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Original Article

Development and Psychometric Testing of Gender-Friendliness Barriers in Nursing Programs Questionnaire

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Purpose: Currently, there are few tools to examine perceived gender-friendliness barriers in nursing education programs. The purpose of this study was to develop and psychometrically assess gender-friendliness barriers in the Nursing Program Questionnaire.
Methods: A descriptive and cross-sectional study was designed. The study was conducted from May to June 2017. A total of 454 nursing students completed the Gender-Friendliness Barriers in Nursing Programs Questionnaire. Participants were recruited from four universities in Taiwan.
Results: Exploratory factor analysis yielded a three-factor structure (curriculum-related barriers – course and clinical practice course, barriers to clinical practice, and barriers to belonging) with a total of 20 items and explained 47.76% of the total variance. The Cronbach alpha coefficient for the three subscales ranged from 0.74 to 0.82. The Kaiser-Meyer-Olkin measure of sampling adequacy (0.86) and Bartlett's test of sphericity (χ^2 = 3386.578, $p < 0.001$) were accepted. A second-order confirmatory factor analysis was performed to assess the three dimensions and result in a better statistical fit of the data (*RMSEA* = 0.056). Regardless of gender barriers, participants indicated that the highest-ranking gender-friendliness barriers were curriculum-related barriers – course and clinical practice course.
Conclusion: A better understanding of the nature of male students and perceived "gender-friendliness barriers" by nursing students can help nursing educators improve teaching strategies for gender education. The Gender-Friendliness Barriers in Nursing Programs Questionnaire may be used to assess perceptions of gender-friendliness barriers. It can help nursing educators understand students' perceptions on gender-friendliness barriers in nursing programs, develop and adopt appropriate teaching strategies for nursing students.

Keywords: Gender, Gender-Friendliness Barriers, Nursing students.

1. Introduction

Traditionally, nursing is considered a female-dominated profession.[1] Although women have dominated the nursing field in history, the number of male nurses is now increasing and has higher overall proportions. However, male nurses are still in the minority. These minorities are engaged in nursing work in most countries, with 9% of registered nurses in New Zealand, 9.6% in the United States, 11% in the United Kingdom, and 11.7% in Australia, respectively [2], however, this percentage is even lower in Taiwan. According to statistics on the number of male and female nurses in the Taiwan Nurses Association (TUNA) in 2020, males are 6.372 (3.5%) and females are 173,276 (96.5%).[3] In the last five

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years, the number of male nurses and female nurses from 2016 to 2020 was 3592-6286 (2.3-3.5%) and 174240-254.511 (96.5-97.7%), respectively [3]. It is worth noting that these statistics include an increase in the number of men engaged in nursing work, which was observed to increase by 3.5% in 2011 [male 1645 (0.01%) vs. female 135066 (98.80%)].[3] Furthermore, according to statistics from the Ministry of Education, the proportion of male nursing students in Taiwan increased by 14.42% between 2006 and 2016.[4] In the last 10 years, the number of male nursing students has increased significantly, reflecting the increase in social awareness of male nursing and the changes in nursing education.[5] The nature of female-dominated creates inherent stereotypes and gender biases in nursing education, which makes male nurses and those who ungendered perspectives feel uncomfortable.[6] Furthermore, studies have confirmed that the main barrier for men was gender stereotypes and gender biases in nursing, which confuses male nursing students.[7-11] Male students report that men are not treated well at school, which creates a lot of pressure, leading to academic struggles and self-doubt about career choices.[12]

O'Lynn (2004) first defined a new concept of "male-friendliness" as a function of the existence and importance of these barriers. Furthermore, O'Lynn (2004) also first proposed that the perception of male nursing students of 'male friendliness barriers" included lack of group/team assignments, male gender non-acceptance, lack of encouragement to pursue leadership roles, lack of invitation to participate in activities, lack of using competition as learning motivation, and must prove that they belong to the field of nursing.[12] Since our study aims to explore the gender barriers of male and female students in nursing education, these barriers create an environment that is unfriendly to men.[12] Therefore, this study refers to the Inventory of Male Friendliness in Nursing Programs (IMFNP) [12] to develop a useful and appropriate tool to examine gender friendliness barriers in nursing programs. Understanding the nature of gender can help nursing educators develop appropriate teaching strategies for nursing students. However, currently there are very few measurement tools available to assess the perceptions of male and female nursing students about gender-friendliness barriers in nursing education programs in Taiwan. To describe the importance of perceived barriers and develop a tool to measure gender-friendliness in nursing programs. Therefore, this study developed and validated the Gender-Friendliness Barriers in Nursing Programs Questionnaire (GFB-NP).

