

Workload of home care nurses: Italian adaptation, validity, and reliability of the National Aeronautics and Space Administration Task Load Index questionnaire

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Abstract

The aim of this study was to adapt the National Aeronautics and Space Administration Task Load Index (NASA-TLX) to the home care setting and translate and validate it in Italian.

An online questionnaire containing the Italian version of the NASA-TLX adapted to the home care setting was administered to home care nurses to measure workload.

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Content Validity Index, Exploratory, and Confirmatory Factor Analyses were used to measure the psychometric characteristics of the modified NASA-TLX.

The modified Italian version of NASA-TLX_HC-IT showed good psychometric characteristics in measuring the workload of home care nurses, with excellent fit indices. The reliability, calculated with Cronbach's alpha, was 0.73, indicating adequate reliability. A negative correlation between workload and job satisfaction among home care nurses, as well as a positive association between high workload and intention to leave the workplace, was verified.

The modified Italian version of the NASA-TLX_HC-IT was confirmed to be a valid and reliable instrument to measure workload in home care nursing. Furthermore, the correlation between workload and the intention to leave the workplace among home care nurses was an important result that community nursing managers should consider preventing the shortage of home care nurses.

KEYWORDS

community nursing, home care nurses, tool validation, workload

1 | BACKGROUND

Nursing workload has been defined as the performance required to carry out nursing activities in a specified period of time (Tubbs-Cooley et al., 2018). Nursing work is referred both to direct care nurses provide to patients and to administrative tasks unrelated to patients (indirect nursing care) (Alghamdi, 2016; Cawthorn & Rybak, 2008). The study of nursing workload is a key aspect of health services management, given the evidence on its association with nurses' poor health (Diehl et al., 2021; Zaghini et al., 2020). In fact, high levels of workload lead to job-related stress (Babapour et al., 2022), burnout (Diehl et al., 2021), emotional exhaustion, and job dissatisfaction (Maghsoud et al., 2022). Although the latter aspect is still unclear (Hellín Gil et al., 2022), all those conditions that lead professionals to leave the profession (Stemmer et al., 2022), constitute a phenomenon known as "intention to leave". Nevertheless, heavy workload is also associated with poor job performance, leading to missed nursing care, miscommunication, increased incidence of falls, medication errors, and higher patient mortality rates (Bagnasco et al., 2020; Banda et al., 2022; Havaei & MacPhee, 2020).

In the last years, due to epidemiological trends, care delivery has increasingly shifted from the hospital to the community (Clarke et al., 2021). Home care represents an indispensable resource globally in response to the aging population. It is projected that by 2050, 22% of the world's population will be over the age of 60 (World Health Organization, 2008). The increasing aging of the population and the rise in chronic diseases (Cheng et al., 2020) necessitate a redefinition of the care model, which can no longer be confined to the hospital setting. In Italy, there is an anticipated increase in the elderly population (>65 years) from 23.8% in 2022 to 34.5% in 2050 (Italian National Statistical Institute, 2023), many of whom suffer from chronic diseases. This situation demands a reevaluation of the concept of care, especially given

the challenges faced by increasingly crowded emergency rooms (Savioli et al., 2022). This scenario inevitably necessitates a shift toward community-based care services. In community-based care, particularly within home care settings, nurses play a pivotal role. They employ a broad spectrum of expertise, encompassing tasks such as personal hygiene assistance, wound care, and the administration of complex medical treatments. This role necessitates a high degree of flexibility and adaptability to various situations and patient needs. Furthermore, nurses in home care exercise considerable professional judgment and independence, frequently making patient care decisions without direct supervision and adeptly navigating complex clinical scenarios (Brenne et al., 2022). However, the number of home care nurses has not increased proportionately to the rise in care demand in the community (Pérez-Francisco et al., 2020) leading to understaffing (Aiken et al., 2014; Bagnasco et al., 2020). This phenomenon particularly affects Italy due to its high patient-to-nurse ratios, which increase workload (Sasso et al., 2017). This aspect can potentially lead to a vicious circle because heavy workload is associated with the willingness of nurses to leave their job (Holland et al., 2019). Previous research has shown that various factors influence home care nurses' intentions to leave, such as insufficient development and career opportunities, a negative working atmosphere, and work context (Tummers & Dulk, 2013). However, despite studies conducted in hospitals demonstrating an association between workload and intention to leave (Holland et al., 2019), there has been limited research on this association within the home care setting. In this perspective, measuring workload in the home care settings is mandatory for health organizations in the community.

