



Research article

Personal and technological skills to coach people with noncommunicable diseases: development and validation of a scale for nursing students



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ABSTRACT

Background: Current international policies converge to the need of empowering patients and families in becoming more autonomous in the self-caring and management of their noncommunicable diseases (NCDs). Given their professional scope, nurses are the most well-positioned health professionals to answer this societal challenge. In the literature, health coaching and the use of information and communication technologies (ICTs) emerge as two still under-used contributions to nursing practice in this regard. Given the lack of instruments and research developed so far in the use of health coaching and ICTs during nurses training, we aim to develop a scale that explores nursing students' perceptions regarding their coaching skills of people with NCDs and the potential role of ICTs in this domain.

Methods: After a comprehensive literature review, an initial items list (n = 39) was delineated and discussed by a panel of international experts. After conceptual and structural consensus, the pre-validated version of the Personal and Technological Skills to coach people with noncommunicable diseases scale (PTSC-NCD scale) was created. Then, the pre-validated PTSC-NCD scale was translated to Portuguese, Finnish, Flemish and Slovenian following Beaton and colleagues' recommendations, and applied to undergraduate nursing students in five European universities. Principal component analysis and reliability analysis were performed in each country through the statistical program Statistical Package for the Social Sciences (version 22.0). All ethical assumptions were complied with throughout this study.

Results: 874 nursing students enrolled in the study, predominantly female (71.1%) and with a mean age of 22.4 years (SD = 5.49). After data analysis across international settings, three dimensions emerged: Coaching Centred Personal Skills (F1); Digital Technology Improving Patient-Centred Care (F2); and Digital Technology Improving Relational Skills (F3). All the dimensions showed good reliability (Cronbach's alpha >.80).

Conclusion: The PTSC-NCD scale evidence good validity and reliability indicators across different international settings.

1. Introduction

Globally, more than 36 million deaths are attributed every year to noncommunicable diseases (NCDs), with an estimated cumulative

economic impact of US\$7 trillion over the next 15 years [1]. By 2030, following similar social and cultural trends, this number is expected to increase to 55 million deaths [1].

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In 2013, the World Health Assembly endorsed the World Health Organization's (WHO) Global Action Plan for the Prevention and Control of NCDs (2013–2020) [1]. To expand service coverage, the WHO reiterates the need to strengthen the role of nursing [1]. Nurses play a decisive role in health promotion, disease prevention, and NCDs management given their person-centred approach [2]. Hence, the optimization of nurses' scope of practice is an international priority to tackle NCDs, which can be achieved through comprehensive training and inclusion of NCDs prevention and control in the nursing curricula [1].

Traditionally, nursing curricula emphasis self-management strategies developed in a top-down, one-way logic, from nursing students (future nurses) to patients and their families [3]. However, after successful reports in psychology, business, and sports, nursing schools are starting to focus their attention to coaching as a strategy to motivate, inspire, and empower patients to unlock their maximum potential [3, 4]. Rather than pointing solutions, coaching helps patients and families to clarify their health goals and provides insight into goal achievement [5]. Thus, coaching centres itself in the same humanistic and holistic perspective that is core to the nursing role [3, 4, 5]. Therefore, nursing schools must attend more to the development of the students' coaching skills if they are to become competent and conscious in its' application [4].

Simultaneously, the WHO Action plan encourages the State Members to empower people with NCDs to seek early detection and manage their condition better, providing tools for self-management, including through information and communication technologies (ICTs) [1]. Such assumptions are not relatively new to the nursing profession. In fact, in the last three decades, a growing interest in this area has led to the development of several studies focused on ICTs use in nursing care [6]. Evidence suggests that the integration of ICTs in nursing practice increases care efficiency, facilitates the implementation of Evidence-Based Practice, and improves communication channels with other health professionals and patients [7, 8, 9, 10].