Background

Men and women in nursing

Ms. Nightingale established a modern nursing school in the United Kingdom in 1860, which only enrolled women. Therefore, gender segregation appeared in the nursing profession at this time and the dilemma of male nursing staff and restricting admission began.[13] More than a century later, in 1980, people had a new understanding of the nursing profession. Nursing work is regarded a profession that provides personalized nursing, requires professional autonomy, and constantly updates technology and nursing expertise. Therefore, it is recommended that nurses have the ability, confidence, and ethics, regardless of gender [14] Today, gender diversity has been accepted and gender issues are gradually changing from biological gender to sexual orientation. However, historically, nursing roles are mainly female occupations, and Florence Nightingale believes that nursing is a suitable job for women.[15] Traditionally, nursing was considered a 'naturally female' activity and is dominated by women; men entering nursing typically face questions about their masculinity or sexual orientation.[5,7] Although nursing is considered a female-oriented profession, male nurses have made significant contributions to the nursing profession in many areas, including mental health, critical care, emergency care, and operating room.[16] In addition, male nurses who stand out from the crowd are welcomed as muscle in the unit and are regarded as good for heavy lifting purposes.[17] With the changes of time and changes in the medical environment, the number of male registered nurses is now increasing, and they have made significant contributions to the nursing profession.[16] However, the literature states that while nursing is considered a rewarding occupation with stable jobs and many opportunities, it is also considered an unsuitable occupation for men. [18] Due to the stereotype that nurses are a female

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occupation, male nurses or male nursing students are under pressure when entering nursing, and they often face unique challenges such as gender segregation,[19,20] culture stereotypes, and nursing is still regarding a female occupation, the work that men shouldn't be doing.[13,18,21]

Gender-friendliness barriers

Gender stereotypes are preconceived ideas in which males and females are arbitrarily assigned characteristics and roles that are determined and restricted by their respective sexes.[7,8] The World Health Organization defines gender roles as 'socially constructed roles, behaviours, activities, and attributes that society considers suitable for men and women.[22,23] The literature shows that gender stereotypes continue to affect the nursing profession and gender discrimination is still widespread.[12] In this regard, male nurses often face gender-friendliness barriers and unique challenges based on their gender. Several studies mention that male nurses encounter gender-based barriers in nursing education programs, including (1) providing intimate care to women,[17] (2) awkward and embarrassing moments in obstetrics,[14,17,18,24] (3) lack of instructions for proper use of touch, (4) being treated unfairly by colleagues, (5) experience loneliness and isolation,[12] (6) difficulties performing duties independently, (7) lack of men in nursing history,[12] (8) lack of substantial male role models and mentors,[12] and (9) lack of support.[25] Additionally, a recent study by Sabre and Ibrahim (2019) also indicated that men entering the nursing program may face challenges when training in obstetrics and gynaecology. Among them, the gender preferences of the patients were stronger.[26] Ahmad's study (2007) found that 66% of male patients accept female nurses and 97% of female patients would prefer female nurses to take care of them.[27] Yilmaz and Polat (2020) revealed that male nursing students are particularly faced with gender role challenges in the clinical practice of obstetrics and gynaecology, male nurses are often directly rejected by patients, leading to increased stress and role strain.[28] Nursing education for men faces a myriad of challenges, including gender-related stereotypes, gender bias, and gender-related barriers in teaching methods and text materials. Zeb et al. (2020) in-depth description of the life experience of male nurse educators, for example, educational institutions prefer female nurse educators to male educators; social barriers to interactions with female colleagues and nursing students; withstanding unfair, conflicts, and negative experiences of working with management; and female nurse educators received preferential treatment.[20] These barriers are multifaceted, but many stems from the disregard of gender-friendliness barriers in nursing education culture and curricula of nursing education.[20]

The Inventory of Male Friendliness in Nursing Programs (IMFNP)

O'Lynn (2004) operationally defines male friendliness as an academic environment in which 'gender-based barriers' are important for men in nursing education programs.[12] O'Lynn hypothesized that the presence of barriers would increase stress and isolation among male students,[29,30] resulting in increased academic struggles and attrition, and that barriers might affect the successful preparation of men as nurses. O'Lynn (2004) proposes that the more barriers perceived to be present in a program, the more unfriendly the learning environment is to men.[32] The higher the gender barriers, the less friendly the male students.[12]