As reported in the literature, nursing workload is commonly assessed using professional-based measures (e.g., subjective workload evaluations and physiological indications), like Spector and Jex scale (1998) which asked respondents "How many times did you find there are many things to do," or "how many times are you asked to work

quickly,” or resource-based measures (e.g., nurse-to-patient staffing ratios or nursing care hours per patient day), and patient-based measures (e.g., clinical acuity), such as the Modified Early Warning Score (MEWS) (Carayon & Gürses, 2005; Suppiah et al., 2014; Tubbs-Cooley et al., 2018).

However, measuring workload in the home care setting is challenging because activities are carried out in a non-standardizable and often unpredictable environment (Fatemi et al., 2019). While a more accurate measurement method would involve a time-motion methodology (Fatemi et al., 2019), but applying this design to a large sample is difficult (Lopetegui et al., 2014). Therefore, a simple, standardizable, and valid tool is necessary.

According to the literature, one of the most widely adopted measurement tools for assessing subjective workload is the National Aeronautics and Space Administration Task Load Index (NASA-TLX) (Hart, 2006; Hart & Staveland, 1988; Masi et al., 2023). Originally developed for evaluating workload in aviation settings (Hart, 2006), this multifaceted tool has been translated into at least 12 different languages and extensively applied in nursing research (Baethge et al., 2016; Dhaini et al., 2022; Grier, 2015; Hoonakker et al., 2011; Racy et al., 2021; Sönmez et al., 2017; Tubbs-Cooley et al., 2018). In particular the NASA Task Load Index (NASA-TLX) is a valid, reliable, versatile, and multidimensional tool that is able to assesses perceived workload (Racy et al., 2021). It allows for the determination of workload across six dimensions (Mental, Physical, and Temporal demand, Effort, Performance, and Frustration level) to ascertain an overall workload rating. Over time, it has become the most widely used tool for workload measurement (Racy et al., 2021) in different settings, such as chemical companies to measure the optimal number of workers (Junaedi et al., 2020), sugar industry workers to calculate mental and physical workload (Zidan et al., 2024), but also informatic, psychological sector, and transportations (Young et al., 2008). Recently, it has also been used to analyze its construct for the healthcare setting, and specifically in neonatal, pediatric, and adult intensive care settings (Ciofi-Silva et al., 2023; Hernandez et al., 2022; Hoonakker et al., 2011; Park et al., 2024; Sönmez et al., 2017; Tubbs-Cooley et al., 2018; Zehnder et al., 2020). Moreover, the primary strength of this tool lies in its ability to assess situation-level variability, making it particularly suitable for the primary care setting (Dhaini et al., 2022).

To the best of our knowledge, this tool has never been tested on a sample of Italian home care nurses. Therefore, the aim of this paper was to validate the Italian version of the NASA-TLX in this specific population and, to verify its association with intention to leave.

2 | METHODS

2.1 | Design and sample

This is a validation study of the NASA Task Load Index (NASA-TLX), which was translated into Italian and adapted to measure the workload of home care nurses. This study is part of the Home Nursing Care in Italy (AIDOMUS-IT) project (Bagnasco et al., 2024). In Italy,

home care is managed by local health authorities (LHAs), that are public health agencies responsible for managing and delivering healthcare services within a specific district or territory, usually corresponding to a province. LHAs manage and coordinate primary care services, delivered by all healthcare professionals (e.g., general practitioners, family nurses, district nurses, etc.). Consequently, all nurses who provide home care at patients' homes through these organizations constituted our sample population. For the aim of this study, nurses working in homecare settings, who provided direct care to patients were enrolled. Nurses who, despite working in home care services, did not provide direct patient care (e.g., nurses engaged in front office or coordination activities) were excluded. Seventy LHAs out of the 110 available in Italy participated in this study. All nurses from the participating LHAs who met the inclusion criteria were invited to participate. At the end of data collection phase, 3949 nurses completed the AIDOMUS-IT project. A total of 800 home care nurses were randomly extracted for the purposes of this study.

