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Development and psychometric testing of the gender misconceptions of men in nursing (GEMINI) Scale among nursing students

Jed Montayre, RN, PhD (ORCID: 0000-0002-2435-8061)
Senior Lecturer | Western Sydney University | School of Nursing and Midwifery
Locked Bag 1797, Penrith NSW 2751 | j.montayre@westernsydney.edu.au | Twitter: @JedMontayre

Ibrahim Alananzeh RN, PhD (ORCID: 0000-0002-2660-0122)
Assistant Professor | University of Wollongong | School of Nursing
ibrahima@uow.edu.au

Kasia Bail, RN, PhD (ORCID: 0000-0002-4797-0042)
Associate Professor | University of Canberra | Discipline of Nursing, Ageing Research Group
kasia.bail@canberra.edu.au

Kate Barnewall, RN, RM, BN, MAdvPrac
Lecturer | Griffith University | School of Nursing and Midwifery
k.barnewall@griffith.edu.au

Tania Beament, RN, PhD (ORCID: 0000-0002-9598-5601)
Director International | Edith Cowan University | School of Nursing and Midwifery
t.beament@ecu.edu.au

Steve Campbell, BN, PhD, FRSH, FACN (ORCID: 0000-0003-4830-8488)
Professor of Clinical Redesign, Nursing | University of Tasmania | School of Nursing, College of Health and Medicine
steven.campbell@utas.edu.au

Cathy Carmody, RN, MAdvPrac
Lecturer | Griffith University | School of Nursing and Midwifery
c.carmody@griffith.edu.au

Alex Chan, RN, BN, MN (ORCID: 0000-0003-2614-0178)
Lecturer | University of Wollongong | School of Nursing
chana@uow.edeu.au

Frank Donnelly, RN, PhD (ORCID: 0000-0001-7675-9505)
Head of School | University of Adelaide | Adelaide Nursing School
frank.donnelly@adelaide.edu.au

Jed Duff, RN, PhD (ORCID: 0000-0003-1427-0303)
Chair of Nursing Royal Brisbane and Women's Hospital | Queensland University of Technology | Centre for Healthcare Transformation
j2.duff@qut.edu.au

Caleb Ferguson, RN, PhD (ORCID: 0000-0002-2417-2216)
Associate Head of School (Research) | University of Wollongong | School of Nursing
calebf@uow.edu.au

Jo Gibson, RN, PhD (ORCID: 0000-0002-3217-2101)
Senior Lecturer - Nursing | University of Canberra | School of Nursing, Midwifery & Public Health
Email: jo.gibson@canberra.edu.au

Peta Harbour, RN, BN, PhD Candidate (ORCID: 0000-0003-2607-895X)
Deputy Head of School | Australian Catholic University | School of Nursing, Midwifery and Paramedicine
peta.harbour@acu.edu.au

Colin J. Ireland, RN, PhD (ORCID: 0000-0002-7983-0255)
Lecturer | University of South Australia | Clinical and Health Sciences
colin.ireland@unisa.edu.au

Xian-Liang Liu, MD, PhD (ORCID: 0000-0002-3296-5339)
Undergraduate Honours Academic Lead| Charles Darwin University | College of Nursing and Midwifery
daniel.liu@cdu.edu.au

Patricia Luyke, RN, MN (ORCID: 0000-0003-0254-0468)
Associate Lecturer | University of Southern Queensland | School of Nursing and Midwifery
trish.luyke@usq.edu.au

Della Maneze, MD, PhD (ORCID: 0000-0001-6475-8804)
Research Associate | Western Sydney University | School of Nursing and Midwifery
d.maneze@westernsydney.edu.au

Jo McDonall, RN, PhD (ORCID: 0000-0001-6696-6316)
Director of Undergraduate Studies | Deakin University | School of Nursing and Midwifery
jo.mcdonall@deakin.edu.au

Lauren McTier, BN, BN(Hons), PhD (ORCID: 0000-0003-4847-8380)
Associate Head of School (Teaching and Learning) | Deakin University | School of Nursing and Midwifery
lauren.mctier@deakin.edu.au