The Gender Role Conflict (GRC) Theory provides the theoretical framework for IMFNP.[12,32] GRC is defined as 'a psychological state in which socialized gender roles have negative consequences for the person or others', ultimately limiting the potential of people. GRC arises from strict, sexist, or restrictive gender roles and masculinity norms.[31] The gender stereotype involves generalized viewpoints and preconceptions about the different attributes, characteristics, and roles that women and men should adhere to.[7] Many people believe that only certain types of people should belong to particular social groups and play certain roles.[8] GRC theory is an appropriate framework for social institutions that have facilitated conflicts between masculine gender roles, images of nursing roles, and the culture of nursing academe.[12,32] IMFNP has adequately quantified the prevalence and perceived importance of barriers for men in nursing education programs. This tool was sent to 24 nurse educators to review the tool for content validity. Nineteen educators responded, 16 of

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them were men. None of the reviewers recommended removing any of the items; resulting in an original 39-item survey tool.[12] Content validity was established in the original tool development study and was initially established in 2004.[12] Cronbach's alpha for the long-version IMFNP was reported to be 0.84.[32] A shortened version of the IMFNP (IMFNP-S; 23 items) was later developed with a Cronbach alpha ranging from 0.80 to 0.84.[12,17,32,34]

The original tool was designed for male nurses, with the aim of creating a tool that would assess the level of male friendliness.[12] Currently, some researchers have revised the tool to adapt it to female nursing students and nursing faculty.[37,38] To date, replication studies have been completed using IMFNP; Keogh and O'Lynn (2007) used a slightly modified version of IMFNP for Irish male nurses.[34] Le-Hinds (2010) used IMFNP to survey 76 registered nurses in California.[39] The tool has since been used in multiple studies in several countries, including Ireland,[17,33] Australia,[17] England,[17,33] Egypt,[35] and Korea,[36] to evaluate numerous types of campus-based programs and perceived male-friendliness nursing programs.

Purpose

The purpose of this study was to create and validate the GFB-NP questionnaire because there are few instruments that can assess the perception of gender-friendliness barriers in nursing education programs in Taiwan. Moreover, we want to understand the perceptions of male and female students of gender-friendliness barriers, therefore, the GFB-NP questionnaire was also appropriately modified for male and female students.

2. Methods

2.1. Study design

This study was a descriptive and cross-sectional study design.

2.2. Participants

Using a convenience sample, a total of 465 undergraduate nursing students participated in this study. The sample size required for exploratory factor analysis (EFA) is generally considered to be 5–10 times the number of items (40). Since there was a total of 20 items in the questionnaire, a sample size between 100 and 200 was acceptable. We included third- and fourth-grade students (senior grades) who have completed year-round clinical practice. In total, 454 completed questionnaires were returned (a response rate of 98.7%).

2.3. Measurement

The demographic questionnaire asked participants to provide information on gender, age, and clinical practice experience.

The Gender-Friendliness Barriers in Nursing Programs Questionnaire

We obtained permission from Dr. O'Lynn to refer to the IMFNP and developed the GFB-NP questionnaire for this study. The Gender-Friendliness Barriers in Nursing Programs Questionnaire (GFB-NP) was designed to measure the perceived gender-friendliness barriers of nursing students in nursing education programs.[12] The GFB-NP questionnaire was developed by the authors based on references to the existing literature[12,30,32] and the survey tool was referred to O'Lynn's IMFNP (2004, 2007).[12] O'Lynn (2004) indicated that nursing education programs will need to reduce gender-based barriers that are unfriendly to men and develop a tool to measure male-friendliness in nursing programs to create a male friendliness academic environment.[12] The IMFNP assesses the degree of agreement among men with any gender-based barriers in their nursing programs and surveyed the responses to determine the overall level of male friendliness in the nursing programs.[32]

We created the GFB-NP with 40 items after carefully reviewing the literature.[12,32] Four nursing professionals reviewed the content and wording of the scale. Based on expert suggestions and the pilot study, certain items were merged or excluded, and the questionnaire was modified to include 26 items, with separate versions for male and female nursing students. After the initial draft of the GFB-NP questionnaire was completed, three nursing professionals with gender expertise were invited to examine its content validity index. The result of the content validity index (CVI) was 0.90. All questionnaire items are scored

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using the Likert 5-point scale, including 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree; the questionnaire has a total score of 100. A higher score indicates that there is more gender-friendliness barriers, while a lower score indicates that there are fewer barriers. Although the 26 initial items were deemed acceptable by the CVI, however, after exploratory factor analysis (EFA), the questionnaire was revised to 20 items. Finally, a total of 20 items were confirmed.