2.2 | Data collection

The data used for this validation study were sourced from the AIDOMUS-IT dataset, collected from April to October 2023. Specifically, an online survey was administered to home care nurses at a single point in time. The survey was disseminated to home care nurses through an email forwarded to each LHA, which included a secure access link to LimeSurvey®. In each LHA a facilitator was identified to facilitate the data collection procedure. Specifically, the facilitator was in charge of spreading the link generated for filling the questionnaire to all the nurses of that LHA. Upon accessing this web application, participants were required to view informational materials and the respective informed consent. After providing their consent, participants could access the survey. Several variables were considered in this study, which have been reported in the AIDOMUS-IT protocol published elsewhere (Bagnasco et al., 2023). Considering the purpose of the study, only variables useful for the validation of the instrument were considered (sociodemographic characteristics of the sample, the NASA-TLX, and the Practice Environment Scale of the Nursing Work Index—PES-NWI).

2.3 | Measurement tools

The NASA-TLX was developed to assess pilot and air traffic controller workload (Hart, 2006; Hart & Staveland, 1988) and there is a validated version in Italian conducted with a sample of motorcyclists (Bracco & Chiorri, 2006).

In particular, the NASA-TLX consists of six items which, through a 20-point Likert scale (ranging from 1 = low to 20 = high), investigate the workload borne by the respondent during the last shift. The original NASA-TLX questionnaire includes the following six items representing six dimensions: mental demand (How mentally demanding was the task); physical demand (How physically demanding was the

task); temporal demand (How hurried or rushed was the pace of the task); performance (How successful were you in accomplishing what you were asked to do); effort (How hard did you have to work to accomplish your level of performance); frustration (How insecure, discouraged, irritated, stressed, and annoyed were you). A previous study outlined the confirmed the reliability of this scale in nursing population (Cronbach's alpha ranged from 0.926 to 0.832). Starting from this tool, the NASA-TLX in home care (NASA-TLX_HC-IT), was developed and validated for this study to measure perceived workload in home care nurses. Specifically, the NASA-TLX_HC-IT was adapted considering the target population and their specific characteristics while retaining the same six dimensions of the original scale and the same response mode. The AIDOMUS-IT working group revised and adapted the NASA-TLX to be used for home care nurses. Specifically, one item was added to the original six-dimensional instrument following the original structure of the other items, to describe the dimension of "emotional demand": how much emotional commitment was required (e.g., due to difficult interviews, complex and burdensome situations). This item was added considering the uniqueness of the nursing profession, which is constantly in contact with illness, suffering, and death. Moreover, emotional demand can be one of the determinants of work strain (Winwood & Lushington, 2006; Yan, 2022) for nurses and it has been considered by previous literature to measure psychosocial workload (Nuebling et al., 2013). After revising the instrument, content and face validity were assessed through the ratings of five experts working in the home care setting. Content validity is considered one of the most important steps of instrument development (Terwee et al., 2018). All content validity steps followed the COSMIN methodology (Terwee et al., 2018) to ensure the highest quality of the measurement tool. The experts received an invitation to participate in an online questionnaire, which included a broad overview of the tool's purpose and detailed guidelines to effectively complete the online form. Their opinions on the instrument items were collected with their sociodemographic, educational, and occupational details. Specifically, experts were asked to read each question regarding an instrument item and to assess its relevance using a Likert scale from 1 (totally irrelevant) to 4 (totally relevant), while comprehensiveness and comprehensibility were assessed through text comments.

Another instrument used in this study was the PES-NWI. Specifically, this instrument was used to test criterion validity. This instrument was originally developed by Lake in 2002 (Lake, 2002) and validated for the Italian context in 2022 (Zanini et al., 2022). The Italian version of the PES-NWI consisted of 32 items assessed on a Likert scale with four response options from 1 to 4 (1 = totally disagree; 2 = disagree; 3 = agree; 4 = totally agree) and covers five dimensions: (1) Staffing and Resource adequacy (SRA); (2) Nurse Manager Ability, Leadership and Support of nurses (NMASSN); (3) Nursing foundations for quality of care (NFQC); (4) Collegial nurse-physician relation (CNPR); (5) Nurse participation in hospital affairs (NPHA). The score can be calculated as the mean value of the items included in each dimension. Higher scores indicate a better working environment and a scores above the cut-off of 2.5 indicate a good practice environment and those below 2.5 are unfavorable. For the purposes of this study, only the first two dimen-

sions were administered and used to test criterion validity, as they are the most important aspects to be considered in the home care setting and potentially correlated to perceived workload.

