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Index of sources of stress in nursing students: a confirmatory factor analysis

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Abstract

Title. Index of sources of stress in nursing students: a confirmatory factor analysis.

Aim. This paper is a report of a study to test the proposed factor structure of the Index of Sources of Stress in Nursing Students.

Background. Research across many countries has identified a number of sources of distress in nursing students but little attempt has been made to understand and measure sources of eustress or those stressors likely to enhance performance and well-being. The Index of Sources of Stress in Nursing Students was developed to do this. Exploratory factor analysis suggested a three-factor structure, the factors being labelled: learning and teaching; placement-related and course organization. It is important, however, to subject the instrument to confirmatory factor analysis as a further test of construct validity.

Method. A convenience sample of final year nursing students (n = 176) was surveyed in one university in Northern Ireland in 2007. The Index of Sources of Stress in Nursing Students, which measures sources of stress likely to contribute to distress and eustress, was completed electronically. The LISREL programme was used to carry out the confirmatory factor analysis and test the factor structure suggested in the exploratory analysis.

Findings. The proposed factor structure for the items measuring 'Uplifts' proved to be a good fit to the data and the proposed factor structure for the items measuring 'Hassles' showed adequate fit.

Conclusion. In nursing programmes adopting the academic model and combining university-based learning with placement experience, this instrument can be used to help identify the sources of stress or course demands that students rate as distressing and those that help them to achieve. The validity of the ISSN could be further evaluated in other education settings.

Keywords: confirmatory factor analysis, hassles, Index of Sources of Stress in Nursing Students, instrument validation, uplifts

Introduction

Stress can be the result of 'too much or too little arousal resulting in harm to mind and body' (Schafer 1992, p. 14) and concerns the perceived factors or experiences that contribute to such states. There is a growing body of research into the factors that contribute to stress among nurses and nursing students, and most has involved the negative effects of stressors on well-being, with little attempt to explore the perceived sources of stress that enhance performance (Parkes *et al.* 1994, Heaman 1995, Jones & Johnston 1997, 1999). That optimal level of stress or arousal is called eustress (Lazarus 1974) but there has been research into the sources of stress which are likely to contribute to eustress in students (Ashkanasy *et al.* 2002, Härtel *et al.* 2002).

Measuring stress

Many inventories used to assess sources of stress in nursing students have been accused of not being psychometrically rigorous (Jones & Johnston 1999). The Beck and Srivastava (1991) 43-item Stress Inventory (BSSI), for example, assesses sources of stress experienced by nursing students. The authors report acceptable indices of reliability and convergent validity, but the BSSI only applies to a subset of the nursing student population and has not been validated with nursing students in the United Kingdom (UK). Nor is it clear from the reports by Beck and Srivastava (1991) or Garbee *et al.* (1980) – who contributed a large number of the items that form the BSSI – what test construction method was used to ensure psychometric adequacy; i.e. it was not clear what criteria were used for item retention. Finally, the factor structure of the BSSI was not explored adequately during its development and it was not tested on a sufficiently large enough sample (Jones & Johnston 1999).

Subsequent researchers using the BSSI (e.g. Clarke & Ruffin 1992, Rhead 1995, Snape & Cavanagh 1995) have identified various factor structures, such as factors relating to practical and academic sources of stress; death of patients; lack of understanding from teaching and nursing staff; the college–home interface; and course organization and resources. However, some of these results were based on studies that failed to detail the factor analytic process used and where the sample size was small (e.g. Rhead 1995).

Jones and Johnston (1999) amended the BSSI and administered it to two independent groups of first year Scottish nursing students. They subjected the results to factor analysis and tested for reliability and validity, calling the new measure the Student Nurse Stress Index (SNSI). The exploratory and later confirmatory factor analysis revealed academic load,

clinical concerns, interface worries and personal problems as factors. Concurrent validity was demonstrated by a series of consistent and reliable first-order correlations with the General Health Questionnaire 30, and strong test retest reliability was observed over a 2-week period. However, as with other measures, the SNSI may be affected by social desirability response bias, and Jones and Johnston (1999) acknowledge that the reduction of the inventory to delete weak and general items meant that the positive gain in validity could have been at the expense of loss of variables of interest and narrowing of its potential usefulness.