2.4. Data collection

Data were collected from March to June 2017. We recruited 465 participants and did not complete 11 questionnaires. Finally, we included 454 samples in the EFA statistics and then used CFA to analyze these 454 samples (Figure 1). All male and female students have completed clinical practice courses. After explaining the purpose of the study of the psychometric properties of the GFB-NP questionnaire, nursing students were asked to complete the questionnaire. It took approximately 15 minutes to complete a given questionnaire.

2.5. Data Analysis

A descriptive statistical analysis was conducted and this study was conducted in two main steps, including exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). Descriptive statistical analysis and EFA were performed using SPSS for Windows (version 22.0), and CFA and measurement model fitting were performed using the LISREL program, Version 8.52. Cronbach's alpha coefficients were used to evaluate the reliabilities of the questionnaire and subdimensions. A value of 0.7 or higher for the questionnaire and 0.6 or higher for the subdimensions was considered acceptable. A value of 0.7 or higher for the questionnaire was considered acceptable.

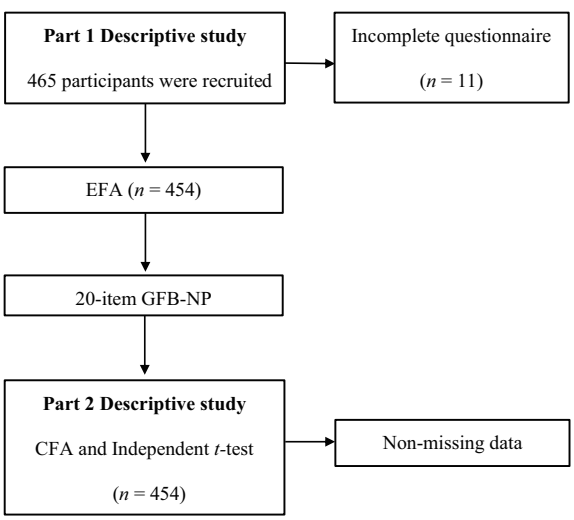


Figure 1. The flow diagram of the participants

The EFA is to identify the underlying relationships between the measured variables. Researchers usually use it when developing a scale (a scale is a collection of questions used to measure a specific research topic) and to identify a set of latent construct variables.[40] The factor loading (ranging from 0 to 1) measures the amount of variance in the variable explained by the component/factor. The factor loading matrix shows the relationship between the factors and the original variables. A factor loading of > 0.4 usually indicates that the variable can be attributed to the factor. The research report indicated that to obtain better results, the factor loading should be greater than 0.5, and 0.5 should be considered as the cut-off point for the acceptable load. Factor loading below 0.4 is too low, and each item < 0.4 were being eliminated.[41] Two common types of rotation are Varimax and Quartimax rotation.[41] The eigenvalue and retain factors have a confidence interval greater than 1.0.[42] The principal component extraction method with varimax solution rotation was used to identify relevant factors. The factors extracted by principal component analysis are rotated by the varimax rotation. Bartlett's test for sphericity and Kaiser-Meyer-Olkin (KMO) determined the adequacy of data sampling. KMO is a metric of 0 to 1, and the closer to 1, the better. A significant Bartlett's test of sphericity is required, and $p < 0.001$.[43] The CFA was conducted to test whether particular items fall into the constructs. The root mean square error of approximation (RMSEA) ranges from 0 to 1, and a value of 0.06 or less is acceptable; the goodness-of-fit index (GFI) ranges between 0 and 1, with a value of more than 0.9 generally indicating acceptable; the comparative fit index (CFI) value ranges from 0 to 1, and a CFI value of 0.95 or higher is currently considered an indicator of good fit (44).

2.6. Ethical Considerations

The Institutional Review Board had approved

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the survey procedure at the Chung Shan Medical University Hospital (No. CS2-16079). All participants received a brief explanation of the purpose of the study and were informed of their right to refuse participation and/or withdraw at any time without any negative consequences. All participants gave their informed consent.

