Preliminary Communication

DEVELOPMENT OF THE DIGITAL COMPETENCE NURSING SELF - ASSESSMENT TOOL

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ABSTRACT

Background: Despite the proliferation of nursing competence frameworks, few assessment instruments demonstrate strong psychometric properties, and even fewer adopt a holistic conceptualization of competence encompassing knowledge, skills, attitudes, ethics, and contextual practice. Aim was to develop and validate the Digital Competence Nursing Self-Assessment Tool for registered nurses within the Maltese healthcare context.

Methods: A pragmatist, mixed-methods design was employed. Tool development followed a modified Delphi process involving a literature review, open-ended questionnaires, and focus groups with ward nurses, charge nurses, academics, and research nurses. Competency domains were identified through thematic analysis and aligned with local and international professional standards. Content validity was assessed using the Item Content Validity Index and modified kappa statistics.

Results: Assessment tool demonstrated strong face, construct and content validity, with most items achieving an I-CVI of ≥0.83 and high modified Kappa agreement scores. Face validity was supported through expert consensus exceeding 75%. Psychometric testing demonstrated strong content validity, with most items achieving an I-CVI of ≥0.83 and high modified kappa agreement scores.

Conclusions: This tool demonstrates strong validity and reliability as a comprehensive, digitally accessible self-assessment tool. It offers a practical framework for reflective practice, identification of competency gaps, and targeted professional development among registered nurses.

Keywords: *Nursing, competence framework, digital competences, assessment tool.*

INTRODUCTION

The concept of 'competence' is being discussed more often in these recent years than it was earlier in the 1900s. Its definition has also changed along the years, mirroring the changes in mentality and philosophy of nursing. A behavioural perspective predominated in the late 1900s and early 2000s, (1,2,3) with competence being related to skills and knowledge of how to carry out those skills safely and well. This approach promoted direct observation as a predominant assessment technique and a more medicalised model of care. Later, in the same century, the approach to nursing started changing to one of a more holistic approach, and started to include knowledge, skills and attitudes and other issues such as morality and ethics (4,5,6). In Malta, there is a lack of systematic assessment of nursing competence and hence this had led to the ideation of this project – to bridge this gap and provide a tool that can be easy to use and appropriate for use in various areas of nursing. As an assessment method, self-assessment and a mixed method of assessment are being promoted. In fact, as emphasised in the literature, a final definition is difficult to achieve (7,8). This article will discuss the development of this digital self-assessment tool for assessing nursing competence in various areas of nursing, adopting a holistic definition of competence. The testing and validation of the tool will follow in another future article. Aim was to develop and validate a

digital, nursing competence self-assessment tool. Objectives were to create a digital self-evaluation tool to assess nursing competency for use within the Maltese (and foreign) healthcare systems, and to assess the tool for face, content and construct validity. Scope of the project was to develop a tool that would help nurses identify areas where their standard of patient care might need improvement.

METHODS

A thorough literature search was carried out using local and international sources. This was followed by a content analysis that led the researcher to identify the competencies that were crucial for the competent functioning of nurses in the various areas. The inclusion and exclusion criteria (shown in Table 1) for the search were based on the PIO framework outlined in Table 2.

Table 1 - Inclusion and exclusion criteria for literature searches.

Inclusion Criteria	Exclusion Criteria
• Studying registered nurses • Published from 2003 onwards (to include the latest plus other relevant research) • Published in English • Containing the search keywords	• Discussing nursing undergraduate students • Discussing or reviewing literature related to specific areas of nursing • Discussing tools or competencies that are specific to particular areas • Published before 2003 • Published in a language other than English

Table 2 - The PIO framework used to formulate the search strategy.

PIO Element	Key Words	Alternate Key Terms & MeSH terms
Population (P)	Registered nurses	Nurs*, registered nurs*, staff nurs*
Intervention (I)	Nursing competency assessment	Self-assessment*, competenc* assessment*
Outcome (O)	Identifying gaps in nursing competence	Outcomes of care, standards of care, competency assessment, care standard*

Keeping in mind the PIO framework, searches were carried in order to identify relevant and quality literature. Google Scholar, ResearchGate, Semantic Scholar, Hydi, EBSCOhost and Academia were used. A number of keywords, synonyms and abbreviations retrieved from the obtained research, the PIO (Population-Intervention-Outcome) framework (see Table 2) and literature found were searched. Boolean operators, such as (AND) and (OR) as well as (*) (!) (?) and words with diverse spellings and endings were also used to broaden the search. Table 3 shows the search results by search engine.