Tameeka Mulquiney, RN, RM, MMID
Lecturer | Charles Sturt University | School of Nursing, Paramedicine and Healthcare Sciences
tmulquiney@csu.edu.au

Jane O'Brien, RN, PhD (ORCID: 0000-0002-6504-8422)
Lecturer | University of Tasmania | School of Nursing, College of Health and Medicine
j.a.obrien@utas.edu.au

Lemuel J. Pelentsov, RN, PhD (ORCID: 0000-0001-8108-491X)
Program Director | University of South Australia | Clinical and Health Sciences
lemuel.pelentsov@unisa.edu.au

Lucie M. Ramjan, BN, BN(Hons), PhD (ORCID: 0000-0001-7815-3005)
Associate Professor | Western Sydney University | School of Nursing and Midwifery
l.ramjan@westernsydney.edu.au

Natasha Reedy, RN, PhD (ORCID:0000-0003-3143-5173)
Bachelor of Nursing Program Director | University of Southern Queensland | School of Nursing and Midwifery
natasha.reedy@usq.edu.au

Gina M. Richards, RN, PhD (ORCID: 0000-0001-8670-0849)
Adjunct Lecturer | Edith Cowan University | School of Nursing and Midwifery
gm.richards@ecu.edu.au

Michael A. Roche, RN, PhD, FACN (ORCID: 0000-0002-3831-537X)
Professor | University of Canberra | Faculty of Health
Adjunct Professor | University of Technology Sydney | School of Nursing and Midwifery
michael.roche@uts.edu.au

Brandon W. Smith, RN, BN (ORCID: 0000-0001-5441-6173)
Research Assistant | Western Sydney University | School of Nursing and Midwifery
b.smith3@westernsydney.edu.au

Jing-Yu (Benjamin) Tan, RN, PhD (ORCID: 0000-0002-1609-6890)
Associate Dean Research | Charles Darwin University | College of Nursing and Midwifery
benjamin.tan@cdu.edu.au

Karen A. Theobald, RN, PhD (ORCID: 0000-0002-2880-1411)
Academic Lead Education | Queensland University of Technology | School of Nursing
k.theobald@qut.edu.au

Kathleen E. Tori, RN, NP, PhD (ORCID: 0000-0003-4026-6842)
Associate Professor | University of Tasmania | School of Nursing
kathleen.tori@utas.edu.au

Peter Wall, RN, MN (ORCID: 0000-0003-0919-8546)
Lecturer | Murdoch University | College of Science, Health, Engineering and Education
p.wall@murdoch.edu.au

Emily Wallis, RN, MCritCare, GradCertHE, (ORCID: 0000-0002-2275-7368)
Senior Lecturer | University of Canberra | School of Nursing, Midwifery and Public Health
emily.wallis@canberra.edu.au

Luke Yokota, RN, BN, MACN (ORCID: 0000-0002-3178-9740)
Inaugural Chair | Australian College of Nursing | Men in Nursing Working Party
luke.yokota@acn.edu.au

Joel Zugai, RN, PhD (ORCID: 0000-0002-2359-7183)
Lecturer | The University of Notre Dame | Faculty of Medicine, Nursing and Midwifery and Health Sciences
joel.zugai@nd.edu.au

Yenna Salamonson, RN, PhD (ORCID: 0000-0002-7429-4086)
Professor | Western Sydney University | School of Nursing and Midwifery
Locked Bag 1797, Penrith NSW 2751 | y.salamonson@westernsydney.edu.au | Twitter:
@salamonson

Abstract

Background: Misconceptions about men in nursing may influence recruitment and

retention, further perpetuating the gender diversity imbalance in the nursing workforce.

Identifying misconceptions and implementing early intervention strategies to address these

deep-rooted stereotypes remain challenging but is considered critical to support students

who are commencing a nursing career.

Objective: To develop and evaluate the psychometric properties of the '**Ge**nder

Misconceptions of me**N** in nurs**I**ng (GEMINI) Scale.

Design: Cross-sectional survey.