3. Results

3.1. Participants' characteristics

A total of 454 nursing students participated in this study. Demographic data showed that 69.82% (n = 313) were female and 30.18% (n = 141) were male. The mean age of the female students was 21.16 years (SD = 1.24), while the mean age of the male students was 21.38 years (SD = 1.33). All participants have completed at least 72 hours of clinical practice experience. Other clinical practice experiences (medical-surgical nursing, paediatric nursing, and obstetrics & gynaecology nursing) are shown in Table 1.

3.2. The Reliabilities of Gender-Friendliness Barriers in Nursing Programs Questionnaire

Cronbach's Alpha tests showed that the alpha coefficient of the overall GFB-NP questionnaire was 0.88 and those of the subdimensions were 0.82, 0.78, and 0.74, respectively; which indicated acceptable internal reliability in both the questionnaires and the subdimensions.

3.3. The Validity of the Gender-Friendliness Barriers in Nursing Programs Questionnaire

Exploratory Factor Analysis

Table 2 shows the results of the factor loading of EFA (a three-factor). We used a series of rotations to remove the 6 items with factor loading < 0.4 and with the phenomenon of cross-loading, reducing 26 items to 20 items. Initially, although the 26 items were deemed acceptable by CVI, the questionnaire was modified to 20 items. Finally, only 20 items were analysed. Three common factors were identified that explained 47.76% of the total variance. Both the Kaiser-Meyer-Olkin measure of sampling adequacy (0.86) and Bartlett's test of sphericity ($\chi 2$ = 3386.578, df = 190, p < 0.001) were acceptable. Individual factor loadings (0.40 – 0.81) are shown in Table 2. The three factors were named according to the content of the item in each subdimension, as follows: curriculum-related barriers – course and clinical practice course, barriers to clinical practice, and barriers to belonging.

Second-Order Confirmatory Factor Analysis

Perform a second-order factor analysis on the above three factors extracted by EFA. Specifically, CFA was conducted to examine the relationships between all indicators and latent variables. Initially, the model did not fit the data (chi-square/df = 1102.62/167=6.60; $RMSEA$ = 0.111). Therefore, we tried to run the model to fit the data several times;

Table 1. Demographic characteristics of nursing students (N = 454)

	Male (n = 141)		Female (n = 313)	
Dimension	***n* (%)**	***M*±*SD***	***n* (%)**	***M*±*SD***
Age		21.38 ± 1.33		21.16 ± 1.24
Clinical practice experience				
Medical and Surgery nursing	97 (70.8)		145 (45.6)	
Paediatrics nursing	94 (68.8)		146 (46.1)	
Obstetrics and Gynaecology nursing	68 (49.6)		138 (43.5)	
Psychiatric Mental Health nursing	62 (45.3)		137 (43.2)	
Community Health nursing	62 (45.3)		137 (43.2)	
Nursing Administration	47 (34.3)		96 (30.3)	

Table 2. Factor loadings of the exploratory factor analysis (*N* = 454)

Dimension/Item	Loading	Eigenvalue	Variance explained
Curriculum-related barriers – course and clinical practice course		6.301	31.51%
1 There are no proper instructions for male students on how to provide care/physical contact to patients.	.73		
2 There are no historical role models for nursing in the curriculum.	.72		
3 Some sections of the nursing curriculum are insufficient to provide gender-specific and individualized communication.	.71		
4 Since nursing was previously regarded as a female occupation, the nursing education program for male students is insufficient.	.62		
5 There are no instructions on how to provide an appropriate therapeutic touch.	.64		
6 There are not enough male nurses as role models.	.50		
7 There are few opportunities to work with male nurses in clinical practice.	.48		
8 In the clinical practice of obstetrics and gynaecology, male students face different conditions and restrictions than female students.	.48		
Barriers to the clinical practice		1.899	9.50%
9 Female nurses generally show a better ability to care for patients than male nurses.	.81		
10 Female nurses tend to outperform male nurses in improving patient morale	.79		
11 Female patients do not prefer to accept care from male nurses.	.54		
12 Male patients prefer to accept the care of female nurses.	.53		
13 Male students may feel embarrassed when explaining sensitive issues to female patients.	.46		
14 Due to gender roles, male students can feel overwhelmed when providing nursing care.	.41		
Barriers to belonging		1.352	6.76
15 Most of the team members are female students, which makes male nursing students feel isolated.	.77		
16 Most of the team members are female students, which makes male nursing students feel isolated.	.67		
17 Male students do not have the opportunity to cooperate with other medical professionals.	.57		
18 Male students are discouraged from seeking opportunities to collaborate with other male peers.	.53		
19 Some clinical practice units do not want or encourage male students to join.	.41		
20 As a female-dominated profession, nursing programs have not been designed to fully integrate with the needs of male students.	.40		
Total variance explained			47.76%

