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Mapping self-confidence levels of nurses in their provision of nursing care to others with alcohol and tobacco dependence, using Rasch scaling

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This study seeks to identify factors that influence the perceived complexity of providing nursing care to others (who are dependent on alcohol and tobacco) and the confidence of undergraduate student nurses to carry out this care. The research project is designed to explore whether there is a difference between the perceived complexities of 57 different nursing tasks and skills as understood by student nurses and their differing ages, gender and types of first language used. By using a probabilistic measurement approach (Rasch model), the study seeks to assess whether a scale of performance for learning can be constructed based on the difficulty of nursing care required and the self-rated capacity of the undergraduate nursing students to provide the nursing care. Outcomes of the study suggest that nursing students do differ significantly both in how they view the complexity of providing nurse care and their capacity to provide that nursing care. Recommendations are made for informing nursing education programs, in a bid to make nursing care as it relates to others who are substance dependent, more effective.

Rasch scaling, partial credit model, attitude measurement, alcohol and tobacco dependence

INTRODUCTION

This paper explores the application of the Rasch model to develop and subsequently to analyse data derived from a series of rating scales that measure the preparedness of nursing students to engage with patients who are dependent on tobacco and alcohol. Brief consideration is first given to the relationship between affect and learning together with an overview of how the rating scales used in this research were developed in terms of their content and processes. A literature review then explores how nurses' attitudes impact on the care delivery to patients who are substance dependent. Emphasis is then placed to how the principles of Rasch scaling can be applied to rating scale calibration and analysis. Data derived from the application of the Nurses' Clinical Confidence Scale (NCCS) are examined for the evidence of differentiated item function and implications of the study for educational programs is explored.

BACKGROUND TO THE STUDY

Useful educational information may be gained by asking participants to complete attitude rating scales at different times during their learning or employment. This is done to identify their

attitudes (positive or negative) and values that underlie their thinking or to estimate the intensity of their attitudes and to gauge the consistency of their attitude toward some belief or value. If done over time, measurements indicating changes in participant values and attitudes can provide an estimate if learning is taking place.

Attitude measurement of nurses and how they relate to others who are substance dependent is important, because there is now a body of knowledge that suggests the attitudes of nurses towards substance misuse in the mentally ill, are generally sub optimal and it influences the quality of nursing care provided (Foster and Onyeukwu, 2003). The outcomes of substance abuse attitude surveys (SAAS) given to both undergraduate and post-graduate students were not significantly related to the student's age, gender, or their level of experience according to one English study. It found instead, that post-graduate students were less moralistic and more optimistic of treatment outcomes than undergraduate students (Richmond and Foster, 2003).

Despite concerted efforts to help undergraduate nurses deal successfully with the care of drug dependent patients through educational programs, difficulties in the management of nursing care persists (Happell and Taylor, 1999). Moreover, nurses believe they are constrained to conduct the professional and holistic care they intended for their clients because of either a limited knowledge base to inform practice or a lack of options or choices for practice (Groenkajer, 2003).

In order to investigate the desired scope of drug and alcohol education for undergraduate student nurses, a survey was developed for this study and conducted using rating scales, specifically trying to capture their attitudes towards their expected roles and their preparedness to assist others who use alcohol and tobacco. The study sought to ascertain if there was a difference between the perceived complexities of caring for others (as understood by undergraduate nurses) as a way of informing and constructing appropriate educational program to facilitate their nursing practice. In order to match simultaneously nurse self-confidence in the care of others who were substance dependent to the different levels of complexity of clinical practice, the partial credit model of Rasch scaling was used (Fox, 1999; Blackman, 2003).

METHODS OF INVESTIGATION AND ANALYSIS

Participants

A total of 745 undergraduate nursing students were chosen for the study and it comprised representatives from all three years of the undergraduate degree in nursing, as shown in Figure 1.

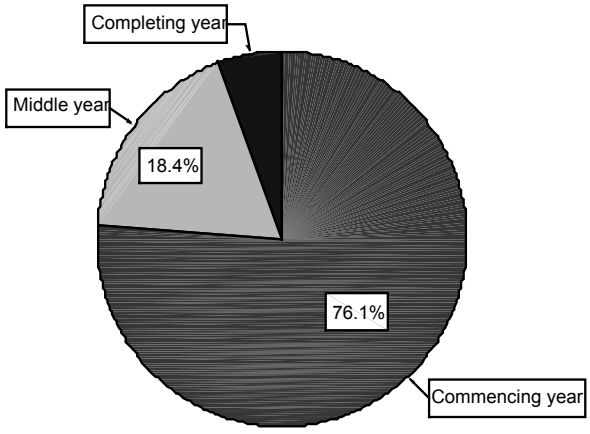


Figure 1. Distribution of the undergraduate nursing students according to the stage of completion of undergraduate nursing studies

Figure 2 shows that female undergraduate nursing students were in the majority of the student sample group with just fewer than 12 per cent of students being male nursing students. This gender differentiation in undergraduate nursing programs was reasonably typical of the gender distribution in nursing, in Australia generally.