However, the integration of ICTs skills in the nursing curricula and undergraduate training is still somewhat lacking [10, 11, 12]. Equally relevant, recent studies in this scope do not dwell into students' perceptions of the role of ICTs in the development of their nursing competencies [13, 14]. After a comprehensive literature review, Button and colleagues [14] identified an urgent need to develop robust quantitative instruments to measure the perceptions of nursing students regarding the use of ICTs. According to the authors [14], such instruments would "provide reliable data able to generate findings that can then be used to develop contemporary nursing curricula" (p.11).

Given the outline reality, we aim to describe the development of a scale that explores undergraduate nursing students' perceptions regarding the potential role of ICTs in the development of their coaching skills of patients with NCDs and assess its psychometric characteristics.

2. Method

2.1 Phase 1: scale development

According to Boateng and collaborators [15], conducting a literature review provides the theoretical basis needed for defining the domain of a scale, given that its construct will be based on the accumulated knowledge of existing items. Thus, a comprehensive literature review was conducted in the CINAHL (via EBSCO), MEDLINE (via PubMed), Scopus and ERIC databases. Articles published after 2012, in English and published in peer-reviewed journals were included for thematic analysis. Given the specificity of our study's research topic, a broader literature review was performed, using keywords and terms such as *nurs**, "digital coach", "health education", "digital support", "digital counselling", "digital guiding", "digital training", "digital health interventions", and "digital monitoring".

Two hundred and eighteen studies were first screened by title/abstract to only include studies focused on patients with NCDs. Data analysis, extraction, and synthesis were conducted by two independent

reviewers. Seventeen studies were included, predominantly addressing nursing students' skills related to interpersonal communication, goal establishment, provision of a personalized care plan, patient motivation and empowerment for self-management, and the assessment of patients' resources and setting emerged from the review. All studies focused on the role of ICTs (e.g., computer-based software; tablets; smartphone apps) in the development of such skills.

An initial pool of 39 items was created by the research team, who discussed the form, wording and type of responses that each item/question was intended to induce from the nursing students. All items were written in English to facilitate the overall analysis and discussion by the different partners involved. An initial draft of the scale was developed (α version), with three main sections: i) the first section focus nursing students' perceptions of their coaching skills concerning patients with NCDs; ii) the second section focus students' perceptions of the role of ICTs in the development of their skills in this field; and iii) the third section concerns students' sociodemographic and educational characteristics. For the first two sections, the items were written as closed questions, answered through a Likert Scale ranging from 1 (strongly disagree) to 7 (strongly agree).

2.2 Phase 2: scale refinement and translation

The scale was reviewed and discussed within a panel of experts composed of 13 nursing doctorates, researchers and teachers from five European universities. Structural and semantic adjustments were performed until all experts involved agreed. This process resulted in the development of the β version of the scale, titled *Personal and Technological Skills to coach people with noncommunicable diseases Scale* (PTSC-NCD scale).

After this process, the PTSC-NCD scale was translated into four languages (Portuguese, Slovenian, Flemish, and Finnish) following the method proposed by Beaton and associates for the Cross-Cultural Adaptation of Self-Report Measures [16]. All local experts reported a correct and accurate translation of the PTSC-NCD scale to each language.

2.3 Subjects and recruitment process

Five Higher Education Institutions (HEIs) were selected as data collection sites, namely: the Escola Superior de Enfermagem de Coimbra (Portugal), Tampere and Karelia Universities of Applied Sciences (Finland), University of Ljubljana (Slovenia), and Thomas More University College (Belgium). The bachelor's degree in nursing science ranges from 6 semesters/3 years (180 European Credit Transfer and Accumulation System, ECTS) in Slovenia, to 8 semesters/4 years (240 ECTS) in Belgium and Portugal. The selected HEIs are members of a consortium financed by the European Union Erasmus + KA2 program that aims to develop the DigiNurse model. The DigiNurse model aims to support the selection, observation and evaluation of teaching and learning methods that enhance nursing students' digital coaching skills.

