

COMMUNICATIONS C1
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The first Italian validation of the most widespread health literacy assessment tool: the Newest Vital Sign

La prima validazione in Italia dello strumento per valutare la *health literacy* più usato al mondo: il Newest Vital Sign

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Abstract

Objective. This work represents the first attempt to validate, for the Italian population, the most widespread health literacy assessment tool: the Newest Vital Sign (NVS).

Design. The UK version of this tool was adapted for Italy using a translation/back-translation process. A web-based survey was then administered to a multidisciplinary panel of experts to assess its face validity. Finally, a preliminary study of construct validity was conducted, focusing on efficiency, comprehensibility, reliability, and sensitivity of the items of the test. For the evaluation of these dimensions we adopted Pearson's *r* correlation and calculated the average scores obtained for the subscales.

Results. Data analysis shows that the NVS-IT can be considered, under every aspect, an adequate tool for the assessment of individual health literacy grade level, given the optimal correlation among the experts' judgments and the average scores above the acceptability threshold.

Conclusion. Our study aims to encourage use of the NVS for the Italian population and, furthermore, introduce a scientific approach to health literacy, an issue that is gaining interest even in our country, though, to date, this has mainly resulted in the production of theoretical works.

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Key words: validation, NVS, health literacy

Riassunto

Obiettivi. Scopo del lavoro è stato validare, per la popolazione italiana, lo strumento più utilizzato a livello mondiale per la misurazione dell'alfabetizzazione sanitaria: il Newest Vital Sign (NVS).

Disegno. Lo strumento oggetto dello studio (NVS-UK) è stato adattato alla popolazione italiana attraverso una procedura di "translation-back translation". Successivamente è stata valutata la validità di facciata attraverso una survey informatizzata somministrata a un panel bilanciato di esperti indipendenti. Inoltre, sono stati prodotti i primi dati per la validazione del costrutto di *health literacy* relativi alla sensibilità, accuratezza e appropriatezza degli *item* proposti. Per valutare le proprietà psicometriche di interesse è stato adottato il coefficiente di correlazione *r* di Pearson, e calcolate le medie dei punteggi ottenuti nelle sottoscale.

Risultati. Dall'analisi statistica dei risultati del sondaggio si evince che l'NVS in lingua italiana può essere considerato uno strumento valido per misurare il livello di alfabetizzazione sanitaria, ottenendo correlazioni tra i giudici adeguate e punteggi medi sempre superiori alla soglia di adeguatezza.

Conclusioni. Questo lavoro apre la strada all'utilizzo nella realtà italiana del test NVS e, più in generale, a un approccio di tipo scientifico in un ambito, quale quello della *health literacy*, che sta suscitando crescente interesse in Italia, seppur oggetto finora soprattutto di studi di tipo teorico.

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Parole chiave: validazione, NVS, *health literacy*, alfabetizzazione sanitaria

INTRODUCTION

The concept of health literacy (HL) has been discussed in the literature since the 1980s.¹ The most recent, and probably ultimate, definition of health literacy was proposed by Sorensen in 2012: «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 life course».² Therefore, HL should be considered to promote patient empowerment and population health. The importance of this issue has been increasingly recognized in European health policies, such as «Health 2020».³ Hence, HL measurement is a critical component of the process of identifying topics and populations that are most in need of support.⁴ There are many tools available to measure HL: the measurements vary from basic screening items to more comprehensive assessments, based on how the concept of health literacy has been operationalized into a measurable construct – i.e., the measurable dimensions of HL, and specific skills and competencies.⁵ The Newest Vital Sign (NVS) is a survey tool based on information presented on a nutritional label, which measures literacy, comprehension, numeracy, application/function, and evaluation skills. It originally consists of six questions regarding the nutritional label; the questions have to be administered to the subject through an interview. Through an objective evaluation, which is expressed with a final score ranging from 0 to 6, this tool helps to classify the subject into one out of three categories:

- high likelihood of limited literacy (score: 0-1);
- possibility of limited literacy (score: 2-3);
- adequate literacy (score: 4-6).

It is quick to administer (taking approximately five minutes) and was developed in the USA in English and Spanish,⁶ and then validated and adapted in many other countries, for example, in the UK,⁷ the Netherlands,⁸ Turkey,⁹ and Japan.¹⁰ Moreover, the NVS has been included in the «European Health Literacy survey».¹¹ To the best of our knowledge, no Italian validation studies relating to the NVS are described in the literature nor in any other health literacy assessment tool, with the exception of the s-TOFHLA for Italian-speaking Swiss.¹² Therefore, the aim of this study is to undertake a process of testing with health practitioners and academics to adapt and validate the NVS for the Italian population.

