Journal of Multidisciplinary Healthcare

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ORIGINAL RESEARCH

The Development of a Comprehensive Dimensions Scale for Assessing Clinical Teachers' Occupational Well-Being

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Objective: In Taiwanese clinical and healthcare environments, there is a dearth of appropriate and effective tools to evaluate clinical teachers' occupational well-being. Therefore, this study aimed to develop a culturally adapted scale, a Taiwanese version of the Clinical Teachers' Occupational Well-Being Dimensions Scale (CTOWDS), to accurately measure the occupational well-being of clinical teachers in Taiwan.

Methods: Following a comprehensive literature review and expert panel discussions, the study developed the CTOWDS and conducted exploratory factor analysis (EFA) with 346 participants using SPSS to identify its underlying dimensional structure and psychometric properties. Confirmatory factor analysis (CFA) was then performed with 255 participants using AMOS to validate the EFA results. The study also assessed internal consistency, convergent and discriminant validities, and goodness-of-fit indexes to ensure that the scale was valid and reliable in the Taiwanese cultural setting.

Results: The EFA refined the scale from 51 to 29 items across five dimensions: personal qualities (11 items), academic research and career development pressure (6 items), teaching experience (4 items), learning experience (4 items), and teaching and communication pressure (4 items). These five dimensions explained 65.279% of the total variance. The CFA confirmed the five dimensions and 29 items, with good convergent and discriminant validities, goodness-of-fit indexes, and Cronbach's alpha values exceeding 0.70.

Conclusion: The findings affirm the utility of the developed CTOWDS as a reliable and culturally relevant instrument for assessing the occupational well-being of clinical teachers.

Keywords: occupational well-being, clinical teachers, scale development, psychometric validation

Introduction

Clinical teachers, such as doctors, nurses, pharmacists, and therapists, are educators working in clinical settings, primarily in the fields of healthcare or medical education.[1] Working in hospitals, clinics, outpatient centers, or other medical facilities, clinical teachers frequently engage directly with students, resident doctors, interns, or other learners. They provide clinical practice by integrating theoretical knowledge with practical expertise, thereby fostering the academic and professional development of learners.[2] As role models, their health and occupational well-being can influence students' attitudes, behaviors, and career choices. Hence, understanding and addressing clinical teachers' occupational well-being is crucial for enhancing medical education quality, developing exceptional healthcare professionals, and ensuring the sustainability of the medical education system.[2,3]

The term "occupational well-being" refers to an individual's overall sense of satisfaction and fulfillment at work, encompassing both subjective and objective dimensions, including stress levels, job satisfaction, work engagement, organizational commitment, employment autonomy, social support networks, and emotional fatigue.[4,5] Clinical teachers' occupational well-being is of great significance in the medical education and, by extension, the overall healthcare system.

Received: 20 May 2024
Accepted: 23 September 2024
Published: 2 October 2024

Their occupational well-being not only influences their own job performance but also has a direct impact on student outcomes.[6] Research has shown that when clinical teachers experience positive conditions and a stronger sense of occupational well-being, their enthusiasm and engagement in classrooms will be enhanced, leading to a contribution to student outcomes and professional development.[2,6] Moreover, while getting more engaged and involved in their teaching and clinical duties, they can sharpen their professionalism and, in turn, improve the quality of healthcare and patient outcomes.[2,7] Conversely, if clinical teachers are experiencing poor psychological well-being or excessive work-related stress, it can adversely affect their teaching and work performance and potentially result in a decline in teaching quality.[2] Consequently, clinical teachers' occupational well-being plays a crucial role in nurturing future medical and healthcare professionals.[2,7]

The clinical teaching experience has the potential to significantly impact the occupational well-being of clinical teachers, subsequently influencing their enthusiasm, engagement, and efficacy in the classroom.[2,8] Those who report high levels of occupational well-being are more likely to feel content and fulfilled in their teaching responsibilities, leading to increased passion, inventiveness, and dedication to student learning.[9,10] This sense of contentment has a beneficial effect not only on their teaching experience but also on their overall job satisfaction and well-being.[11,12] Research indicates that clinical teachers who perceive themselves as effective teachers and can anticipate positive learning outcomes from their students are more likely to experience higher occupational well-being, greater job satisfaction, and increased sense of self-worth.[13] Moreover, when they perceive recognition and appreciation from their students, colleagues, and institutions for their teaching contributions, they are more likely to feel valued and acknowledged, thereby leading to positive overall well-being.[14–16]

In addition to the teaching experience, clinical instructors' learning experiences are inextricably linked to their occupational well-being. According to Cruess et al's study,[17] clinical teachers who reported positive learning experiences, such as opportunities for professional advancement and meaningful interactions with students, exhibited higher levels of well-being compared to those who reported negative experiences. Clinical teachers who see opportunities for professional growth and development are more likely to experience positive occupational well-being.[18] Furthermore, enhanced well-being among clinical teachers is associated with a greater willingness to learn new skills and pursue opportunities for professional growth.[13]

Additionally, the occupational well-being of clinical teachers is influenced by their personal qualities as well.[19] Personal qualities such as empathy, resilience, and emotional intelligence play a significant role in shaping the well-being of clinical teachers. Moreover, positive well-being can further enhance these qualities, enabling clinical teachers to build meaningful relationships with students, skillfully handle challenging situations, and maintain a supportive and nurturing learning environment.[20–22] Furthermore, research indicates that individuals with high emotional intelligence are adept at identifying, comprehending, and managing both their own and others' feelings effectively, thereby enhancing their interpersonal interactions and communication abilities—essential qualities for collaborating with colleagues, assisting students, and passing on knowledge. Moreover, individuals with strong communication skills are likely to experience higher levels of job satisfaction and occupational well-being.[23,24]

However, clinical teachers may become emotionally exhausted as a result of the challenges associated with teaching and communication.[25] This exhaustion could be attributed to the emotional work required to display empathy and compassion during patient interactions, as well as the cognitive demands of teaching complex medical topics to students.[26] The pressure to communicate and deliver knowledge effectively can be stressful and have an influence on clinical teachers' occupational well-being.[26,27] The demands of clinical teaching and communication can lead to interpersonal challenges, such as difficulties in establishing rapport with students or effectively communicating with patients. Such challenges may result in interpersonal conflicts and feelings of inadequacy among clinical teachers, potentially compromising their occupational wellbeing.[2,28]

In addition to the pressures associated with clinical teaching and communication, clinical teachers frequently encounter demands related to academic research and career development, along with their teaching and clinical duties.[16,29] The need to maintain a balance between their clinical practice and teaching responsibilities, excel in academic research, and progress professionally all contribute to this stress. Moreover, the pressure to succeed in academic careers, particularly in securing tenure or promotions, can lead to feelings of inadequacy and anxiety among clinical teachers.