What is common to all existing inventories exploring sources of stress in nursing students (including the BSSI, Beck & Srivastava 1991; Expanded Nursing Stress Scale, Clarke & Ruffin 1992; SNSI, Jones & Johnston 1999 and Stress in Nursing Students questionnaire, Deary *et al.* 2003) is that their main focus is on asking respondents to rate perceived stressors in terms of the extent to which they are distressing. The assumption is that, if college and placement experiences are reported as less distressing, then student well-being, insofar as it results from the demands of the course, will be healthier and that they will learn more. Such an approach ignores the fact that those stressors may, at different times, contribute to eustress (a level of stress that enhances performance). Deary *et al.* (2003), for example, measured burnout and stress in nursing students and found increased perceived stress combined with increased levels of personal achievement, suggesting that stress experiences can be sources of eustress.

The Index of Sources of Stress in Nursing Students (ISSN) is a 29-item questionnaire whose items were generated from a series of focus groups exploring sources of stress among final year nursing students (Gibbons *et al.* 2008). The inventory is different from other measures because it asks respondents to appraise sources of stress in terms of 'Hassles' (potential contributors to distress) and 'Uplifts' (potential contributors to eustress).

The ISSN assesses the appraisal of potential stressors as described in the Transactional model of stress (Lazarus & Folkman 1987). The focus of the model is on how a source of stress is perceived and appraised and on the coping responses called upon. Research with nursing students has shown the student perspective to be a critical component in coping (Gibbons *et al.* 2008). The model involves primary appraisal of a stressor, which can be construed as a potential for distress, eustress or no stress. The subsequent secondary appraisal refers to the coping resources the person draws on to manage a recognized stressor, and the outcome of the coping response has an important effect on well-being. There have been limited attempts to explore both appraisals and

their effects in the same inventory (e.g. Elder *et al.* 2003) The ISSN is designed to do this. However, it does not measure the coping component of the Transactional model. In the development stage of the instrument, principal component factor analysis revealed three factors, which were labelled learning and teaching; placement-related and course organization. Respondents rated each of the sources of stress twice. For the hassles ratings, the exploratory factor analysis explained 46·14% of the variance; when the sources of stress were rated as uplifts, 43·97% of the variance was explained (Gibbons 2008).

Exploratory factor analysis identifies which items in a questionnaire assess the same constructs. This means that the scores for particular items which correlate most strongly with each other are considered to load on to the same factor. Given that exploratory factor analysis could suggest a range of slightly different solutions, all of which could be equally valid, confirmatory factor analysis is required to add further weight to the chosen solution. Confirmatory factor analysis is a means of testing and confirming the factors proposed by the exploratory factor analysis, i.e. it tests the fit of the model proposed in the exploratory factor analysis, and it is important to subject an instrument to confirmatory factor analysis as a further test of construct validity.

The study

Aim

The aim of this study was to test the proposed factor structure of the Index of Sources of Stress in Nursing Students.

Design

An electronic survey method was used to collect the data, which were then subjected to confirmatory factor analysis.

Participants

In November, 2007, a cohort of 250 final year nursing students in one university in Northern Ireland (one of the constituent countries of the UK) was introduced to the study by the lead researcher at the start of a lecture and invited to take part. A convenience sample of 176 (70%) consented [a minimum sample size of 100 is sufficient when undertaking confirmatory factor analysis (Sapnas & Zeller 2002)]. Those included were students in the final year of the adult nursing programme.

Instrument

The ISSN consists of 29 items, with respondents being asked to rate a source of stress, such as 'quality of tutorials' or 'portfolio feedback', twice – once as a source of distress or 'hassle' and once as a source of eustress or 'uplift'. Each item has a 6-point response scale ranging from 0, indicating that the item represents no source of satisfaction or influence when rated as an uplift, to 5, where it represents an influence that really helps the person to achieve and gives a strong sense of satisfaction. When rated as a hassle, 0 indicates that the source of stress poses no hassle, whereas 5 represents a major source of distress. Additional items are included to measure demographics.

Data collection

During a college lecture, the students were briefed on the project by the lead researcher, who was not a member of the teaching staff and was not known by the students. After the briefing, students were invited to attend a computer suite later that week. At that point the aims were reiterated, along with the ethical considerations. Participant information sheets and consent forms were distributed. These were read by students and they were given the opportunity to ask questions before signing and returning the consent forms. They were then given the web browser address for the questionnaire and shown how to complete it on-line. They were told that they could receive a copy of their results if they emailed the lead researcher.

Ethical considerations

This study was approved by the university ethics committee. The information sheet given to students emphasized that participation was entirely voluntary; that they were free to leave at any time; that being involved would have no affect on course progression and that confidentiality and anonymity would be maintained at all times. These points were re-iterated orally by the researcher before the students began completing the questionnaire.