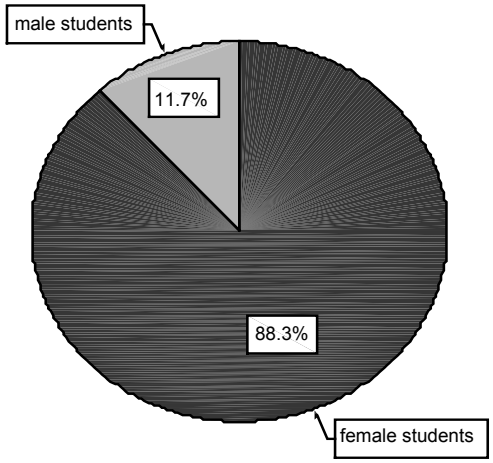


Figure 2. Distribution of the undergraduate nursing students according to their gender

The age composition of the undergraduate nurses employed in the research project ranged from 17 years of age to the age of 56 years. Figure 3, shows the distribution of the undergraduate student group with the mean age of the group being just over 25 years of age.

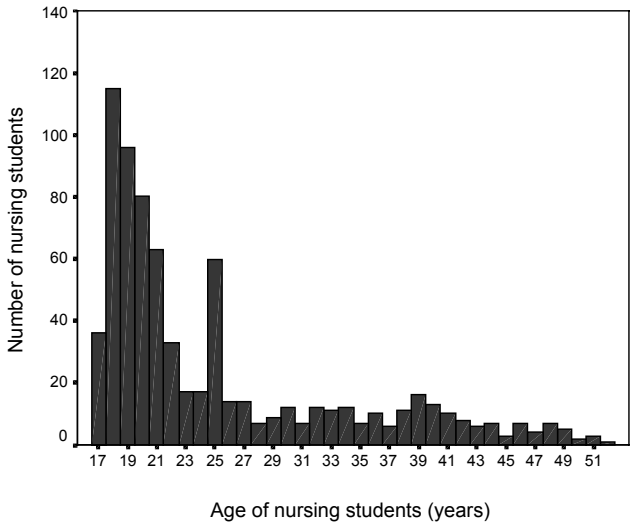


Figure 3. Distribution of the undergraduate nursing students according to student age

While the majority of undergraduate nurses used in this research project were Australian born and used English as their first language, just over 13 per cent of the student group used English as a second language. A little over half of that group of undergraduate nursing students who used a language other than English, were likely to have had a northern European background, as students from Norway engaged in undergraduate nursing studies in Australia. Figure 4 demonstrates this distribution.

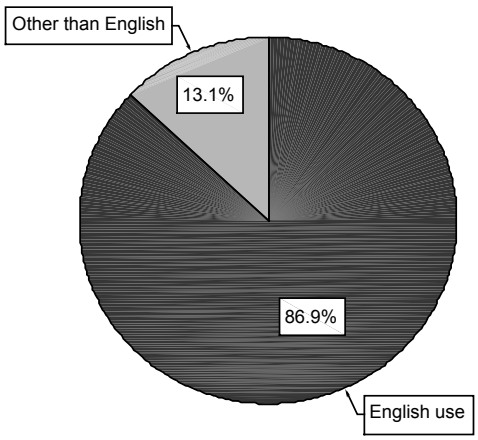


Figure 4. Distribution of the undergraduate nursing students according to type of first language used

Instrument Development

A total of 57 test items were developed to form the basis of a confidential questionnaire to establish the undergraduate's readiness to administer different aspects of nursing care to patients who were dependent on tobacco and alcohol. With ethical considerations taken into account, undergraduates nursing students were asked to rate how easy or difficult it would be for them to complete different aspects of nursing care.

Each of the 57 clinical confidence items used in the survey were formed as statements, followed by four ordered response categories namely; a very simple task (coded as 1), 2 an easy task (coded as 2), or a hard task (coded as 3): or 4 as the code for a very difficult task. This scale from 1 to 4 can be viewed as a continuum of increasing nursing care complexity as perceived by the undergraduate nursing students.

Table 1 identifies the content that underpins the questions selected for the survey. Two questionnaires were developed, one survey established student self-confidence as it related to providing nursing care to patients who were dependent on alcohol (41 items) and the other questionnaire, focused on their care towards another who was dependent on tobacco (16 items).

Table 1. Overview of the content of the nurse clinical confidence (alcohol and tobacco use) questionnaire given to undergraduate nursing students

Focus of the nurse clinical confidence	Questionnaire item number(s)
Elicits history of alcohol and tobacco use (including legal history)	2,3,4,5,7,42,43,4445,
Recognises level of risk associated with alcohol or tobacco use	1
Explores patient's rationale for using alcohol or tobacco	6,
Recognises intoxification	9,22
Identifies risk for alcohol or tobacco withdrawal	8,14,15,16,17,18,32,49,
Initiates activity to minimise alcohol or tobacco intake	10,35,36,37,46
Estimates capacity to change drinking/smoking behaviours	12,13,33,34,47,4853,
Recognises patho-physiological effects of alcohol or tobacco use	11, 23,30,38,39,40,5152
Provides care for the patient undergoing withdrawal symptoms	19,20,21,24,25,2627,28,29,31,50,5455,56
Educates patient about community resources	41,57

Both questionnaires were developed with the advice of experienced health care professionals who worked in the area of drug dependence.

DATA ANALYSIS

The Nurses' Clinical Confidence Scale comprised 57 items that were used to survey participants' affect, values and clinical confidence to nurse patients who were dependent on alcohol and or tobacco. Given that the scale used for the questionnaire was polytomous (a four point Likert scale having four categories) in nature, the partial credit model was used for data collection and analysis. The partial credit model had the advantage of not constraining response (also known as threshold levels also) categories between items allowing threshold levels to vary across each and all items. This model approach, estimated if distances between response categories were constant for each clinical confidence item and if the options for each clinical confidence item varied in the number of response categories (Bond and Fox, 2001).

