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Original article

ITALIAN VALIDATION OF THE MEDICAL DATA INTERPRETATION TEST (MDIT) FOR HEALTH LITERACY

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ABSTRACT

Improving health literacy is a public health goal. Our aim was to validate the Italian version of the Medical Data Interpretation Test (MDIT-I) and create a MDIT-I short version. This cross-sectional study assessed gender, age, education, biomedical employment, MDIT-I and its short version. Internal consistency was evaluated through Cronbach's α; construct validity by comparing MDIT-I score across education levels and employment fields. There were 141 participants, 50.4% were female and the median age was 37 (IQR 31). MDIT-I internal consistency was good (α=0.747) and construct validity was confirmed. The short version had α=0.66 and construct validity was confirmed like the long version. The short version score was tested in correlation: Spearman's ρ=0.932 (p-value<0.001). The scores were dichotomized and Cohen's κ was estimated to be 0.786. Long and short MDIT-I showed good internal consistency and construct validity and could be used to increase knowledge about health literacy in the Italian population.

1. Introduction

Improving Health Literacy (HL) is a public health goal and a determinant of health. HL can influence numerous health outcomes, e.g. health status, healthcare costs, and use of healthcare services.[1] One of the latest definitions of HL has been provided by Sørensen et al.: "HL 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".[1] Specifically, HL is multidimensional and a broad variation between conceptual models exist.[1] Additionally, there are over thirty instruments for measuring HL[2] and tools can vary in terms of the time they take to complete and the factors measured.

Recommendations for robust research methods in HL measurement include the use of multiple measure of HL in a single study. [2]

In Italy, several tools have been translated. However, to our knowledge, a test like the Medical Data Interpretation Test (MDIT), i.e. focused on skills to understand and compare medical statistics about disease risk and about risk reduction,[3] is missing. MDIT consists of twenty items and has four subscales, i.e. knowledge basis for comparisons, ability to perform comparisons tasks, calculations related to comparisons, and context for comparisons.[3] The percentage of correct answers is calculated for the final score: a 0-100 scale represents a score from low to high HL.[3] A score ≥75 can be considered as a 'pass' score.[4] The authors suggested that MDIT could be used as an assessment of abilities required to make sense of ordinary health information, e.g. media messages, direct-to-consumer drug commercials, conversations with health professionals about patients' risks.[3]

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Therefore, the aim of this study was primarily to validate an Italian version of MDIT (MDIT-I). A secondary purpose was the creation of a short version of MDIT to make self-administration quicker and more feasible if included in a larger questionnaire.

2. Methods

Italian validation

MDIT-I was created by completing two independent forward translations from the English questionnaire, performed by 2 groups of Certified English-speaking researchers. With the aid of a native English colleague, a comparison between the two versions was performed, resulting in the final version. Researchers agreed to change English names to Italian-sounding ones, to achieve a better adaptation.

The test was uploaded to the G-suite Google Forms application, and the web link was disseminated via researchers' personal and institutional social media pages. Participants (age≥18 years) were asked to fill in a section asking for gender, age, education level and possible employment in the biomedical field. All procedures were approved by the Internal Review Board of the Department of Public Health Sciences of the University of Turin.

The tendency toward returning the same result through different measurements of the same phenomenon is known as internal consistency. Internal consistency of a questionnaire is commonly assessed through Cronbach's α (α≥0.7 is considered sufficiently reliable), therefore we examined internal consistency accordingly.

In the absence of an external gold standard, MDIT construct validity was validated by using the hypothesis that medical data comprehension links to other attributes such as education level or working in the scientific field. This hypothesis has been confirmed by Schwartz et al.[3] and by Smerecnik and Mesters.[5]

Therefore, we assessed construct validity comparing MDIT-I score among different education levels and between biomedical-employed participants and laypeople.