Data analysis

Confirmatory factor analysis of the data was conducted using LISREL version 8.8 to test the factor structure proposed by Gibbons (2008). The purpose of a confirmatory factor analysis is to test the validity of a given factor model. The statistical procedure gauges the relationship between the questionnaire items suggested by earlier analyses. The LISREL

programme produces several goodness-of-fit indices as summary appraisals of the instrument's validity. As there are problems with all goodness-of-fit indices, it is important to examine more than one to ensure that an adequately-fitting model has been produced. The chi-squared statistic is often used to indicate goodness-of-fit. However, this has been linked with sample size problems and distribution misinter-pretations (Fan *et al.* 1999, Hu & Bentler 1999), which render its associated statistical significance level unhelpful in terms of assessing model adequacy. Tabachnik and Fidell (2007) suggest that a good fitting model may be indicated when the chi-squared value is less than twice the degrees of freedom. One of the most popular and robust fit statistics used is the root mean square error of approximation
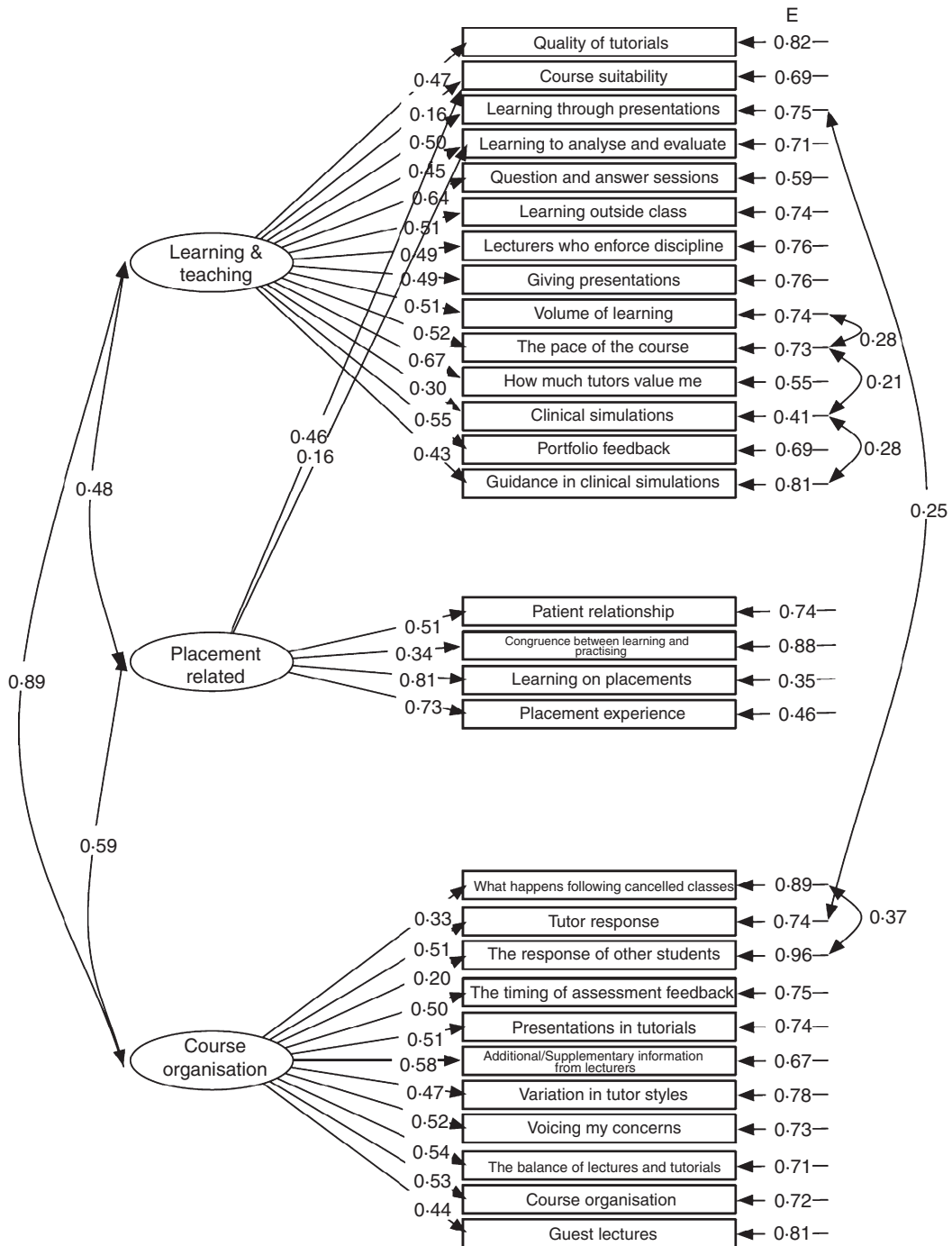

Figure 1 Confirmatory factor analysis for hassles.

