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Occupational Health Literacy Scale development and validation in Italy: a pilot study

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ABSTRACT

Objectives: This study aimed to adapt and validate the Occupational Health Literacy Scale (OHLS) for the Italian workforce, assessing its psychometric properties and ensuring its relevance and applicability within this specific cultural setting.
Study design: Validation process by observational and descriptive study.
Methods: Initially, two members of the research team independently translated the original OHLS into Italian. Subsequent comparisons and syntheses of these translations produced a unified Italian document. To ensure translation accuracy, this document was then retranslated back into English. An expert committee with specialized knowledge in occupational safety and health evaluated the retranslations to finalize the Italian version. This version underwent a preliminary test using a pilot group, followed by anonymous administration to a sample of 398 workers.
Results: The adaptation of the OHLS into Italian demonstrated outstanding psychometric characteristics. The scale exhibited an excellent model fit and strong internal consistency. Furthermore, the factorial structures were congruent with theoretical expectations, underscoring the scale's robust construct validity.
Conclusions: The Italian version of the OHLS has been validated as a reliable and effective instrument for quantifying occupational health literacy among Italian workers. This tool's demonstrated validity and reliability suggest its potential for broader application in promoting occupational health awareness and interventions within Italian-speaking populations.

Introduction

In the context of health promotion, people must be equipped with the necessary tools to enhance their state of well-being (according to the World Health Organization, 1986), addressing both the ability to perfect their health practices and to make a positive impact on the work environment.[1,2] To preserve one's health and secure a lasting and sustainable ability to work,[3] beyond specific safety training for all workers (L.D. 81/08), workers must develop more in-depth knowledge, skills, and abilities relevant to health and the work environment.[4,5] Health literacy is defined as the set of knowledge and skills that people have to research, understand, evaluate, and apply health information relevant to their lives, including their work lives.[6–8]

When workers possess high health literacy skills, they can take a proactive and self-determined approach to their health care. Workforce studies show that good health literacy correlates with general well-being,[9,10] correct perception of one's health[11] and quality of life.[12] In addition, workers who actively manage their health tend to be happier with their jobs and enjoy better health status.[13,14]

Many models are available to investigate occupational health literacy, including the Health Communication Questionnaire in Australia,[15] the Thai Occupational Health Literacy Scale for Informal Workers in Thailand,[16] the Health Literacy Scale for Workers in Iran,[17] and the Occupational Health Literacy Scale (OHLS) validated in Germany in 2023.[18]

The Health Communication Questionnaire[15] focuses on interactive and critical health literacy, specifically in the mining sector, without embracing an in-work environment. General instruments are generally transferable to other contexts due to cultural specificities and different worker populations. The Thai Occupational Health Literacy Scale for Informal Workers[16] does not address individuals' motivation and willingness to engage and take

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responsibility for health in the workplace. Because it is focused on non-contracted workers, it is therefore not applicable in industrialized countries such as Europe. Finally, the Health Literacy Scale for Workers[17] covers various aspects of health literacy, including decision-making and self-efficacy, but lacks a defined conceptual model and precise definition. The OHLS[18] appears, due to its origin of drafting and application as well as its structure, to compensate for the socio-cultural and contractual discriminations noted with the study of the previous instruments mentioned above.

For this reason, we decided to validate, also in the Italian language, the OHLS questionnaire, which, also from the available data, proved to be a valid tool for measuring literacy in the work environment.

Methods

Description of the OHLS questionnaire

The OHLS was recently compiled and validated by German researchers and currently stands as the most comprehensive method for assessing the health literacy of workers in industrialized settings in Western countries. The questionnaire, consisting of twelve questions (Q), is structured into two main survey domains:

1. The perceived ease of finding, evaluating, and applying information related to occupational safety and health (Q1 → Q8). This includes activities such as locating information in plain language, assessing the impacts of work on health and well-being, understanding occupational safety and health information, implementing solutions for stressful work situations, modifying working conditions constructively, discussing occupational health risks, evaluating appropriate occupational health promotion services, and seeking information on work-related health risks.
2. The degree of perception and responsibility the individual assumes regarding his or her health and safety at work (Q9 → Q12). This domain covers perceptions of the importance of keeping informed about health and safety regulations, personal responsibility for one's health and well-being at work, health and well-being information exchange, and active engagement in workplace health promotion.

These domains are explored through a series of statements requiring them to rate the ease or difficulty of specific occupational health-related activities and the degree to which they agree or disagree with statements regarding the importance and personal responsibility of occupational health and safety. They are rated using a rating scale with scores from 1 to 4 (Fig. 1).

Translation and validation

For the proper translation process and subsequent validation of the OHLS questionnaire, we referred to the guidelines of Beaton et al.[19] Beaton's guidelines for questionnaire validation ensure that the questionnaires are culturally and linguistically adapted while maintaining the psychometric properties of the original; they involve steps such as translation, synthesis, retranslation, evaluation by a committee of experts, pilot testing, and creation of the final version (Fig. 1).