RESULTS

Scale Validity

While the nurses' clinical confidence scale contained 57 items, some measurement of the validity of the instrument was warranted. Unidimensionality is a requirement underpinning the Rasch model and it seeks to ensure that all test items used in the surveys to construct the nurses' clinical confidence scale, reflect the same underlying construct. If items are not seen to reflect a common clinical confidence construct, they are reviewed by the researcher and either modified or removed from the instrument (Hambleton, 1991; Linacre, 1995; Smith, 1996). In order to test for scalability of the data, the QUEST program (Adams and Khoo, 1996) was employed. The two main goodness of fit indices used in the analysis are the unweighted (or the outfit means square) index and the weighted (or infit means square) index. Both are a form of chi-square ratios, which provide information about discrepancies between the predicted and observed data given by the nursing students, particularly in terms of the size and the direction of the residuals for each clinical confidence items being answered. Fit values are calibrated around a mean of zero and are either positive or negative, depending whether the observed values show greater variation in responses than expected (greater variation showing a positive value and less variation as a negative value). In this way, the compatibility of the data obtained from the clinical confidence scale can be monitored against the Rasch model requirements. With reference to Figure 5, which represents the fit model of all clinical confidence items completed by nursing students, not all the survey items fit the Rasch model. From Figure 5, ten nurse clinical confidence items do not fit the Rasch model as their fit indices are exceeding their parameters (infit means square values should not be greater than 1.30 or less than 0.77). Table 2 highlights the content of the poorly fitting items. When re-examining student nurses' responses to these survey items, it was noted that some nursing students rated all the survey questions with extreme responses (rating with either 1 or 4) only. A considerable number of students tended to rate the clinical confidence questions with numbers of 2 or 3 only, with no items being either very simple or very difficult. If there are any major deviations in the students' responses compared to what the Rasch model expectations are, the item reliability index alerts the researcher to the fact that either the student nurses may not be responding as accurately as possible. Alternatively poorly fitting items could be just the result of poorly worded survey questions and students misinterpreting the underlying focus of the question.

Given that 10 of the 57 items are not fitting the Rasch model, it is essential at this point, to review these items because while it may seem logical or appropriate for these items to be in the survey overall from the researcher's perspective, students are not responding according to the Rasch model's expectations and unless the source of why the items are not fitting and corrected, the poorly fitting items need to be rejected from future surveys and restricted in their use in the analyses undertaken in this study.

