirana, Albania, including 239 individuals aged ≥ 18 years (61% women; 87% response). A structured interviewer-administered questionnaire was applied twice (test and retest procedure after 2 weeks) including HLS-EU-Q and TOFHLA instruments. **Results:** The internal consistency was high for both instruments (Cronbach's alpha for the test procedure was 0.92 for TOFHLA and 0.98 for HLS-EU-Q). Both tools exhibited a high stability over time (Spearman's rho: 0.88 for TOFHLA and 0.87 for HLS-EU). Mean values of both instruments were similar in men and women (mean score for TOFHLA: 76.0 vs. 76.5, $P=0.83$; mean score for HLS-EU-Q: 32.2 vs. 32.6, $P=0.63$). For both instruments, higher HL scores were significantly associated with younger age, higher educational and economic level and lower body mass index. **Conclusions:** Our study provides valuable novel evidence on concurrent validation of two major HL instruments in a South Eastern European population-based sample. Future studies should be conducted in order to confirm and expand our findings.

Introduction

Health literacy (HL) consists of oral literacy (speaking and listening), print literacy (reading and writing) and numeracy skills which, in the context of cultural and conceptual knowledge, determine one's health decisions.¹ Print literacy and numeracy skills are the most studied dimensions of HL,¹ probably because they are easier to be measured.

Various instruments have been used to assess HL including the Test of Functional Health Literacy in Adults (TOFHLA),² the Rapid Estimate of Adult Literacy in Medicine (REALM),³ the Wide Range Achievement Test (WRAT)⁴ and the Newest Vital Sign (NVS),⁵ mainly used in health care settings. Among these tools, TOFHLA and NVS measure both reading and numeracy skills, whereas REALM and WRAT measure reading ability. The most widely used HL instruments are TOFHLA and REALM.⁶ Hence, in a review of 85 studies measuring HL, TOFHLA was used in 42 (49%) studies, REALM in 34 (40%) studies, WRAT in 3 (4%) studies and NVS only in 1 study.⁶

TOFHLA instrument consists of two parts. The first part assesses the numeracy skills and is limited to 10 minutes, whereas the second part assesses reading comprehension skills and consists of a number of sentences with missing words which the respondents are required to replace choosing from four given alternatives within 12 minutes.²

Other HL instruments, which have been used in population-based settings, have tried to capture broader dimensions of HL. These include the National Assessment of Adult Literacy survey,⁷ the Swiss Health Literacy Survey⁸ and the Health Literacy Questionnaire.⁹

The overwhelming research on HL has been conducted in USA and Canada.^{10,11} In Europe, HL has been a central issue only recently.^{11,12} The fact that there is no conclusive comprehensive

definition of HL has been a motivation to efforts for finding one. To this goal, the European Health Literacy Survey Questionnaire (HLS-EU-Q) was developed in the framework of the European Health Literacy Survey.¹² The HLS-EU-Q comprises a list of 47 items exploring the ability to obtain, understand, appraise and apply health information in the domain of health care, disease prevention and health promotion.¹¹ The HLS-EU-Q was applied together with the NVS and the correlation between the two instruments has been weak to moderate.¹³ Other surveys report different correlation levels among TOFHLA, REALM and NVS instruments applied in health care settings^{2,5,14} and population settings.¹⁵

To date, however, there are no reports on simultaneous application of HLS-EU-Q and TOFHLA in population-based samples. Seemingly, such a procedure is rather important given the controversy regarding the results obtained by application of different HL instruments. In this framework, the aim of this study was to assess the concurrent validity of HLS-EU-Q and TOFHLA in a population-based sample of adults in Albania—a transitional country in South Eastern Europe. More specifically, we aimed to determine the correlation between the two instruments and the association of HL with demographic and socioeconomic factors among the Albanian adults.

Methods

Study population

A cross-sectional study was conducted in urban Tirana during September–December 2013.