These concerns may have a detrimental impact on their career journey and undermine their sense of worth and identity in the workplace. Furthermore, perceived shortcomings in research output worsen this situation, leading to a negative impact on their well-being.[26]

In clinical settings, where teaching often occurs concurrently with professional practice, the demands of clinical duties and teaching responsibilities may lead to increased stress levels and contribute to burnout among the clinical teachers, which can result in decreased occupational well-being.[30,31] While endeavoring to maintain a balance between their clinical duties and teaching and research responsibilities, they frequently experience pressure from workload demands and time constraints.[32] This never-ending balancing act between clinical duties and the responsibilities of research, teaching, and communication can raise stress levels and cause emotional fatigue. Consequently, achieving a healthy work-life balance may prove challenging for clinical teachers, potentially leading to diminished occupational well-being and job satisfaction. Therefore, it is imperative to identify and manage these stressors in clinical and academic healthcare settings to enhance clinical teachers' occupational well-being.[13,31,33] Hence, it becomes crucial to develop a dimensional scale for assessing clinical teachers' occupational well-being so as to systematically identify the unique stressors and challenges that clinical teachers may encounter in their workplace. In order to maximize helpers' well-being and reduce the risks for developing compassion fatigue and secondary trauma, Stamm[34–36] developed a Professional Quality of Life Scale (ProQOL), a 30-item self-report measure of the positive and negative effects of working within a helping profession such as nursing, teachers, social service workers, or emergency response. The ProQOL included three subscales: compassion satisfaction, secondary traumatic stress, and burnout, with reported evidence of scale validity and reliability.[34–36] The ProQOL has been used extensively in nursing research. However, Heritage et al[37] thought that the construct validity of the ProQOL is not well represented in the literature. Heritage et al's research[37] found out that Stamm's ProQOL should be used with caution. Then they revised 30 items of Stamm's ProQOL to 21 items, using a sample of 1615 registered nurses or nurse officers from Australian hospitals. Hence, Heritage et al's[37] revised scale can only be used exclusively for nurses in Australia, not for clinical teachers In Taiwan. Saaranen et al[38] developed the Work Well-Being Index Questionnaire to assess occupational well-being and satisfaction among 271 staff members from 12 schools in eastern Finland. The scale assesses the domains of job retention, working conditions, working community, workforce and professional competency, and career development needs. Due to the cultural, occupational, and contextual differences among participants, the aforementioned scales cannot be a reliable indicator of the professional well-being of clinical teachers in Taiwan.

Given that Taiwan's clinical culture may have distinct norms, beliefs, and expectations that influence clinical teachers' well-being,[39] culturally relevant measures of occupational well-being are required for Taiwanese medical settings. However, there is a shortage of relevant and effective scales for assessing clinical teachers' occupational well-being within Taiwanese clinical and healthcare contexts. Hence, this study aimed to develop a culturally appropriate measure, specifically a Taiwanese version of the Clinical Teachers' Occupational Well-Being Dimensions Scale (CTOWDS). This endeavor ensures that the instrument accurately assesses the occupational well-being of clinical teachers in Taiwan.

Methodology

Procedure and Participants

The study was approved by the Institutional Review Board of National Cheng Kung University Hospital (A-ER-110-369, dated January 5, 2021). The research was conducted from January 1, 2022, to December 31, 2022. Before the study began, the participants' informed consent was acquired. The scale development process followed three different phases and ten sequential steps as outlined in Slavec and Drnovšek's[40] systematic scale development framework. The primary objective of Phase 1 was to conceptualize and produce scale items, focusing on the theoretical significance of the scale construct. This phase included conducting a literature review and interviews (Step 1), developing scale items (Step 2), and assessing content validity (Step 3). In Phase 2, the primary goal was to ensure the representativeness and appropriateness of data collection procedures. This involved scale development and evaluation (Step 4), scale translation and back-translation (Step 5) to maintain linguistic coherence, a pilot study to assess the feasibility of the scale (Step 6),

and analysis of data collection (Step 7). Finally, Phase 3 focused on using statistical analysis and validation techniques to examine the scale construct. This phase included assessments of dimensionalities (Step 8), reliabilities (Step 9), and construct validities (Step 10).

After conducting an extensive literature review, the researchers compiled 51 items related to the occupational well-being of clinical teachers. The primary sources were derived from databases such as Pubmed, EBSCO, ScienceDirect, and ProQuest. Search keywords included clinical teachers, psychological well-being, professional fulfillment, occupational well-being, workload management, and job satisfaction, among others. In order to determine if these items addressed the relevant theoretical concepts, the researchers convened a panel discussion.[41] The expert panel for this assessment comprised four distinguished professionals with diverse academic backgrounds. The first expert panelist was a gastroenterologist working as an associate professor and director at the Teaching Center of a national university. Expert Panelist 2 was a distinguished professor at a national university's institute of public health, specializing in biostatistics, bio-epidemiology, health risk assessment, and healthcare service research. Expert Panelist 3 was a distinguished professor of a graduate school of education, specializing in educational statistics and psychology. Expert Panelist 4 was a professor at a university's department of healthcare management, specializing in psychometrics, healthcare management, and organizational behavior. These knowledgeable panelists collectively contributed a diverse range of expertise and experience to the review process, ensuring a thorough and balanced analysis of the scale development. The experts reviewed and graded 51 items on a 4-point scale (1–4) based on their relevance to the constructs, using the following criteria: 1 = extremely unimportant/inapplicable/unclear; 2 = unimportant/inapplicable/unclear; 3 = important/applicable/clear; 4 = extremely important/applicable/clear. Each scale item was assessed based on its importance, applicability, and clarity.

- Importance: The degree to which the scale item is significant to the main theme of the study.
- Applicability: The degree to which the scale item fits with the main theme of the study.
- Clarity: The degree to which the wording used in the scale item is understood.

During the evaluation and modification of the 51 items derived from the literature review, each item received a rating of 2 or lower, and the experts engaged in discussions and made modifications until a consensus was reached. The items were rated on a 5-point Likert scale (5: completely agree; 1: completely disagree), with higher scores indicating greater occupational well-being among clinical teachers. The researchers conducted a pilot study involving 346 participants. Exploratory factor analysis (EFA) was employed to determine the probable factor-dimensional structure, followed by confirmatory factor analysis (CFA) conducted on a subset of 255 participants to validate the resulting factor-dimensional structure. Selection criteria for participation included clinical teachers from National Cheng Kung University Hospital. Staff not engaged in clinical teaching were excluded.

Data Analysis

The researchers employed SPSS (version 14.0)[42] for EFA on 346 participants, followed by CFA on 255 individuals using AMOS (version 24.00)[43] to identify and validate a probable factor-dimensional structure. Furthermore, varimax rotation, principal component analysis (PCA), and eigenvalues were used to extract the factor-dimensional structure. The adequacy of the sample size for factor analysis was assessed using the Kaiser-Meyer-Olkin test (KMO)[44,45] and Bartlett's sphericity test.[46–48] Additionally, the researchers assessed the goodness-of-fit of the EFA and CFA models using various model fit indices, including the $\chi 2$/df ratio,[49] the Tucker Lewis Index (TLI),[50] the comparative fit index (CFI),[50] and the root mean square error of approximation (RMSEA).[49] Furthermore, the scale's convergent and discriminant validity, as well as Cronbach's and composite alphas, were examined.[51,52]

Results

EFA for the Clinical Teachers' Occupational Well-Being Dimensions Scale (CTOWDS)

The researchers initially conducted EFA on 346 participants to determine the probable factor-dimensional structure of the CTOWDS scale and assess its psychometric qualities. The following provides a summary of the participants' demographic information (see Table 1). Out of the total, 160 participants (46.2%) were male, while 186 participants (53.8%)