Methods: Pre-registration nursing students enrolled in undergraduate nursing programs

across 16 nursing institutions in Australia were surveyed from July to September 2021. The

17-item self-report GEMINI Scale measured the gender misconceptions of men in nursing.

Results: Of the 1410 completed surveys, data from 683 (45%) women were used for

exploratory factor analysis showing a one factor structure, while data from 727 men (47%)

were used for confirmatory factor analysis of the 17-item GEMINI Scale, which showed a

good model fit. The scale demonstrated high internal consistency (Cronbach's alpha of

0.892). Men were found to have higher gender misconceptions ($p < 0.001$) while

respondents who: a) identified nursing as their first career choice ($p = 0.002$); b) were in

their final year of program enrolment (p = 0.016); and c) engaged in health-related paid work (p = 0.002) had lower gender misconceptions.

Conclusion: The GEMINI Scale is a robust, valid, reliable, and easy to administer tool to assess misconceptions about men in nursing, which may potentially influence academic performance and retention. Identifying and addressing specific elements of misconceptions could inform targeted strategies to support retention and decrease attrition among these students.

Impact statement: Genderism harms nursing, as well as the men and women working in the profession. Recruitment and retention of men into nursing is needed to cultivate male role models and diversify the workforce, however this is impeded by negative portrayals in popular culture and misconceptions entrenched in society.

*Keywords***:** gender misconception; gender role; gender bias; instrument development; psychometric testing; nursing student; men in nursing

Introduction

Misconceptions and stereotyping of nursing as a predominantly female occupation are contributing factors to the current gender divide evident in the nursing profession. Misconceptions about men in nursing have previously been examined from a gender-based lens (Whitford et al., 2020). Misconceptions such as a lack of compassion in men has adversely impacted men entering the nursing workforce (Stanley et al., 2016). Earlier studies confirmed these negative stereotypes about men who are nurses persist in modern society

(Stanley et al., 2016) and are perpetuated by mainstream media and TV dramas (Weaver et al., 2014). As such, these widely held views by the society are challenges the nursing profession need to address to increase recruitment of men.

While active efforts to diversify the workforce and recruit men into the nursing profession have increased in the last decade (Nursing and Midwifery Board of Australia, 2019), the nursing workforce remains challenged by deeply rooted beliefs and misconceptions about men in nursing (Grady & Gough, 2015). These misconceptions contribute to higher attrition rates among men in nursing programs which hinders substantial gains toward increasing the number of men in the nursing profession (Hodges et al., 2017), compounding the nursing workforce shortage. Further research is needed to determine the level of impact stereotyping and misconceptions has on men in pursuing nursing as their chosen career and staying in the profession.

Understanding perceptions and misconceptions regarding men in nursing can provide insights into how to better support men in nursing programs. To date, there is no psychometrically validated instrument that assesses nursing students' perceptions or misconceptions of men in nursing. This paper presents the development and testing of the psychometric properties of an instrument that measures nursing students' views in relation to the influence of gender in nursing, the *Gender Misconceptions of meN in nursIng* (GEMINI) Scale.

Background

Genderism in professions is counterproductive to the sustainability and retention of the workforce (Ottsen, 2018), fueling campaigns promoting diversity in gender-dominated professions and jobs. In healthcare, for example, nursing has been traditionally perceived as a female career since the time of Florence Nightingale in the 19th century (Ross, 2017).

Principles of nurturing and caring were seen as an extension of women's domestic duties, intrinsically suited to their empathic and sensitive nature, which implied contrast to the brusque, rough and machismo qualities of men (Forsman & Barth, 2017; Vaughan et al., 2019). These misconceptions persist today, with many still viewing men who enter this feminised profession as unmanly, creating a significant barrier for men in choosing nursing as a career.