Two bilingual translators worked independently to convert the original text into Italian, thus generating two different translations of the questionnaire. After thoroughly comparing the two versions, the various expressions were compared to select the one that best reflected the original, resulting in a unified, synthesized version. The fidelity of this synthesis was then verified through back-translation into English by native speakers unfamiliar with the source text, a crucial process for revealing possible misalignments or ambiguities. In conclusion, a panel of experts, including authors and translators, reviewed all iterations of the questionnaire to eliminate discrepancies and ensure that the Italian version maintained semantic, idiomatic, experiential, and conceptual integrity concerning the English original. This collaborative, interdisciplinary method refined the translation, ensuring that the adapted questionnaire accurately reflected the meaning and context of the original, making it suitable for use in field research in the Italian context.

Comprehension pretest

Once the process of translating the OHLS into the Italian language was completed, scrupulously adhering to the prescribed methodologies, the questionnaire was subjected to a first useful way phase employing a diverse sample of 28 subjects, distinguished by gender, age, nationality, educational level, and occupational profile (including blue-collar, white-collar, drivers, and restaurant workers) (Table 1 and Charts 1 and 2). At this preliminary stage, each participant filled out the questionnaire (Annex 1); then, through a unique, equally anonymous section, we explored the comprehensibility and usability of the instrument under consideration through open-ended questions. This step is crucial in verifying that the questions proposed in the OHLS are interpreted consistently by the subjects, thus offering a reliable measure of its content validity. In addition, an analysis was performed on the distribution of responses to identify any significant patterns of non-response, which might indicate the need for further clarification or to make specific terms or concepts more accessible in the Italian edition of the OHLS.

As part of our scientific study, we undertook a validation phase by examining a sample of 398 individuals (that did not include pretest subjects) employed in different sectors obliged to undergo the periodic medical examination imposed by Legislative Decree No. 81/08, with a view to health surveillance. During these visits, a two-part questionnaire was administered: one collected socio-demographic, occupational, medical history, and lifestyle and nutrition data; the other investigated the primary variable of interest, namely the 12 items of the OHLS. This data collection process ensured the anonymity of the participants.

After receiving detailed information about the study and the processing of personal data, participants provided written informed consent, agreeing to both participation in the research and potential anonymous, aggregate publication of the data. Only those who gave such consent participated in the study, excluding anyone who refused. Notably, the study protocol did not require approval from the Ethics Committee of the University of Palermo, in line with World Health Organization regulations on scientific research.

Statistical analysis

To assess the construct validity of the Italian version of the OHLS, an internal reliability analysis was performed by calculating Cronbach's alpha for the occupational health literacy question set to test the internal reliability of the responses in the Italian context; a multiway ANOVA analysis of differences between demographic groups was performed to assess whether there were significant differences in the responses to the occupational health literacy questions about gender and occupation; finally, a correlation analysis (Pearson's coefficient) was performed with external variables such as age, length of employment, or level of education to assess the convergent validity of the questionnaire.