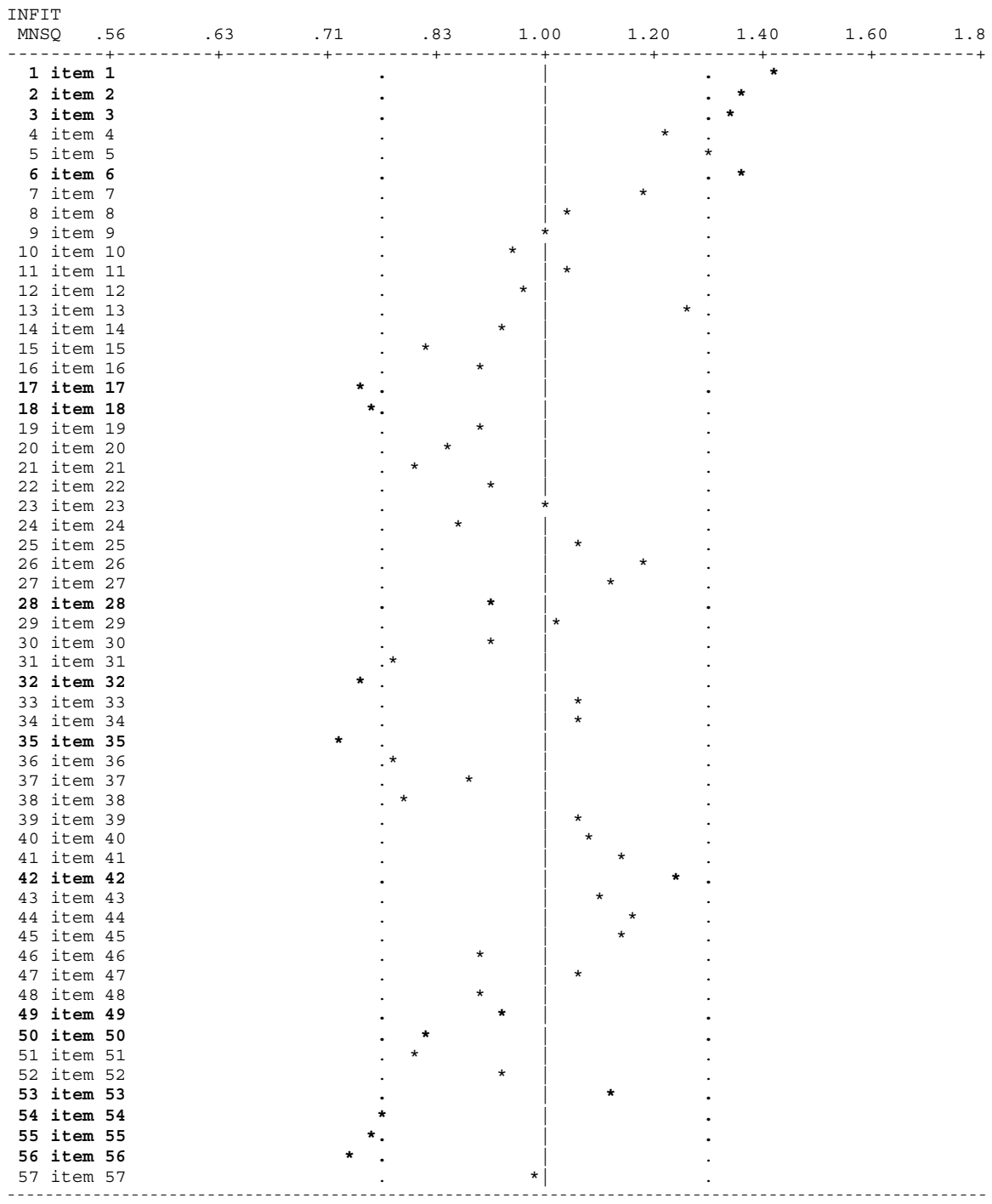


Figure 5. Misfitting clinical confidence survey questions

Table 2. Student nurses' clinical confidence survey questions not fitting the Rasch model

Question	Focus of the clinical confidence statement
1	Understands alcohol use and low level risk to health
2	Elicits if patient drinks alcohol
3	Takes a patient's history about alcohol use
17	Evaluates the severity of alcohol withdrawal
18	Records observations related to alcohol withdrawal
32	Understands relationship between falling blood alcohol level and withdrawal
35	Responds to patient acknowledgement that changing drinking behaviour is difficult
54	Provides advice about nicotine replacement therapy
55	Gives advice about strategies to decrease smoking
56	Educates patient about nicotine addiction

Differential Item Functioning

Procedures are often used to investigate whether individual survey questions function differently for different groups of respondents. Such differentiation can occur according to the respondent's gender, age, past experience and racial or ethnic background. By using item response theory to identify item bias or differentiated item functioning (DIF), the estimated parameters of the item response function are kept constant for different samples drawn from a student population. DIF is employed to see if the probability of nursing student responses, and falls into a particular category (very easy to very difficult) for each survey question is the same for different groups of nursing students of the same ability levels (Scheuneman and Bleistein, 1988). If this is not the case, then the particular survey question can be said to be biased in favour of one portion of the student group over another, and should be reviewed and possibly discarded from future surveys.

In reference to Figure 6, it can be seen that the 57 clinical confidence survey items are compared according to the type of first language used by nursing students undertaking the clinical confidence survey. The scale across the top of the figure ranging from -4 to 0 then through to +5, indicates the number of standard deviations the student nurses' responses to each survey question is away from the mean (located at zero). Any clinical confidence survey question that lays two or more spaces to the left or right of zero, are seen as being statistically significant according to the nursing students' first language usage.

Three clinical confidence questions were identified as being significantly easier for non-English speaking background nurses to undertake than native English speaking nurses. These included taking a history to establish if the person used alcohol regularly, feeling confident to stay with an agitated patient who was detoxifying and providing counselling about ceasing smoking. Conversely, six items were rated as being easier for native English speaking nurses compared to those who use English as a second language. They include assessing the effects of medication used for alcohol withdrawal, understanding the effects of alcohol use on the nervous system, recognising the association between alcohol use and liver disease, differentiating between the effects of alcohol and other types of illnesses, being able to assist the their when drinking behaviour is out of control and understanding the relationship between heavy drinking and mental health co-morbidity.

Nine clinical confidence items are statistically significant in differentiating for the student's language use and these items should be reviewed and careful consideration given to the interpretation of any future ratings given for this items by future respondents.

With reference to Figure 7, only one clinical confidence survey item is significantly differentiating according the gender of the student nurse. Being able to describe the acute effects of alcohol on the central nervous system has been estimated as being easy for female nursing students than for their male counterparts.

Item Threshold Values

How complex the student nurses have rated the different aspects of nursing care is depicted in Figure 8. As mentioned, with partial credit model it is assumed that threshold values (or the spaces between the categories) are different within each individual clinical confidence survey question itself and across all the clinical confidence survey questions too. The assumption of equidistance between the categories or thresholds of the clinical confidence rating scale is not held by the Rasch's partial credit model. The logit scale is plotted on the left of the histogram (in Figure 8) and survey question numbers to the right but now, each survey question number has an additional dot point after each question number (either a.1, a.2 or a.3), which reflects the threshold value (and increasing complexity) for that clinical confidence question.