Previous research found that the few men who entered the nursing workforce were largely motivated by career opportunities, job security and financial compensation. However, many male nurses contend with discrimination, questions about their masculinity, and suspicions of inappropriate behaviours in the performance of their caring role (Yi, 2016). These negative stereotypes led to marginalisation and were prejudicial to the continuance of a nursing career among men (Evans & Frank, 2003; Smith et al., 2021). The pejorative attitude towards men in nursing has also been reported at the undergraduate level, where male nursing students reported discrimination from female nurses, other healthcare professionals, and patients (Sedgewick, 2015). The sense of isolation and exclusion described by male nursing students during clinical placement were particularly heightened during rotation to the obstetrics ward, where, unsurprisingly, the culture favoured the female gender (Sedgwick & Kellett, 2015). Current strategies to counter these negative conceptions and experiences have been grounded on targeted messages, presenting nursing as an exciting career choice for both men and women, profiling successful male nurses, and peer encouragement (Forsman & Barth, 2017). However, there is a need to examine these disparaging misconceptions in entry-to-practice programs where career intentions are incubated. Recruitment and retention initiatives could then be tailored to attract and then support the needs of men in nursing.

Methods

Design

The items included in the GEMINI Scale were researcher-developed based on available literature from studies on men in nursing. The process was guided by the four steps of instrument development recommended by Davis (1996): (1) concept identification through the literature; (2) item construction by determining the blueprint, format, item writing, readability, and scoring; (3) validity of the instrument through expert review, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA); and (4) reliability of the instrument.

Initial items were generated based on a review of the literature. In Phase 1, face validity was tested using a reference group, followed by an expert panel review in Phase 2 to test content validity. Based on expert feedback on the scale items, a national multi-site study was conducted in Phase 3 to determine the structural validity and reliability of the scale. Exploratory and confirmatory factor analyses were conducted. The 'Consensus-based Standards for the selection of health status Measurement Instruments (COSMIN) (Mokkink et al., 2012) guided the conduct and reporting of this study, as applicable.

Study setting

This study was conducted across 16 universities in Australia from July to September 2021 in collaboration with the Australian College of Nursing, the peak nursing organisation in Australia. Seven institutions targeted all enroled nursing students, while nine targeted only enroled male students. The Bachelor of Nursing (BN) degree in Australia is a three-year undergraduate, pre-registration program that includes a combination of university teaching and a minimum of 800 hours of clinical placements in various clinical settings.

Ethical considerations

Ethical approval for this study was received from the Human Research Ethics Committee of [BLINDED for REVIEW] as the lead university with approval number H14132. Reciprocal ethics approval was also received from all participating institutions. Participants were provided written information about the study attached in the study survey link and flyers. Contact details of the lead researcher was made available in the recruitment flyers to provide participants the opportunity to seek clarification before answering the survey. The voluntary nature of participation was emphasised to all participants.

Item generation

The GEMINI Scale aims to assess the gender attitudes and misconceptions about men in nursing. In developing the instrument, a comprehensive review of the literature relating to perceptions of male nursing students in a female-dominated profession was conducted. Literature included a previous report from a Western Australian workforce study on men in nursing collected from clinicians and academic professionals (Stanley et al., 2016). A 5-point Likert response format from 1 (strongly disagree) to 5 (strongly agree) was chosen to provide sufficient variability in responses, including a neutral midpoint.

Sampling and participants

Convenience sampling was used to recruit participants for all phases of this study. Participants were invited via internal (university) email, official social media pages, and posted flyers with QR codes, where information about the study, the GEMINI Scale and its rationale, and participation requirements were detailed. The Australian College of Nursing also advertised Phase 3 of this study in their electronic newsletters, on interest group web

pages (specifically the Men in Nursing Interest/Working Group), and on social media platforms.

In Phase 1, male nursing students, including those undertaking research degrees who have the skills to provide feedback on the qualities of the scale were invited to participate. In Phase 2, experts in interdisciplinary nursing studies, such as academics, clinicians, and administrators, were invited to participate. For Phase 3, male nursing students enrolled in a participating Australian university were eligible to join the study. These universities were recruited via Expressions of Interest, emailed to Heads of School or representatives, and endorsed by the Australian College of Nursing.