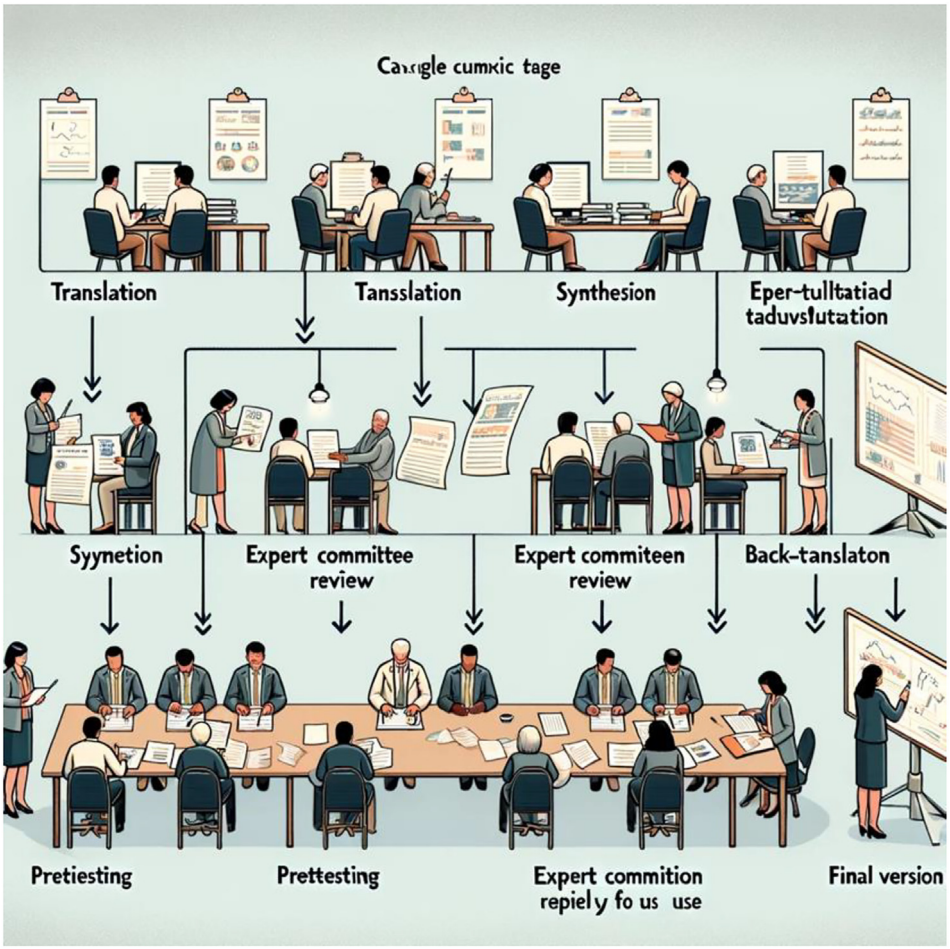

Fig. 1. Stages of validation according to the Beaton guidelines.

Table 1
Characteristics of pre-test sample.

No.	Gender	Age	Nationality	Education level	Job title
1	Female	35	Italian	High school award	Administrative employee
2	Female	50	Italian	University degree	Insurance employee
3	Male	47	Foreigner	Middle school award	Manufacturing worker
4	Male	52	Italian	Middle school award	Construction worker
5	Male	41	Italian	High school award	Taxi driver
6	Male	58	Italian	Middle school award	Truck driver
7	Female	27	Foreigner	High school award	Cleaning staff
8	Female	32	Italian	Professional award	Cook
9	Male	45	Italian	Middle school award	IT technician
10	Female	30	Italian	University degree	Teacher
11	Male	40	Foreigner	Professional award	Mechanical worker
12	Female	35	Foreigner	High school award	Secretary
13	Male	50	Italian	University degree	Manager
14	Female	25	Italian	Middle school award	Saleswoman
15	Male	55	Foreigner	High school award	Bus driver
16	Female	45	Italian	University degree	Doctor
17	Male	60	Italian	Professional award	Bricklayer
18	Female	50	Foreigner	High school award	Secretary
19	Male	32	Italian	University degree	Lawyer
20	Female	28	Foreigner	Middle school award	Bartender
21	Male	37	Italian	Professional award	Gardener
22	Female	42	Italian	High school award	Cleaning staff
23	Male	48	Foreigner	University degree	Researcher
24	Female	33	Italian	Middle school award	Journalist
25	Male	53	Italian	Professional award	Hairdresser
26	Female	27	Foreigner	High school award	Clerk
27	Male	49	Italian	University degree	Electrician
28	Female	29	Foreigner	Middle school award	Caregiver

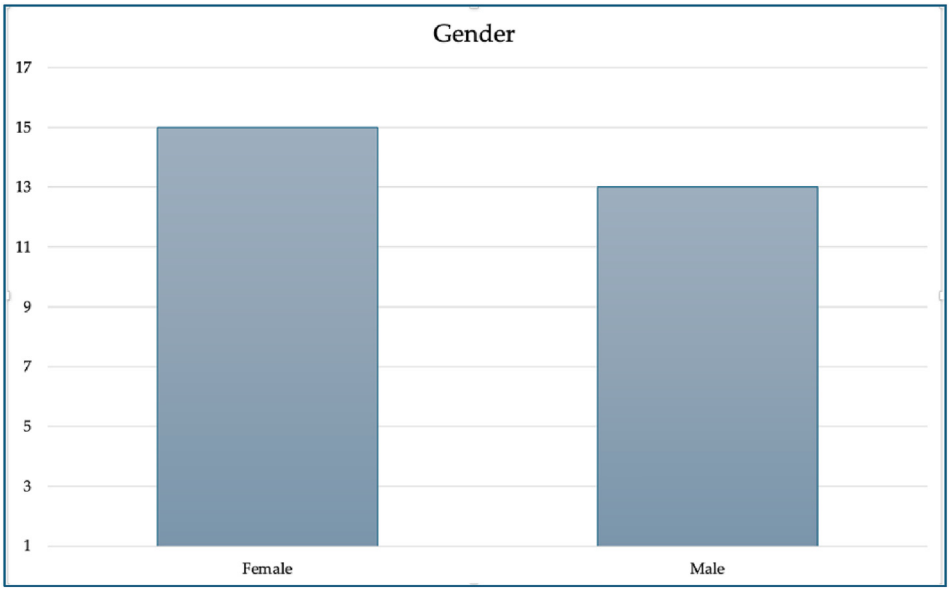

Chart 1. Pre-test sample by gender.