METHODS

For the Italian validation, the NVS-UK was used. The validation steps followed a standard procedure: translation and back translation; drafting of the final Italian version, which was then shared by the research group; creation of the structured survey to be administered to the group of experts (judges) to test the face and preliminary construct validity of the draft; and administration and data analysis.¹³

NVS-UK

For our work, we used the UK version of the NVS, which had been adapted and validated by Rowlands⁷ from the USA ver-

sion.⁶ The NVS-UK was chosen because it contains a nutritional label that is consistent with European regulations. This tool comprises an instruction page to be read by the interviewers, which aims at standardizing the administration procedure, a typical nutritional label that can be found on a container of ice cream, seven questions related to the nutritional label, the sheet where the score of each question should be reported (1 for correct answers and 0 for wrong ones), as well as the total score.

The NVS-UK differs from the USA version for the presence of an additional question, which specifically investigates the comprehension of the item related to allergic reactions.

Forward-translation and back-translation of the NVS-UK

In order to strengthen the translation process, we selected two independent pairs of translators (i.e., two native English speakers and two native Italian speakers) who autonomously translated and later proofread the result of the back-translation process. Finally, a focus group out of the research groups was formed to assess and verify any discrepancies emerging from the process, while the output was the ultimate version of the NVS translated into Italian (NVS-IT, see [Supplementary file 1](#), available online).

Creation and administration of the structured validation survey

In order to test the face and construct validity of the NVS-IT, we developed a web-based survey that was distributed to a selected panel of experts who could complete the self-administered test by themselves (see [Supplementary file 2](#), available online).¹⁴ The protocol for the self-administered survey was divided into two steps: first, a standardized set of instructions was administered by the researchers of our group; second, the experts were asked to complete the survey directly on the web. Data was automatically stored online at the end of the collection so that participants could no longer access them. Filling in the questionnaire required around 25 minutes and none of the experts reported any trouble regarding the procedure.

At the beginning of the survey, the socio-demographic dimensions of interest (i.e., age, gender, education, and employment) were collected in order to evaluate possible interactions with the ratings of the experts. Then the questionnaire was structured into 10 sections, one for each original section of the tool, with five different dimensions for each section (i.e., aesthetic validity, efficiency, comprehensibility, reliability, and sensitivity)¹³ collected using Likert scale scores – ranging from 1 (not sufficient) to 5 (optimal), with a threshold of 3 which represented an adequate level.

Aesthetic validity was assessed to reflect how the items of each section are properly perceived by the subjects as adequate to measure their specific targets. Efficiency, reliability, and sensitivity were introduced to estimate the experts' judgements regarding these important features of the different sections of the NVS. Finally, the comprehensibility score was used to estimate the general population's degree of accessibility to the items of the instrument (i.e., disregarding their specific expertise or education). Data collection took place between September and October 2014.

Panel selection criteria

Given the multidisciplinary of the topic and the different settings suitable for the adoption of the tool (e.g., general practitioner clinics, hospitals, and schools), a balanced panel of experts was assembled by selecting clusters of healthcare professionals (both from academia and the National Health System) – on a voluntary basis – in order to investigate their different perceptions of the NVS-IT. A convenience sample was chosen, as suggested by other authors, in order to involve the most accessible participants with knowledge on health and health literacy.^{15,16} Each cluster was adequately numerous, and the panel was sufficiently balanced regarding genders, in spite of the prevalence of women among healthcare professionals. During data analysis we merged different types of expertise by assembling three different groups: physicians and biologists, considering their common background and activity related with organic aspects; psychologists and dieticians, who usually cover behavioural and counselling aspects; and nurses, given their peculiar role in direct care of patients.

Data analysis

The data analysis was conducted by using IBM® SPSS v.22©.17 The procedures required two stages. During the first stage, data pre-processing involved descriptive statistics dealing with the socio-demographic data and the score of each item for each section. Then the preconditions required by the subsequent inferential analysis were verified. At this stage, the sample number, the balance of subsamples, and the normal distribution of continuous variables (i.e., skewness and kurtosis ranging from -1 to +1) were assessed. In order to verify the im-

pact of discrete socio-demographic factors on the instrument perception, the validity criteria were discretized at two levels by using the median. Then the validity criteria taken into account were computed for each subsection of the NVS-IT, as well as for the instrument as a whole, thereby producing 15 different scores. At the second stage, an inferential analysis was conducted to assess the relations between the socio-demographic factors and the final scores obtained for the NVS-IT validation procedure, and the relations within the validity criteria, respectively. We used Pearson's *r* to evaluate the effects of age, the chi-square test to assess the relation between the discrete unbalanced socio-demographic factors (i.e., education and gender) on the discretized validity criteria, and, finally, the ANOVA test to assess the effects of expertise.