Short version

In accordance with the principle of parsimony,[6] researchers tested item-total correlation and item contribution in determining overall consistency, to select the most reliable items. The proposed short version was tested for internal consistency and validity in the same manner as the long version. Additionally, Spearman's ρ for linear correlation and Cohen's κ for proportion of agreement were estimated to compare scores from the two versions and evaluate discriminatory power.

The Shapiro-Wilk test was used to study the distribution of scalar variables. The confrontation among groups who would supposedly score differently on the MDIT was performed using Mann-Whitney U-Test (Kruskal-Wallis test, when appropriate). SPSS (v22) was used. The significance level was 0.05 using 2-sided tests.

3. Results

Italian validation

The final sample consisted of 141 participants, 50.4% were female and the median age was 37 years (IQR 31).

The most common educational level was high school (49.6%). Thirty-one respondents (22.0%) were involved in biomedical activities. Table 1 shows the complete data. The median MDIT-I score was 72.2 (IQR 27.7). Subscale median scores were: 72.2 (IQR 20.0) for "Knowledge basis for comparisons", 68.3 (IQR 50.0) for "Comparison Tasks", 75.7 (IQR 40.0) for "Calculations related to comparisons", and 58.1 (IQR 50.0) for "Context for comparisons".

The data suggest that the easiest question was number 6 (subscale "Comparison tasks") with 91.5% correct answers, and the most difficult one was number 2 (subscale "Context for comparisons") with 50.7%. Full data are available in Table 2. Internal consistency was good (Cronbach's α=0.747). Biomedical staff performed better than laypeople (p-value<0.001). A similar outcome appeared comparing MDIT-I scores among different educational levels (p-value=0.010). Gender was not associated with a different MDIT-I score (p-value=0.642). Categorized age was associated with MDIT-I score (p-value=0.001), in particular younger participants performed better (Table 1). Notably, 27 out of 31 respondents involved in biomedical activities are included in the younger age group (p-value<0.001).

Characteristic		N	%	MDIT-I score*	p-value
Age					0.001§
	≤ 39	79	56.0	78.6 (16.7)	
	40-59	24	17.0	53.7 (22.2)	
	≥ 60	38	27.0	59.3 (27.8)	
Gender					0.642†
	Female	71	50.4	69.1 (22.2)	
	Male	70	49.6	69.2 (38.9)	
Education level					0.010§
	Below High School	8	5.7	52.7 (44.4)	
	High School	70	49.6	66.3 (27.7)	
	University Degree	47	33.3	72.4 (22.2)	
	Post-Graduate	16	11.3	80.5 (44.4)	
Biomedical employment					< 0.001†
	Yes	31	22.0	82.1 (11.1)	
	No	110	78.0	65.5 (33.3)	

Table 1. Characteristics of the sample *(* Median (IQR) - § Kruskal-Wallis test - † Mann-Whitney U-Test Abbreviation: MDIT-I Medical Data Interpretation Test - Italian version, IQR interquartile range)*

Short version

A MDIT-I short version was assembled selecting, for each subscale, items with higher correlation with total score and that, if excluded, would lower the internal consistency of the survey (estimated α if item is excluded). Three items were selected for 5-item subscales and two items from 4-item subscales. In the event of minimal discrepancies among coefficients, the shortest ones were preferred. Selected items are marked with a star (*) in Table 2. Overall α of the final short form was estimated to be 0.66.

The score resulting from the short version was tested in correlation resulting in a Spearman's ρ=0.932 (p-value<0.001). The scores were then discretized using the threshold of 75% as suggested by Woloshin and Colleagues[4] and Cohen's κ was estimated to be 0.786.

The short version's validity was tested in the same fashion as above: biomedical staff and participants with a higher educational level achieved a higher score (p-value=0.002 and 0.012, respectively). There were no significant relationships with gender of participants (p-value=0.848).