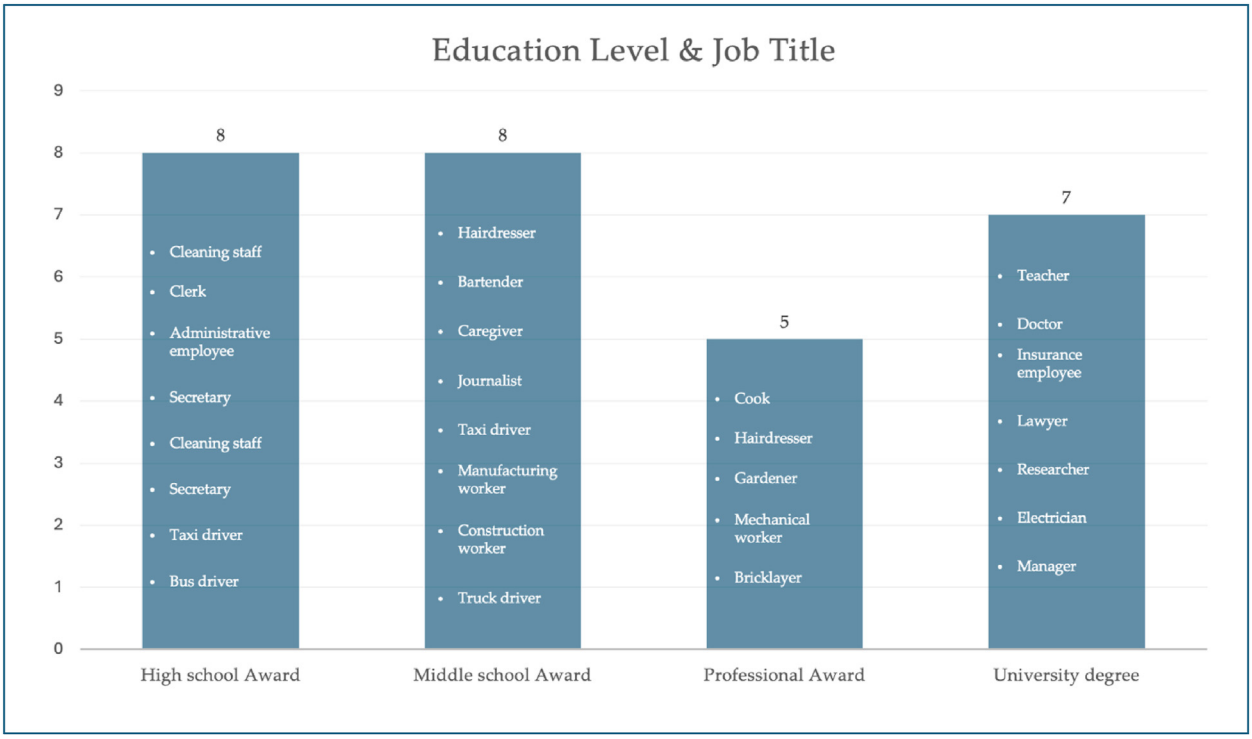

Chart 2. Pre-test sample by education level and job title.

To analyze whether there were significant differences in the responses to questions Q1–Q12 between different job tasks, the Kruskal–Wallis test was carried out, which allowed us to assess whether the medians of the responses differed significantly between occupational categories. It was chosen to use this test, and not ANOVA, because job task represents a variable with a non-normal distribution in response to the questionnaire, differently from age, gender, and level of schooling.

GraphPad Prism (Version 10.2.0 (335), February 5, 2024) was used.

Results

Sample characteristics

The sample, in terms of gender, shows a predominance of males, making up 74.87% of the sample with a total of 298 subjects, compared to females, who account for 25.13%, equivalent to 100 subjects. Regarding age, males have an average age of about 42.59 years and females 43.02 years, with ages ranging from 19 to 67

years for both sexes. The average age of the sample stands at 42.70 years, indicating a mature and experienced workforce.

The distribution in age groups is even, with 85 subjects (21.36%) in the 36–45 age group, followed by 79 subjects (19.85%) in both the 26–35 age group and the 56–65 age group. The 46–55 age group has 70 subjects (17.59%), the 18–25 age group has 57 subjects (14.32%), and finally the over-65 age group includes 28 subjects (7.04%).

Regarding educational level, most participants completed junior high school, with 207 individuals (52.01%), while 122 individuals (30.65%) have junior high school education, and 69 individuals (17.34%) hold a bachelor's degree.

Looking at occupations, blue-collar workers account for nearly 30 percent of the sample, with 119 individuals, followed by drivers with 102 individuals (25.63 percent), office workers with 98 individuals (24.62 percent), and restaurant workers with 79 individuals (19.85 percent). Italian nationality is predominant, with 386 Italian subjects (96.98%) compared to a minority of 12 foreigners (3.02%).

Seniority is evenly distributed among the various categories, with a pronounced presence of individuals with seniority over 20 years, counting 100 subjects (25.13%). This is followed by 82 individuals with a seniority of 6–10 years (20.60%), 81 individuals with a seniority of fewer than five years (20.35%), 76 individuals with a seniority of 16–20 years (19.10%), and 59 individuals with a seniority of 11–15 years (14.82%).

Domain 1: assessment of perceived ease in finding, evaluating, and applying information related to occupational safety and health (Q1 → Q8)

The Italian version of the domain inherent in the assessment of perceived ease in finding, evaluating, and applying information related to occupational safety and health, which includes questions 1–8, showed an excellent model fit, with a Cronbach's alpha value of 0.963, indicating a high internal consistency of the questions exploring perceived ease in finding, evaluating, and applying information related to occupational safety and health. This suggests that the group of questions forms a cohesive construct and reliably measures this aspect of occupational health literacy. The multi-way ANOVA test shows statistically significant results for all questions (Q1–Q8), with extremely low *P*-values ($P < 0.005$). This indicates significant differences in perceptions of the ease of accessing, understanding, and using occupational health and safety information among different levels of education.