Data collection

For Phase 1, data were collected from a reference group via email. Participants were asked to provide feedback on the readability, clarity, relevance, and completeness of the scale items (face validity). Suggestions to refine, reorder, and remove items were provided via comments or track changes in the document. In Phase 2, a panel of experts was approached to assess an online questionnaire where they could rate the relevance of each item on a 4-point scale, from 0 (not relevant) to 3 (highly relevant), with space for further written feedback and suggestions to include additional items. In Phase 3, participants were provided with an online Qualtrics survey link containing the GEMINI Scale and the socio-demographic information sheet.

Data Analysis

Data collected in Phase 2 was used to calculate the individual content validity index (I-CVI) for each item by dividing the number of experts who gave an item a rating of "highly relevant" by the total number of experts. Items with insufficient content validity scores (I-

CVI<0.70) were removed from the scale (Almanasreh et al., 2019). A scale-level content validity index (S-CVI) was computed for the scale, specifically the average CVI (S-CVI/Ave), which is the sum of all I-CVIs divided by the total number of items.

Data collected in Phase 3 were imported from Qualtrics into IBM SPSS statistics version 27 (IBM Corp., 2020) for analysis. Descriptive statistics were used to describe demographic characteristics of participants, including their age, gender, country of birth, year of study, whether nursing was their first choice, and whether they are currently undertaking nursing (i.e., assistant in nursing) or health-related work (i.e., personal care worker). The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy of ≥0.6 was set as the threshold for adequate correlation for EFA. Principal axis factoring (PAF) was conducted with Varimax rotation to extract the number of factors in the scale, with ≥0.3 as significant factor loading. The number of factors to be extracted was also guided through inspection of the scree plot and eigenvalues of each factor. Reliability or internal consistency of the scale was measured by Cronbach's alpha, with a reliability coefficient ≥0.7 deemed an acceptable level of reliability. The corrected item-total correlation and alpha value if an item was deleted were also examined.

Results

Across the 16 participating institutions, 1532 nursing students (Years 1 to 3, and beyond) responded to the survey. Of these, 122 (8%) responses were not analysed due to missing data. The age of students ranged from 17 to 67 years (mean: 26.5, *SD*: 8.6). Nearly half (47%) of respondents were males. While 75% of respondents spoke only English at home, 30% were born overseas. Less than one-quarter (23%) were not engaged in paid work, while 44% were employed in health-related work during the teaching period. The

majority (88%) of respondents indicated that nursing was their first program of choice, approximately one-third reported having an immediate family member who was in the nursing profession. Table 1 shows the distribution of GEMINI Scale scores which ranged from 17 to 83 (mean: 34.8, median: 34, *SD*: 10.4).

Content validity

A total of 19 items were assessed for content validity. Of the six experts contacted, five rated the relevance of each of the 19 items in relation to gender misconception of men in nursing. Two items with I-CVI of < 0.70 were removed, and 17 items were retained.

Exploratory Factor Analysis: Female nursing students

The first half-split sample for EFA was computed using data of female respondents (n=683). Data factorability was established through the Kaiser-Meyer-Olkin measurement of sampling adequacy (0.91). Using the Principal Axis Factoring (PAF) procedure, exploratory factor analysis extracted a one-factor solution, with an eigenvalue of 5.28 (cumulative explained variance: 31.04%). Except for one item (Item 7: 0.10), the extracted communality of remaining items ranged from 0.25 to 0.44, with factor loadings that ranged from 0.31 to 0.66.

Confirmatory factor analysis: Male nursing students

Data obtained from male survey respondents (*n* = 727) were used for CFA of the 17-item GEMINI Scale. Standardised factor loadings of the 17 items on the one-factor scale ranged from 0.45 to 0.73 (statistically significant at the 5% level). Following controlling of error terms between items using modification procedures (Hopko et al., 2003), fit statistics were as follows: $\chi2$ = 220.24, *df*: 92, *p* = <0.001, GFI = 0.959, TLI = 0.951, CFI = 0.967, RMSEA = 0.047.

Internal consistency

Cronbach's alpha of the whole sample was 0.892. The Cronbach's alpha value did not increase with the deletion of any of the 17 items, indicating each contributed uniquely to the overall GEMINI Scale.