In the first stage, a primary health care centre (serving 61 806 populations) was randomly selected (with probability proportional to size) in Tirana municipality (overall: 763 634 inhabitants), the capital of Albania. Subsequently, a simple random sample of 274

individuals aged ≥ 18 years was drawn based on the (population-based) list of inhabitants (sampling frame) available from the registries of family physicians working at the primary health care centre selected in the first stage. Calculations of the minimal required sample size were done with Win-Pepi.¹⁶ Of 274 individuals targeted for recruitment, 35 could not be contacted and/or refused to participate. Overall, 239 individuals participated in this validation study with a response rate of $239/274 = 87\%$. Non-respondents did not differ from survey participants in terms of age, sex or educational level.

Data collection

A structured interviewer-administered questionnaire was used to assess HL level of the respondents. The questionnaire consisted of three parts: part 1—general demographic and socioeconomic information; part 2—HL questionnaire based on HLS-EU-Q instrument; part 3—HL questionnaire based on the TOFHLA instrument.

The original full version of HLS-EU-Q was translated from English into Albanian language and then back-translated into English in order to check whether the translation was accomplished properly. The translated version of the HLS-EU-Q was piloted (pre-tested) in 12 individuals (seven primary care users and five family members accompanying the primary care patients) to assess whether the items were understandable. The TOFHLA instrument was already translated, back-translated and validated among 54 primary care patients in another Albanian-speaking country, namely in Kosovo.¹⁷ However, because of the changing of currency and health insurance system used in Kosovo and Albania, a panel of experts was invited to agree on the adaptation of the corresponding items of TOFHLA questionnaire in the Albanian context. Subsequently, the final (Albanian) versions of HLS-EU-Q and TOFHLA were administered to 239 individuals who agreed to participate in this study.

The HLS-EU-Q consisted of 47 items which explored four dimensions of HL: access, understanding, appraisal and application of health information in three different domains: health care (16 items), disease prevention (16 items) and health promotion (15 items).¹³ Each item consisted of a four-point scale (very easy, easy, difficult and very difficult) for measuring the self-perceived difficulty of selected health tasks.¹³ An overall HL score (overall index or general HL) as well as sub-domain scores were calculated for each participant. The scores of each question were reversed in order for the higher scores to indicate better HL. Each score was then standardized on a scale ranging from 0 to 50, in accordance with the suggestions of the developers of the instrument.¹³ The scores for general HL, health care HL, disease prevention HL and health promotion HL were categorized into 'inadequate HL': score 0–25, 'problematic HL': score 25.01–33, 'sufficient HL': score 33.01–42 and 'excellent HL': score 42.01–50.¹³ The first two categories in this scale are used to denote subjects with limited HL (inadequate + problematic).

The long Albanian version of TOFHLA instrument consisted of 67 items, 17 of which explored the numeric skills and the remaining 50 items the reading comprehension skills.² Further details about the validated Albanian version of TOFHLA are provided elsewhere.¹⁷ The overall TOFHLA score was categorized into the following groups: inadequate (0–59), marginal (60–74) and adequate HL (75–100), in accordance with instrument developers' suggestions and current practice.^{17,18}

The general background information included data about age (categorized into the following: ≤ 25 , 26–45, 46–65 and ≥ 66 years), sex, education (categorized into the following: 0–8, 9–12, 13–16 and ≥ 17 years), body mass index (BMI) [categorized into the following: 18.5–24.99 (normal), 25.00–29.99 (overweight) and ≥ 30.00 (obese)] and economic status of the respondents (upon question: 'How would you assess your current economic status', with answering options on a 5-point Likert scale ranging from

'very bad' to 'very good'; this variable was further trichotomized into 'very bad or bad', 'average' and 'good or very good'). BMI was calculated based on the height and weight, which were measured through a standardized procedure (removal of heavy clothes, shoes and heavy objects from the pockets).

The HL questionnaires were administered to each participant twice: on the first encounter (test procedure) and subsequently after 2 weeks (retest procedure). However, 53 individuals refused to participate in the retest procedure. Therefore, the retest procedure included 186 participants only.