Finally, nurses' intention to leave was measured using a dichotomous "Yes" or "No," response item, in which they were asked, "If you had the opportunity, would you consider leaving your job at the LHA within the next year due to job dissatisfaction?"

2.4 | Analytic strategy

The Content Validity Index (CVI) for each item (I-CVI) was computed to evaluate content validity. The relevance score (1–4) was dichotomized into two categories: scores 1 and 2 (indicating irrelevant items), were recoded as 0, whereas scores 3 and 4 (indicating relevant items) were recoded as 1. Next, each item's CVI was determined by summing all the positive scores (coded as 1) and dividing the total by the total number of experts involved. Additionally, the average value of the scale content validity (S-CVI) was calculated by combining all the I-CVI scores divided by the total number of items. We considered S-CVI > 0.90 and I-CVI > 0.78 as an excellent content validity score (Lynn, 1986).

Regarding the analysis for testing the factorial structure of the NASA-TLX_HC-IT, two subsamples were randomly selected from the entire dataset. Random sampling was performed using R (R Core Team, 2024). A seed (#125) was set for reproducibility of the random sampling. A first random sample of 200 patients was selected for constituting the subsample 1. These 200 cases were excluded from the main dataset and the procedure was repeated to extract another 600 cases for constituting subsample 2. The selected samples were examined to ensure they maintained the distribution and characteristics of the original dataset. This approach ensured that the samples used for analyses were both random and representative of the larger nurse population, thereby supporting the validity and the generalizability of the results to the entire population.

The socio-demographic and work characteristics of the participants underwent analysis through descriptive statistics. To evaluate the distribution of each item and dimension of the NASA-TLX_HC-IT validated in this study, we calculated the mean, standard deviation, skewness, and kurtosis. Scale validity was scrutinized using the cross-validation approach (Xiong & Shang, 2016), involving the random division of the sample into two sub-samples. Sub-sample 1 was utilized to explore the psychometric properties of the modified NASA-TLX_HC-IT through exploratory factor analysis (EFA), while sub-sample 2 was employed to confirm its validity via confirmatory factor analysis (CFA).

The exploratory factor analysis (EFA) employed the Maximum Likelihood (ML) method with robust estimator to deal with non-normal distribution of data. EFA adequacy was verified through the Kaiser-Meyer-Olkin (KMO) measure. Values above 0.6 indicated sampling adequacy to conduct the analysis. In addition, to reject the hypothesis that there was no correlation between any of the variables, Bartlett's sphericity test was performed.

The determination of the number of factors considered loadings >0.30, absence of cross-loadings, eigenvalues greater than 1,

interpretability of the factor structure (Thurstone, 1940), and theoretical consistency of dimensions (Comrey & Lee, 2013). Items with poor psychometric properties, such as high cross-loadings and saturations ≤ 0.30 , should be excluded. Subsequently, in sub-sample 2, confirmatory factor analysis (CFA) was conducted using the Maximum Likelihood (ML) estimation method to validate the scale's dimensionality. Mardia's test was used to assess multivariate normality. The adequacy of the measurement model was assessed through various fit indices, including Chi-square (non-significant), RMSEA (< 0.06), CFI (> 0.90), TLI (> 0.90), SRMR (< 0.08) (Muthén et al., 2012) and goodness of fit index (GFI) (> 0.95) (Shevlin & Miles, 1998). Internal consistency for each factor was evaluated using Cronbach's α coefficient, with values ≥ 0.70 considered sufficiently reliable (Nunnally, 1975). The item-total correlation measures the relationship between a single item and the whole scale. A score above 0.20 for each item is considered satisfactory (Kline, 1986). Pearson's correlation coefficient "r" was used to assess the construct validity of the NASA-TLX-HC-IT to compare it with the dimensions of the PES-NWI. The Mann-Whitney U test for independent variables was used to test the association between nurses' perceived workload and intention to leave the home care job. Descriptive statistics analyses were conducted using JASP Statistics V. 0.18.1 (JASP Team, 2024), while EFA and CFA were performed using R[®] (version 4.3.2) and the "lavaan," "semPlot," and "semTools" packages (R Core Team, 2024).