Domain 2: assessment of the importance attached to and responsibility taken by the individual regarding his or her occupational health and safety (Q9 → Q12)

The Italian version of the domain inherent in the assessment of the importance attributed to and responsibility assumed by the individual toward his or her occupational health and safety, which includes questions 9 through 12, showed high internal consistency for questions regarding the importance attributed to and responsibility assumed by the individual toward his or her occupational health and safety, with a Cronbach's alpha value of 0.943. This shows that the second group of questions also constitutes a cohesive construct.

The ANOVA revealed significant differences between education groups, with *P*-values <0.05 indicating a solid distinction in opinions about the importance and personal responsibility regarding occupational health and safety.

The statistical significance observed in ANOVA analyses for both domains further supports the construct validity of the questionnaire, indicating that it is sensitive to variations in occupational health literacy levels by respondents' educational background (Fig. 2).

The correlation between participants' age and their mean responses to the questionnaire was −0.053, with a *P*-value of 0.291. This indicates a weak and non-significant correlation, suggesting that age does not significantly affect the responses.

The correlation between participants' working seniority and their mean responses to the questionnaire is −0.031, with a *P*-value of 0.541. Again, a very weak and non-significant correlation is observed, indicating that work seniority does not significantly impact questionnaire responses.

Analysis using the Kruskal–Wallis test revealed significant differences in the responses to questions Q1–Q12 among the different occupational categories (blue-collar worker, driver, office worker, food service worker). The *P*-values for each question are extremely low, well below the standard significance threshold of 0.05, suggesting that the observed differences between the job task groups are statistically significant for all the questions analyzed.

These results indicate that job tasks impact the responses given to the questionnaire, suggesting that the perceptions, opinions, or behaviors measured by the questions may vary significantly depending on the occupational category of the respondents. The differences could reflect variations in work experience, vocational training, or other factors related to the job context specific to each job task.

Discussion

In the context of a global shift toward sustainability and well-being in the workplace environment, as well as dependent on workplace safety, it is widely recognized that one of the priority research areas and emerging issues is the need to acquire more and more data on occupational health literacy.[20]

Health literacy in the workplace is a crucial aspect that touches various areas, from individual to organizational, affecting both worker health and business productivity.[21] Occupational health literacy, i.e. the ability to understand, evaluate, and apply health-related information in the workplace enables individuals to make informed decisions regarding their safety and well-being.[9] In addition, increased awareness and understanding of health issues enable effective workplace health management, including early recognition of symptoms and timely seeking of medical care.[22]

The impact of health literacy also extends to work productivity, optimal health status, maintained through informed behaviors, can significantly reduce absenteeism and improve work performance.[23] This type of literacy also promotes inclusion and support for diversity within the work environment by ensuring that health information is accessible to all workers, regardless of their needs or background. Empowering workers is another critical aspect, as being informed about occupational health makes them more capable of acting proactively for their safety and that of their colleagues.[24]

From an economic perspective, preventing occupational injuries and illnesses through practices based on adequate health literacy can also help reduce healthcare costs for workers and employers.[25] This translates into lower direct and indirect medical costs, highlighting how investing in training programs and initiatives to improve occupational health literacy can lead to significant long-term benefits.[26]

The results of our study indicate that the OHLS questionnaire,[18] in its Italian version, appears to be simple and straightforward in use, presenting no significant interpretive challenges for Italian workers. The instrument's items are characterized by their clarity and logic concerning the objectives of the questionnaire. Their