Table 1 Participants' Demographic Characteristics of 346 Participants for EFA

Characteristics	Categories	Number	Percentage
Gender	Male	160	46.2%
	Female	186	53.8%
Age	19+ to 25 years old	2	0.6%
	26+ to 32 years old	64	18.5%
	33+ to 39 years old	112	32.4%
	40+ to 46 years old	71	20.5%
	47+ years old	97	28.0%
Academic Rank	Not Shown	252	72.8%
	Instructor	6	1.7%
	Assistant Professor	32	9.2%
	Associate Professor	31	9.0%
	Professor	25	7.2%
Healthcare Discipline	Nurse Practitioner	66	19.1%
	Dentist	14	4.0%
	Physician	143	41.3%
	Medical Examiner	24	6.9%
	Radiologist	35	10.1%
	Pharmacist	26	7.5%
	Respiratory Therapist	8	2.3%
	Physiotherapist	8	2.3%
	Occupational Therapist	8	2.3%
	Dietitian	7	2.0%
	Clinical Psychologist	4	1.2%
	Speech Therapist	1	0.3%
	Audiologist	2	0.6%
Years of Teaching	0–10 years	212	61.3%
	11–20 years	80	23.1%
	21–30 years	47	13.6%
	31–40 years	7	2.0%

were female. Regarding age distribution, the majority of participants (112 participants, 32.4%) fell within the 33- to 39-year-old range, with 97 participants (28.0%) aged 47 years and older. Participants' academic ranks varied; the majority (72.8%; N = 252) did not specify their academic rank, while smaller percentages were instructors (1.7%; N = 6), assistant professors (9.2%; N = 32), associate professors (9.0%; N = 31), and professors (7.2%; N = 25). Among the healthcare professionals, physicians constituted the largest group, represented by 143 participants (41.3%), followed by nurse practitioners (19.1%; N = 66) and radiologists (10.1%; N = 35). Regarding teaching experience, the majority of the participants (61.3%; N = 212) reported teaching for 0 to 10 years, while 23.1% (N = 80) had 11 to 20 years of teaching experience.

KMO Test and Bartlett's Test of Sphericity

To determine the adequacy of the sample size for factor analysis,[48] the researchers conducted the KMO test[44,45] and Bartlett's test of sphericity.[46,47] The results demonstrated that the sample size was sufficient for factor analysis,[48] with a KMO value (0.895) surpassing the critical value of 0.60,[53,54] and Bartlett's test of sphericity[46,47] yielding significant results ($p = 0.000 < 0.05$; approximate chi-square = 6117.707; degree of freedom = 406). Additionally, the scree-plot graphic (see Figure 1) indicated that the CTOWDS scale potentially had an ideal five-dimensional solution.

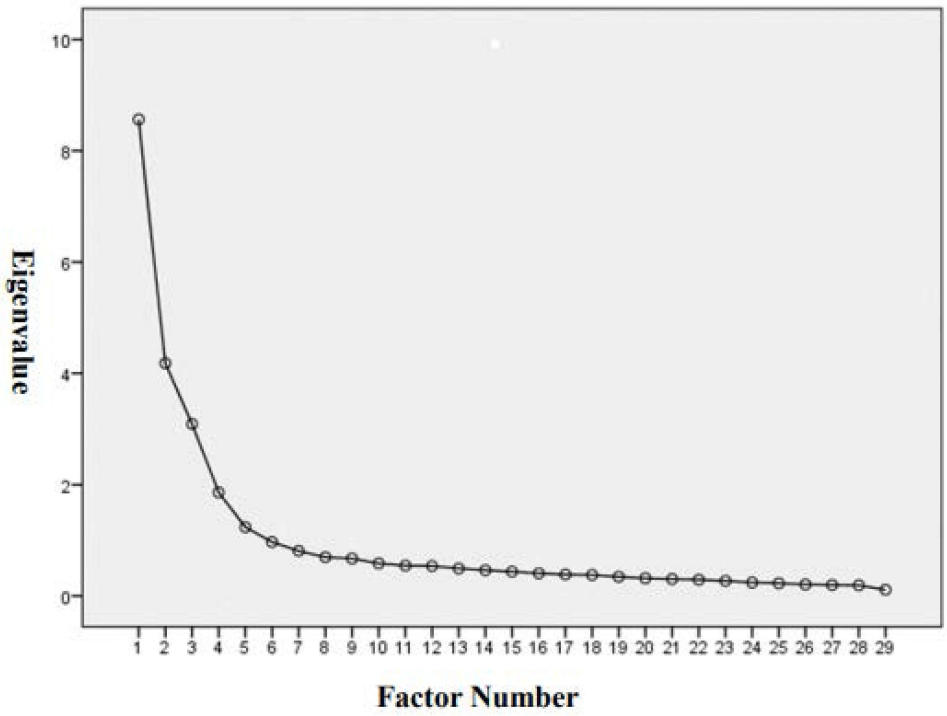

Figure 1 Scree plot for factor analysis of the CTOWDS Scale.

EFA-Model CTOWDS Scale

As previously stated, the researchers used EFA to identify and evaluate the consistency of the scale variables. Eigenvalues (with values exceeding 1.0) and PCA were also employed to confirm the CTOWDS scale's internal consistency and construct validity.[55] Furthermore, as the dimensions were not quite interdependent, varimax rotation was used to maximize high- and low-value factor loadings while minimizing mid-value factor loading.[56] Moreover, a factor loading value below 0.5 was considered unacceptable, while a value of 0.70 or higher was considered indicative of a satisfactory level of variable explanation, according to Hair et al's[51] factor structure criterion. Consequently, the study retained the items with factor loadings exceeding 0.50 for relevant variables and less than 0.50 for non-related factors. After conducting the EFA and PCA, the study identified the following five dimensions—personal qualities (11 items; 22.275% of total variance explained), academic research and career development pressure (6 items; 13.642% of total variance explained), teaching experience (4 items; 10.523% of total variance explained), learning experience (4 items; 10.383% of total variance explained), and clinical teaching and communication pressure (4 items; 8.456% of total variance explained)—for a total of 29 items, accounting for 65.279% of the variance. All eigenvalues obtained were greater than one: 8.563, 4.182, 3.090, 1.859, and 1.237 (see Table 2).

Validities and Reliabilities of the EFA-Model CTOWDS Scale

The generated scale items were translated into English and then back into Mandarin Chinese by two multilingual English language experts to ensure the semantic equivalency of the scale items, thereby guaranteeing face and content validities.[41] The researchers then compared the back-translation version to the original to ensure its accuracy and consistency. Subsequently, three university students were asked to read and respond to the scale items to ensure clarity. Cronbach's alpha[49,50] was calculated by the researchers to assess the coherence of the constructs and the internal consistency of the multi-dimensional CTOWDS scale. A Cronbach's alpha of 0.70 is regarded as satisfactory, while 0.8 or higher is preferred.[57] The statistical findings from the Cronbach's alpha analysis indicated that the CTOWDS scale exhibited a Cronbach's alpha of 0.811. Additionally, the Cronbach's alphas obtained for the five dimensions were 0.925, 0.873, 0.873, 0.871, and 0.791 for the

Table 2 Factor Loadings, Cronbach's α, and Eigenvalues of the 29-Items EFA Model CTOWDS Scale

Item	Dimension 1: Personal Qualities	Dimension 2: Academic Research & Career Development Pressure	Dimension 3: Teaching Experience	Dimension 4: Learning Experience	Dimension 5: Teaching and Communication Pressure
Dimension 1:α= 0.925					
37	0.809				
35	0.799				
38	0.790				
32	0.758				
33	0.741				
40	0.735				
39	0.723				
34	0.714				
29	0.711				
36	0.662				
31	0.640				
Dimension 2:α= 0.873					
48		0.817			
46		0.816			
47		0.787			
49		0.772			
51		0.692			
50		0.596			
Dimension 3:α= 0.873					
15			0.844		
16			0.811		
17			0.809		
18			0.641		
Dimension 4:α= 0.871					
22				0.912	
23				0.910	
10				0.790	
21				0.701	
Dimension 5:α= 0.791					
42					0.816
41					0.744
43					0.673
45					0.539
Eigenvalue	8.563	4.182	3.090	1.859	1.237
% of variance	22.275	13.642	10.523	10.383	8.456

Notes: Overall α= 0.811; total variance explained of the scale=65.279%.

