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The psychometric properties of five Professional Identity measures in a sample of nursing students

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The psychometric properties of five Professional Identity measures in a sample of nursing students

Abstract

Background: Researchers have yet to fully explore and adequately measure Professional Identity (PI) in nursing. **Objectives:** This paper aims to examine the psychometrics of five measures of PI and compare these results in first and third year nursing students. As a consequence of utilising multiple self-assessed survey tools this study also examines common methods bias. **Design:** The study utilised an on-line survey to gather responses from nursing students. **Methods:** The pilot study examined the validity and reliability of the five measures while investigating the potential for common methods bias. **Results:** All five measures tested demonstrated poorer psychometric properties or model fits for this sample than those reported by their original authors. One measure demonstrated a small mean score increase from first to third year, while all others revealed a fall from first to third year, although these were not significant. Harman's tests performed on all scales were negative for common methods bias. **Conclusions:** A psychometrically strong measure of PI was not determined however, this may relate to the sample size in this pilot study. The fall of PI from first to third year and the factors that influence such change may have implications for the recruitment and retention of nurses.

Keywords

properties, five, psychometric, professional, measures, identity, sample, students, nursing

Disciplines

Medicine and Health Sciences | Social and Behavioral Sciences

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The psychometric properties of five Professional Identity measures in a sample of nursing students

Leanne S. Cowin, Maree Johnson, Ian Wilson, Kaye Borgese

Abstract

Background: Previously, researchers in the social sciences including nursing have approached the measurement of Professional Identity (PI) using a ‘black-box’ conceptualisation and while recognising the crucial importance of the construct, they have yet to fully explore and adequately measure PI. Common methods bias, a problem of multiple testing of the one construct and the use of self-report measures, was also considered.

Objectives: This paper aims to examine the psychometrics of five measures for assessing PI and to compare these results across years (1st and 3rd year) of nursing students at one university. As a consequence of utilising multiple self-assessed survey tools this study also aims to examine the effect of common methods bias.

Design: This study utilised an on-line survey to gather responses from students at one university for psychometric testing. The participants were a cohort of first year and third year nursing students in a large Bachelor of Nursing program.

Methods: The pilot study examines the validity and reliability of the previously constructed tools while investigating the potential for common methods bias in self-report methods such as on-line surveying.

Results: All five measures tested demonstrated poorer psychometric properties or model fits for this sample than those reported by the authors. While one measure demonstrated the smallest possible increase in mean scores from first to third year, all other measures revealed a fall from first to third year in mean scores although these were not significant. Harman’s tests performed on all multi-factorial scales were negative for common methods bias.

Conclusions: A psychometrically strong measure of PI was not determined however, this may relate to sample size in this pilot study. The fall of PI from 1st to 3rd year in four out of five measures has important implications for nursing program structures, nursing image, recruitment and retention.

INTRODUCTION

A positive and dynamic Professional Identity (PI) that originates in self-choice (Skorikov, & Vondracek, 2011) can lead to personal, social and professional fulfilment. The development of a PI requires the integration of personal values, morals, and attributes with the norms of the profession, thereby forming that critical allegiance of the individual's personal identity with the professional self (Johnson et al., 2012 in press).

An exploration of PI theory (Kroger & Marcia, 2011) and measurement (Arthur & Randle, 2007) highlight how fragmented previous research on the measurement of this construct for the profession of nursing has been to date. A unified, theoretically derived approach to measurement is uncommon with various researchers utilising aspects of the construct to fit their existing studies rather than a unique exploration of the construct (Arthur & Randle, 2007; Mieg, 2008). This has led to a plethora of available tools for measuring PI. However, deciding on the appropriate tool for measuring the development of PI may prove to be a difficult prospect as some tools have been tailor made for specific studies. Furthermore, the use of multiple self-report (surveys) tools aiming to measure PI should account for the potential inflation of relations within and between PI measurement tools assessed via the same method such as common method bias (Meade et al. 2007).

Aims

The aim of this study (pilot) was to determine the best tool to measure PI from existing tools and compare the psychometric properties of these five within one sample. The pilot study is a precursor to a larger multi-cohort longitudinal study. In addition, given the social desirable nature of PI for nursing students, and the self-report nature of the measures, it was also important to explore whether CMB would impact on the performance of the tools.

BACKGROUND LITERATURE

PI is often referred to in the social sciences as career, occupational or even vocational identity (Holland et al., 1993; Schwartz et al., 2011). It is a 'sense of self' that is derived and perceived from the role we take on in the work that we do (Erikson, 1968). From adolescence through to old age our PI helps to construct the core or essential aspects of an individual's meaning and being. PI is constructed of periods of endurance and interruptions (Skorikov, & Vondracek, 2011). For example, a PI is assembled (and disassembled) around the interpersonal relationships that are currently of importance in our lives (Skorikov, & Vondracek, 2011). Although a PI is affected by these relationships, it is the individual who contributes (invests) the most to the construction and deconstruction of PI.