Participants were approached by the nurses of the health centre where the study took place. Hence, the nurses invited all individuals targeted for recruitment and explained them the aims and procedures of the study. Each individual who agreed to participate in the study signed an informed consent form. The study was approved by the Committee of Bio-Medical Ethics of Albania.

Statistical analysis

Cronbach's alpha test was used to assess the internal consistency of HLS-EU-Q and TOFHLA questionnaire. More specifically, Cronbach's alpha index was used for the overall scales and for the sub-domains of each instrument (numeracy and reading comprehension for TOFHLA; health care HL, disease prevention HL and health promotion HL for the HLS-EU-Q instrument).

To assess the stability over time (alias test–retest reliability) of the instruments, we applied Spearman's rho, a measure of linear association.

General linear model was used to compare the mean values of independent variables such as age, education, BMI and economic status, by different categories of HL as measured by HLS-EU-Q and TOFHLA instruments, separately. Mean values and their respective 95% confidence intervals were calculated.

Binary logistic regression was used to assess the association of limited HL, based on HLS-EU-Q and TOFHLA instruments, with independent variables. For this analysis, we recoded the general HLS-EU-Q score into inadequate general HL (inadequate + problematic general HL) vs. adequate general HL (sufficient + excellent general HL). Regarding the TOFHLA instrument, we recoded its score into inadequate functional HL (inadequate + marginal) vs. adequate functional HL. This enabled calculation of the odds ratios of limited HL according to selected independent factors.

Statistical Package for Social Sciences, version 17.0 was used for all statistical analyses.

Results

Characteristics of the study population (not shown in the tables)

Mean age of the sample [men: $N=92$ (38.5%); women: $N=147$ (61.5%)] was 42.90 ± 17.69 years. About 11% of the participants had 0–8 years of formal education, 32% had 9–12 years, 40% had 13–16 years and the remaining 17% had ≥ 17 years of formal education. About 10% of individuals reported a bad or very bad economic situation, whereas 55% and 35% had average and good or very good economic situation, respectively. As for the BMI, 51% of participants had normal weight, 30% were overweight and 19% were obese.

Internal consistency of HL instruments

The internal consistency was high for both instruments: overall Cronbach's alpha for the test procedure was 0.92 for TOFHLA and 0.98 for HLS-EU-Q. A similar strength of Cronbach's alpha was evident for the retest procedure. As for the TOFHLA's subscales, reading comprehension exhibited a higher internal consistency (0.94 for the test) compared with the numeracy domain (0.81). Conversely, the HLS-EU-Q subscales showed similar

Table 1 Stability over time (test–retest reliability) of HL instruments

Domain (subscale)	Spearman's rho	P value
TOFHLA		
TOFHLA (overall)	0.868	<0.001
Numeracy	0.820	<0.001
Reading comprehension	0.638	<0.001
HLS-EU-Q		
General HL	0.884	<0.001
Health care HL	0.827	<0.001
Disease prevention HL	0.815	<0.001
Health promotion HL	0.812	<0.001

internal consistencies for the test procedure (data not shown in tables).

Stability over time of HL instruments

Overall, both TOFHLA and HLS-EU-Q exhibited a high stability over time: the test–retest reliability coefficient (Spearman's rho) was 0.88 for TOFHLA and 0.87 for HLS-EU-Q (table 1). As for the TOFHLA's subscales, the numeracy domain had a high test–retest reliability ($r=0.82$), whereas the reading comprehension had a much lower stability over time ($r=0.64$) notwithstanding the highly statistical significance. On the other hand, all the three HLS-EU-Q's subscales displayed a high test–retest reliability score (0.83 for health care and 0.81 for disease prevention and health promotion subscales).

Construct validity of HL instruments

Overall, mean [\pm standard deviation (\pm SD)] value of TOFHLA was 76.32 \pm 16.96 (median [interquartile range]: 80.00 [68.00–90.00]). Conversely, mean (\pm SD) value of general HLS-EU-Q was 32.81 \pm 10.30 (median [interquartile range]: 34.04 [26.60–41.49]) (data not shown in the tables).