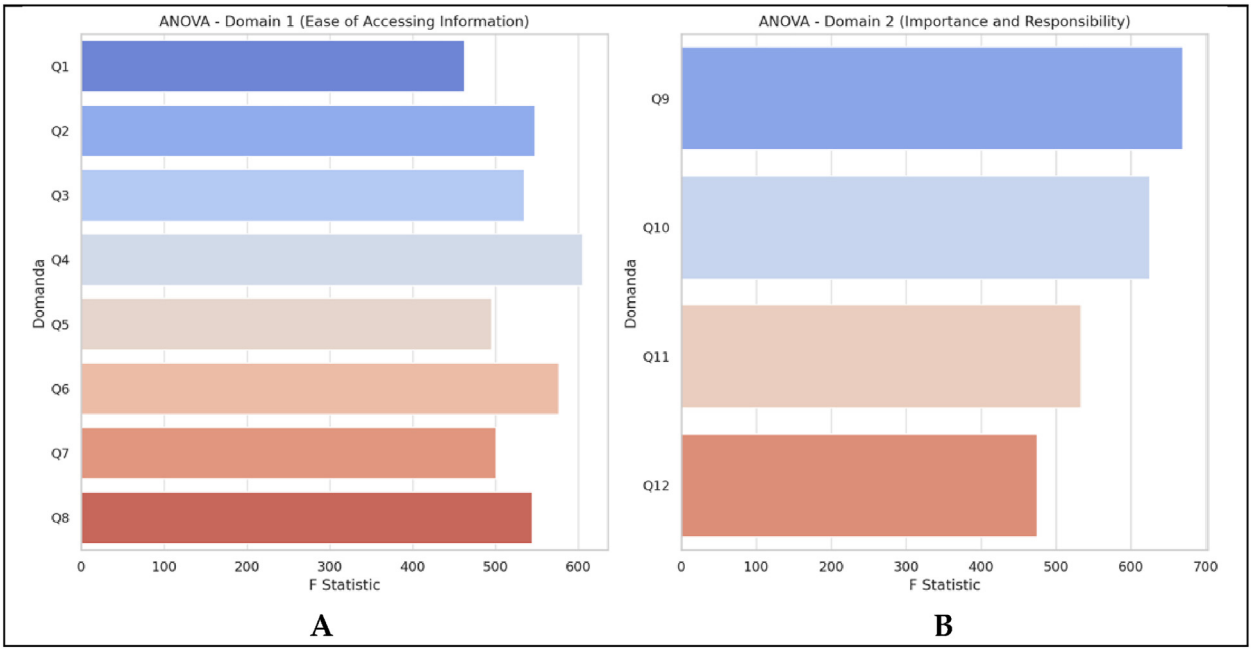

Fig. 2. A. Domain 1 (Ease of Accessing Information): The graph shows F-statistics for each question within this domain, reflecting significant differences between education groups regarding perceived ease of finding, evaluating, and applying information related to occupational safety and health. The high F-statistics indicate significant differences between groups. **B. Domain 2 (Importance and Responsibility):** Similarly, this graph presents F-statistics for questions related to the importance attached to and responsibility taken by the individual regarding his or her occupational health and safety. Again, the high F-statistics confirm significant differences between education groups.

organization within the various domains has been carefully thought out, making the questionnaire an effective tool for assessing occupational health literacy among Italian workers.

Although variations in the use of synonyms were noted in some questions, the general meaning of the items remained unchanged and understandable to the recipient. Similarly, the retranslations of the OHLS questionnaire retained semantic and content fidelity to the original, making them highly like the original OHLS. Any minor differences were resolved by consensus agreement of a committee of experts.

In the process of adapting the OHLS questionnaire to the Italian labor context, the expert committee paid particular attention to verifying the applicability of the items in the specific Italian context and assessing the need for any modifications or adaptations. After a detailed analysis, all items in the questionnaire were considered relevant and applicable, despite any social, cultural, or legislative differences that may exist between Italy and the context in which the questionnaire was initially developed.

Notably, the study was conducted in a multicenter setting, thus ensuring the generalizability of the results to different work contexts comprising different levels of education. However, the clarity and relevance of the items in the OHLS questionnaire, which cover different aspects of occupational health literacy with which Italian workers are generally familiar, suggest that any differences in the interpretation of the questionnaire may primarily affect how the items are answered rather than how they are understood.

The validation model used demonstrates that the Italian version of the questionnaire is faithful to the original instrument and, as such, allows for an efficient and robust measurement of worker well-being.

In terms of validation, the high Cronbach's alpha suggests that the translated questionnaire has excellent internal reliability, being able to measure perceptions related to occupational health literacy consistently. The weak correlations with age and length of employment do not show direct links between these demographic variables and questionnaire responses, potentially suggesting that the questionnaire measures a construct that is relatively independent of these factors. This could be interpreted as an indicator of the construct validity of the questionnaire, as it suggests that responses are more influenced by individual knowledge and perceptions of occupational health rather than demographic or occupational characteristics.

The results show that the questionnaire is sensitive to variations in occupational health literacy levels among individuals with different educational backgrounds, confirming the validity of the questionnaire in capturing significant differences in perceptions of occupational health and safety. The statistical significance of the differences between educational groups further supports the construct validity of the translated questionnaire, highlighting how understanding and evaluation of occupational health and safety may vary according to the educational level of respondents.

The high internal reliability of both domains confirms that the questionnaire translated into Italian cohesively and consistently measures the dimensions considered, both in terms of access to and understanding of information (Domain 1) and in terms of importance attributed and personal responsibility (Domain 2), and the ability to distinguish between groups with different levels of education confirm the validity of the Italian version of the OHLS and suggest that the questionnaire is a valuable tool for assessing occupational health literacy in the Italian context.

Adequate occupational health knowledge enables workers and employers to recognize the symptoms of sleep disorders and mental health problems,[27] such as depression and anxiety, which are often exacerbated by occupational stressors. For example, shift work, long hours, and high work demands can alter normal sleep patterns and lead to sleep disturbances,[28] which in turn can precipitate or exacerbate psychiatric conditions. By promoting a better understanding of these dynamics, workers can demand changes in their work environment, while employers can implement targeted

interventions, such as flexible schedules and mental health support programs.