Table 3 - Search results by search engine.

Search Engines	Articles thought to be relevant to this study
Google scholar	156
ResearchGate	32
Semantic Scholar	12
Hydi	19
EBSCOhost	20
Academia	41
TOTAL	**280**

All articles identified were processed using CASP (CASP-UK.net, 2024) and Revman (9) for critical analysis. Apart from the initial search, the literature identified in searches related to various areas of nursing was also passed through a process of content analysis. A summary of the process of selection of the articles is outlined in the PRISMA diagram below (see Figure 1).

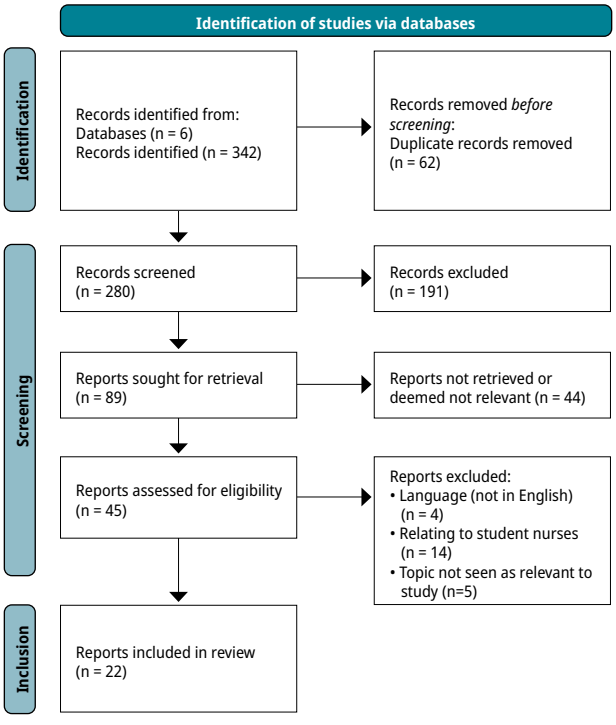

Figure 1 - PRISMA Diagram showing initial search strategy.

ETHICAL CONSIDERATIONS

All data collection sessions and methods were conducted while maintaining strict confidentiality and anonymity. All the participants were chosen by intermediaries who did not inform the researchers of their choices at any time. Even in focus groups, the participants' personal details were not documented or published anywhere. Ethical permissions were obtained from the University of Malta (MED-2022-000340) and from the entities where the participants worked before any data were collected. All intermediaries signed formal consent forms to assist in the study. Participants were also informed of their rights to participate only if they agreed to and that they could refrain from participating at any point during the study. They were offered the opportunity to get access to the results of the study once it was concluded. All data were destroyed immediately after they were input and analysed.

RESULTS

ASSESSMENT TOOLS IDENTIFIED IN THE LITERATURE

Several authors have talked about the methods they used to develop nursing tools to assess nursing competence. Table 4 summarises the assessment tools identified in the literature, giving a summary of the methodologies used.

Table 4 - Summary of studies discussing assessment and assessment tools in nursing.

Author	Title	Sample / Participants	Summary of results	Tool assessed
Palese et al. (2014) (10)	Clinical assessment instruments validated for nursing practice in the Italian context: a systematic review of the literature	Various	Validation studies for assessment tools used in clinical practice. Only a limited number of validated tools exist.	101 tools validated
Reljic et al. (2017) (11)	Assessment of Clinical Nursing Competencies: Literature Review	12 studies	A number of approaches are currently being used and include inclusion and exclusion criteria. A number of approaches are currently being used and include a variety of assessment tools, objective structured clinical examinations (OSCEs), and complex assessment approaches.	Various tools
Flinkman et al. (2017) (12)	Nurse Competence Scale: a systematic and psychometric review	30 studies	The value of Nurse Competence Scale has been confirmed in determining relationships between background variables and competence. The instrument has been widely used with experienced and newly graduated nurses and their managers. Cross-cultural validation must be continued using rigorous methods.	Nurse Competence Scale (NCS)
Meretoja & Leino-Kilpi (2001) (13)	Instruments for evaluating nurse competence	755 articles reviewed	Nurse managers have to choose a tool to assess competence wisely and after considering the wider context and background. Reviews show that nurse competence instruments can be problematic and time consuming. More sound theoretical testing for reliability is needed.	Various tools
Redfern et al. (2002) (14)	Assessing competence to practise in nursing: A review of the literature	2343 articles reviewed	Few competence assessment methods in nursing have been adequately evaluated for their psychometric properties and so there is little research evidence to guide the development of methods that are objective, grounded within a theoretical framework and are reliable and valid (Coates and Chambers, 1992; Fitzpatrick et al., 1994; Sharp et al., 1995). Research into reliability and validity of competence assessment methods has been much more rigorous in medicine (Van der Vleuten et al., 1991).	Various tools