3 | RESULTS

3.1 | Face and content validity

A total of six experts were involved in the content and face validity process. Experts were all nurses with a valuable experience in home care setting, mainly female ($n = 4$, 66.67%), had mean age of 50.0 (SD = 8.4) years, had mostly a Master of Science in Nursing ($n = 4$, 66.67%), reported a mean number of 27.0 (SD = 9.4) years in practice and were mostly working as nurses with organizational tasks ($n = 5$, 83.3%). Face validity was excellent, as no comments were left by respondents regarding comprehensiveness and comprehensibility. Regarding content validity, I-CVI ranged from 0.67 (item #6) to 1 (item #3, #4, #5). The AIDOMUS-IT working group therefore revised item #6 that obtained poor I-CVI and removed it from the scale, as it was considered redundant. The S-CVI obtained a value of 0.92.

3.2 | Structural validity

3.2.1 | Participants

Data from the sample of 800 nurses randomly extracted from the AIDOMUS-IT study were analyzed. Nurses had a mean age of 46.7 years (SD = 10.4), were mostly female ($n = 637$, 79.6%), had a regional Diploma or a bachelor's degree in nursing ($n = 713$, 89.3%) but did not attend a master's degree or a professional course in-home nursing care

($n = 587$, 73.4%). Moreover, nurses reported a mean of 22.4 years of experience (SD = 11.2) and a mean of 9.8 years in the home care setting (SD = 9.0) (Table 1).

3.2.2 | Exploratory factor analysis

Subsample one was used to perform EFA and to identify the underlying factor structure of the scale. The KMO overall value was adequate (0.70) while items #5 – Performance and #6 – Frustration obtained values of 0.55 and 0.54, respectively. Therefore, one item (#5 – Performance) was not considered in the factor analysis as this item differed from the others as it reflects a positive aspect of the work environment (to what extent did the participant feel satisfied with their performance) compared to other items. Therefore, the KMO test was repeated with the new 5-item NASA-TLX_HC-IT, obtaining an overall value of 0.73 and single-item values ranging between 0.67 and 0.76. Bartlett's test was adequate, revealing significant sphericity ($\chi^2(10) = 194.18$, $p < .001$). EFA was conducted, revealing a one-factor model (eigenvalue > 1) with factor loadings ranging from 0.43 (item #6) to 0.72 (item #3) (Table 2).

Descriptive statistics for NASA-TLX-HC-IT items in the subsample one can be retrieved in Table 3.

3.2.3 | Confirmatory factor analysis

CFA was conducted with subsample two to confirm the factorial structure of the NASA-TLX_HC-IT. Mardia's test revealed a multivariate non-normality distribution (Skewness = 283.21, $p < .001$; Kurtosis = 3.71, $p < .001$), thus indicating the adequacy of using a robust estimator to perform the analysis. The tested model resulted in a poor fit ($\chi^2(5) = 141.911$, $p < .001$; RMSEA = 0.223 (90% CI = 0.192–0.255), $p < .001$; CFI = 0.818, TLI = 0.635, GFI = 0.910, SRMR = 0.085). The inspection of the modification indices revealed an excessive shared covariance between items #4 (Temporal demand) and #6 (Frustration) and between items #1 (Mental demand) and #3 (Emotional demand). Mental and emotional demand can be considered as strictly related aspects, while previous research demonstrated that temporal demand could be related to frustration when tasks occupy more time than is available (Govasli & Solvoll, 2020). Thus, we specified a model that included these residual covariances. The model tested resulted in an excellent fit ($\chi^2(3) = 3.874$, $p < .001$; RMSEA = 0.024 (90% CI = 0.000–0.081), $p = .706$; CFI = 0.999, TLI = 0.996, GFI = 0.997, SRMR = 0.016) with factor loadings ranging from .33 (item #6) to .70 (item #1) (Figure 1).

3.2.4 | Reliability

Cronbach's alfa coefficient was calculated for subsample one and subsample two and considering all five items retained in the factorial analyses, obtaining respectively 0.71 and 0.74, showing adequate reli-

TABLE 1 Socio-demographics and work characteristics of participants.