As inclusion criteria, students had to be 18 years of age or older, integrate the last year of the bachelor's degree in nursing science, and give informed consent to their participation. First, students were approached by a senior research team member between classes and informed about the study goals. Then, students were asked about their desire to participate in completing the PTSC-NCD scale. After its completion, students were instructed to place the scale form in a sealed box in a designated location within the institution's facilities.

2.4 Ethical considerations

Before the conduction of this study, institutional authorization was obtained in the five participating institutions. Following the ethical principles of the Declaration of Helsinki [17], students who willingly decided to participate in the study signed a written informed consent form. All forms used during this study were alphanumerically encoded to

preserve students' identity. This study was approved by the Ethics Committee of the Health Sciences Research Unit: Nursing (UICISA: E) of the Nursing School of Coimbra (reference 665/04-2020).

2.5 Data analysis

An intentional non-probabilistic sample by quotas was used, considering a minimum criterion of at least 10% of the total number of students in each institution. Principal component analysis (PCA) and reliability analysis were performed in each country through the statistical program Statistical Package for the Social Sciences (version 22.0). Frequencies of answers were examined to eliminate items without variation, or in which the positioning of the sample deviated clearly from a normal distribution. Outliers were analysed according to Mahalanobis squared distance [18]. The normality of the variables was assured by the coefficients of skewness (Sk) and kurtosis (Ku) ($|sk|$ and $|ku| < 1$).

The PCA requirements were checked according to Tabachnick and Fidell [18], namely sample size and adequacy, normality and linearity of the variables, and R's factorability. VARIMAX rotation method with Kaiser's normalization was used since we intend to retain independent factors.

3. Results

A total of 874 nursing students enrolled in the study, from Finland ($n = 105$, 12% of the total student population in both Finnish universities), Slovenia ($n = 187$, 56% of the total student population in the University of Ljubljana), Belgium ($n = 131$, 44% of the total student population in Thomas Moore University), and Portugal ($n = 451$, 25% of the total student population in the Nursing School of Coimbra). Overall, students' mean age was of 22.38 years ($SD = 5.49$), and 621 (71.1%) were females. The PCA results are presented in Table 1.

The percentage of missing values across the variables varied between 0 and 15.4% (students' gender), which is considered acceptable in studies conducted in this field [19]. Considering the ratio subjects per item, since we used 22 items, the ratio subjects per item found was over 5 for all the countries (excluding Finland with a ratio of 4.8), which enables, according to Gorsuch [20], a reliable utilization of PCA. Additionally, the intercorrelation matrix differed from the identity matrix, since Bartlett's test showed significant scores for all the countries ($p < .001$), and the Kaiser-Meyer-Olkin (KMO) measure was over .70, indicating an adequate sampling for the four countries in the analysis.

Two criteria were used for factors' extraction: eigenvalue over one and Scree plot. The combining of these two criteria lead to the extraction of three factors in each country. Some items were excluded since their commonalities (h^2) and factorial loadings (s) were below .50. Other items were excluded based on high factorial loadings in more than one factor.

A final solution of the same factors with precisely the same items for all the four countries was extracted, being responsible for 73.9% of the total variance in Belgium, 71.8% in Finland, 67.6% in Portugal, and 64.4% in Slovenia. Factorial loadings are higher than .50 for all dimensions [18]. For the four countries, Factor 1 is composed of items concerning the professional's skills in coaching people with NCDs (*Coaching Centred Personal Skills*). Factor 2 aggregates items concerning the digital technology improvements on the patient centred care of people with NCDs (*Digital Technology Improving Patient-Centred Care*). Finally, Factor 3 is composed of items that illustrate the way digital technologies and tools improve health-professional competence in coaching people with NCDs (*Digital Technology Improving Relational Skills*). All the dimensions showed good reliability (Cronbach's alpha $> .80$). Concerning the mean scores, Factor 2 displayed the highest scores in all the countries, followed by Factor 1 and 3.