Conclusions

Occupational health literacy plays a crucial role in creating safer and healthier work environments, supporting the overall well-being of workers, and contributing positively to business productivity and success. Promoting a work culture that values and supports health and safety is, therefore, a valuable investment for any organization.

In this context, our analyses revealed a valid model fit and solid internal consistency regarding the OHLS questionnaire. Evaluation of the correlations between the different parameters of the questionnaire confirmed its concurrent, convergent, and discriminant validity, aligning the results with the fundamental theories and expectations of occupational health literacy. Interestingly, our results align closely with those obtained in previous studies, such as those by Friedrich et al., thus providing further support for the reliability and methodological rigor of the original OHLS and promoting its widespread application.

The validation of the OHLS in its Italian version thus paves the way for its extensive use among native Italian speakers. In this framework, considering the guidelines of the Italian National Prevention Plan (PNP) 2020–2025,[29] which encourages the adoption of preventive strategies aligned with the Total Worker Health (TWH) model[30] and actions aimed at improving health literacy, the data we collected offer an essential starting point for advancing toward an informed and practical application of the OHLS in Italy.

Finally, including the development of evaluative tools, can contribute to the practical and concise integration of health literacy with compulsory training required by current occupational safety regulations, contributing significantly to the advancement of knowledge in occupational health literacy and worker well-being.[31]

Author statements

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Ethical approval

Non-necessary.

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Competing interests

The authors declare no conflict of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.puhe.2024.07.017.

References

1. Kumar S, Preetha G. Health promotion: an effective tool for global health. *Indian J Community Med* 2012;**37**(1):5–12. https://doi.org/10.4103/0970-0218.94009.
2. Pulimeno M, Piscitelli P, Colazzo S, Colao A, Miani A. School as ideal setting to promote health and wellbeing among young people. *Health Promot Perspect* 2020;**10**(4):316–24. https://doi.org/10.34172/hpp.2020.50. Published 2020 Nov 7.
3. Drejeris R, Drejeriene E. Novel approach to the actions for causes elimination of staff resistance to innovative change. *J Multidiscip Healthc* 2022;**15**:1011–22. https://doi.org/10.2147/JMDH.S354329. Published 2022 May 6.
4. Galli P, Di Leone G. Il D.Lgs. n. 81/08: ruolo dei Servizi di Prevenzione e Sicurezza negli Ambienti di Lavoro delle ASL [L.D. n. 81/08: the role of National Health Service Occupational Health and Safety Units]. *G Ital Med Lav Ergon* 2010;**32**(4 Suppl):218–21.
5. Ilmarinen J. Work ability–a comprehensive concept for occupational health research and prevention. *Scand J Work Environ Health* 2009;**35**(1):1–5. https://doi.org/10.5271/sjweh.1304.
6. Liu C, Wang D, Liu C, Jiang J, Wang X, Chen H, et al. What is the meaning of health literacy? A systematic review and qualitative synthesis. *Fam Med Comm Health* 2020 May;**8**(2):e000351. https://doi.org/10.1136/fmch-2020-000351. PMID: 32414834; PMCID: PMC7239702.
7. Rademakers J, Heijmans M. Beyond reading and understanding: health literacy as the capacity to act. *Int J Environ Res Public Health* 2018;**15**(8):1676. https://doi.org/10.3390/ijerph15081676. Published 2018 Aug 7.
8. Gernert M, Stassen G, Schaller A. Association between health literacy and work ability in employees with health-related risk factors: a structural model. *Front Public Health* 2022;**10**:804390. https://doi.org/10.3389/fpubh.2022.804390. Published 2022 Feb 18.
9. Friedrich J, Rupp M, Feng YS, Sudeck G. Occupational health literacy and work ability: a moderation analysis including interpersonal and organizational factors in healthy organizations. *Front Public Health* 2024;**12**:1243138. https://doi.org/10.3389/fpubh.2024.1243138. Published 2024 Feb 7.
10. Stassen G, Grieben C, Hottenrott N, Rudolf K, Froböse I, Schaller A. Associations between health-related skills and young adults' work ability within a structural health literacy model. *Health Promot Int* 2021;**36**(4):1072–83. https://doi.org/10.1093/heapro/daaa099.
11. Ehmann AT, Groene O, Rieger MA, Siegel A. The relationship between health literacy, quality of life, and subjective health: results of a cross-sectional study in a rural region in Germany. *Int J Environ Res Public Health* 2020;**17**(5):1683. https://doi.org/10.3390/ijerph17051683. Published 2020 Mar 5.
12. Zheng M, Jin H, Shi N, Duan C, Wang D, Yu X, et al. The relationship between health literacy and quality of life: a systematic review and meta-analysis. *Health Qual Life Outcomes* 2018;**16**(1):201. https://doi.org/10.1186/s12955-018-1031-7.
13. Chow BC, Jiao J, Duong TV, Hassel H, Kwok TCY, Nguyen MH, et al. Health literacy mediates the relationships of cognitive and physical functions with health-related quality of life in older adults. *Front Public Health* 2024;**12**:1355392. https://doi.org/10.3389/fpubh.2024.1355392.
14. Lindert L, Choi KA, Pfaff H, Zeike S, et al. Health literacy at work - individual and organizational health literacy, health supporting leadership and employee wellbeing. *BMC Health Serv Res* 2023;**23**(1):736. https://doi.org/10.1186/s12913-023-09766-0.
15. Shannon HA, Parker AW. Evaluation of a health literacy instrument designed for the mining industry. *Health Lit Res Pract* 2020;**4**(2):e84–93. https://doi.org/10.3928/24748307-20200316-01.
16. Suthakorn W, Songkham W, Tantranont K, Srisuphan W, Sakarinkhul P, Dhatsuwan J. Scale development and validation to measure occupational health literacy among Thai informal workers. *Saf Health Work* 2020;**11**(4):526–32. https://doi.org/10.1016/j.shaw.2020.06.003.
17. Azizi N, Karimy M, Abedini R, Armoon B, Montazeri A. Development and validation of the health literacy scale for workers. *Int J Occup Environ Med* 2019;**10**(1):30–9. https://doi.org/10.15171/ijoem.2019.1498.
18. Friedrich J, Münch AK, Thiel A, Voelter-Mahlknecht S, Sudeck G. Occupational Health Literacy Scale (OHLS): development and validation of a domain-specific measuring instrument. *Health Promot Int* 2023;**38**(1):daac182. https://doi.org/10.1093/heapro/daac182.
19. Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. *Spine* 2000;**25**(24):3186–91. https://doi.org/10.1097/00007632-200012150-00014.
20. Kavouras S, Vardopoulos I, Mitoula R, Zorpas AA, Kaldis P. Occupational health and safety scope significance in achieving sustainability. *Sustainability* 2022;**14**(4):2424. https://doi.org/10.3390/su14042424.
21. Lindert L, Choi KA, Pfaff H, Zeike S. Health literacy at work – individual and organizational health literacy, health supporting leadership and employee wellbeing. *BMC Health Serv Res* 2023;**23**(1):736. https://doi.org/10.1186/s12913-023-09766-0. Published 2023 Jul 6.
22. Rosen MA, DiazGranados D, Dietz AS, Benishek LE, Thompson D, Pronovost PJ, et al. Teamwork in healthcare: key discoveries enabling safer, high-quality care. *Am Psychol* 2018 May-Jun;**73**(4):433–50. https://doi.org/10.1037/amp0000298. PMID: 29792459; PMCID: PMC6361117.
23. Sato Y, Iwakiri K, Matsuo T, Sasaki T. Impact of health literacy on health practices in the working life of young Japanese nurses and care workers. *Ind Health* 2021;**59**(3):171–9. https://doi.org/10.2486/indhealth.2020-0218.
24. Stanford FC. The importance of diversity and inclusion in the healthcare workforce. *J Natl Med Assoc* 2020;**112**(3):247–9. https://doi.org/10.1016/j.jnma.2020.03.014.