"personal qualities", "academic research and career development pressure", "teaching experience", "learning experience", and "clinical teaching and communication pressure", respectively (see Table 2).

Descriptive Statistics of the EFA-Model CTOWDS Scale

Table 3 displays the item descriptions, means, and standard deviations for the EFA-model CTOWDS Scale.

Table 3 Item Descriptions, Means, and Standard Deviations for the EFA-Model CTOWDS Scale

Dimension and Item	*Mean*	*S.D.*
I. Personal Qualities	41.24	6.064
37. Trustworthiness	3.99	0.712
35. Ability to reflect	3.85	0.681
38. Resilience to setbacks	3.77	0.710
32. Good communication skills	3.74	0.723
33. Good interpersonal skills	3.76	0.732
40. Ability to influence	3.53	0.788
39. Creativity	3.57	0.789
34. Continuous learning for improvement	3.87	0.727
29. Clinical skill proficiency	3.69	0.697
36. Emotional intelligence	3.74	0.744
31. Enthusiasm for teaching	3.71	0.703
II. Academic Research and Career Development Pressure	18.60	4.782
48. I feel stressed about my career development.	3.09	1.030
46. I feel pressured by my academic and research work.	3.35	0.993
47. I feel pressured about promotion.	3.08	1.143
49. My stress comes from a lack of time.	3.35	1.034
51. I feel physically and mentally exhausted due to the demands of the job.	2.94	0.946
50. My stress comes from my lack of abilities.	2.80	0.954
III. Teaching Experience	15.78	2.429
15. I enjoy teaching.	3.95	0.762
16. I feel a sense of achievement when teaching.	4.01	0.700
17. I am willing to contribute to teaching.	4.12	0.657
18. My teaching effectiveness is excellent.	3.70	0.732
IV. Learning Experience	15.71	2.363
22. Participating in the hospital's faculty training courses is helpful to my teaching.	3.94	0.695
23. Participating in the hospital's faculty training courses is helpful to my personal growth.	3.92	0.697
10. I will use the content learned in the faculty training courses to teach.	3.78	0.721
21. I enjoy acquiring online teaching skills.	4.07	0.669
V. Teaching and Communication Pressure	10.20	2.487
42. I feel pressure when communicating and interacting with my colleagues.	2.42	0.773
41. I experience pressure when speaking with patients or patient families.	2.41	0.725
43. I feel pressure for students' negative learning attitudes.	2.65	0.836
45. I feel stressed about my clinical teaching job.	2.73	0.831

Abbreviation: *S.D*, Standard Deviation.

CFA for the Clinical Teachers' Occupational Well-Being Dimensions Scale (CTOWDS)

After applying EFA to assess the structure of potential CTOWDS scale dimensions, the initial 51 scale items were reduced to 29 items across five dimensions. To further examine the obtained factor-dimensional structure, the researchers conducted CFA using data from 255 participants. The demographic characteristics of these 255 valid participants were categorized (see Table 4). Regarding gender, 114 participants (44.7%) were identified as male, while 141 (55.3%) were identified as female. Regarding age distribution, the majority of participants were 47 years or older (37.3%; N = 95), followed by those 33 to 39 years old (23.1%; N = 59). Participants' academic status varied, with the majority (74.5%; N = 190) not reporting their position. Smaller percentages were identified as instructors (2.4%; N = 6), assistant professors (6.3%; N = 16), associate professors (10.6%; N = 27), and professors (6.3%; N = 16). Physicians constituted

Table 4 Participants' Demographic Characteristics of 255 Participants for CFA

Characteristics	Categories	Number	Percentage
Gender	Male	114	44.7%
	Female	141	55.3%
Age	19+ to 25 years old	3	1.2%
	26+ to 32 years old	42	16.5%
	33+ to 39 years old	59	23.1%
	40+ to 46 years old	56	22.2%
	47+ years old	95	37.3%
Academic Rank	Not Shown	190	74.5%
	Instructor	6	2.4%
	Assistant Professor	16	6.3%
	Associate Professor	27	10.6%
	Professor	16	6.3%
Healthcare Discipline	Nurse Practitioner	54	21.2%
	Dentist	6	2.4%
	Physician	109	42.7%
	Medical Examiner	25	9.8%
	Radiologist	11	4.3%
	Pharmacist	26	10.2%
	Respiratory Therapist	3	1.2%
	Physiotherapist	3	1.2%
	Occupational Therapist	7	2.7%
	Dietitian	3	1.2%
	Clinical Psychologist	5	2.0%
	Speech Therapist	1	0.4%
	Audiologist	2	0.8%
Years of Teaching	0–10 years	141	55.3%
	11–20 years	70	27.5%
	21–30 years	38	14.9%
	31–40 years	6	2.4%

the largest group of participants (42.7%; N = 109), followed by nurse practitioners (21.2%; N = 54) and pharmacists (10.2%; N = 26). Regarding teaching experience, the majority of participants (55.3%; N = 141) reported teaching for 0–10 years, while 27.5% (N = 70) reported teaching for 11–20 years.

The CFA conducted using the AMOS[43] confirmed the same five scale dimensions and 29 items. No items were removed in the dimensions of "personal qualities" (11 items; factor loadings: 0.717–0.879), "academic research and career development pressure" (6 items; factor loadings: 0.654–0.788), "teaching experience" (4 items; factor loadings: 0.647–0.939), "learning experience" (4 items; factor loadings: 0.664–0.958), and "teaching and communication pressure" (4 items; factor loadings: 0.546–0.854), respectively (see Figure 2).

Examination for Goodness of Fit

The researchers employed a variety of fit indices to crosscheck the goodness of fit in order to investigate the goodness of fit of the EFA model and CFA model in greater detail. The chi-square divided by the degrees of freedom (χ2/df ratio) evaluates the difference between observed and expected values. Values close to 0 (p-value ≤ 0.05) suggest a minimal difference between the observed and expected values. However, there is no consensus on the acceptable χ^2/df ratio. Some experts recommend a range of 5.0 to 2.0,[58,59] while others advocate for χ2/df < 2.0 as an indicator of good model fit.[60,61] Regarding the TLI, higher values denote better model fit, with a minimum value of 0.90 considered appropriate and