Although the number of students is larger in Portugal, the collected sample/total number of students ratio is of 25%, below to Belgium (44%) and Slovenia (56%). Nonetheless, to ensure the stability of the results, a random partition of the Portuguese sample was performed, creating 3

sub-samples ($n = 141$), similar to the sample size of the other three international sites. The Portuguese sample was randomly selected in 3 sub-samples and exploratory factor analysis (EFA) was performed on principal component analysis. The results showed stability in the three-factor structure, maintaining the same items with saturations above 0.66.

4. Discussion

Health education constitutes one of the cornerstones of the nursing profession. Traditionally, nurses implement a "teach, review, review again if needed, and confirm understanding of the facts" strategy with patients and families who are dealing with NCDs [5]. However, this strategy can be overly directive without comprehensively exploring patients' beliefs, motivations and concerns [4, 5]. Health coaching emerges in the literature as a valid strategy that can assist nurses in identifying health goals that are meaningful for the patient with NCDs and take action to meet them, enhancing their ability to self-manage [4, 5].

Recent technological developments allowed nurses to establish a more personalised/integrated healthcare plan, enhancing the patient's self-care abilities when dealing with NCDs [21, 22]. Patients can support and augment their self-care activities through ICTs, which improve organisation, provide information, and enhance communication, improving their health-related knowledge and gaining a sense of empowerment [22]. Such contributions are essential in contemporary nursing, given that international health policies encourage patients and families to take greater responsibility for their health [1, 23].

While the current nursing training in the majority of the international settings is adequate, tackling subjects like nursing theoretical basis studies, ethics and professionalism, clinical studies, or leadership and entrepreneurship, nursing schools must actively integrate the use and implications of ICTs in their curricula [24]. ICT tools and web systems and interfaces will become one of the main channels for patient counselling and monitoring, and nursing students must be aware of how to properly use them to assist patients tackle unhealthy lifestyle factors and NCD-related conditions [22, 23, 24].

To the best of our knowledge, we developed the first scale focused on nursing students' perceptions of their coaching skills of patients with NCDs and the role of ICTs tools in this scope, thus addressing a gap found in recent literature [4, 14]. The PTSC-NCD scale showed good psychometric properties and similar results when applied to nursing students in schools from Portugal (southwestern Europe), Finland (northern Europe), Slovenia (southern central Europe), and Belgium (central-western Europe). These results reiterate the potential that the PTSC-NCD scale must be applied across many different geographic settings with similar cultural background and nursing education and training paradigm.

Some limitations must be considered. Although a total of 874 nursing students were enrolled in the study, the samples are not representative of the entire local nursing student population in each participating country, especially in Finland. Although only senior students were included in this study, the differences in the number of course years and content lectured across the international HEIs could not be controlled. This can constitute a source of bias given that it is expected that nursing students possess more clinical experience and knowledge as they progress throughout the course and may respond differently to the scale questions. Future studies must address these limitations, ideally by conducting validation studies with larger and stratified samples and by performing confirmatory factor analysis (CFA).

5. Conclusion

Evidence of psychometric validity and good reliability was found for the PTSC-NCD Scale across different international settings. Future validation studies with larger and stratified samples per course year are warranted. Nursing educators and researchers may choose the PTSC-NCD scale to explore nursing students' perceptions of their coaching skills in

patients with NCDs and the potential role of ICTs tools in this domain, both valid contributions to the development of the contemporary nursing curricula and implementation of a student-centre course.

Declarations

Author contribution statement

P. Parreira and P. Santos-Costa: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Wrote the paper.

J. Graveto and P.A. Ferreira: Conceived and designed the experiments; Performed the experiments; Wrote the paper.

A. Salgueiro-Oliveira, L.B. Sousa, R.A. Bernardes and B. Serambeque: Conceived and designed the experiments; Wrote the paper.

L. Mónico: Performed the experiments; Analyzed and interpreted the data; Wrote the paper.

M.M. Kapun, T. Gogova, P. Vesa, H. Vandenhoudt, D. Nevelsteen and R. Kokko: Conceived and designed the experiments; Performed the experiments.

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Data availability statement

Data will be made available on request.

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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