	Total (n = 800) n (%)	Subsample 1 (n = 200) n (%)	Subsample 2 (n = 600) n (%)	p-value
Sex				.10 ^a
Male	144 (18.0%)	44 (22.0%)	100 (16.7%)	
Female	637 (79.6%)	153 (76.5%)	484 (80.7%)	
Prefer not to say	19 (2.4%)	3 (1.5%)	16 (2.7%)	
Title				.29 ^a
Regional diploma	353 (44.2%)	80 (40.0%)	273 (45.6%)	
University diploma	62 (7.8%)	21 (10.5%)	41 (6.8%)	
Bachelor's degree	360 (45.1%)	91 (45.5%)	269 (44.8%)	
Master's degree	24 (3.0%)	8 (4.0%)	16 (2.7%)	
Home care course				.04 ^a
No	587 (73.4%)	158 (79.0%)	429 (71.5%)	
Yes	213 (26.6%)	42 (21.0%)	171 (28.5%)	
Post-basic training				.03 ^a
None	587 (73.4%)	158 (79.0%)	429 (71.5%)	
Update course	50 (6.3%)	11 (5.5%)	39 (6.5%)	
Regional course	45 (5.6%)	9 (4.5%)	36 (6.0%)	
Master	101 (12.6%)	19 (9.5%)	82 (13.7%)	
University course	7 (0.9%)	-	7 (1.2%)	
Other	10 (1.3%)	3 (1.5%)	7 (1.2%)	
	Mean ± SD	Mean ± SD	Mean ± SD	
Age, years	46.7 ± 10.4	47.1 ± 10.3	46.6 ± 10.4	.55 ^b
Years of experience	22.4 ± 11.2	22.5 ± 10.9	22.4 ± 11.3	.92 ^b
Years of experience in home care setting	9.8 ± 9.0	10.3 ± 9.1	9.7 ± 8.9	.41 ^b

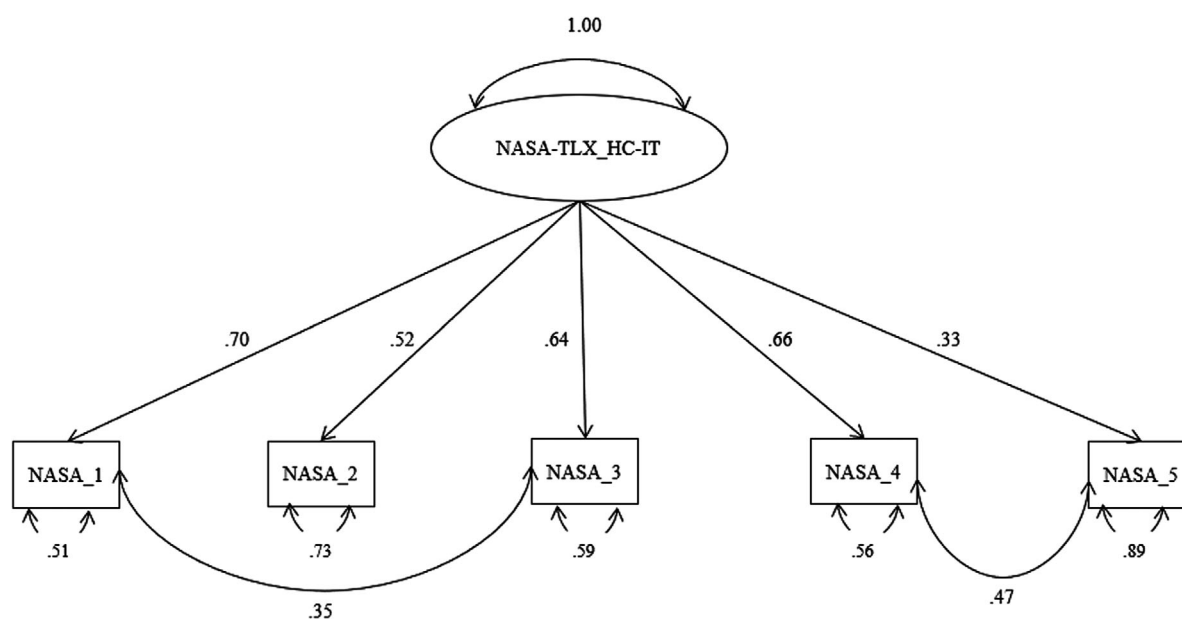
^aSignificance at Chi².^bSignificance at t-test.**FIGURE 1** Confirmatory factor analysis of NASA-TLX_HC-IT.