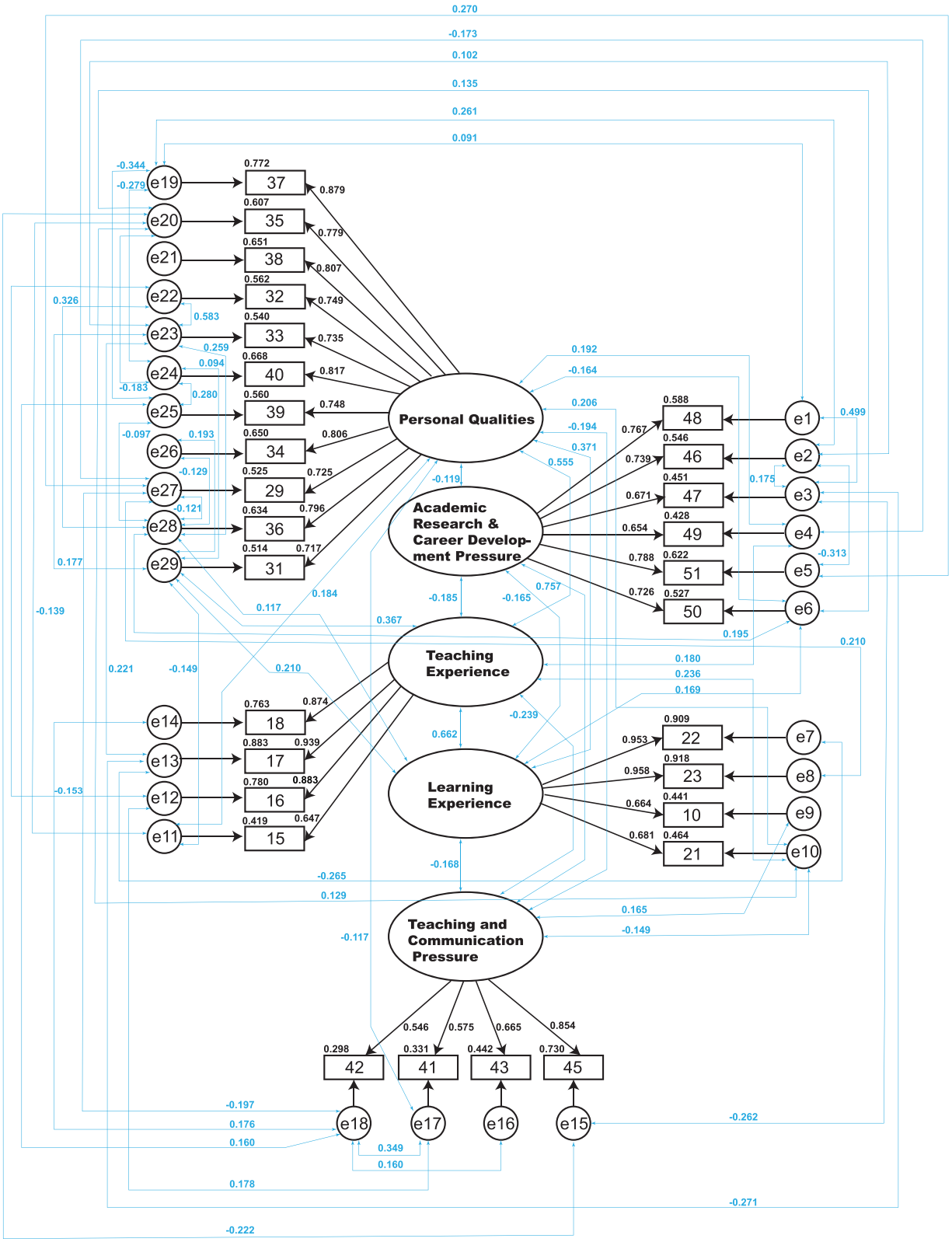

Figure 2 The CFA-model CTOWDS Scale.

a value of 0.95 deemed exceptional.[62,63] With regard to the CFI, a value of 0.95 or higher indicates a good model fit, while a value exceeding 0.90 is deemed acceptable.[64] The RMSEA index assesses the disparity between a hypothesized and observed model.[65] According to Fabrigar et al,[66] an RMSEA index less than 0.05 is indicative of good fit; an index between 0.05 and 0.08 is deemed acceptable; an index between 0.08 and 0.10 suggests marginal fit; and an index greater than 0.1 indicates poor model fit. According to Hu and Bentler,[64] an RMSEA index less than 0.08 indicates adequate goodness of fit, while an index less than 0.05 indicates excellent goodness of fit.[64] Table 5 presents the goodness-of-fit indices for the EFA-model and CFA-model CTOWDS scale.

Reliabilities: Cronbach's Alphas and Composite Reliabilities

The researchers examined the stability and internal consistency of the CFA-model CTOWDS scale, which has proved to be an appropriate instrument for assessing participants' occupational well-being. Values greater than 0.70 for both Cronbach's alpha and composite reliability are deemed acceptable.[51,57] After calculation, the CFA-model CTOWDS scale exhibited excellent reliabilities (see Table 6) in both composite reliabilities (0.944, 0.869, 0.906, 0.893, 0.760, and 0.977, respectively) and Cronbach's alphas (0.946, 0.874, 0.900, 0.884, 0.792, and 0.877, respectively) for the dimensions of "personal qualities", "academic research and career development pressure", "teaching experience", "learning experience", "teaching and communication pressure", and the total scale.

Convergent Validity

To assess whether the scale items in the CTOWDS scale converge and accurately represent the underlying construct, the scale's convergent validity was evaluated using AVE (average variance extracted) values and composite reliabilities. Convergent validity is established when AVE values are greater than 0.5 but less than the composite reliabilities, which should be greater than 0.6.[51,53] However, Fornell and Larcker[67] cautioned that the average variance extracted can be a conservative estimate of the measurement model's validity; therefore, if the composite reliability is greater than 0.70, an AVE value below 0.50 may still be considered. Table 6 presents the AVE values for the five dimensions of the CTOWDS scale—"personal qualities" (0.607), "academic research and career development pressure" (0.527), "teaching experience" (0.711), "learning experience" (0.683), and "clinical teaching and communication pressure" (0.450)—alongside their respective composite reliability values (0.944, 0.869, 0.906, 0.893, and 0.760, respectively).[51,53,67] Notably, all AVE values were lower than the corresponding composite reliability values, all of which were greater than 0.70.

Table 5 Goodness-of-Fit Indexes of the EFA-Model and CFA-Model CTOWDS Scale

	X^2	df	χ^2/df	*p*	TLI	CFI	RMSEA
CFA-model CTOWDS	1019.12	367	2.78	0.000	0.87	0.88	0.08
CFA-model CTOWDS	401.46	315	1.27	0.001	0.98	0.98	0.03

Abbreviations: *df*; degree of freedom; TLI, Tucker Lewis index; CFI, comparative fit index; RMSEA; root mean square error of approximation.

Table 6 AVE and Reliabilities the -CFA-Model CTOWDS Scale

Reliability / Dimension	AVE	Composite Alpha	Cronbach's Alpha
Personal Qualities	0.607	0.944	0.946
Academic Research and Career Development Pressure	0.527	0.869	0.874
Teaching Experience	0.711	0.906	0.900
Learning Experience	0.683	0.893	0.884
Teaching and Communication Pressure	0.450	0.760	0.792
Total	0.594	0.977	0.877

Abbreviation: AVE, average variance extracted.

Table 7 $\sqrt{AVE}$, and Correlation Coefficients (r) with Other Dimensions

Dimension	1	2	3	4	5
1. Personal Characteristics	**0.779**				
1. Academic Research and Career Development Pressure	−0.057	**0.726**			
1. Teaching Experience	0.584**	−0.113	**0.843**		
1. Learning Experience	0.409**	−0.088	0.661**	**0.826**	
1. Clinical Teaching and Communication Pressure	−0.224**	0.573**	−0.160*	−0.112	**0.671**

Notes: The $\sqrt{AVE}$ values are displayed in bold. The remaining values are *r*. *p<0.05; **p<0.01.

Discriminant Validity

If a factor's $\sqrt{AVE}$ is greater than its correlation coefficient (r) with other factors, discriminant validity can be proven.[68] After calculation (see Table 7), it is evident that the criterion is met in discriminating between "personal qualities" and "academic research and career development pressure" ($\sqrt{AVE}$ = 0.779 and 0.726; r = −0.057), between "personal qualities" and "teaching experience" ($\sqrt{AVE}$ = 0.779 and 0.843; r = 0.584), between "personal qualities" and "learning experience" ($\sqrt{AVE}$ = 0.779 and 0.826; r = 0.409), between "personal qualities" and "teaching and communication pressure" ($\sqrt{AVE}$ = 0.779 and 0.671; r = −0.224), between "academic research and career development pressure" and "teaching experience" ($\sqrt{AVE}$ = 0.726 and 0.843; r = −0.113), between "academic research and career development pressure" and "learning experience" ($\sqrt{AVE}$ = 0.726 and 0.826; r = −0.088), between "academic research and career development pressure" and "teaching and communication pressure" ($\sqrt{AVE}$ = 0.726 and 0.671; r = 0.573), between "teaching experience" and "learning experience" ($\sqrt{AVE}$ = 0.843 and 0.826; r = 0.661), between "teaching experience" and "teaching and communication pressure" ($\sqrt{AVE}$ = 0.843 and 0.671; r = −0.160), and between "learning experience" and "teaching and communication pressure" ($\sqrt{AVE}$ = 0.826 and 0.671; r = −0.112).