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finally, we set six error covariances for free based on the modification indices. As shown in Figure 2, a second-order factor for the GFB-NP questionnaire presented a good fit for the full model (chi-square/*df* = 392.05/161=2.44; normed-fit index (*NFI* = 0.95; *comparative fit index* (*CFI* = 0.97; goodness of fit index (*GFI* = 0.92); and Root Mean Square Error of Approximation (*RMSEA* = 0.056). All item loadings ranged from 0.40 to 0.70 and were significant at $p < 0.05$. The standardized second-order factor loadings varied between 0.77 and 0.94. Finally, the composite reliability for the three factors (barriers to belonging, curriculum-related barriers, and barriers to clinical practice) was 0.78, 0.66, and 0.68, respectively.

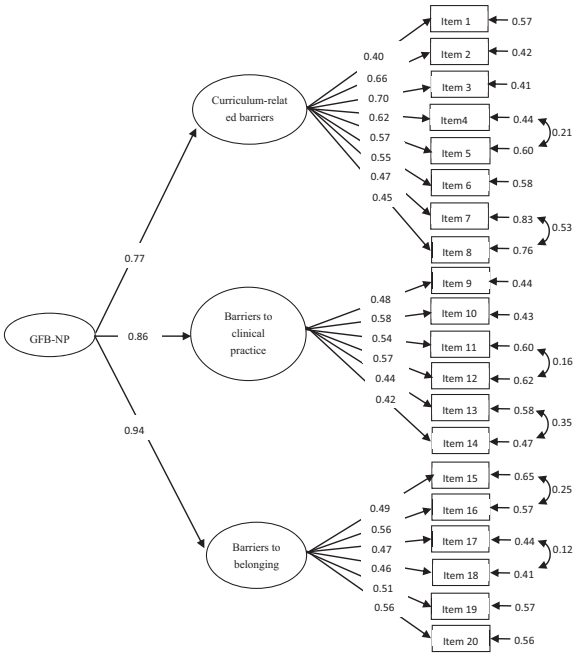


Figure 2. Factor structure of the Gender-Friendliness Barriers in Nursing Programs (GFB-NP) questionnaire.

Note. Model fit indices: $\chi 2$ = 392.05 (*df* = 161, *p* =0.000); Root mean square error of approximation (*RMSEA*) = 0.056; all value present statistically significant ($p < 0.001$). Item numbers correspond to those in Table 2.

3.4. Correlation coefficients of three factors

Curriculum-related barriers – course and clinical practice course and barriers to clinical practice (r = 0.48, $p < 0.01$); barriers to the clinical practice and barriers to belonging (r = 0.54, $p < 0.01$); barriers to belonging and curriculum-related barriers – course and clinical practice course (r = 0.56, $p < 0.01$).

3.5. Difference between male and female nursing students perceived on Gender-Friendliness Barriers in Nursing Programs

The mean score of GFB-NP for male and female students was 56.64 (*SD* = 11.13) and 57.68 (*SD* = 9.84). We want to determine whether there are differences in barriers between male and female students. Therefore, we conducted an independent *t*-test. As shown in Table 3, no significant differences were found (t = 0.99, p = 0.32). Furthermore, there were no differences between male and female students in the three factors of curriculum-related barriers, barriers to clinical practice, and barriers to belonging (t = 1.48, p = 014, t = 1.04, p =0.30, t = 0.32, p = 0.75; *respectively*) (Table 3).

Table 3.

		Male (n = 141)			Female (n = 313)				
Dimension	**Items**	**M±SD**	**%[a]**	**Rank**	**M±SD**	**%[a]**	**Rank**	***t***	***p***
Gender-Friendliness Barriers in Nursing Programs	20	56.64±11.13			57.68±9.84			0.99	.32
Curriculum-related barriers	8	24.91±5.19	62.28	1	25.67±5.00	64.18	1	1.48	.14
Barriers to the clinical practice	6	16.45±4.13	54.83	2	16.84±3.46	56.13	2	1.04	.30
Barriers to belonging	6	15.28±3.94	50.93	3	15.16±3.58	50.53	3	0.32	.75

Compare gender-friendliness barriers in nursing programs between male and female nursing students (*N* = 454)