The average values and standard deviations for each section, as well as for the aggregated total scores of the instrument as a whole, were then produced and evaluated with respect to the adopted thresholds.

RESULTS

In order to validate the NVS-IT as regards the dimensions considered, we split the procedure into two phases. Initially, the average scores and the degree of agreement between the experts were assessed, and the effects of the socio-demographic variables were then evaluated. Accordingly, the diversity of the expert sample was the first dimension to be taken into account, and the factors characterizing it were explicitly considered in terms of effects and relation with subscale perception and comprehension.

Table 1 reports the distribution of the socio-demographic vari-

	Sample as a whole	Physicians and biologists	Dieticians and psychologists	Nurses
number	60	24	21	15
age (years; mean ± DS)	41.1 ± 9.9	35.9 ± 8.2	44.1 ± 11.7	45.3 ± 5.6
gender (female)	42 (70%)	17 (70.8%)	16 (76.2%)	9 (60%)
education				
Bachelor's degree	11 (18.3%)	0	8 (38.1%)	3 (20%)
Master's degree	27 (45%)	11 (45.8%)	8 (38.1%)	8 (53.3%)
spec./Ph.D.	22 (36.7%)	13 (54.2%)	5 (23.8%)	4 (26.7%)
sections (mean±SD)				
instructions	4.1 ± 0.7	4.3 ± 0.5	3.7 ± 0.7	3.9 ± 0.8
show card	4.2 ± 0.6	4.4 ± 0.4	3.9 ± 0.8	4.3 ± 0.5
question #1	4.0 ± 0.7	4.2 ± 0.5	3.7 ± 0.9	3.9 ± 0.7
question #2	4.0 ± 0.8	4.2 ± 0.6	3.7 ± 1.0	3.9 ± 0.6
question #3	3.8 ± 0.8	4.0 ± 0.6	3.6 ± 0.9	3.8 ± 0.6
question #4	3.9 ± 0.8	4.2 ± 0.5	3.5 ± 0.9	3.9 ± 0.7
question #5	3.9 ± 0.9	4.2 ± 0.8	3.5 ± 1.1	3.9 ± 0.7
question #6	3.9 ± 1.0	4.3 ± 0.7	3.5 ± 1.2	3.8 ± 0.8
question #7	3.9 ± 0.9	4.3 ± 0.7	3.7 ± 1.1	3.7 ± 0.9
score sheet	4.2 ± 1.1	4.6 ± 0.8	4.1 ± 1.1	3.8 ± 1.2
general dimensions (mean±SD)				
aesthetic validity	4.0 ± 0.7	4.3 ± 0.5	3.7 ± 0.8	3.5 ± 1.0
efficiency	4.0 ± 0.8	4.3 ± 0.6	3.7 ± 0.9	3.8 ± 0.7
comprehensibility	3.8 ± 0.7	4.2 ± 0.5	3.5 ± 0.7	3.7 ± 0.5
reliability	4.1 ± 0.8	4.5 ± 0.7	3.7 ± 0.9	4.1 ± 0.6
sensitivity	3.7 ± 0.9	3.9 ± 0.7	3.5 ± 1.0	3.7 ± 0.8

Table 1. Socio-demographic characteristics of the expert sample and descriptive statistics of scores.

Tabella 1. Caratteristiche sociodemografiche del campione di esperti e statistiche descrittive dei punteggi.

ables, showing the balance between the expert subsample. In the same table, the average scores obtained for each section of the tool (i.e., average score considering the five dimensions for all experts) and for the five general dimensions are reported. In particular, a score higher or equal to 3 indicates an adequate result. The data shows the good representativeness of the expertise involved in the health literacy assessment. Moreover, good results for each assessed section and dimension, with average scores always greater than the acceptability threshold (3), is demonstrated by the data, even when we take into account the potential ranges.

Table 2 reports the average scores obtained for each item of the tool. Once again, all sections have good scores for each dimension, even taking into account the potential ranges. The second part of the inferential analysis considered the relations between the socio-demographic factors and validity criteria (**table 3**).

As shown in **table 3**, no significant statistical differences emerged with regard to gender and education, while age weakly correlates only with comprehensibility, thereby explaining less than 7% of the variance of this criterion and suggesting, as expected, that the higher the age, the lower the comprehensibility score. Despite the good scores obtained by all the expert clusters for each dimension (**table 1**), significant differences emerged in four dimensions (with the only exception of sensitivity) between the physician and biologist clusters, compared with the clusters of dieticians and psychologists. In particular, the first always has a higher score in comparison with the second.