After undergoing various tests, including those for sample size, validity, reliability, and model fit, the EFA-model and CFA-model CTOWDS scales have demonstrated their suitability as tools for evaluating clinical teachers' occupational well-being.

Discussion

The purpose of this research was to develop a comprehensive psychometric scale to assess clinical teachers' occupational well-being within Taiwanese clinical and healthcare contexts. The researchers conducted EFA to examine the structure of potential factor dimensions within the dataset, as well as CFA to confirm that the dataset fits the model, to validate the psychometrical features of the CTDOWS scale.[67,68] Using the EFA, the researchers first developed a preliminary 29-item CTDOWS scale. This scale had five dimensions that explained 65.279% of the variance: personal qualities (11 items), academic research and career development pressure (6 items), teaching experience (4 items), learning experience (4 items), and teaching and communication pressure (4 items). The factor loadings in the EFA results ranged from 0.912 to 0.539, all exceeding the threshold recommended by Hair et al.[51] To assess common method bias, the study employed Harman's single factor test. According to Podsakoff et al,[69] this test indicates that if a single factor accounts for a substantial proportion (usually more than 50%) of the variance, common method bias may be a significant concern. In this study, common method bias was not an issue, as the variance extracted by a single factor was 22.275% (see Table 2), well below the 50% threshold.

The researchers thoroughly examined the mean scores across five dimensions in the hope of providing insights into various aspects of clinical teachers' professional lives concerning well-being. The highest mean score was observed in the "teaching experience" dimension, with an average score of 3.95 per item. This suggests that clinical teachers generally perceive their teaching experience positively, reflecting their ability to engage students effectively.[9,10,13] They may hence find fulfillment and well-being in their roles as educators,[11,12] possibly through imparting knowledge and guiding students. It can be inferred that these teachers' positive teaching experiences appear to have a positive impact on their occupational well-being. With a mean of 3.93, the "learning experience" dimension has the second-highest mean score, reflecting clinical teachers' ongoing growth and professional development. It suggests that clinical teachers' occupational well-being is generally higher when they actively participate in professional development and learning.

Their dedication to learning new skills and honing existing ones adds to their sense of fulfillment.[17,18] It can also be inferred that their well-being can be enhanced by supporting lifelong learning and providing satisfying teaching experiences.

The third highest mean score was in the "personal qualities" dimension, with a mean of 3.75, encompassing traits such as trustworthiness, ability to reflect, and resilience to setbacks. It can be noted that clinical teachers' personal qualities have an influence on their interactions with students, coworkers, and the overall work environment.[20–22] This suggests a level of self-awareness and confidence in their personal qualities, which could contribute to their overall well-being and effectiveness in their roles as clinical teachers. The "academic research and career development pressure" dimension had a mean score of 3.10. This highlights the challenges clinical educators have to deal with in terms of career progression and research requirements, which may hinder their occupational well-being. The lowest mean score was in the dimension of "teaching and communication pressure", with an average of 2.55. This score suggests that clinical teachers face challenges in effectively communicating complex medical concepts, managing diverse student populations, and navigating interpersonal dynamics in clinical settings.[26,27] While high pressure in clinical teaching and communication can lead to stress and burnout, it has a lesser impact than other dimensions on clinical teachers' occupational well-being. From the mean scores, it can be inferred that while clinical teachers generally find fulfillment in their teaching and value their own learning experiences, they may face challenges in balancing teaching with research and career development pressures. Additionally, the relatively low score in the dimension of teaching and communication pressure indicates that this aspect of their role as clinical teachers may warrant attention and support to enhance their occupational well-being and effectiveness.

In applying CFA to further examine the dimensional validity, the same 29 items were obtained, with factor loadings between 0.624 and 0.959, above the threshold proposed by Hair et al.[46] All fit indexes in the CFA-derived CTOWDS scale were satisfied, showing a good or adequate model fit.[58,64] Moreover, compared to the good model fit indexes in the EFA-derived CTOWDS scale, the indexes in the CFA-derived CTOWDS scale had superior goodness of fit, as evidenced by increases in TLI and CFI of 0.11 and 0.10, a decrease in RMSEA of 0.05, and a decrease in the value of the $\chi 2/df$ ratio of 1.51, with p-value < 0.01.

The CTOWDS scale was found to meet the criteria for the convergent validity and discriminant validity examinations. Regarding convergent validity, the study proved that the AVE values for "personal qualities", "academic research and career development pressure", "teaching experience", and "learning experience" are greater than the Hair et al's[46] and Malhorta's[47] benchmark criteria of 0.50 and smaller than the corresponding composite values, which should be above 0.6. The AVE value for "teaching and communication pressure" is 0.45, ie, below 0.5. However, according to the suggested criteria by Fornell and Lacker,[67] AVE value below 0.5 can be regarded as acceptable convergent validity if composite reliability is above 0.70. Therefore, it can be concluded that the convergent validity of the CTOWDS scale is adequate. Additionally, the $\sqrt{AVE}$ for each dimension of the CTOWDS scale exceeds its correlation coefficients (r) with any other dimension, thereby meeting Fornell and Larcker's criteria for discriminant validity.[67]

With regard to reliability, both the EFA-derived and CFA-derived CTOWDS scales demonstrated high internal consistency. Cronbach's alpha and composite reliability values for the total scale and all dimensions in both the EFA-derived and CFA-derived CTOWDS scales range between 0.760 and 0.977. These values exceed Hair et al's[51] and Cunha et al's[70] lowest acceptable reliability value of 0.70.

In summary, based on the results of the validity and reliability tests, the EFA and CFA-CTDOWS scales can be considered reliable instruments for evaluating the occupational well-being of clinical teachers. The research findings may provide policymakers and practitioners in developing interventions to enhance the well-being of Taiwanese clinical teachers. However, the study may have limitations. For instance, it might not have included a sufficiently diverse group of clinical teachers, which could have limited the extent to which the research results represent clinical teachers overall. Additionally, the results may not be reliable if clinical teachers do not consistently provide honest responses. Though the sample size in the study is adequate, to enhance the generalizability of the findings, future research would recruit a more diverse pool of clinical teachers and use strategies to encourage candid responses. Future research can also examine how the occupational well-being of clinical teachers changes over time, especially how it changes as they gain expertise. Furthermore, the well-being of the clinical teachers can be compared to that of other healthcare professionals or educators to gain insight into any differences or similarities.

Furthermore, the CTOWDS scale was developed based on Taiwanese cultural setting. Those interested in using the scale should take into account their own cultural backgrounds as well as the backgrounds of the respondents when translating the scale into their mother tongues to ensure that the respondents properly grasp the items.