Occupational choice and commitment are core attributes of identity (Kroger & Marcia, 2011) and we tend to choose our career and work to suit the perception we hold of ourselves (Skorikov, & Vondracek, 2011). However, PIs are not always the most prominent aspect of our identity (who we think and feel we are) as a variety of socio-economic factors, media image, and opportunities can contribute considerably to occupational appeal. At the undergraduate level, a PI may fluctuate and even disintegrate when influenced by clinical exposure and the realities of a nursing career (Coster, et al., 2008; Levett-Jones & Lathlean, 2008). A strong PI is critical for nurses to function at a high level and benefits not only health professionals, but also patients and other healthcare workers. For example; nurses' concepts of their professional roles have changed over time: they thought of themselves chiefly as doctors' assistants in the mid-twentieth century within the acute care setting, but now conceive of themselves as more autonomous and active in patient care (new reference) .

Despite the plethora of PI theory emanating from the theoretical framework of Erikson's 1950s psychosocial development model (Erikson, 1968; Schwartz, 2011) and measurement discussion in the literature, the question of how to validly and reliably measure PI is not uniformly embraced by researchers. The type of measure used is most commonly dependent on the theoretical perspectives of the researchers as to what dimensions of PI will be targeted (Skorikov, & Vondracek, 2011). Consequently, there are many measures with a range of reported psychometric qualities from weak to strong.

Five measures of professional identity

From an initial search of the literature in databases such as CINAHL, Medline, Science-direct and Proquest for the past 11 years (2000 to 2011) seven measures were identified that could be readily and freely accessed. Following examination of the items and constructs and other psychometric properties five measures—Adams et al. 2006, Weis and Schank 2009, Dobrow and Higgins 2005, Rognstad et al. 2004, and Bennett 2010—were identified as representing the construct for measurement in this study of nursing students (see Table 1 for details).

Common methods bias

Measurement error is a constant potential threat particularly for self-report research such as the PI measures in this study and there is more than one way that error can become a problem particularly for behavioural and attitudinal research (Antonakis et al. 2010; Meade et al. 2007; Podsakoff et al. 2003). Measurement error that is attributable to how we measure rather than what constructs we measure is a potentially threatening, yet often an under acknowledged problem (Podsakoff et al., 2003).

Common methods bias (CMB) is defined as an artificial inflation or deflation of the correlation (relationships) amongst variables (Siemsen et al. 2010). Common methods variance (which creates the bias) is variance that arises from the method of measurement instead of what is being measured (Siemsen et al. 2010) and is regarded as a leading cause of systematic measurement error (Johnson et al. 2011). The method of measurement can attract variance leading to bias from the content of items in a scale, the type of scale, how responses are presented, as well as issues of response fatigue, desirability, and halo effects (Meade et al. 2007; Podsakoff et al. 2003).

CMB may simply arise from study participants that have attempted to avoid cognitive dissonance (incompatible attitudes) by increasingly answering similarly to their last response. In turn, all responses can end up being highly correlated and the 'real' result disappears as bias takes over (Podsakoff et al. 2003). The reasons that participants start to 'correlate' their responses may be as simple as the measure contains questions that are very similar, often repeated, and are accessed on-line. The danger of CMB is that the end results of a survey can be erroneous with misleading conclusions (Podsakoff et al. 2003).

A search of nursing and medical databases such as CINAHL and Medline located few nursing papers referring to CMB. Major nursing research texts do not commonly include explanations of CMB. Discussion of this issue is most likely arising in the limitations of study section as a potential problem for self-report data rather than any investigation for CMB in their current study (Van der heijden et al. 2008; Weng et al. 2010). Tests specifically aimed at detecting CMB are not commonly reported in the nursing literature although the study by Weng et al. (2010) highlights the issues for nursing research.

Aims

The aim of this study (pilot) was to determine the best tool to measure PI from existing tools and compare the psychometric properties of these five within one sample. The pilot study is a precursor to a larger multi-cohort longitudinal study. In addition, given the social desirable nature of PI for nursing students, and the self-report nature of the measures, it was also important to explore whether CMB would impact on the performance of the tools.

METHODS

Design

The study utilised a descriptive correlational design to conduct psychometric testing on five measures of PI sourced through available literature. An on-line survey was used to gather responses from participants in order to examine the relationships between items, factors, scales and groups.