Discriminant validity

Figure 1 shows group differences among respondents with low and high GEMINI Scale scores. Overall, men were more likely to have higher gender misconception ($p < 0.001$). In contrast, respondents with the following characteristics were more likely to have lower gender misconception scores, those: a) with nursing as their first choice ($p = 0.002$); b) in the final (i.e., 3 years full time) of program enrolment ($p = 0.016$); and c) engaging in health-related paid work ($p = 0.002$).

Multivariate logistic regression analysis revealed that those with high gender misconception, as indicated by a low GEMINI Scale score, were over two times more likely to be men (AOR: 2.167, 95% CI: 1.723 – 2.747). Additionally, the model also showed those who were engaging in health-related employment were more likely to have low gender misconception (AOR: 1.379, 95% CI: 1.091 – 1.743). Low gender misconception was also shown among those who indicated that nursing was their program of first choice (AOR: 1.594, 95% CI: 1.126 – 2.254), and those in their final year of program enrolment (AOR: 1.305, 95% CI: 1.015 – 1.678). The data suitably fitted the logistic regression model as demonstrated by the Hosmer-Lemeshow Goodness-of-fit test (Chi-square = 2.619, 7 *df*, $p = 0.918$).

Discussion

This paper reports on the development and testing of the psychometric properties of a tool that measured misconceptions about men in nursing. The 17-item GEMINI Scale exhibited validity and reliability with a demonstrated unidimensional construct in the factor analysis for both male and female nursing student groups. Further, the GEMINI Scale also showed good discriminant validity, identifying factors associated with higher and lower misconceptions about men in nursing. Students who declared nursing as their first choice showed lower misconceptions, which resonated with the findings of an earlier study highlighting successful study completion and better academic performance among students who chose nursing as their first career, emphasising the importance of active engagement (Salamonson et al., 2014). Furthermore, those who are in the final year of program enrolment (i.e., 3 years full time study) and engaging in health-related paid work had fewer gender misconceptions demonstrating the importance of having hands-on experience in reducing misconceptions. This finding was similar to the results of a study conducted among midwives where those who had the opportunity to work with male midwives were more likely to be accepting of male midwives and were more likely to hold the attitude that the quality of care was not affected by the gender of the caregiver (Bly et al., 2020).

The GEMINI tool was able to discriminate the differences between subgroups, particularly for those who had some relevant experience in the healthcare sector either paid employment or as part of their clinical placement in nursing. It is remarkable to note that the misconception scores of third year nursing students are lower when compared to the first- and second-year students. The trend of improved perceptions among third year students or those in their final year of the nursing program has been reported in many

studies examining the changing perceptions over time and with increased clinical exposure and nursing experience (Montayre et al., 2019). Nursing students reported favourable attitudes in specific nursing specialties due to a longer time period in clinical placement and more advanced academic experience in the nursing program (Happell & Gaskin, 2013). The GEMINI Scale discerned this reported trend in terms of gender misconceptions.

Addressing gender misconceptions in nursing is crucial to preparing a sustainable workforce, promoting diversity and ensuring that the nursing profession is inclusive and free from biases based on gender. To our knowledge, and following an extensive search, the GEMINI scale is the first psychometrically tested scale developed to measure gender misconception in nursing, which is currently a highly gendered profession. The GEMINI Scale is a reliable and valid tool that measures common misconceptions, which can be used to inform targeted interventions from the overall misconception scores and based on the commonly misconceived items in the scale. As the GEMINI Scale reports good internal consistency, this demonstrates the potential for implementing uniform approaches in the nursing curriculum, across Australian universities to address gender misconceptions in nursing.

Strengths and Limitations

A key strength of the GEMINI Scale was the brevity of the 17- item scale, which was an advantage for a large-scale survey as it reduced respondent burden, and cost to researchers and increased the ease of analysis. In addition, data collection was undertaken across multiple universities from all Australian states and territories, which increased the representativeness of the sample and improved the external validity of the findings. Including participants from a wide range of demographic characteristics enhanced the

cogency of the findings. Despite the strengths and national scope of the data collected, the online method of data collection might have excluded those participants who did not have access to the online link or were not reached by the online recruitment process (i.e., flyers, emails or social media).