(RMSEA), for which a good fitting model will score a RMSEA index between 0·00 and 0·06, and a poor fitting model will score > 0·10 (Browne & Cudeck 1993).

Results

There were 19 missing values for age and 24 for sex. Of those who responded, 32% (*n* = 50) were aged under 21 years; 40% (*n* = 63) were 22- to 30-year old; 23% (*n* = 36) were 31–40 and 5% were 41–50 (*n* = 8); 90% were female (*n* = 137). The LISREL analyses for the three factor structure of the ISSN when rated as hassles produced a chi-squared of 728·03 with 367 d.f. and an RMSEA index of 0·076, (CI: 0·068–0·084). Figure 1 shows the three factors, with paths emanating from each factor to identify the items which load on each factor. For each path, the factor loadings (which represent the relationship between the item and its factor) are given. The figure also contains estimates of the relationships
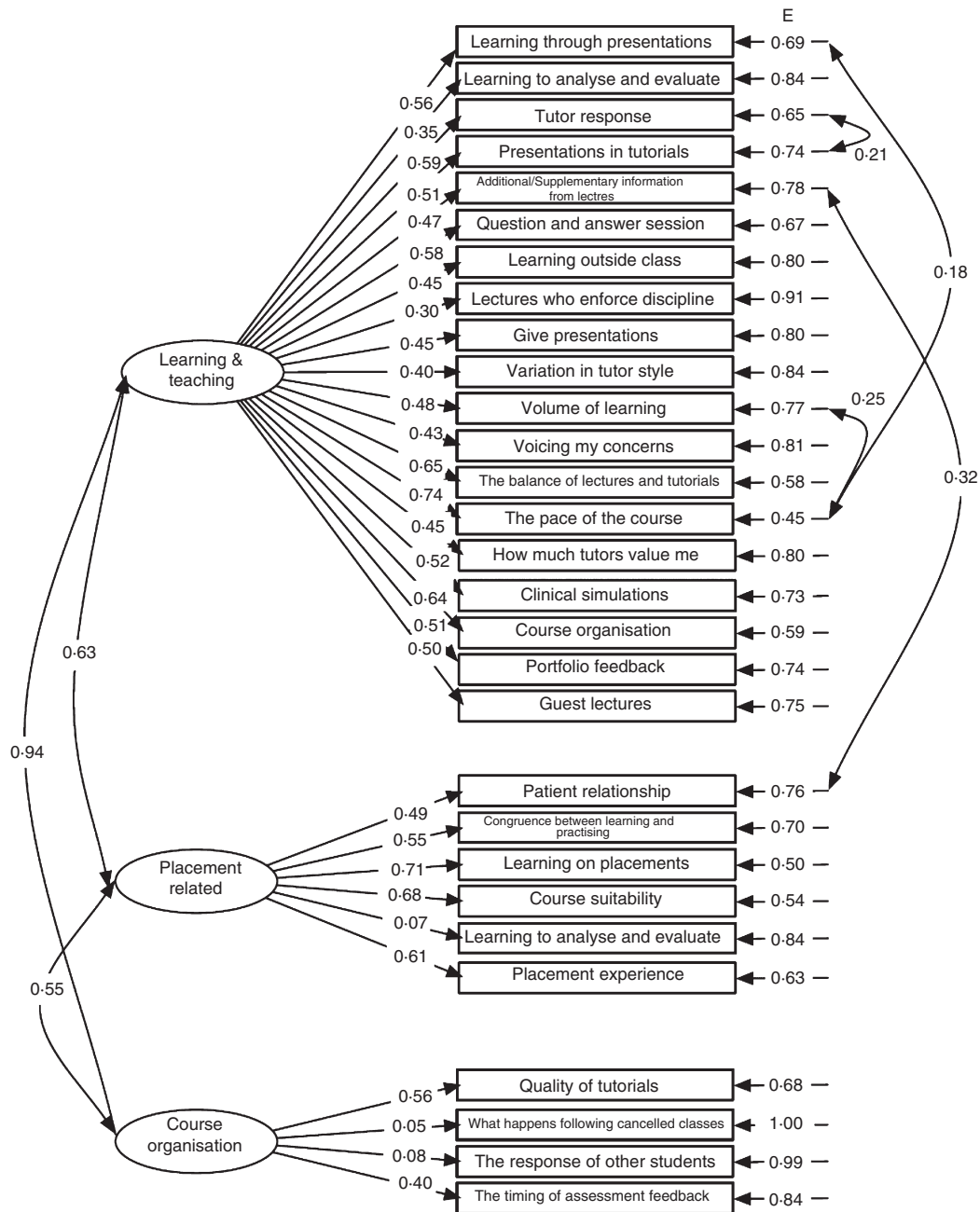

Figure 2 Confirmatory factor analysis for uplifts.

between factors and between items (indicated by curved lines).