Watson et al. (2002) (15)	Clinical competence assessment in nursing: a systematic review of the literature	212 articles	The assessment of clinical competence remains almost universally relevant in the nurse education literature as a laudable pursuit yet there are aspects of it that remain at odds with the higher education of nurses.	Various tools
Wilkinson (2013) (16)	Competency assessment tools for registered nurses: An integrative review		The results of the review showed an improvement in the development and availability of tools. However, the tools are still lacking in dimension and further investment in this area of research is needed.	Various tools
Lejonqvist & Kajander-Unkuri (2021) (17)	Evaluating nursing competence with the Nurse Competence Scale from an ontological and contextual point of view: An integrative literature review	34 studies	Results showed that the Nurse Competence Scale covers both ontological and contextual competence, that the competence profiles vary in different cultures, cohorts and contexts, but that it is suitable for evaluating and following up competence development in nursing.	Nurse Competence Scale (NCS)
Numminen et al. (2014) (18)	Congruence between nurse managers' and nurses' competence assessments: A correlation study	2083 nurses	Although the difference between managers' and nurses' competence assessments was significant in favour of managers, there is a strong congruence between the groups concerning core tasks of nursing. Competences with low scores, differences between groups, management's support, and factors influencing competence need further research for planning interventions to enhance competence development. Use of multiple assessment methods is recommended to add validity and reliability of the measurements.	Nurse Competence Scale (NCS)
Meretoja & Koponen (2012) (13)	A systematic model to compare nurses' optimal and actual competencies in the clinical setting	24 experts, 87 nurses	It is important that the multidisciplinary experts in a particular care context develop a shared understanding of the future competency requirements of patient care. Combining optimal competence profiles to systematic competence assessments contribute to targeted continual learning and educational interventions.	Nurse Competence Scale (NCS)
Yaqoob Mohammed Al Jabri et al. (2021) (19)	A systematic review of healthcare professionals' core competency instruments		Few instruments addressed competencies in quality improvement, safety, communication, or health information technology. The findings demonstrate the reviewed tools' validity and reliability and pave the way for a comprehensive evaluation and assessment of core competencies into clinical practice.	Various tools
Charette et al. (2020) (20)	Measurement properties of scales assessing new graduate nurses' clinical competence: A systematic review of psychometric properties.	Literature based	Ten scales were included: eight original scales, one culturally adapted and one modified. The content validity study of all scales in this review was deemed to be doubtful or inadequate quality. Reliability was almost exclusively assessed by calculating the internal consistency with Cronbach's alpha coefficient which gives no information on equivalence or stability of the measure. Responsiveness was never properly assessed in the reviewed studies.	Various tools

Literature shows that the number of assessment tools is quite limited (10,14,19,20) and few of the tools are well validated (see Table 5). The aim of developing this tool was to bridge this gap and following the development of the tool, psychometric testing will be carried out to ascertain validity and reliability.

Table 5 - Categorisation of results of studies discussing nursing competency assessment

Author	Outcome Summary			
	Limited validated tools exist	A mixed approach to assessment advocated	Tool valid and reliable	More reliability testing needed
Palese i sur. (2014) (10)	✔			
Reljic i sur. (2017) (11)		✔		
Flinkman i sur. (2017) (12)			✔	✔
Meretoja i Leino-Kilpi (2002) (13)				✔
Redfern i sur. (2002) (14)	✔			
Watson i sur. (2002) (15)				✔
Wilkinson (2013) (16)				✔
Lejonqvist i Kajander-Unkuri (2021) (17)			✔	
Numminen i sur. (2014) (18)		✔	✔	
Meretoja i Koponen (2012) (13)		✔	✔	
Yaqoob Mohammed Al Jabri i sur. (2021) (19)	✔			
Charette et al. (2020) (20)	✔			✔

Studies further advocated a mixed approach, rather a single assessment method (11,18,19). The reasons were that different tools balance out the advantages and disadvantages and add reliability and validity to the assessment.