TABLE 2 Factor loadings of the NASA-TLX_HC-IT in subsample one after EFA ($n = 200$).

Items	Factor 1	h2
1	0.60	0.36
2	0.52	0.27
3	0.72	0.51
4	0.66	0.43
6	0.43	0.19

Note: $h2 =$ communalities; eigenvalue = 5.03; percentage of variance: 35%. Abbreviation: EFA, exploratory factor analysis.

ability. Total item correlation ranged from 0.41 (item #2) to 0.57 (item #4) in subsample one, and from 0.37 (item #2) to 0.65 (item #4) in subsample two.

3.2.5 | Criterion validity and hypothesis testing

We performed Pearson's correlation to explore the relationship between the NASA-TLX_HC-IT and the dimension adequacy of staffing resources (SRA) and nurse manager ability and leadership (NMALS) of the PES-NWI. The total score of the NASA-TLX_HC-IT was obtained standardizing from 0 to 100 the score obtained by summing the five items retained in the validation phase. Perceived workload was moderately correlated with SRA ($r = -0.334; p < .001$) but weekly correlated with NMALS ($r = -0.086; p = .015$). We also explored the correlation between perceived workload (using the validated five-item NASA-TLX_HC-IT) and job satisfaction (using item #5 of the NASA_TLX). Pearson's correlation revealed a significant positive weak correlation between perceived workload and nurses' satisfaction ($r = 0.132;$

$p < .001$), indicated that higher workload was correlated with higher performance satisfaction (Table 4).

Finally, with the Mann-Whitney U test, we found a positive association between the score of NASA-TLX_HC-IT and the nurses' intention to leave their home care job ($U = 37610.0; p < .001$).

4 | DISCUSSION

For several years, nursing workload has been shown to affect different aspects of nursing care, such as nursing well-being, quality of care, patient outcomes, and safety (Aiken et al., 2023; Carayon & Gurses, 2008; Jansson et al., 2019; Maghsoud et al., 2022). Therefore, it is essential to have valid and reliable instruments to assess the workload perceived by nurses, orient healthcare organizations, and address the related issues. On the other hand, it has also been recognized that workload can be perceived and consequently impact on nurses, in different ways depending on the specific nursing context (Carayon & Gurses, 2008; Hoonakker et al., 2011).

The present study confirmed the content, structural, and criterion validity of the NASA-TLX_HC-IT, in accordance with previous research (Dhaini et al., 2022; Grier, 2015; Tubbs-Cooley et al., 2018). Moreover, the NASA-TLX_HC-IT, adapted for the home care setting, demonstrated reliable results for this specific context. Since its development (Hart, 2006), the NASA TLX has been adapted and employed in various settings (Hoonakker et al., 2011). Specifically, it has been employed for several years in healthcare settings, including neonatal, pediatric (Tubbs-Cooley et al., 2018), and adult intensive care units (Lebet et al., 2021).

It is worth noting that, to ensure a proper fit of the model, we had to exclude the item related to nurses' satisfaction with their job

TABLE 3 Descriptive statistics of NASA_TLX_HC-IT items in subsample one ($n = 200$).

Item	n	Mean	SD	Median	Min	Max	Range	Skew	Kurtosis	SE
1	200	15.06	3.83	15.0	2	20	18	-0.51	-0.46	0.27
2	200	12.09	5.11	10.5	1	20	19	-0.09	-0.99	0.36
3	200	14.64	4.67	15.0	2	20	18	-0.70	-0.39	0.33
4	200	11.48	5.63	10.0	1	20	19	-0.17	-1.08	0.40
6	200	8.38	5.43	8.0	1	20	19	0.39	-0.80	0.38

Abbreviation: SE, standard error.

TABLE 4 Pearson's correlation between variables in study ($N = 800$).

Variables	M	SD	Alpha	NASA-TLX_HC-IT	NMALS	SRA
NASA-TLX_HC-IT	59.44	18.72	0.74			
NMALS	3.24	0.74	0.90	-0.09*		
SRA	2.58	0.85	0.88	-0.33**	0.29**	
JS	15.21	4.03	-	0.13**	0.18**	0.18**

Abbreviation: JS, job satisfaction; NMALS, nurse manager ability and leadership; SRA, adequacy of staffing resources.