When rated as uplifts, four of the eight items in the confirmatory factor analysis, related to the course organization factor, gave factor loadings >1 and were therefore deleted from this factor. They did, however, load on to the learning and teaching factor (see Figure 2). When rated as uplifts, the chi-squared statistic was 451·77, with 342 d.f., and the RMSEA index was 0·042 (CI: 0·020–0·058).

Discussion

The three-factor structure suggested by the exploratory analysis for the ISSN (Gibbons 2008) was supported by this confirmatory factor analysis and is an adequate fit for the data for the items in the ISSN. The grouping of items in the confirmatory analysis remained the same as in the exploratory analysis when rated as hassles and as uplifts, with the

exception of four of the eight course organization items. These four items had loaded on both the learning and teaching uplifts and course organization uplifts factors in the exploratory factor analysis. However, the confirmatory factor analysis suggested that the model fit would be improved if these items were allowed to load on the learning and teaching uplifts factor only. One item, referring to the ability to analyse and evaluate, is an important skill needed by students in relation to academic and clinical competencies, and this may explain why the model produced a good fit when this item loaded as uplifts on to learning and teaching and placement-related factors.

The proposed factor structure for the items measuring uplifts proved to be a good fit for the data, with the proposed factor structure for the items measuring hassles demonstrating adequate fit.

It would be useful to incorporate measures of social desirability in the ISSN, as this is likely to be an issue irrespective of the level of respondents' experiences concerning the sources of stress they are being asked to rate. The ISSN is a new instrument and one of the few that measures not just the appraisal of sources of stress as a potential for distress but also eustress. Earlier findings suggested that those at risk of the adverse effect of stress may not necessarily be experiencing more distress than those not at risk. Rather, where they differ is in the opportunities to achieve (Gibbons 2008). Those who are psychologically distressed appear not to appraise stressors as potentially more distressing, but do appraise them as providing far fewer opportunities to achieve. Such a result challenges the assumption that stress denotes psychological distress, a conception common to much earlier research, and it adds weight to the argument that researchers need to consider sources of stress likely to contribute to eustress or the positive effects of stress, as well as measuring sources of stress likely to lead to distress. This is what the ISSN attempts to do.

Confirmatory factor analysis is more powerful than exploratory factor analysis because it allows for explicit hypothesis testing – allowing testing of the 'goodness-of-fit' of a predetermined model. In an instrument such as this – which claims to measure the potential positive as well as negative effects of stress – confirmatory factor analysis is especially important because it offers a more viable method for evaluating construct validity.

The ISSN offers a valid measure of the sources of stress, both those that contribute to distress and those that contribute to eustress or the positive effects of stress. There are few existing instruments that measure both (e.g. Elder *et al.* 2003), but if learning and performance are to be enhanced it is important that students and educators try not only to

minimize and manage sources of distress but also to enhance the opportunities to experience eustress.

Conclusion

Information about the sources of stress or course demands that most students rate as distressing and those that they rate in helping them to achieve can inform positive course changes at the course review stage of nursing programmes. Moreover, if the ISSN is used in conjunction with measures of learning and well-being, it would be possible to identify which of these demands or sources of stress are the strongest predictors of learning and well-being. In relation to coping, the ISSN could be coupled with measures of coping style and moderators, such as personality and self-efficacy, and with well-being measures, to determine the impact of such coping resources on the appraisal of stress and on well-being. Such information could be used to inform initiatives to promote better coping among students. Periodically administering the ISSN to students could provide nurse educators with important information relevant to quality assurance and course review. This could potentially help to make learning experiences not only less distressing but also more uplifting.

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Author contributions

CG was responsible for the study conception and design. CG performed the data collection. CG and MD performed the data analysis. CG was responsible for the drafting of the manuscript. CG and MD made critical revisions to the paper for important intellectual content. CG and MD provided statistical expertise. MM obtained funding. MM provided administrative, technical or material support. MD supervised the study.

Conflicts of interest

No conflict of interest has been declared by the authors.

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