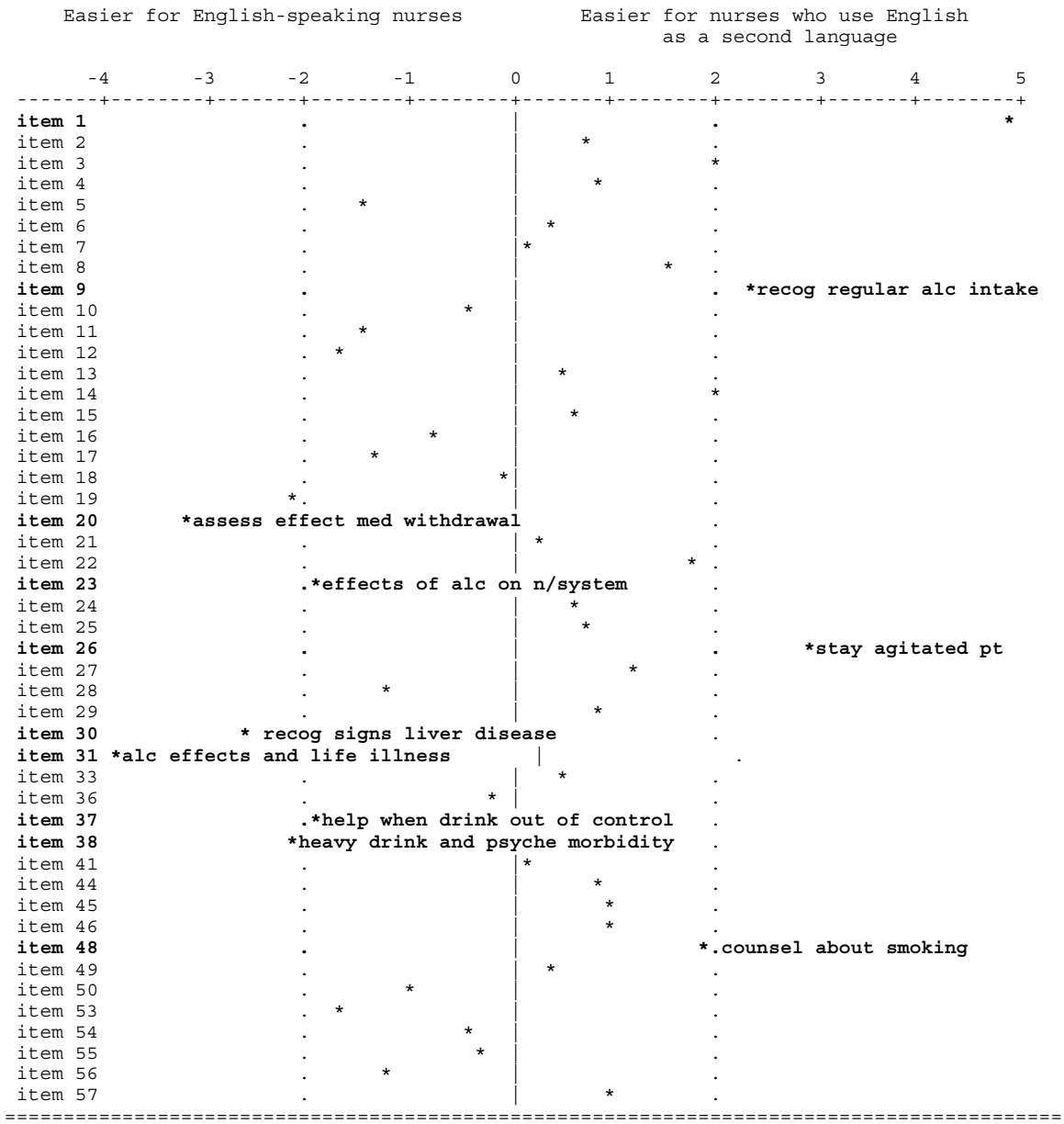


Figure 6. Student nurses' clinical confidence survey questions differentiating for the type of language used, plotted using the standardised difference

A most difficult nursing task for student nurses to undertake was item No.35 which assessed their ability to respond to the patient who acknowledges to the nurse, that giving up drinking behaviour is very difficult. Note the thresholds for this item are well spaced with the first threshold located on the logit scale at -2.50, the second threshold at +0.8 and the last threshold on the logit scale at +5.0. This suggests that there is equal probability that student nurses view this item as either being very easy or simple to complete, or the item is seen as either an easy or difficult task to undertake or viewed as being a hard to very difficult to negotiate. This is a similar pattern for item No.32, which explores a student's confidence in recognising the relationship between the patient's falling blood alcohol level and possible impending alcohol withdrawal. The first threshold occurs at -1.7, the second threshold at +1.2 and the third threshold at +4.8. With both these items, the thresholds are spread widely up the scale ability scale, clearly differentiating between the confidence levels of students and how complex they see these two clinical activities. This is not a uniform pattern across all clinical confidence survey questions. Note how survey question number 42 (determines if a patient smokes cigarettes or tobacco) has a different threshold configuration. The first

threshold is located at logit -4.8, the second threshold at -3.0 and the last threshold at +1.0. For this survey question, there is less probability that student nurses will score between the second and third thresholds, but are more likely to rate themselves (their confidence level) and the task complexity as being between the first and second thresholds. This suggests that students probably see this as a simple task requiring little ability on their part because the threshold levels of 42.1 and 42.2 are located closely together in the lower end of the logit scale and the 42.3 threshold level is located near zero on the logit scale.

