**Correlation between two health literacy self-reported measurement tools:**
**data from an online survey on a sample of patients of Italian General Practitioners**

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**Introduction.**
Heath literacy (HL) can be defined in different ways. A European Consortium proposed a conceptual framework that identify HL as a set of knowledge and competencies that allow people to access, understand, appraise and apply information about health (their own or that of family or cared ones). People engagement ranges from healthcare or disease prevention to a more socially active domain of health promotion. Drawing from this model *Sørensen* et al. proposed the European Health Literacy Survey Questionnaire (HLS-EU-Q47). Low health literacy can be a public health issue, leading to inappropriate or ineffective use of health resources. Citizens are called to greater awareness of the fact that they need to be actively involved in the decision making process about their health. Different measurement tools have been proposed to assess HL level in different settings. In this survey we focus on the following self-reported tools: the "short form" (HLS- EU-Q16) of the HLS-EU-Q, the Brief Health Literacy Screener (BHLS), two subjective numeracy items aimed at assessing self-reported numeracy confidence. [1,2,3,4,5,6]

**Objectives.**
To describe the distribution of the HL measurement obtained with the BHLS and the two subjective numeracy items and to evaluate if these measurements correlate with the one obtained with the HLS-EU-Q16.

**Methods**.
Data were collected using a survey distributed through a specific online platform to a convenience sample of patients, registered to a group of General Practitioners (family doctors) which were recruited through the Tdme. The survey took place between January and March 2021, in the context of a cross-sectional study and included questions about socio-demographic characteristics (such as sex, age, nationality, city of residence, marital status, education level and profession) and a series of self-reported tools which included the Italian versions for the HLS- EU-Q16, the BHLS and two subjective numeracy items.

**Results.**
The HLS-EU-Q16 (score range 0-16) identifies three levels of HL: people with inadequate HL (score 0-8) were 49 (11.7%); people with problematic HL (score 9-12) were 128 (30.6%); people with adequate HL (score 13-16) were 241 (57.7%). The HLS-EU-Q16 score distribution had median 13 and IQR 11-16. [7,8,9]
Four different scores were obtained from the BHLS: one individual score for each of the three items and one total score (range 1-15) obtained from the sum of the scores from the three BHLS items. The BHLS total score (range 1-15) had median 11 and IQR 10-13. Two separate scores were obtained from the two subjective numeracy items. For these items a low score corresponds to high health literacy, contrary to the other tools.

We obtained the following results from Pearson's correlation tests:
1) $r = 0.38$ (95% CI: 0.29, 0.46) between HLS-EU-Q16 score and the score from BHLS item n.1;
2) $r = 0.23$ (95% CI: 0.13, 0.31) between HLS-EU-Q16 score and the score from BHLS item n.2;
3) $r = 0.31$ (95% CI: 0.22, 0.39) between HLS-EU-Q16 score and the score from BHLS item n.3;
4) $r = 0.38$ (95% CI: 0.30, 0.46) between HLS-EU-Q16 score and the BHLS total score;
5) $r = -0.50$ (95% CI: -0.57, -0.42) between HLS-EU-Q16 score and the first numeracy item;
6) $r = -0.12$ (95% CI: -0.22, -0.03) between HLS-EU-Q16 score and the second numeracy item.
Correlations were all significant although more or less weak. The correlation with the numeracy items had negative direction as expected. [3,4,5,6,10,11]

**Conclusions.**
BHLS is a self-reported HL measurement tool first validated in the US population, with the goal of having an instrument to quickly identify a subject with low health literacy in order to improve the efficacy of communication in health settings. Also the two numeracy items have first been used and validated in the US population. Some authors proposed surveys that used both the two subjective numeracy items and the three-item BHLS. BHLS is mostly focused on confidence with written (health) information and the two subjective numeracy items explore one's confidence with medical statistics. [3,4,5,6] HLS-EU-Q16 is a short form of a larger tool created for and validated in the European population and while it explores a broader number of health literacy dimensions, it doesn't directly address numeracy. [1,2,7,8,9] Findings from the survey conducted on our Italian sample suggest that although significant, correlation between the HLS-EU-Q16 and the BHLS is quite weak. [11] Some other limitations should be considered: the sample was recruited through a convenience criteria and all the tools are self-reporting tools and do not include objective items, hence the evaluation of HL could be biased by subjectivity. Further analyses could be conducted in order to evaluate BHLS performance in detecting inadequate health literacy and a possible threshold to identify HL levels in the Italian population. [9]