DISCUSSION

In this study, we developed an Italian version of the NVS, and tested its face and preliminary construct validity. Our results show that the NVS-IT presents a good level of adequacy for each investigated dimension (aesthetic validity, efficiency, comprehensibility, reliability, and sensitivity), both for each section/question and for the tool as a whole.

Face validity is a technical description of the belief that a scale looks reasonable. In particular, face validity indicates whether, on the face of it, the instrument appears to be assessing the desired qualities.¹³ Construct validity, on the other hand, deals with the capability of a tool to assess a dimension (e.g., functional literacy) in accordance with the theory that defines it (e.g., Nutbeam's health literacy classification).¹

Despite the importance of these aspects, face and construct validities are infrequently assessed in validation studies of health literacy assessment tools, as well as in other psychometric properties.^{18,19}

Good face validity of the NVS-IT is a fundamental aspect for future use of this tool at the population or patient levels: face validity increases motivation and cooperation among respondents; it may attract candidates and reduce dissatisfaction among users: this means policy-makers and others are more likely to accept the results.¹³ A good level of construct validity demonstrates the accuracy of our tool, which is an essential requirement for acceptance among the scientific community pending the results of future assessment works based on the NVS-IT.

Even though the analysis of the scores of each dimension bro-

	Aesthetic validity	Efficiency	Comprehensibility	Reliability	Sensitivity
sections (mean \pm SD)					
instructions	3.9 \pm 1.0	4.1 \pm 1.0	4.1 \pm 0.8	4.4 \pm 0.8	3.6 \pm 1.0
show card	n/a	4.4 \pm 0.8	4.0 \pm 0.7	4.4 \pm 0.7	n/a
question #1	4.1 \pm 0.9	4.1 \pm 0.8	3.9 \pm 0.8	4.1 \pm 0.8	3.6 \pm 1.0
question #2	4.1 \pm 0.8	4.1 \pm 0.8	3.6 \pm 0.9	4.2 \pm 0.9	3.9 \pm 0.9
question #3	4.0 \pm 1.0	3.9 \pm 0.9	3.5 \pm 0.9	4.1 \pm 1.0	3.7 \pm 1.0
question #4	4.1 \pm 0.9	4.0 \pm 0.9	3.5 \pm 0.9	4.1 \pm 0.9	3.7 \pm 1.0
question #5	4.0 \pm 1.0	4.0 \pm 1.0	3.9 \pm 1.0	3.9 \pm 1.1	3.8 \pm 1.1
question #6	4.0 \pm 1.0	4.0 \pm 1.0	3.9 \pm 1.0	3.9 \pm 1.1	3.7 \pm 1.1
question #7	4.0 \pm 1.0	4.0 \pm 1.0	4.0 \pm 1.0	4.0 \pm 1.1	3.7 \pm 1.1
score sheet	n/a	4.2 \pm 1.1	4.2 \pm 1.1	n/a	n/a

n/a: not applicable

Table 2. Scores and validity measures. / **Tabella 2.** Punteggi e misure di validità.

	Aesthetic validity	Efficiency	Comprehensibility	Reliability	Sensitivity
age	ns	ns	r. = -0.26*	ns	ns
gender	ns	ns	ns	ns	ns
education	ns	ns	ns	ns	ns
job [#]	F = 3.85*	F = 3.95*	F = 7.60**	F = 5.47**	F = 1.10
A vs B	14.8*	4.9*	6.9*	13.0**	ns
A vs C	ns	ns	ns	ns	ns
B vs C	ns	ns	ns	ns	ns

*p < 0.05; **p < 0.01 ns: not significant;
[#]job clusters: A=physicians and biologists, B=dieticians and psychologists, C=nurses. The difference value is reported and the Scheffe test was performed in order to estimate the statistical significance. If the value is positive, it means that the score reported by the first group is higher than the second.

Table 3. Scores and validity measures. / **Tabella 3.** Punteggi e misure di validità.

ken down by expert profession shows a statistically significant association (the scores assigned by physicians and biologists are generally higher than those assigned by dieticians and psychologists), the NVS-IT presents an adequate or good level of adequacy for all clusters of healthcare professionals. Considering this, we can say that there is a general consensus among the included clusters of experts in judging the adequacy of the NVS-IT in resembling what it intends to measure. This result is particularly important if we consider that there is no need to check the degree, specialization, or professional skills of the operators for the NVS as well as for other health literacy

tools, but only minimal training on how to administer the tool is required.⁵

In conclusion, the results of our survey indicate that the NVS-IT can be used in pre-testing and field-testing surveys to complete its validation process. Our study aims to introduce a scientific approach to health literacy, an issue which is gaining interest in our country, to enable the scientific community to measure aspects of functional literacy in individuals, groups, or communities.

Conflicts of interest: none declared

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