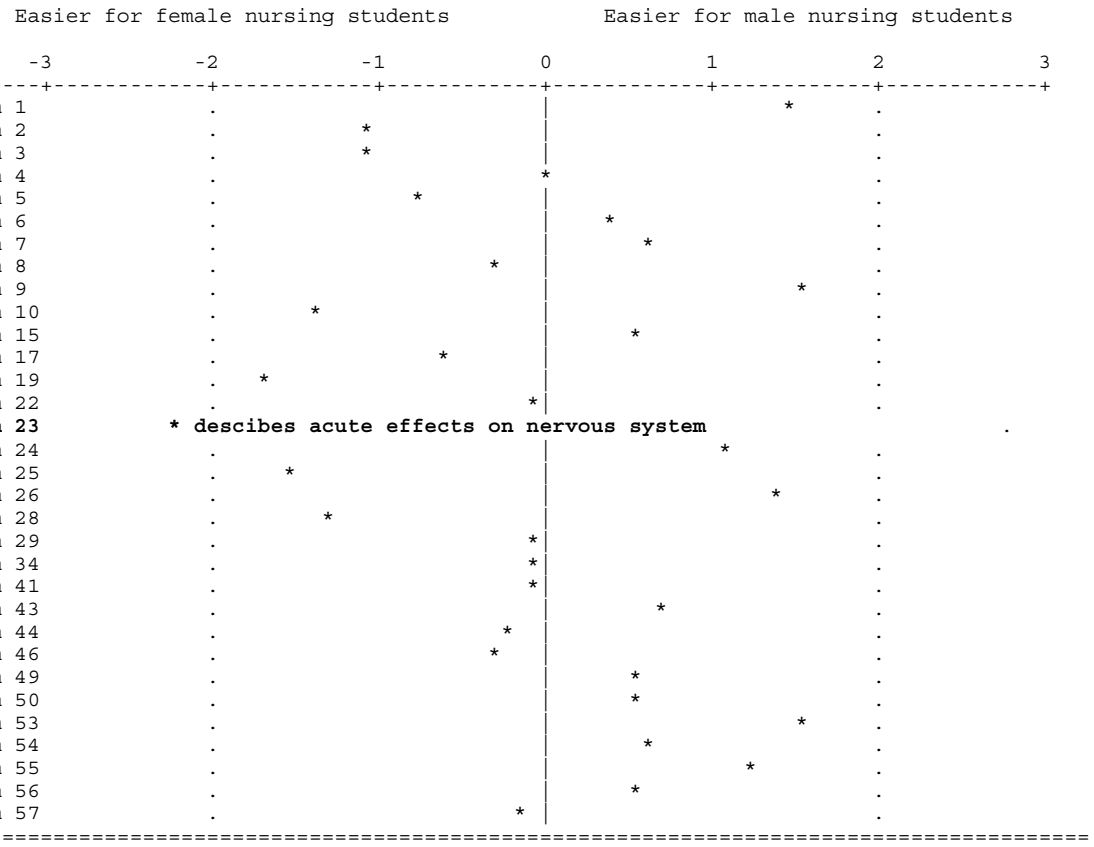
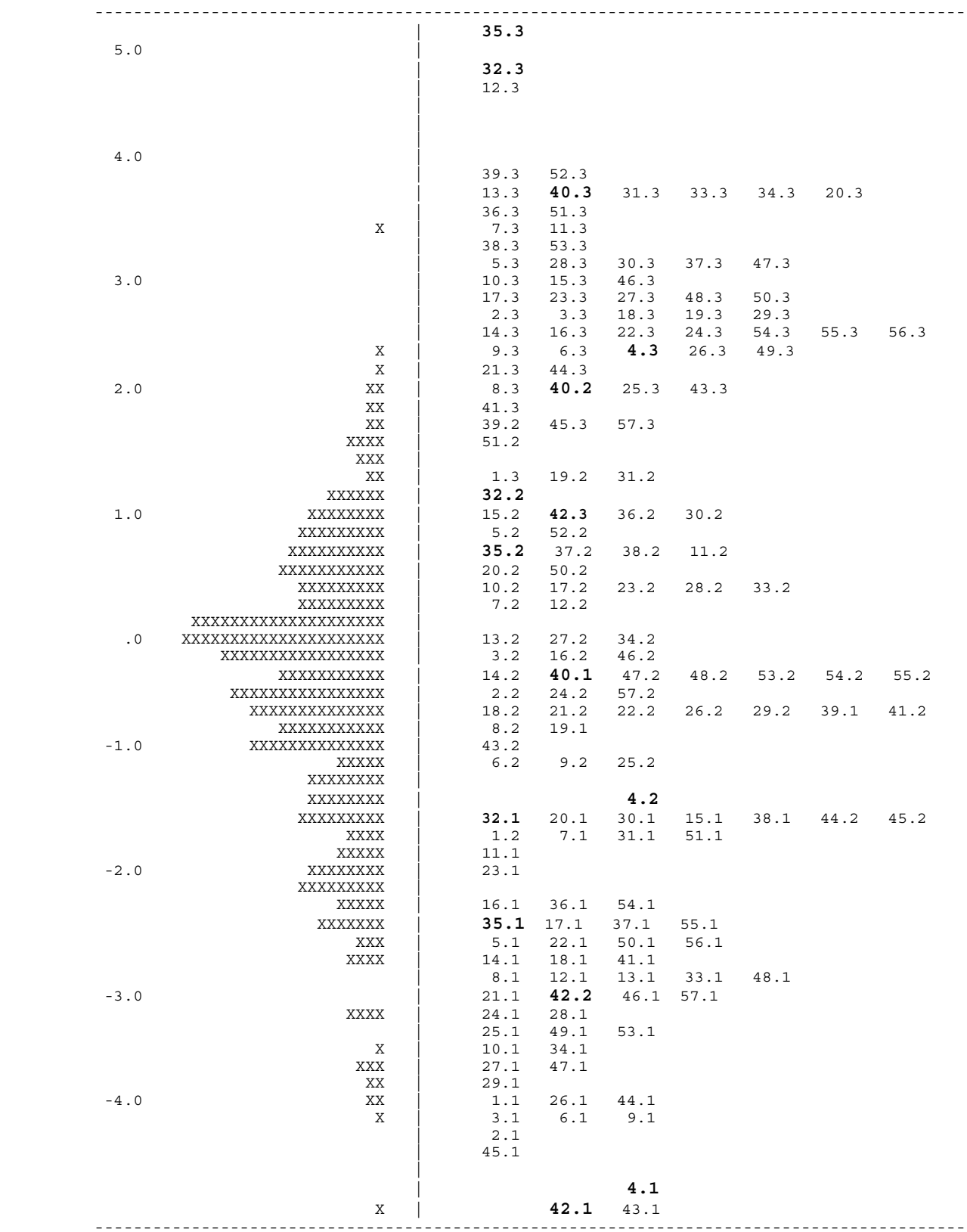