Conclusion

This study developed a comprehensive instrument for evaluating the dimensions of clinical teachers' occupational well-being through a rigorous process of scale development and verification. With the development of the Clinical Teachers' Occupational Well-Being Dimensions Scale (CTOWDS), educational institutions can now design feasible interventions and support systems to address challenges that may be hindering clinical teachers' occupational well-being, thereby enhancing their job satisfaction. Additionally, clinical teachers and institutions may use the scale to introduce early interventions to prevent certain negative impacts from worsening. This can help reduce detrimental effects on students' learning outcomes and teachers' job satisfaction. By using the Clinical Teachers' Occupational Well-Being Dimensions Scale (CTOWDS) as a tool for early diagnosis of indicators of burnout, professional stress, or discontent, clinical teachers and institutions may discover which occupational well-being factors are most relevant to clinical teachers.

Acknowledgments

The researchers express appreciation to all study participants.

Funding

This study was supported by a grant from the National Cheng Kung University Hospital (NCKUH-20220244).

Disclosure

There is no conflict of interest.

References

1. Burgess A, van Diggele C, Roberts C, Mellis C. Key tips for teaching in the clinical setting. *BMC Med Educ*. 2020;20:463. doi:10.1186/s12909-020-02283-2
2. Gibson S, Palermo C. Optimizing the role of clinical educators in health professional education. In: Neste D, Reedy G, McKenna L, Gough S, editors. *Clinical Education for the Health Professions: Theory and Practice*. Singapore: Springer; 2021:1–14.
3. Jayasuriya-Illesinghe V, Nazeer I, Athauda L, Perera J. Role models and teachers: medical students perception of teaching-learning methods in clinical settings, a qualitative study from Sri Lanka. *BMC Med Educ*. 2016;16:52. doi:10.1186/s12909-016-0576-6
4. Bakker AB, Demerouti E. The job demands-resources model: state of the art. *J Manage Psychol*. 2007;22(3):309–328. doi:10.1108/02683940710733115
5. Maslach C, Schaufeli WB, Leiter MP. Job burnout. *Annu Rev Psychol*. 2001;52:397–422. doi:10.1146/annurev.psych.52.1.397
6. Bautista TG, Roman G, Khan M, et al. What is well-being? A scoping review of the conceptual and operational definitions of occupational well-being. *J Clin Transl Sci*. 2023;17(1):e227. doi:10.1017/cts.2023.648
7. Waters L, Lo K, Maloney S. What impact do students have on clinical educators and the way they practise? *Adv Health Sci Educ*. 2018;23:611–631. doi:10.1007/s10459-017-9785-y
8. Song K. Well-being of teachers: the role of efficacy of teachers and academic optimism. *Front Psychol*. 2022;12:831972. doi:10.3389/fpsyg.2021.831972
9. Burroughs N. A review of the literature on teacher effectiveness and student outcomes. In: Burroughs N, Gardner J, Lee Y, editors. *Teaching for Excellence and Equity: Analyzing Teacher Characteristics, Behaviors and Student Outcomes with TIMSS*. Cham, Switzerland: Springer; 2019:7–17.
10. Bardach L, Klassen RM, Perry NE. Teachers' psychological characteristics: do they matter for teacher effectiveness, teachers' well-being, retention, and interpersonal relations? An integrative review. *Educ Psychol Rev*. 2022;34(1):259–300. doi:10.1007/s10648-021-09614-9
11. Tipwong A, Hall NC, Snell L, Chamnan P, Moreno M, Harley JM. Clinical teaching self-efficacy positively predicts professional fulfillment and negatively predicts burnout amongst Thai physicians: a cross-sectional survey. *BMC Med Educ*. 2024;24(1):361. doi:10.1186/s12909-024-05325-1
12. Schleicher A. *Valuing Our Teachers and Raising Their Status: How Communities Can Help*. Paris, France: OECD; 2018.
13. Steinert Y, Mann K, Anderson B, et al. A systematic review of faculty development initiatives designed to enhance teaching effectiveness: a 10-year update: BEME Guide No. 40. *Med Teach*. 2016;38(8):769–786. doi:10.1080/0142159X.2016.1181851
14. Irby DM, O'Sullivan PS. Developing and rewarding teachers as educators and scholars: remarkable progress and daunting challenges. *Medical Education*. 2018;52(1):58–67. doi:10.1111/medu.13379
15. Moffett J, Crawford R, Pawlikowska T. Enhancing clinical educator well-being. *Clin Teach*. 2019;16(4):306–311. doi:10.1111/tct.13046
16. Rinne J, Leino-Kilpi H, Saaranen T, Pasanen M, Salminen L. Educators' occupational well-being in health and social care education. *Occup Med*. 2022;72(5):289–297. doi:10.1093/occmed/kqac024
17. Cruess RL, Cruess SR, Steinert Y. Amending Miller's pyramid to include professional identity formation. *Acad Med*. 2016;91(2):180–185. doi:10.1097/ACM.0000000000000913