Sample

A total of 162 nursing students completed the on-line survey including 82 first year and 80 third year students. This represents 9% (82/918) of first year and 13% (80/620) of the third year students. All first and third year students were sent an email invitation to participate and as this was a pilot study, the survey was closed after a two-week open period.

Characteristics: The 1st year cohort ranged in age from 18 to 52 (M 30, SD 10.18), were predominately female (93%), were born in over 23 countries, spoke 24 different languages and 31 of the 82 (37%) had a close family member as a nurse or doctor. The 3rd year cohort ranged in age from 20 to 63 (M 31, SD 9.82), were also mostly female (90%), came from over 20 countries, spoke 15 different languages and 25 of the 80 (32%) had a close family member as a nurse or doctor.

Instruments

Five measures were utilised in this pilot study totalling 53 items and five different Likert type scales. The first measure of PI is the Adams et al., (2006) Professional Identity Scale. The authors claim their new nine item measure (reduced from the original 12 items) produced a one factor model when utilising an Exploratory Factor Analysis (EFA) with all factor loadings ranging from .46 - .73, as well as a reliability score (Cronbach's alpha) of .79 (Adams et al. 2006).

The second measure was the Nurses Professional Values Scale – Revised by Weis and Shank (2009) who reported weak to moderate correlations and Cronbach's alpha scores ranging from .70 to .92 for the five scales and .92 for the total measure (all 26 items). The mean scale and total measure scores (and associated Standard Deviations SD) were not reported however, five factors were identified explaining 57% of the variance and a below acceptable model fit (< 0.90) was reported.

The third measure was the Clarity of Professional Identity by Dobrow and Higgins (2005) who reported Cronbach's alpha as .90 for their four item measure and report that discriminant validity exceeded .76 when compared to three other measures of career planning, career self-efficacy and perceptions of career success. The authors report an initial mean scale score of 4.69 (SD = 1.36) and because of their longitudinal element the authors were able to report on a significant increase in PI from time 2 to time 3 for a sample of MBA students ($t = 4.94$, $p < .0001$ see Dobrow & Higgins, 2005, p.577).

It is not clear how the fourth measure, The Values Survey from Rognstad et al., (2004), was assessed for validity (no CFA or model details were reported). The authors claim the Cronbach's alpha for the eight statements was .64. An EFA utilising a Varimax rotation revealed two factors; first five items and the last three items with loadings from .443 to .839. Rognstad et al. (2004) named the first factor as "altruism" and the second as "acknowledgement" and these factors explained 27 & 21% of the total variance.

The final measure from Bennett (2009) was unnamed and the literature did not report developmental psychometrics. It is unclear how well this scale performed in the reported study as most discussion is based on beta weights of the path analysis performed on selected factors in a 17 factor model of which PI was only one factor. Correlation scores (*r*) are reported for eight of the 17 factors demonstrating weak to moderate relationships between PI and commitment and satisfaction scales.

Procedure

Participants in this pilot study were invited to take part by completing the collection of short PI measures in a survey format within an on-line survey site (Qualtrics.com). Once the participant had read and acknowledged the information in the email invitation they were then able to access the survey and complete their responses by clicking on their choice. No names were collected thereby ensuring anonymity for the participant. At each stage of the survey a small scale informed the participant how much further until completion. This was felt to be important because of the use of several tools. Four issues are described by Fan and Yan (2010) as critical for response rates in electronic surveying - survey development and quality of the layout, access to potential participants, survey completion (technical knowhow with computers and navigation skills) and survey return (browser failure and connection issues).

Analysis

All items were transferred into an SPSS database from the electronic survey site. There was no missing data as the survey was set so that it could not be closed unless all responses were received. Descriptive statistics were conducted; reliability and correlational scores were produced, as well as exploratory and confirmatory factor analyses (EFA and CFA). The CFA was conducted by using AMOS according to the authors' factor configuration. Model assessment details included Chi-Square and Goodness-of-Fit Indices where a value of 1 is indicative of a perfect fit and values greater than 0.90 are generally indicative of a good fit with the data (Jöreskog & Sörbom, 1984). The root mean square error of approximation (RMSEA) is also reported as this will indicate a close fit to the data if less than 0.05 (Byrne, 2010).

The Harman's single factor method (Meade et al. 2007; Podsakoff et al. 2003) was utilised to examine all PI measures containing theorised factors for CMB. The total survey of five measures containing at least 7 theoretically derived components of PI was also analysed. This test is achieved by constraining all factors to one and reporting on the amount of variance explained by the forced one factor model. The aim of this test is to examine the amount of variance explained and specifically that which is explained by one factor (Podsakoff, & Dalton, 1987; Podsakoff et al. 2003; Weng et al. 2010). If the result demonstrates less than half of the variance (< 50%) then CMB is not a cause of erroneous or misleading results.