Conclusion

This paper reports the robust and systematic development and psychometric testing of the GEMINI Scale, which is a reliable and valid tool to measure misconceptions about men in nursing. The GEMINI Scale can be used to measure misconceptions in different groups and is able to discriminate between demographic and academic characteristics, which is helpful in developing targeted strategies and interventions addressing gender misconceptions in nursing. The GEMINI Scale can be particularly useful in nursing education as it can identify specific misconceptions that have the potential to impact academic performance and supportive learning environments. This could then inform strategies to support education reform to the nursing curricula that is broader than work knowledge and skills but also includes a focus on socio-cultural aspects to improve students' preparedness for their clinical experience.

Author contributions

JMo and YS conceptualised and designed the study. All co-authors facilitated the ethics application and data collection in their respective institutions. JMo, YS, and DM conducted the final stage of data analysis and prepared the manuscript for submission. All co-authors critically reviewed, revised and approved the final paper.

Disclosure statement

The authors report there are no competing interests to declare.

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Figure 1: Socio-demographic differences between low and high GEMINI Scale score groups (*n* = 1410)
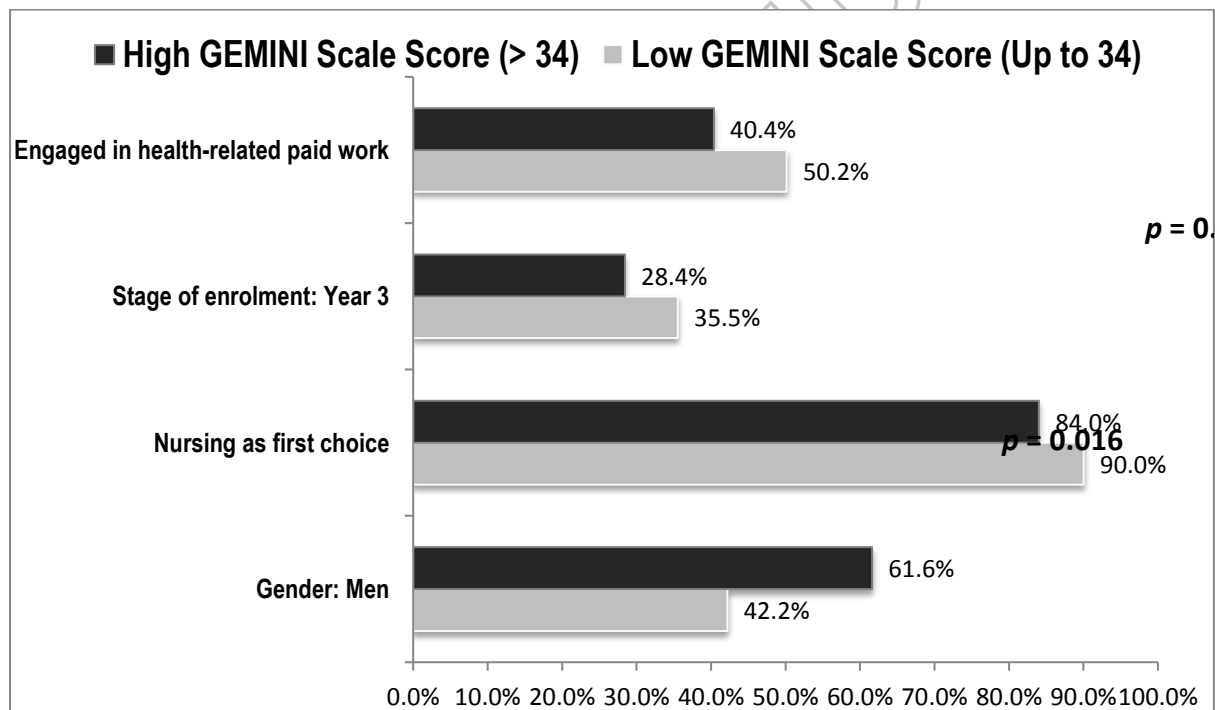