Note: A Standardized mean = original mean ÷ number of items ÷ maximum score per item ×100%

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4. Discussion

The purpose of this study was to develop a GFB-NP for nursing programs and to evaluate the reliability and validity of the scale by internal consistency analysis, EFA, and CFA. After a two-stage development process and 454 students, a 20-item questionnaire was developed, divided into three dimensions: curriculum-related barriers, barriers to clinical practice, and barriers to belonging. Our tool is different from the established tool, the development of GFB-NP was based on the current literature[12,17,31-34] and referred from O'Lynn's IMFNP.[12] The IMFNP assesses the level of agreement among men on whether there is gender-based barriers in nursing programs to determine the overall level of male-friendliness in the nursing program.[12,32] However, GFB-NP was designed to measure male and female nursing students in nursing education programs.

The reliability and validity of the questionnaire

Internal consistency determines the consistency and stability of the items. Cronbach's α was between 0.7 and 0.9, which indicated a good level of reliability. A total of three factors were identified according to EFA, and a total of 20 items were generated (the Cronbach α of the three factors was between 0.74 and 0.82, and the Cronbach α of the overall questionnaire was 0.88). According to the recommendation of Tavakol and Dennick (2011), accepting a Cronbach α coefficient ranging from 0.70 to 0.95, internal consistency was deemed adequate.[45]

This study examined the construct validity of GFB-NP by performing EFA. In this study, the KMO value in the EFA was approximately 0.90, indicating a good factor analysis suitability. The three factors are extracted and explain 47.76% of the total variance. Although the factor loading of some items was > 0.60, there are 3 items with the phenomenon of cross loading, and it is impossible to clearly judge whether it belongs to factors one, two, or three, and there are three factors loading < 0.4, therefore, it was removed and revised to 20 items.

The second-order factor for GFB-NP was determined by CFA.[44] This study produced *NFI*, *CFI*, *and GFI* values greater than 0.90 and *RMSEA* values (0.056) below 0.080. These indexes indicated that the full model presented sufficient goodness-of-fit.[45] Obviously, this instrument has many potential applications for future use and provides feedback on important factors that influence gender-related barriers in nursing programs. As such, the instrument can highlight the differences between gender-related barrier factors in nursing programs, allowing the identification of specific strategies that can improve nursing recruitment. GFB-NP can also be used to examine the factors that influence whether men choose nursing as a career.

Three factors of gender-friendliness barriers in nursing programs

Curriculum-related barriers – course and clinical practice course.

The first factor consists of eight items that reflect the barriers experienced by male nursing students in the course and clinical practice course, particularly restrictions related to obstetrics and gynaecology. Among them, nursing is regarded as a female profession, and there is a lack of proper guidance on how to provide nursing care, touch (body touch), and therapeutic touch for male students, a lack of historical role models, and fewer job opportunities. The first factor accounts for most of the explanation of the total variance (31.51%), which is consistent with previous studies reporting that male students have negative experiences during clinical practice,[7,46] face gender role challenges in obstetrics and gynecology, which is consistent with previous studies that reported male students have negative experiences during clinical practice,[7,46] face gender role challenges of gynaecology and obstetrics, which lead to increased stress and role strain.[20,26] .It should be noted that 'male students who do not have adequate instructions on how to provide nursing care, physical contact, or therapeutic touch to patients' have a high load (0.73), and responses to Yilmaz and Polat (2020) stated that despite facing privacy concerns, male students feel stressed in maternity clinics.[20] Additionally, the item 'there are no historic role models for male nursing in the curriculum' is generally considered to be female-dominated and therefore regarded as a female-oriented profession.[1,15] Furthermore, the item "There are sections in the curriculum that are insufficient

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to provide gender-specific and individualized communications" responds to the reasons resulting from perceived gender-based barriers that increase hostility toward men or an "unfriendly" learning environment.[12] The unfriendly environment has lasted for decades.[12,23]

Barriers to Clinic Practice

The second factor included six items that reflect the idea that male and female patients are more likely to accept care from female nurses; women are considered more suitable for the nursing job than men.[27] Male students may feel overwhelmed and embarrassed when providing care; it is believed that female nurses generally demonstrate better nursing skills. Due to the high degree of personal intimacy involved, women preferred female nurses to give them a bath, shower, or shaving; whereas males tended to have no preference.[27] The literature reports that female patients prefer female nurses.[27,47] Women prefer female nurses in terms of reproductive, sexual health, intimacy, or psychosocial issues, while the preference was not evident. Female patients believe that considerately and the ability to boost patient morale often make women more suitable than men to engage in the nursing profession.[27] A recent study indicated that female patients believe that male nurses were polite and courteous, skilled in nursing techniques, and provided a comfortable environment while caring for patients; and male patients believe that professional conduct and cooperation in male nurses were higher than in female nurses.[47]