The overall TOFHLA score and HLS-EU-Q score exhibited a weak-to-moderate inverse association with age and BMI, but a positive relationship with educational attainment and economic status. No significant associations with sex were noticed (table 2).

Mean values of both instruments were similar in men and women (mean score for TOFHLA: 76.0 vs. 76.5, $P=0.83$; mean score for HLS-EU-Q: 32.2 vs. 32.6, $P=0.63$). Furthermore, there were no sex differences in the proportions of HL categories either for TOFHLA or for HLS-EU-Q. Correlation of TOFHLA scores and HLS-EU-Q scores was moderate (Spearman's rho = 0.493) (data not shown in the tables).

For both instruments, participants who exhibited higher HL scores were significantly younger than their counterparts who displayed lower HL scores (table 3). Furthermore, individuals who reported a higher TOFHLA and/or HLS-EU-Q score had a higher educational level and economic status, but a lower BMI.

In addition, for both instruments, participants who exhibited limited HL scores were significantly older, had a lower educational level and economic status, but a higher BMI (table 4). On the other hand, there were no sex differences.

Discussion

Main findings

This is the first study conducted in a sample of adults aged 18 years or older in Tirana, Albania, which measures HL as assessed by TOFHLA and HLS-EU-Q instruments concurrently with the aim to validate these two HL tools in Albanian settings.

TOFHLA is an internationally used instrument for measuring numeracy and reading comprehension skills in clinical settings,⁶ whereas HLS-EU-Q was developed to capture broader aspects of HL in population settings.^{11,12}

Table 2 Spearman's correlation coefficients between health literacy indices and sociodemographic variables

Variable	TOFHLA instrument	HLS-EU instrument			
		General HL	Health care HL	Disease prevention HL	Health promotion HL
Sex	0.015	−0.034	−0.045	−0.031	−0.021
Age	−0.419 ^a	−0.301 ^a	−0.279 ^a	−0.269 ^a	−0.333 ^a
Education	0.537 ^a	0.377 ^a	0.360 ^a	0.364 ^a	0.359 ^a
BMI	−0.229 ^a	−0.292 ^a	−0.266 ^a	−0.267 ^a	−0.316 ^a
Economic status ^b	0.234 ^a	0.259 ^a	0.233 ^a	0.256 ^a	0.267 ^a

a: Correlation is significant at the 0.01 level (2-tailed).

b: Higher values indicate better economic status [range of scores was from 1 (very bad) to 5 (very good)].

The results of our study revealed that both instruments exhibit good internal consistency and stability over time in both the test and the retest applications. Convergent validity was moderate (Spearman's rho = 0.493), whereas measures of construct validity suggested that older age, lower education, higher BMI and lower economic status were significantly associated with limited HL as assessed by both instruments in this population-based sample of Albanian adults.

Measures of validity of HL instruments in other countries and in Albania

Measures of reliability in our study are in line with previous research from the region and beyond. Hence, Cronbach's alpha for the Serbian version of TOFHLA was 0.94¹⁹ and it was 0.93 for the Albanian version of TOFHLA applied in a sample of primary care users in Kosovo.¹⁷ The original version of TOFHLA had an internal consistency of 0.98.²

The test–retest reliability of TOFHLA and HLS-EU-Q in our study was satisfactory ($r=0.884$ and 0.868 , respectively). The internal consistency of HLS-EU-Q in our study is comparable with that reported by the HLS-EU survey.¹³