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Frequency distribution of single items answers according to HLS-EU-Q16 HL level

| HL level | | Inadequate | Problematic | Adequate |
|---|---|---|---|---|
| n | | 49 | 128 | 241 |
| bhls1 n(%) | Never(5) | 3 ( 6.1) | 30 (23.4) | 79 (32.8) |
| | Occasionally(4) | 12 (24.5) | 57 (44.5) | 115 (47.7) |
| | Sometimes(3) | 27 (55.1) | 34 (26.6) | 44 (18.3) |
| | Often(2) | 7 (14.3) | 6 ( 4.7) | 3 ( 1.2) |
| | Always(1) | 0 ( 0.0) | 1 ( 0.8) | 0 ( 0.0) |
| bhls2 n(%) | Never(5) | 7 (14.3) | 36 (28.1) | 100 (41.5) |
| | Occasionally(4) | 18 (36.7) | 44 (34.4) | 82 (34.0) |
| | Sometimes(3) | 17 (34.7) | 25 (19.5) | 36 (14.9) |
| | Often(2) | 4 ( 8.2) | 18 (14.1) | 15 ( 6.2) |
| | Always(1) | 3 ( 6.1) | 5 ( 3.9) | 8 ( 3.3) |
| bhls3 n(%) | Not at all(1) | 3 ( 6.1) | 2 ( 1.6) | 6 ( 2.5) |
| | A little bit(2) | 12 (24.5) | 9 ( 7.0) | 7 ( 2.9) |
| | Somewhat(3) | 23 (46.9) | 65 (50.8) | 84 (34.9) |
| | Quite a bit(4) | 10 (20.4) | 30 (23.4) | 92 (38.2) |
| | Extremely(5) | 1 ( 2.0) | 22 (17.2) | 52 (21.6) |
| twosubject1 n(%) | Very hard(4) | 7 (14.3) | 7 ( 5.5) | 1 ( 0.4) |
| | Hard(3) | 28 (57.1) | 45 (35.2) | 25 (10.4) |
| | Easy(2) | 13 (26.5) | 68 (53.1) | 164 (68.0) |
| | Very easy(1) | 1 ( 2.0) | 8 ( 6.2) | 51 (21.2) |
| twosubject2 n(%) | Strongly disagree(4) | 7 (14.3) | 20 (15.6) | 27 (11.2) |
| | Somewhat disagree(3) | 22 (44.9) | 46 (35.9) | 76 (31.5) |
| | Somewhat agree(2) | 19 (38.8) | 57 (44.5) | 121 (50.2) |
| | Strongly agree(1) | 1 ( 2.0) | 5 ( 3.9) | 17 ( 7.1) |

Summary BHLS and Two Subjective Numeracy items.

| | Min | 1$^{st}$ qu. | Median | 3$^{rd}$ qu. | Max |
|---|---|---|---|---|---|
| bhls1(score 1-5) | 1.0 | 3.0 | 4.0 | 5.0 | 5.0 |
| bhls2(score 1-5) | 1.0 | 3.0 | 4.0 | 5.0 | 5.0 |
| bhls3(score 1-5) | 1.0 | 3.0 | 3.0 | 4.0 | 5.0 |
| Bhls(score 1-15) | 4.0 | 10.0 | 11.0 | 13.0 | 15.0 |
| num1(score 1-4) low score=highHL | 1.0 | 2.0 | 2.0 | 3.0 | 4.0 |
| num2(score 1-4) low score=highHL | 1.0 | 2.0 | 2.0 | 3.0 | 4.0 |
| HLS-EU-Q16 | 1.0 | 11.0 | 13.0 | 16.0 | 16.0 |

bhls1: "How often do you have problems learning about your medical condition because of difficulty in understanding written information?" (Problems learning)
bhls2: "How often do you have someone help you read hospital materials?" (Help read)
bhls3: Confident with forms "How confident are you in filling out medical forms by yourself?" Confident with forms)
twosubject1: "In general, how easy or hard do you find it to understand medical statistics?"
twosubject2: How much do you agree or disagree with the following statement: "In general, I strongly depend on numbers and statistics to help me make decisions about my health."