Figure 7. Student nurses' clinical confidence survey questions differentiating for the gender of student nurses, plotted using the standardised difference

In contrast to this pattern is survey question No.40, which explores the student nurse's ability to recognise Korsakoff's syndrome. Note the first threshold is located at logit -0.4, the second threshold at +2.0 and the last at +3.5. This is a most difficult task for students as the threshold levels 40.1 and 40.2 are located to the middle and upper part of the logit scale, which usually suggests that students believe greater ability, is required on their part to carry out what they see as a complex task.

The Rasch model is able to place all the surveyed nursing activities identified by student nurses on a scale ranging from the more complex to the most simple. Figure 9 depicts this hierarchy. Those nursing activities located opposite the zero logit value, extend upwardly to approximately to logit area +0.50 and downwardly to logit area -0.50, are viewed as being of average complexity by the student nurse with average ability. Nursing activities located adjacent to the logit scale of -0.50 and below, are perceived to be very easy nursing activities requiring minimal skill in order to complete them. Conversely, nursing activities locate above logit +0.50 reflect a greater probability that the student nurse with average ability is likely to find these nursing activities becoming increasingly harder for them to undertake, believing instead they need greater abilities to practise these skills. It is this conjoint scaling that allows student confidence levels to be directly measured against the complexity of the nursing tasks that is the hallmark of Rasch scaling and serves as a

foundation on how to direct training to maximise nursing care. It is also important to note that both the nurses and the tasks are located on an interval scale that extends theoretically to ±∞.



Each X represents 3 students

Figure 8. Clinical confidence item threshold map differentiating between the student nurses' perceived confidence levels and the complexity of nursing practices