In our study, we found a moderate correlation between TOFHLA and general HLS-EU-Q scores (Spearman's rho = 0.493). The HLS-EU survey, which applied the NVS instrument concurrently with HLS-EU-Q instrument, found a moderate agreement between these HL tools (Spearman's rho = 0.25), with considerable variations across countries (ranging from 0.34 in Bulgaria to 0.07 in the Netherlands).¹³ The authors suggested that the different focus of the two instruments was responsible for this moderate correlation between NVS and HLS-EU-Q. As described earlier, NVS assesses numeracy and reading comprehension skills,⁵ but a person's HL level is also dependent on a wide range of social, cultural and health system factors, which differ greatly across eight countries under study.¹³ Therefore, the authors expected only moderate correlations between the 2 instruments.¹³ Both TOFHLA and NVS measure functional HL and they have shown to be moderately correlated.⁵ Given that HLS-EU-Q is a newly developed and applied instrument, it is difficult to explain the discrepancies between the results of our study and HLS-EU survey regarding the correlation with other HL instruments measuring functional HL (TOFHLA in our study and NVS in HLS-EU survey). Discrepancies between the results yielded by different tools measuring HL in same populations are common.^{2,5,14,15} For example, a study among 310 individuals selected in community settings in Australia used REALM, TOFHLA and NVS to assess the HL levels.¹⁵ The prevalence of limited HL was 10.6%, 6.8% and 26.0%, respectively.¹⁵ Obviously, instruments trying to measure HL differ in the dimensions of HL they tackle and, because different individuals have different skills in numeracy, reading and/or comprehensions abilities, then the tests yield very

Table 3 Association of HLS-EU-Q and TOFHLA scores with socioeconomic variables (mean values from the general linear model)

HL level	Age		Education		Economic status		BMI	
	Mean (95% CI)	P value	Mean (95% CI)	P value	Mean (95% CI)	P value	Mean (95% CI)	P value
Upper panel: HLS-EU-Q instrument								
General HL		0.001 (3) ^a		0.001 (3)		0.001 (3)		0.001 (3)
Inadequate	59.3 (54.7–63.8)	<0.001	8.9 (8.3–9.5)	<0.001	3.0 (2.8–3.2)	0.001	28.6 (27.4–29.7)	<0.001
Problematic	38.7 (34.9–42.4)	0.739	12.5 (12.0–12.9)	<0.001	3.1 (2.9–3.3)	0.003	25.3 (24.3–26.2)	0.225
Sufficient	34.5 (34.8–42.2)	0.678	15.2 (14.7–15.7)	<0.001	3.4 (3.3–3.6)	0.466	25.4 (24.5–26.4)	0.151
Excellent	39.7 (35.3–44.1)	–	17.4 (16.8–17.9)	–	3.5 (3.3–3.7)	–	24.4 (23.2–25.5)	–
Lower panel: TOFHLA instrument								
HL level		0.001 (2)		0.001 (2)		0.001 (2)		0.001 (2)
Inadequate	61.0 (56.2–65.9)	<0.001	9.3 (8.4–10.2)	<0.001	2.9 (2.7–3.1)	<0.001	27.5 (26.2–28.8)	<0.001
Marginal	47.3 (43.6–51.1)	<0.001	12.4 (11.7–13.1)	<0.001	3.2 (3.0–3.4)	0.017	27.2 (26.1–28.2)	<0.001
Adequate	35.9 (33.4–38.5)	–	15.4 (14.9–15.8)	–	3.5 (3.3–3.6)	–	24.7 (24.0–25.4)	–

CI = confidence interval.

a: Overall P values and degrees of freedom (in parentheses).

Table 4 Association of limited HL based on HLS-EU-Q and TOFHLA instruments with covariates (ORs from binary logistic regression)

Variable	HLS-EU-Q ^a			TOFHLA ^b		
	OR	95% CI	P value	OR	95% CI	P value
Sex						
Female	Reference	–	0.283	Reference	–	0.891
Male	1.07	0.45–1.27		1.04	0.61–1.76	
Age (years)			<0.001 (3)			<0.001 (3)
≤25	Reference	–	–	Reference	–	–
26–45	0.56	0.27–1.16	0.119	1.48	1.03–2.98	0.042
46–65	1.17	0.61–2.28	0.635	2.82	1.55–6.27	<0.001
≥66	3.20	2.85–12.24	0.001	6.52	3.61–28.9	<0.001
Education (years)			<0.001 (3)			<0.001 (3)
≥17	Reference	–	–	Reference	–	–
13–16	2.88	2.07–12.13	0.008	1.73	0.54–5.59	0.014
9–12	4.00	12.7–44.4	<0.001	5.53	1.83–28.6	<0.001
0–8	6.45	1.58–42.3	<0.001	9.32	2.33–31.3	<0.001
Economic status			0.002 (2)			0.001 (2)
Good or very good	Reference	–	–	Reference	–	–
Average	1.70	0.97–2.98	0.062	1.96	1.09–3.52	0.024
Very bad or bad	7.97	2.48–25.57	<0.001	6.96	2.45–19.80	<0.001
BMI			0.015 (2)			<0.001 (2)
Normal	Reference	–	–	Reference	–	–
Overweight	2.06	1.14–3.17	0.016	2.67	1.46–4.88	0.001
Obese	2.28	1.13–4.59	0.021	3.69	1.80–7.53	<0.001