METHODOLOGY

During this study, a Pragmatist Philosophy was adopted, as it was considered to present knowledge as dynamic, and understanding human real-life experiences as a means of understanding reality (21, 22,23,24,25). The mixed-methods that were adopted was also seen as being appropriate for social study research (26,27) and as offering more flexibility in research (22,28). Pragmatist approach also offered the possibility of utilising a pluralistic (29) but practical stance towards epistemology and ontology (24).

Table 6 outlines epistemological and ontological stances used throughout this research study.

Table 6 - Summary of Epistemology and Ontology of the study

Epistemology (Knowledge)	Ontology (Reality)
Constructivist – knowledge is constructed through experience and context	Relativist – multiple realities exist based on perspectives

Table 7- Tool Development Methodology Steps.

Step	Method Used	Outcomes
	Literature search	• Identification of competencies from the literature • Identification of tool to model new tools on • Drafting of questionnaire
	Interviews (with academic professionals)	• To evaluate the questionnaire for clarity and content validity
	Questionnaire dissemination	• To collect competencies identified as important by ward nurses
	Focus groups	• To confirm, amend or remove competencies identified as important by ward nurses • Drafting of the 4 tools applicable per area of nursing

	Focus groups with ward experts	• To confirm, amend or remove competencies identified as important by ward nurses and focus groups • For wider evaluation of the tool – face, content and construct validity
	Redesigning of the tool into one	• Literature search
	Expert academic focus group	• To decide on tool items and evaluate the tool before testing • To obtain more face, content and construct validity.

The methodology used was a modified Delphi study method which started with an in-depth literature review, followed by the drafting of open-ended questionnaires that aimed to identify ward nurses' opinions about which competencies they deemed the most important for nurses to practice safely within their areas. Interviews with academic healthcare professionals were carried out to ascertain clarity and understanding of the questionnaire. This was followed by the dissemination of the questionnaires to ward nurses. This was all done through intermediaries who identified the participants and gave them the tool to fill in. Anonymity and confidentiality were maintained throughout the process. A total of 247 nurses responded to the questionnaire.

After the results of the questionnaires were analysed, several focus groups were organised with ward nurses and Charge nurses to confirm, amend or remove the competencies identified. These included a total number of 20 nurses. The Nurse Competence Scale (13) was used as a model for the tool and other items identified from the questionnaires were added to it. The resulting tool was made up of 80 items in total.

Final meetings were carried out with five expert nurses working in the different areas of nursing. These were not chosen randomly but based on their roles as supervisory nurses, who had both expertise and academic qualifications in the various areas of nursing. Their opinions were that the tool was too long and that even more contemporary competencies could be included in the tool, rather than those contained in the Nurse Competence Scale (13).

After analysing the outcomes of the focus groups and expert meetings using a content analysis framework, it was decided that the tool should be redesigned, shortened and updated. Thus, another thorough literature search was carried out using the same search engines, search strings and criteria. The search focused on nursing curricula within Maltese academic institutions, the World Health Organisation, the European Union, the United Nations and other foreign academic educational higher institutions. A summary of the search strategy is outlined in Figure 2. Another focus group composed of six nurses including academics, research nurses, practice nurses and a few ward nurses was also formed. The tool was reviewed and discussed several times until there was a very strong consensus (over 75%) as to the content and the layout of the tool. Then the final tool was developed. Following all this a statistical analysis of the tool was carried out. This determined its content validity and item-content validity.

The final set of competencies identified from the various sources, the open-ended questionnaires, the literature and the nursing curricula can be seen summarised in Table 8.