* $p < .05$.

** $p \leq .001$.



performance from the factor analysis of the NASA-TLX_HC-IT. Moreover, we found an interesting positive correlation between this excluded item and the rest of the scale.

Indeed, our results demonstrated that despite the increase in workload, nurses' satisfaction with their job performance also increases. This result aligns with the "Goal Setting Theory" (Locke & Latham, 2019), which posits that working in a challenging environment, despite potentially elevating work-related stress, translates into setting stimulating goals. When these goals are attained, they enhance nurses' job satisfaction (Locke & Latham, 2019), in line with other research conducted in demanding nursing environments, such as cardiovascular settings for example (Zaghini et al., 2024).

Specifically, this study confirms that an increased workload, combined with the achievement of objectives, enhances nurses' job satisfaction as it enables nurses to meet patients' needs (Zaghini et al., 2023). Additionally, these results can assist nurse managers in mitigating the phenomenon of intention to leave. Indeed, the more satisfied nurses are, the more engaged they are in their work (Yildiz & Yildiz, 2022) and consequently, they are less inclined to leave their professions (Ramoo et al., 2013).

This is a noteworthy finding that suggests nurses are committed to delivering quality and high-standard care, even when workload is high. It could also imply that nurses' dedication succeeds to some extent in mitigating the difficulties caused by increased workload, leading to satisfaction with their own performance. In this regard, with the instrument we validated, it is currently not possible to understand the extent to which this phenomenon may occur. Additionally, it is unclear beyond what level of workload this becomes unattainable and could, therefore, result in a series of negative outcomes for nurses (e.g., burnout, intention to leave, etc.) and for patients (e.g., preventable adverse events), as already known in the literature (MacPhee et al., 2017). This may also indicate that the NASA TLX_HC-IT instrument may need further investigation to expand the use and reliability of the scale, confirming some concerns already expressed in the literature (McKendrick & Cherry, 2018).

Another interesting result that we obtained concerned the association between the intention to leave the home care job (within one year) and workload. We found that a higher workload was associated with the intention to leave home care job. This result is in accordance with previous research on this topic (Holland et al., 2019) and highlights the importance for nurses to have adequate well-being to continue working adequately. Surely, the COVID-19 pandemic caused an increase in the workload of the nursing workforce (Ulupinar & Erden, 2024), which should be considered when interpreting this result. However, considering the constant nursing shortage worldwide, specific interventions to reduce workload (potentially impacting on intention to leave the job) by policymakers should be implemented, such as insufficient recruitment and retention strategies, unattractive working conditions, and a lack of staff turnover/attrition are current problems that already characterize healthcare organizations (Tamata & Mohammadnezhad, 2023). The impact of workload should not be underestimated with respect to the staff who remain, as for nurses who decide not to leave their job (while continuing to have a high workload), the risk is that they could

face more problems associated with stress and burnout (Diehl et al., 2021), thus risking delivering inadequate nursing care.

5 | CONCLUSION

This study demonstrated the validity and reliability of the NASA-TLX_HC-IT instrument in the home care nursing setting. This tool will be useful for health care organizations to measure the perceived workload within their organizational setting. For research purposes, this tool will be useful to assess the association between workload and other organizational variables of interest for health policies (e.g., organizational well-being, work environment, or missed care) as well as aspects related to nursing well-being (e.g., burnout, stress). The investigation of these aspects plays a key role in limiting nurses' intentions to leave their jobs and limit staff shortages.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

Research data are not shared.

ETHICAL STATEMENT

In our research, we conscientiously followed ethical principles to safeguard the well-being of human participants and uphold the integrity of our study. Prior to their participation, all subjects granted informed consent, and we took great care to uphold strict confidentiality during both data collection and analysis phases. Approval for the study was obtained from the Ethics Committee (Liguria Region, n° 675/2022–DB ID 12844, approved 29/11/2022). Moreover, we exerted careful efforts to mitigate potential biases, conflicts of interest, and any instances of research misconduct. To ensure anonymity, the questionnaires administered to nurses were aggregated to conduct subsequent data analysis.

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