CI = confidence interval; OR = odds ratio.

a: For HLS-EU-Q, the ORs: limited HL (inadequate + problematic) vs. adequate HL (sufficient + excellent).

b: For TOFHLA, the ORs: limited FHL (inadequate + marginal) vs. adequate FHL.

different results. In our opinion, these findings once more highlight the fact that there is still no accepted definition for the term ‘HL’ and, therefore, unless a comprehensive, globally accepted HL definition comes across, it is very likely that we will face the same situation in the future.

Both HL instruments in our study showed good predictive validity. Previous research has shown that HL is significantly associated with age,^{10,11,13,19} education,^{10,11,13,19} BMI^{20–22} and socioeconomic status,^{10,13,21,23,24} whereas the association with gender is not straightforward as some studies did not find an association,^{10,13,19} while some other studies did so.^{23–26} Similar to previous studies, we found that HL as measured by either HLS-EU-Q or TOFHLA was significantly associated with age, education, BMI and economic status.

Study limitations

Our study has several limitations. Its cross-sectional design does not allow drawing conclusions about the temporality of events. In addition, since the study relied on self-perceived items, such as ‘the self-perceived socioeconomic status’, the information bias

cannot be entirely excluded. However, the literature suggests that subjective social status might be a reflection of the objective social status.²⁷ Furthermore, there is always the risk that the respondents might have memorized the items on the first application of HL tools and, as a result, this might have had an impact on the retest results, a phenomenon known as the ‘practice effects’ which becomes less important when the test–retest interval increases.²⁸ However, the test–retest interval was rather adequate (2 weeks), in line with the recommended methodology on similar reapplication procedures.²⁸

Conclusions

Our findings revealed that the Albanian versions of TOFHLA and HLS-EU-Q are reliable and valid instruments for measuring HL in a large-scale population-based studies. Both instruments showed good internal consistency, test–retest reliability, construct validity and convergent validity.

These two instruments might be particularly useful in health promotion activities by revealing high-risk groups at a population

level in terms of lifestyle determinants of ill-health including smoking, unhealthy diet, physical inactivity and hypertension. However, health care providers should be aware of the fact that identifying and intervening in people with risk factors tend to benefit the more socioeconomic advantaged groups, because they have the agency required to engage and participate in health promotion programmes.²⁹ Therefore, health care professionals and health promotion specialists should make particular efforts to improve the socioeconomic disadvantaged groups because they most commonly endure most of the disease burden.²⁹

In conclusion, our study provides valuable novel evidence on concurrent validation of two major HL instruments in a South Eastern European population-based sample. Future studies should be conducted in order to confirm and expand our findings.

Conflicts of interest: None declared.

Key points

- This survey aimed to concurrently validate TOFHLA and HLS-EU-Q, two major international instruments for assessing HL, for the first time in Albanian settings.
- The Albanian versions of both instruments exhibited good internal consistency and stability over time as measured by the test–retest procedure.
- Similar to international findings, older age, lower education and economic status and higher BMI were significantly associated with lower HL scores and/or higher likelihood of limited HL in this population-based sample of Albanian adults.
- The HLS-EU-Q and TOFHLA instruments, validated in Albanian settings, could be used in future large-scale studies in order to explore the concept of HL and its correlates in this South Eastern European country.

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