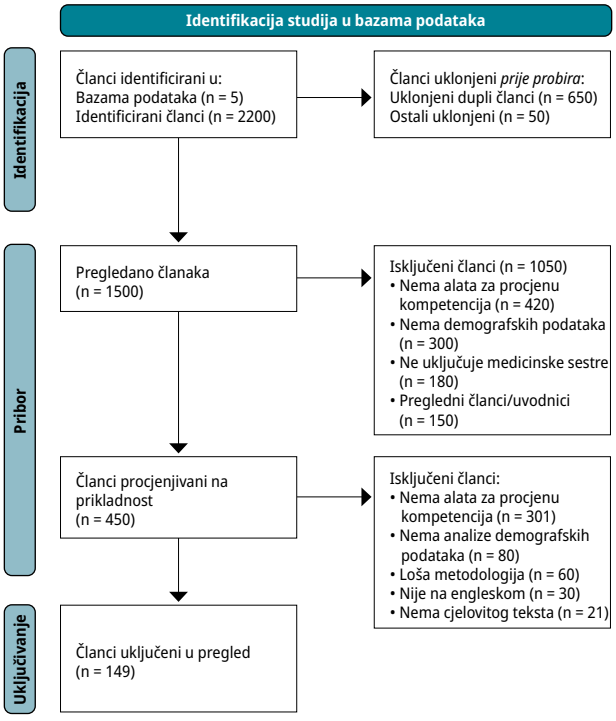

Figure 2 - PRISMA Diagram showing final literature search strategy

Table 8. Important competencies identified from the literature and Maltese Universities and Entities.

Sources consulted		Competencies Identified as Important																			
		Empathy & Compassion	Communication skills	Nursing skills	Knowledge of conditions	Activities of daily living	Knowledge of medications	Knowledge of equipment	Management skills	Knowledge of rehabilitation	Maintaining a homely environment	Palliative/ end-of-life care	Observation skills	Knowledge about culture	Assessment skills	Management of care	Psychological care	Ethical, just and fair practice	Evidence-based practice	Interdisciplinary collaboration	Sustainable and responsible care
Questionnaires disseminated during Phase 1 of this dissertation	Geriatric area nurses	✔	✔	✔	✔	✔		✔	✔	✔	✔	✔	✔	✔		✔	✔	✔	✔		
	Medical area nurses	✔	✔	✔			✔	✔	✔						✔	✔		✔	✔		
	Surgical area nurses	✔	✔	✔			✔						✔		✔	✔	✔	✔	✔		
	PHC area nurses		✔	✔					✔							✔	✔	✔		✔	
The Maltese Scope of Practice (Council of Nurses and Midwives of Malta, 2002)				✔					✔					✔	✔	✔		✔	✔		
The NMBI Scope of Practice (Nursing and Midwifery Board of Ireland, 2024)				✔				✔							✔	✔		✔	✔	✔	
The University of Malta curriculum (University of Malta, 2024a, 2024b, 2024c)			✔	✔	✔	✔			✔	✔	✔	✔	✔		✔	✔	✔	✔	✔		
MCAST Malta (MCAST, 2024)			✔	✔	✔	✔	✔			✔	✔				✔	✔	✔	✔	✔		
BCIT (British Columbia Institute of Technology, 2014)		✔	✔		✔	✔	✔						✔		✔	✔				✔	
U.N. (United Nations, 2024)								✔			✔			✔				✔		✔	✔
W.H.O. (World Health Organisation, 2021)			✔	✔			✔			✔	✔			✔		✔		✔	✔	✔	✔
Other sources (Elsevier.com, 2024; Harleystreetnurses.com, 2024)				✔									✔		✔	✔			✔	✔	

Table 9 below summarises the results obtained from the psychometric testing of the developed tool.

Table 9. I-CVI and Modified Kappa scores of tool items after statistical analysis

I-CVI SCORE	Modified Kappa	Number of items
1	1	42
0.83	0.82	20
0.67	0.56	5
0.5	0.27	2

The items having an I-CVI score of 0.78 or higher were considered to be the most important. This suggested that the experts considered these items to be highly relevant to the tool and showed the tool to have high content validity (30,31,32) and the scores indicated a very good agreement and consistency between the different raters – members of the expert focus group thus giving the tool a strong content validity (30,33). The face validity was indicated as being high due to the high degree of agreement between the respondents.

DISCUSSION

An issue that remains constant within the nursing hierarchy is the difficulty to define competence. Melnyk et al. (2014) and Wilkinson (2013) adopted a rather 'behaviouristic', medicalised and task-oriented approach, where 'competence' was linked more to skills and the ability to perform skills safely and correctly (16,34). Dellai et al. (2009) and even Murrells et al. (2009) mention the importance of including quality of care, safety and practicing cost-effective healthcare as a crucial component of competence (1,2). The International Council of Nurses (1997), the Australian Nursing and Midwifery Council ANMC) (2005) and Black et al. (2008) however, view competence with a broader and more holistic view, encompassing skills, attitudes and personal values (35,36,37). Even more recently, the International Council of Nurses (2023), Atalla et al. (2025) and Borycki (2025) discussed the importance of digital health and its importance, Cummings-Koether et al. (2025) and Deering (2026) discussed cultural competence while Terrasi (2024), the UK Parliament (2024) and Grammoustianou et al.)2025) discussed gender issues and their influence on competence (38-43). Notwithstanding all the studies examining competence and its definition, no ultimate consensus has been reached on the definition of competence, and this remains an unsolved mystery.