Barriers to belonging

The third factor includes six items, reflecting that male students are often affected by the feeling that they do not belong to the nursing profession, especially women dominant. Male nursing students often experience loneliness and isolation while working in a female-dominated nursing environment,[29] and unequal clinical opportunities can lead to feelings of isolation.[10] In other words, some clinical practices do not expect or encourage male students to join, and the curriculum design does not fully consider the need for male students.[12,32]

Differences between male and female nursing students' perceptions of gender-friendliness barriers

We also compared the differences between the perceptions of male and female nursing students of gender-friendliness barriers. As shown in Table 3, we did not find significant differences between genders. Furthermore, there were no differences in the three dimensions. This finding shows that, regardless of gender, students have the same perception of gender-friendliness barriers. In our results, male and female students' perceptions of gender-friendliness barriers reported moderate barriers in the clinical setting; this result supports and is consistent with several previous studies,[26,28] indicating that male nurses face gender-based barriers when participating in nursing education programs.

Awareness of gender-related barriers in the nursing profession

Regardless of gender, especially, the first friendliness-barrier experience for male students was in clinical practice, including the general belief that nursing is a female occupation, lack of guidance on proper care, therapeutic touch, and different requirements/limitations for male students during maternity clinical setting. This finding also supports previous research, showing that male nurses often worry about physical contact and are afraid of being accused of inappropriate touch.[18] As mentioned above, male students have negative experiences during clinical practice.[7,26,28-46] It also supports the study by Saber and Ibrahim (2019), who found that men entering nursing programs may face challenges during maternity training.[26] Therefore, the nursing profession can raise awareness of the barriers and challenges associated with men by developing strategies to change traditional education programs and increase the inclusion of male and female students. Male nursing students also need support in the clinical setting to overcome situations that prevent them from fully participating in nursing.[25] Male nursing students have discovered in their undergraduate nursing professional education experience that choosing nursing as a profession faces the challenge of gender barriers, which is a dilemma for nursing professions. However, due to the benefits of studying nursing, most of the male students passively choose a nursing profession.[48]

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Therefore, it is important to awaken gender awareness in the learning environment to maintain masculinity and male superiority.[49] Although there are still some bottlenecks in the views of male nurses about patient care, as time goes by, patients' perceptions of male nurses will no longer have gender differences. Gradually, male nurses will be openly accepted by patients and flourish in the clinical environment.[50]

Limitations

This study has several limitations. First, convenience sampling was used to recruit participants, which means that not all nursing students were represented. Since the participants were from four different universities and colleges, future research may include larger samples from more universities and colleges to obtain more generalizable findings. Second, although participants had a variety of different clinical practice experiences, the outcome measures focused mainly on perceived gender-friendliness barriers between male and female nursing students, respectively. Therefore, it is impossible to understand how male and female nursing students perceived gender-friendliness barriers in clinical practice experiences of different subjects. Third, our participants are nursing students and it has not been extended to male and female nurses; therefore, we cannot understand the perception of gender-friendliness barriers among clinical male and female nurses. Future research could conduct a longitudinal study to assess the relationships between the latent variables and find the predictor of gender -friendliness barriers and thereby evaluate its potential predictors. Additionally, qualitative research is recommended to gain insight into the views of male and female nursing students on gender-friendliness barriers. Finally, randomized controlled trials could be conducted to further evaluate problem-solving strategies.

5. Conclusion

This study provides useful information to create a more male-friendlier academic environment. The GFB-NP questionnaire is a reliable and valid instrument for examining how nursing students perceive gender-friendliness barriers in clinical practice environments and nursing education programs. It can help nursing educators understand the gender-friendliness barriers perceived by male and female students in nursing programs and develop and adopt appropriate teaching strategies for nursing students. Indeed, we have found that both male and female students perceived that there was gender-friendliness barriers, which may be useful for interventions aimed at improving gender-friendliness in nursing programs. By recognizing gender barriers, a more inclusive environment can be created and professional diversity can be enhanced.

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Declaration of competing interest

The authors declared that they had no conflict of interest.

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