Table 1. Socio-demographic characteristics of nursing students (*n* = 1410)

Variable	
Age, mean [median] (*SD*) years (Range: 17 to 67)	26.5 [23.0] (8.6)
Sex, *n* (%)	

Male	727 (47)
Female	683 (45)
Other / Prefer not to say / Missing data	122 (8)
Country of birth, *n* (%)	
Australia	919 (60)
Born outside Australia	460(30)
Prefer not to say	153(10)
Language spoken at home, *n* (%)	
English only	1046 (75)
Other than English	351 (25)
Year of enrolment in nursing program, *n* (%)	
Year 1	360 (25)
Year 2	559 (40)
Year 3	455 (32)
Other (e.g., beyond Year 3)	46 (3)
Immediate family member in the nursing profession, *n* (%)	
Yes	446 (32)
No	952 (68)
Nursing program as first choice, *n* (%)	
Yes, nursing program was my first choice	1225 (88)
No, another program of study was first choice	174 (12)
Paid work engagement and type, *n* (%)	
No, not engaging in any paid work during term-time	319 (23)
Yes, health-related employment during term-time	621 (44)
Yes, non-health-related employment during term-time	454 (33)
Gender Misconception of Men in Nursing (GEMINI) Scale score, mean [median] (*SD*) (Range: 17 to 83)	34.8 [34] (10.4)

Table 2. First half-split group: Factor loading of the 17-item GEMINI Scale (*n* = 683)

Items	Communality	Factor Loading
One-factor solution (Eigenvalue: 5.28, Total explained variance: 31%)		

15. Men nurses often experience communication difficulties with other healthcare professionals	**0.44**	**0.66**
10. Men should choose other professions that pay more than nursing	**0.41**	**0.64**
3. Nursing is often a "dead-end" job for men	**0.39**	**0.62**
2. Being caring does not come naturally for men in nursing	**0.37**	**0.60**
4. Nursing erodes the masculine identity of men	**0.36**	**0.60**
16. As a minority group, it is difficult for men to be successful in nursing	**0.34**	**0.58**
9. Compared to other health professionals (e.g. physiotherapist, dietitian, podiatrist), nursing is a low status job for men	**0.33**	**0.58**
12. Men in nursing are often just used as "muscles" by their female nurses	**0.32**	**0.57**
1. Men are less suited to nursing as a career than women	**0.32**	**0.57**
11. Men who are nurses are not taken seriously by other health professionals	**0.31**	**0.56**
8. I would not encourage a male family member (e.g., brother, son or cousin) to choose nursing as a career	**0.28**	**0.53**
5. Men who choose nursing as a career are mostly gay	**0.27**	**0.52**
17. Nursing is not an appropriate profession for men from certain cultural and religious groups	**0.27**	**0.52**
13. Men nurses are often ostracised (isolated) by female nurses in the clinical settings	**0.27**	**0.52**
6. Men have less opportunities for advancement in nursing than women	**0.26**	**0.51**
14. Patients are generally reluctant to be nursed by men nurses	**0.25**	**0.50**
7. The mass media (e.g., television and movies) puts most men off nursing	**0.10**	**0.31**

Table 3. Predictors of low gender misconception

Variables	Coefficient (B)	Std. error	Adjusted odds ratio (95% CI)	*p* value
Low gender misconception: GEMINI Scale Score: Up to 34				
Gender: Female	0.774	0.117	2.167 (1.723-2.747)	<0.001
Nursing is first choice	0.466	0.177	1.594 (1.126-2.254)	0.008
Year of enrolment: Final year student	0.266	0.128	1.305 (1.015-1.678)	0.038

Engaging in health-related employment	0.321	0.120	1.379 (1.091-1.743)	0.007

CI denotes confidence interval

Hosmer-Lemeshow goodness-of-fit for the model, chi-square = 2.619, 7 *df* (p = 0.918)