18. Laine S, Saaranen T, Pertel T, et al. Working community-related interaction factors building occupational well-being – learning based inter - vention in Finnish and Estonian schools (2010–2013). *Internat J Higher Educ*. 2018;7(2):1–4. doi:10.5430/ijhe.v7n2p1
19. Soroush A, Andaieshgar B, Vahdat A, Khatony A. The characteristics of an effective clinical instructor from the perspective of nursing students: a qualitative descriptive study in Iran. *BMC Nursing*. 2021;20:36. doi:10.1186/s12912-021-00556-9
20. Jacobs JC, van Luijk SJ, van der Vleuten CP, Kusurkar RA, Croiset G, Scheele F. Teachers' conceptions of learning and teaching in student-centred medical curricula: the impact of context and personal characteristics. *BMC Med Educ*. 2016;16(1):244. doi:10.1186/s12909-016-0767-1
21. Li AT, Lin JW. Constructing core competency indicators for clinical teachers in Taiwan: a qualitative analysis and an analytic hierarchy process. *BMC Med Educ*. 2014;14:75. doi:10.1186/1472-6920-14-75
22. Schwarzer R, Jerusalem M. Generalized self-efficacy scale. In: Weinman J, Wright S, Johnston M, editors. *Measures in Health Psychology: A User's Portfolio. Causal and Control Beliefs*. Windsor, UK: NFER-NELSON; 1995:35–37.
23. Austin EJ, Saklofske DH, Egan V. Personality, well-being and health correlates of trait emotional intelligence. *Pers Individ Dif*. 2005;38 (3):547–558. doi:10.1016/j.paid.2004.05.009
24. Segrin C. Communication and personal well-being. In: Michalos AC, editor. *Encyclopedia of Quality of Life and Well-Being Research*. Dordrecht, Netherlands: Springer; 2014.
25. Spányik A, Simon D, Rigó A, Griffiths MD, Demetrovics Z. Emotional exhaustion and traumatic stress among healthcare workers during the COVID-19 pandemic: longitudinal changes and protective factors. *PLoS One*. 2023;18(12):e0291650. doi:10.1371/journal.pone.0291650
26. Agyapong B, Obuobi-Donkor G, Burback L, Wei Y. Stress, burnout, anxiety and depression among teachers: a scoping review. *Int J Environ Res Public Health*. 2022;19:10706. doi:10.3390/ijerph191710706
27. Xu X, Chen L, Yuan Y, et al. Perceived stress and life satisfaction among Chinese clinical nursing teachers: a moderated mediation model of burnout and emotion regulation. *Frontiers in Psychiatry*. 2021;12:548339. doi:10.3389/fpsyt.2021.548339
28. Levinson W, Roter DL, Mullooly JP, Dull VT, Frankel RM. Physician-patient communication. The relationship with malpractice claims among primary care physicians and surgeons. *JAMA*. 1997;277(7):553–559. doi:10.1001/jama.277.7.553
29. Mandel J. Career development strategies for the clinical educator. *ATS Scholar*. 2020;1(2):101–109. doi:10.34197/ats-scholar.2020-0005PS
30. Dyrbye L, Shanafelt T. A narrative review on burnout experienced by medical students and residents. *Medical Education*. 2016;50(1):132–149. doi:10.1111/medu.12927
31. Shanafelt TD, Bradley KA, Wipf JE, Back AL. Burnout and self-reported patient care in an internal medicine residency program. *Ann Internal Med*. 2002;136(5):358–367. doi:10.7326/0003-4819-136-5-200203050-00008
32. West CP, Tan AD, Habermann TM, Sloan JA, Shanafelt TD. Association of resident fatigue and distress with perceived medical errors. *JAMA*. 2009;302(12):1294–1300. doi:10.1001/jama.2009.1389
33. Dyrbye LN, Shanafelt TD. Physician burnout: a potential threat to successful health care reform. *JAMA*. 2011;305(19):2009–2010. doi:10.1001/ jama.2011.652
34. Stamm BH. *The ProQOL Manual (The Professional Quality of Life Scale: Compassion Satisfaction, Burnout & Compassion Fatigue/Secondary Trauma Scales)*. Baltimore, MD: Sidran Press; 2005.
35. Stamm BH. *The ProQOL Test Manual*. Baltimore, MD: Sidran Press and the ProQOL.org; 2008.
36. Stamm BH. *The Concise ProQOL Manual*. Pocatello, ID: ProQOL.org; 2010.
37. Heritage B, Rees CS, Hegney DG. The ProQOL-21: a revised version of the Professional Quality of Life (ProQOL) scale based on Rasch analysis. *PLoS One*. 2018;13(2):e0193478. doi:10.1371/journal.pone.0193478
38. Saaranen T, Tossavainen K, Turunen H, Naumanen P. Development of occupational wellbeing in the Finnish ENHP schools. *Health Educ*. 2006;106(2):133–154. doi:10.1108/09654280610650963
39. Chen CK, Lin C, Wang SH, Hou TH. A study of job stress, stress coping strategies, and job satisfaction for nurses working in middle-level hospital operating rooms. *J Nurs Res*. 2009;17(3):199–211. doi:10.1097/JNR.0b013e3181b2557b
40. Slavec A, Drnovšek M. A perspective on scale development in entrepreneurship research. *Econ Bus Rev*. 2012;14(1):39–62. doi:10.15458/2335-4216.1203
41. Boateng GO, Neilands TB, Frongillo EA, Melgar-Quiñonez HR, Young SL. Best practices for developing and validating scales for health, social, and behavioral research: a primer. *Front Public Health*. 2018;6:149. doi:10.3389/fpubh.2018.00149
42. IBM Corp. *IBM SPSS Statistics for Windows. Version 24.0*. Armonk, NY, USA: IBM Corp; 2016.
43. Arbuckle JL. *IBM SPSS Amos 24 User's Guide*. Armonk, NY, USA: IBM; 2016.
44. Kaiser HF. A second generation of Little Jiffy. *Psychometrika*. 1970;35:401–415. doi:10.1007/BF02291817
45. Kaiser HF, Rice J. Little Jiffy, Mark IV. *Educ Psychol Meas*. 1974;34:111–117. doi:10.1177/001316447403400115
46. Bartlett MS. Tests of significance in factor analysis. *Br J Psychol*. 1950;3:77–85.
47. Bartlett MS. A further note on tests of significance in factor analysis. *Br J Psychol*. 1951;4:1–2.
48. MacCallum RC, Widaman KF, Zhang S, Hong S. Sample size in factor analysis. *Psychological*. *Methods*. 1999;4(1):84–99. doi:10.1037/1082-989X.4.1.84
49. Hooper D, Coughlan J, Mullen M. Structural equation modelling: guidelines for determining model fit. *Elect J Busin Res Meth*. 2008;6:53–60.
50. Bentler PM. Comparative fit indexes in structural models. *Psychol Bull*. 1990;107:238–246. doi:10.1037/0033-2909.107.2.238
51. Hair J, Black W, Babin B, Anderson R. *Multivariate Data Analysis*. 8th ed. Andover, Hampshire, UK: Cengage Learning EMEAUK: Cengage Learning EMEA; 2018.
52. Malhotra NK. *Pesquisa de Marketing: Uma Orientação Aplicada*. 6th ed. São Paulo, Brazil: Bookman; 2008.
53. Pallant J. *SPSS Survival Manual. A Step by Step Guide to Data Analysis Using SPSS*. 4th ed. Crows Nest, NSW, Australia: Allen & Unwin; 2013.
54. Kaiser HF. An index of factorial simplicity. *Psychometrika*. 1974;39:31–36. doi:10.1007/BF02291575
55. Kent MG The importance of window view: using an exploratory factor analysis to uncover the underlying latent dimensions; 2018. Available from: https://escholarship.org/uc/item/4mj1b1vz. Accessed February 19, 2023.
56. Abdi H. Factor rotations in factor analyses. In: Lewis-Beck M, Bryman A, editors. *Encyclopedia of Social Sciences Research Methods*. Thousand Oaks, CA, USA: Sage; 2003:792–795.
57. Ga. C Jr. A paradigm for developing better measures of marketing constructs. *J Market Res*. 1979;16:64–73. doi:10.1177/002224377901600110

58. Wheaton B, Muthen B, Alwin DF, Summers G. Assessing reliability and stability in panel models. *Sociolog Meth*. 1977;8(1):84–136. doi:10.2307/270754
59. Tabachnick BG, Fidell LS. *Using Multivariate Statistics*. 5th ed. New York, NY, USA: Allyn and Bacon; 2007.
60. Schumacker RE, Lomax RG. *A Beginner's Guide to Structural Equation Modeling*. 3rd ed. New York, NY, USA: Routledge; 2010.
61. Koufteros XA. Testing a model of pull production: a paradigm for manufacturing research using structural equation modeling. *J Operat Manag*. 1999;17:467–488. doi:10.1016/S0272-6963(99)00002-9
62. Schermelleh-Engel K, Moosbrugger H. Evaluating the fit of structural equation models: tests of significance and descriptive goodness-of-fit measures. *Methods Psychol Res Online*. 2003;8:23–74.
63. Tucker LR, Lewis C. A reliability coefficient for maximum likelihood factor analysis. *Psychometrika*. 1973;38:1–10. doi:10.1007/BF02291170
64. Hu L, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Struct Equ Modeling*. 1999;6:1–55. doi:10.1080/10705519909540118
65. Chen FF. Sensitivity of goodness of fit indexes to lack of measurement invariance. *Struct Equ Modeling*. 2007;14:464–504. doi:10.1080/10705510701301834
66. Fabrigar LR, MacCallum RC, Wegener DT, Strahan EJ. Evaluating the use of exploratory factor analysis in psychological research. *Psychological Methods*. 1999;4(3):272–299. doi:10.1037/1082-989X.4.3.272
67. Fornell C, Larcker DF. Evaluating structural equation models with unobservable variables and measurement error. *J Market Res*. 1981;18:39. doi:10.1177/002224378101800104
68. Kim YM. Validation of psychometric research instruments: the case of information science. *J Am Soc Inf Sci Technol*. 2009;60(6):1178–1191. doi:10.1002/asi.21066
69. Podsakoff PM, MacKenzie SB, Lee JY, Podsakoff NP. Common method biases in behavioral research: a critical review of the literature and recommended remedies. *J Appl Psychol*. 2003;88(5):879–903. doi:10.1037/0021-9010.88.5.879
70. Cunha CM, Almeida Neto OP, Stackfleth R. Main psychometric evaluation methods of measuring instruments reliability. *Rev Atenção Saúde*. 2016;14:98–103.