Question N.		Knowledge basis for comparisons	Correct answers (%)
1		Know that the base rate is needed in addition to relative risk to determine the magnitude of benefit	58.9
3		Know that lowering all cause mortality provides better evidence of benefit than lowering a single cause of death	85.8
8	*	Know that denominators are needed to compare risks in 2 groups	66.0
11	*	Know that a denominator is needed to calculate risk	74.5
12	*	Know that a comparison group is needed to decide whether benefit exists	75.9
		Comparison tasks	
6		Select "1 in 296" as larger risk than "1 in 407"	91.5
7&20		Rate the riskiness of a 9 in 1000 chance of death as the same as a 991 in 1000 chance of surviving	67.4
13&14	*	Select a larger risk estimate for deaths from all causes than death from a specific disease	56.7
14&15	*	Select a larger risk estimate for a 20-year than 10-year risk	57.4
		Calculations related to comparisons	
9		Calculate 2 absolute risk reductions from relative risk reductions and baseline risks and select the larger	84.4
10		Calculate risk in intervention group by applying relative risk reduction to a baseline risk	80.1
17	*	Calculate relative risk reduction from 2 absolute risks	68.1
18	*	Calculate absolute risk reduction from 2 absolute risks	70.2
19	*	Calculate the number of events by applying absolute risk to number in group	75.9
		Context for comparisons	
2		Know age and sex of individuals in the source data are needed	50.4
4	*	Know that age of individuals in the source data is needed	69.5
5		Know that risk of other diseases is needed for context	60.3
16	*	Know that, for male smokers, the risk of lung cancer death is greater than prostate cancer death	52.5

Table 2. Descriptive analysis of the Medical Data Interpretation Test – Italian version (MDIT-I) ***(* Items selected for a short version of MDIT-I)***

4. Discussion

The aim of the present paper was to validate an Italian version of MDIT (long and short version) in order to make this test easy to use for Italian speakers.

The MDIT-I showed a good internal consistency (Cronbach's α=0.747). This result appeared to be slightly higher than the one produced by Schwartz et al. in the development of MDIT (α=0.71)[3] and by Smerecnick and Mesters in the validation of the Dutch version (α=0.73)[5]. Furthermore, construct validity was confirmed by the relationship of the MDIT-I score with educational attainment and biomedical expertise, as suggested by Schwartz and colleagues.[3] Indeed, MDIT-I score was significantly higher among biomedical workers and increased significantly with education level.

Similarly, the short version of the MDIT-I showed quite a good internal consistency (α=0.66) and the construct validity was supported by results comparable to the ones reported for the long version. Moreover, a significant and very strong correlation was found between the scores of long and short versions. Lastly, the Cohen's κ for proportion of agreement was 0.786, which can be interpreted in the upper limit of the Good agreement category (0.6 to 0.8).[7]

This study had both limitations and strengths. The main limitations were the small sample and the absence of features other than education and biomedical expertise to test construct validity. The primary strength was the heterogeneity of participants: the sample was not limited to a very specific age range and education level. Indeed, the focus on a specific category (e.g. students) has been reported as limitation to generalizability in other validation studies.[5,8]

This study shows that the MDIT-I (both long and short version) could be used to study the HL of Italian general population. Some research has already addressed the issue of general population HL in Italy. For instance, Bonaccorsi and colleagues found a good level of HL (63.9% of adequate HL) by using the Italian version of Newest Vital Sign, which is composed of an ice cream nutrition label with associated questions that assess literacy and numeracy.[9] Another example is that of Schiavone and Attena who, in contrast, reported 61.6% of participants with a low level of HL, using the 16-item European HL Survey questionnaire.[10] It seems clear that future research must examine the HL of Italian general population in more depth to plan and develop strategies to increase HL levels if necessary. In this context, the MDIT-I might represent a new instrument to further enable this kind of investigation in Italy. Indeed, McCormack et al. recommended more than one measure of HL in each study and underline the importance of comparing findings to learn more about the performance of each instrument to enhance HL measurement.[2]

In conclusion, both the long and short MDIT-I showed a good internal consistency and construct validity and could be used to increase knowledge about HL in the Italian general population. In particular, the short version could be very useful if it is included in surveys in which many instruments are used at the same time, as recommended.[2]

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