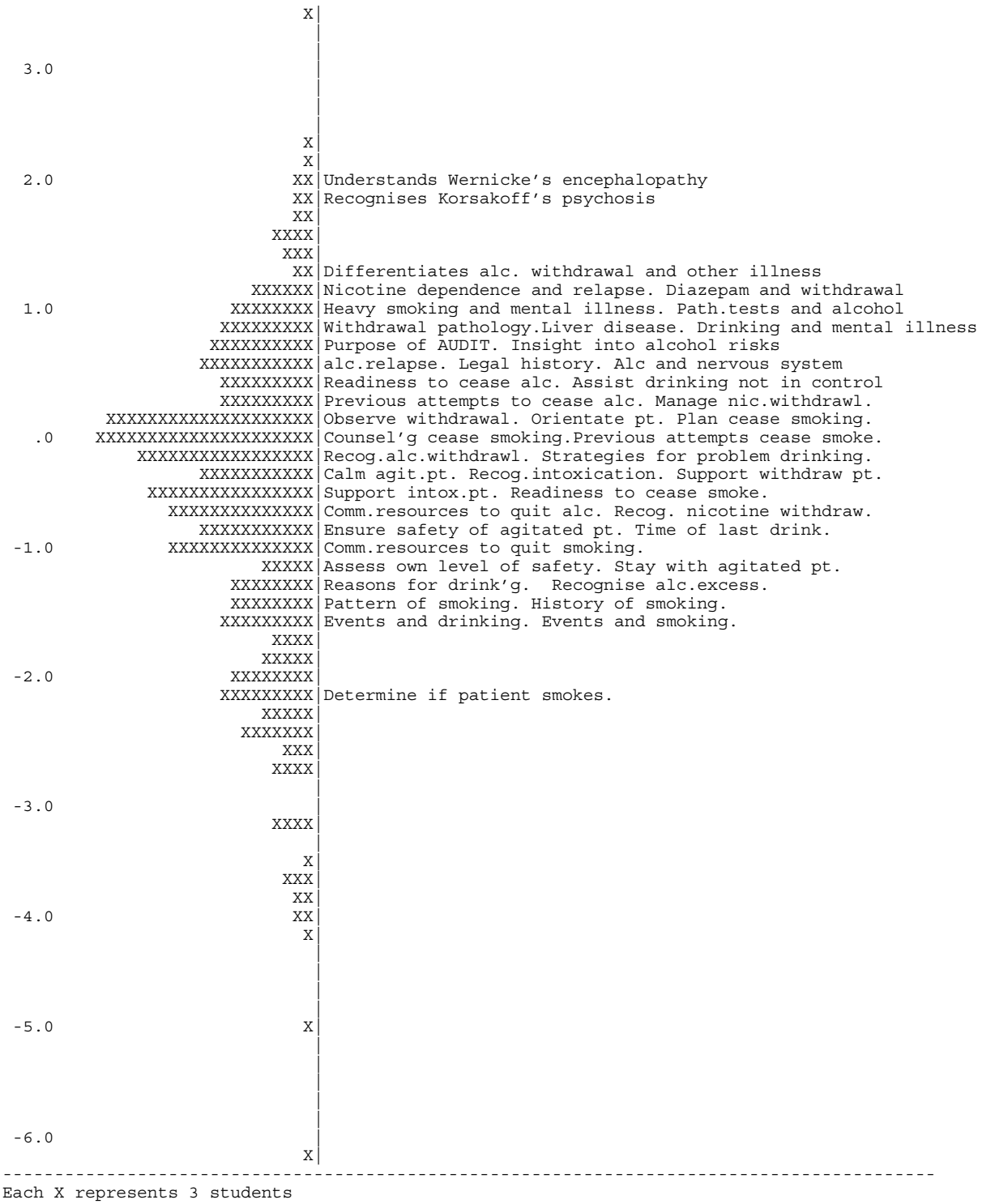


Figure 9. Item map indicating student nurse clinical confidence levels for different clinical nursing practices

DISCUSSION

Any education program that helps undergraduate nurses to care for others who are dependent on nicotine or alcohol, needs to address the contrasting requirements in terms of the students' capacity or preparedness to provide nursing care and the differing degrees of complexity of the care that is required to be undertaken. This study has shown that different nursing care requirements are perceived by students as needing greater or lesser preparation on their part, in

order to deliver that care. These demands have direct impact on what should be included in a curriculum that facilitates nursing care. It is clear that students without sufficient educational input would experience considerable difficulty not only in recognising, but also in providing interventions for others who have experienced brain damage associated with long term alcohol abuse. Additionally, nursing students find it very difficult to differentiate between alcohol withdrawal and other types of life-threatening illnesses. It is suggested that these outcomes should help inform educators what should be included in any future training programs to enhance a nurse's sense of improved efficacy. The relationships between mental health problems and dependence on alcohol and tobacco are not well understood by student nurses and this suggests that the curriculum needs to emphasise more co-morbidity presentations. Similarly, understanding withdrawal regimes are seen as difficult tasks for student nurses to do also. This suggests also that the curriculum needs to focus more fully on how client withdrawal is manifested and why interventions are carried out. As these nursing tasks are perceived as being very difficult for student nurses to act upon, it is recommended that considerable educational effort (using multiple methods of teaching and learning) and thought is put into making these skills easier for student nurses to undertake. Conversely, nursing students have indicated that identifying patterns of alcohol and tobacco use and understanding why others use these substances as being very simple tasks for them to do. Identifying and advising others of community resources that could help with alcohol and tobacco dependence was also rated by students as being easy tasks for them to complete. In terms of making decisions about how urgent is it that these elements are integrated into a curriculum (given students have rated these simplistically), educators may wish to consider how else students can learn more about these issues (e.g. fostering student self-direction) individually rather than committing valuable didactic time to this content area).

Students in this sample also indicated that it would not be overtly difficult to provide nursing care in order to calm an agitated patient who is experiencing withdrawal. This is an interesting outcome given student nurses earlier acknowledged that they find the rationales for withdrawal management difficult to understand, yet they perceive the actual care of managing the withdrawing client as being more easy. Survey questions that were rated as being most simplistic for student nurses to attend to should be explored by educators with a view to generating criterion-referenced assessments that can be used to measure students' capacity to deal successfully with those aspects of care that students rate as being easiest to do. In this context, the clinical confidence scales as developed in this research assist in developing appropriate student clinical assessment tools.

Much of the literature about nurses' attitudes towards others who are substance dependent has indicated that the nurses' affect and thinking needs to be modified if nursing care is to improve. Educational strategies therefore need to have a strong affective component (Flaskrud, 1991). In order to have this effect, it is likely that very short courses are of limited value (Fennel, 1991). Educational programs that are conducted over several weeks, which call for active participation, group discussions and simulations, allow for gradual development of the student nurses' self-awareness and sensitivity (Martinez and Murphy-Parker, 2003). Moreover, allowing nursing students exposure to actual clinical events and interaction with patients who are substance dependent may be expected to maximise student learning (Byrnes and Kiger, 1990) and (Stein, 2003).

More research is needed into the relationship between student nurse confidence and care delivery especially since the type of first language used by the student nurse has a significant effect on the confidence to provide different aspects of nursing care. Additionally, student nurses' attitudes towards the care of others who use illicit drugs is another area in which Rasch scaling can be used to inform the curriculum and complement the outcomes demonstrated by this research.

CONCLUSIONS

It is argued in this paper, that Rasch scaling analyses offers a great deal for the development and analysis of rating scales, which in turn serve to give reliable information to educators about curriculum content and processes, as they relate to alcohol and tobacco nursing care. There are limitations to using traditional analytical procedures in the examination of rating scales which are overcome when Rasch scaling is used to measure conjointly the complexity of nursing care with confidence levels and abilities estimates of student nurses' engagement in the learning process. By employing the partial credit model, the educational researcher is no longer constrained by the assumption that rating scale categories are static or uniformly estimated across each item or survey question. Instead rating scales can be visualised as an interval scale continuum of student nurse self-confidence which, when used on multiple occasions can be a valuable adjunct to see if learning has taken place. Test item validity can also be employed in Rasch analysis by examining survey tasks for unidimensionality. In total, item response theory works well to inform educators about curriculum content, processes and to estimate if learning is taking place because Rasch scaling remains robust in its approach to developing and evaluating educational data generated by using rating scales.

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