25. Grimani A, Bergström G, Casallas MIR, Aboagye E, Jensen I, Lohela-Karlsson M. Economic evaluation of occupational safety and health interventions from the employer perspective: a systematic review. *J Occup Environ Med* 2018;**60**(2): 147–66. https://doi.org/10.1097/JOM.0000000000001224.
26. Lotfi M, Lotfi F, Sedghi S, Panahi S. Cost-effectiveness of health literacy enhancement intervention on patients with type II diabetes. *Med J Islam Repub Iran* 2023;**37**:86. https://doi.org/10.47176/mjiri.37.86. Published 2023 Aug 2.
27. Lo Coco D, Cupidi C, Mattaliano A, Baiamonte V, Realmuto S, Cannizzaro E. REM sleep behavior disorder in a patient with frontotemporal dementia. *Neurol Sci* 2012;**33**(2):371–3. https://doi.org/10.1007/s10072-011-0702-5.
28. Cirrincione L, Plescia F, Malta G, Campagna M, Lecca LI, Skerjanc A, et al. Evaluation of correlation between sleep and psychiatric disorders in a population of night shift workers: a pilot study. *Int J Environ Res Public Health* 2023;**20**(4):3756. https://doi.org/10.3390/ijerph20043756. Published 2023 Feb 20.
29. Ministero della Salute. Direzione Generale della Prevenzione Sanitaria. Piano Nazionale della Prevenzione 2020–2025. Available at: https://www.salute.gov.it/imgs/C_17_notizie_5029_0_file.pdf. [Accessed 28 December 2022].
30. Roelofs C. *Total worker Health*® employer preparedness: a proposed model and survey of human resource managers' perceptions. *Disaster Med Public Health Prep* 2022;**17**:e91. https://doi.org/10.1017/dmp.2021.364. Published 2022 Feb 18.
31. Malta G, Plescia F, Zerbo S, Verso MG, Matera S, Skerjanc A, et al. Work and environmental factors on job burnout: a cross-sectional study for sustainable work. *Sustainability* 2024;**16**(8):3228. https://doi.org/10.3390/su16083228.