At the start of this study (between 2021 and 2022), the number of tools developed to assess nursing competence were few and most were not well validated (10,14,19,20). The idea to develop such a tool resulted from this lack of existing tools. In Malta nursing competence assessment was non-existent. Malta being a small island, we sometimes lag behind other countries in research and other such initiatives due to problems with funding, manpower and other resources. In fact, the (University of Malta, 2026) explicitly stated that national research budgets are limited compared to larger EU countries and funding is highly competitive (44-47). Malta has a relatively small pool of experienced research personnel and therefore, stronger interdisciplinary and international collaboration is necessary. They finally stated that international research projects are also very administratively complex (University of Malta, 2026) (44-47). Most ward nurses are also more focussed on nursing practice rather than on academy and research, for the same reasons. Assessing competence can also be seen as threatening to the nursing profession, both by the nurses themselves and by the local nursing union. Once again, our geography influences this issue greatly. It also influences the choice of assessment method that is employed. In this study, the tool was designed using a self-assessment style. The reason was initially because the tool was modelled on the Nursing Competence Scale by Meretoja (2003), using the same scaling system based on the five competence levels (Benner, (1984) (13,48). Then after carrying out questionnaires, focus groups and meetings during the development stage, several assessment methods were discussed however, self-assessment again emerged as a less threatening and more acceptable method of competence assessment. According to Rizany et al. (2018), Telesford et al. (2024) and Lessy et al. (2026) this was a principle that they agreed with (49,50,51). They stated that in small island countries, self-assessment promotes reflection and strengthens social aspects and ownership of the problems identified by the tool and the solutions that nurses can seek to deal with them. Lessy et al. (2026) also stated that nurses' limited expertise or training due to geographical limitations, could increase the risk of bias and lead to inaccurate evaluation (51). As a final point, Feeny & Vuong (2017) stated that in small island contexts self-assessment becomes more important than external evaluation as the participants will be able to understand each other better and need less support (52). A final point is that most of the latest nursing competence assessment tools that have been developed use a self-assessment methodology (1,17,53,54,55). This can be interpreted as advocating the use of self-assessment for such tools as this newly developed one.

ETHICAL CONSIDERATIONS

All data collection sessions and methods were conducted while maintaining strict confidentiality and anonymity. All the participants were chosen by intermediaries who did not inform the researchers of their choices at any time. Even during focus the groups, the participants' personal details were not documented or published anywhere. Ethical permissions were obtained from the University of Malta (MED-2022-000340) and from the entities where the participants worked before any

data was collected. All intermediaries signed formal consent forms to assist in the study. Participants were also informed of their rights to participate only if they agreed to and that they could refrain from participating at any point during the study. They were offered the opportunity to get access to the results of the study once it was concluded. All data was destroyed immediately after it was input and analysed.

LIMITATIONS

The study was carried out with a limited number of participants. This was probably due to the number of research studies that were taking place at the same time within the same institutions. More discussion, with other participants and experts might have influenced the results. The time constraints of the study might have affected the outcomes to some extent although the researchers gave the study its due importance and adhered to correct research methods and methodologies throughout.

CONCLUSION

This article outlined the process of development of the Digital Competence Nursing Self-Assessment Tool (DiCoNSaT). This tool demonstrated strong validity and was developed using a modified Delphi approach. The tool development was carried out as part of a Doctorate in Philosophy degree. Once it was finalised, the authors passed onto the next stage of the study, i.e. testing the tool for validity and reliability. Initial analyses of the tool before the formal testing, gave encouraging results, determining that the tool showed strong content validity and item-content validity as well as face, content and construct validity. In a subsequent article, the authors will describe the tool-testing methodology, findings and results of psychometric testing, besides the conclusions and recommendations that followed.

ETHICS STATEMENT

None

AUTHORS CONTRIBUTION

Authors declared that all contributed equally. All authors approved the submitted version.

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CONFLICT OF INTEREST

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

GENERATIVE AI STATEMENT

The authors used a generative AI tool to assist with language editing, formatting, and journal-specific manuscript preparation. All AI-assisted output was critically reviewed, revised, and verified by the authors, who take full responsibility for the final content. No AI tools were used for data collection, analysis, or interpretation.

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