Ethics

The project was subjected to review by the university's peer review group and was approved by the university's ethics committee in September 2011. No names or identification numbers were used and all respondents remain anonymous.

RESULTS

Five measures of PI were tested through an on-line survey on a sample of 1st year and 3rd year nursing students in a pilot study. While one measure demonstrated the smallest possible increase in mean scores from first to third year, all other measures revealed a fall from first to third year in mean scores. The results of psychometric testing are presented here in Tables 2 and 3.

Measure 1: The Professional Identity Scale by Adams et al. (2006) revealed three factors instead of one as published. The total variance explained for these three factors was 70%. The Cronbach's alpha for this instrument was .78 however, the model fit in a confirmatory factor analysis revealed a poor fit to the data, $\chi^2(27) = 277.92$, $p < .001$; GFI = 0.71; RMSEA = 0.24 (see Table 2).

Insert Table 2 about here

Measure 2: The Nurses Professional Values Scale – Revised NPVS-R by Weis and Schank (2009) revealed a five factor model describing 63% cumulative variance. The internal consistency range of .67 to .89 was found for the subscales and a total scale score of .94. Model fit statistics revealed a poor fit to the data, $\chi^2(289) = 721.08$, $p < .001$; GFI = 0.74; RMSEA = 0.10 (see Table 3).

Insert Table 3 about here

Measure 3: The scale of Clarity of Professional Identity by Dobrow and Higgins (2008) is a four item one factor measure and in this study one factor was identified describing 62% cumulative variance. The internal consistency of .76 was reported for the scale and the model fit mostly revealed a poor fit to the data, $\chi^2(2) = 23.29$, $p < .001$; RMSEA = 0.26, however the GFI = 0.94 was acceptable (see Table 2).

Measure 4: The two factor eight item Values Survey by Rognstad et al. (2004) revealed a two factor model with 59% of the total variance explained however, the items were different to those reported by the creators. The internal consistency of .81 was reported for the total measure and the model fit in a confirmatory factor analysis revealed an unsatisfactory fit to the data, $\chi^2(20) = 77.30$, $p < .001$; GFI = 0.89; RMSEA = 0.13 (see Table 3).

Measure 5: The six item single scale from the Professional Development model by Bennett (2010) revealed one factor describing 55% of the variance (see Table 2). The internal consistency of .79 is reported for the subscale and model fit statistics revealed an acceptable fit result fit to the data, $\chi^2(9) = 20.05$, $p = 0.25$; GFI = 0.93; however, the RMSEA = 0.12 is outside the accepted level of <0.05 (Byrne, 2010).

The results indicated previously that all five measures demonstrated poorer psychometric properties or model fits than those reported in publication. Therefore, Harman's tests (Meade et al. 2007) were run to examine CMB as a possible cause for the differences in these results (see Table 2 and 3). All items (53) were utilised for a Harman's test with one factor explaining 27.85% of the total variance. Based on these results we concluded that common method bias was not a major problem in this study with this sample.

DISCUSSION

Two groups of students completed the survey—82 from first year and 80 from third year. The results show no significant difference in mean scores across these groups however, it is interesting to note that four measures reveal a fall in total mean score from first year to third year (see Tables 2 and 3). The finding of a fall in PI as the participant gets close to course completion was also demonstrated by Coster et al. (2008, p. 1676) who hypothesised that “professional identity declines over time” and is affected by clinical experience.

No one measure resulted in robust psychometric properties with at least three measures performing quite differently on this sample to the results published by the authors of the measure. For example, Adams et al. (2006) redesigned their original measure from 12 to nine items on the basis that their initial 12 item EFA demonstrated more than one factor. Therefore, this study has not been able to demonstrate whether a uni-dimensional or a multi-dimensional model is best able to capture the PI construct. The lack of psychometrically sound and well tested measures for PI is interpreted here as meaning there is little consistency between the five measures. There is some dispute between the five measures regarding what factors a PI might contain. Whether a PI is specific to a particular role such as health care or education is also untested, requiring further nursing research.

One of the difficulties that arose in searching for instruments to examine PI was that no one specific measure has been commonly utilised in nursing PI research. Lack of measurement standardisation increases the difficulties of finding meaningful interpretation of results. In fact, some of these measures were so diverse that it might raise the question of whether the construct of PI was captured at all.

Adams et al. (2006) state that higher mean scale scores represent higher PI however, the authors did not provide scores to compare with this study. While the Cronbach alpha scores for all nine items were almost a replica of the reported score, the EFA revealed three factors (see Table 1). No CFA is reported by Adams et al. and the model fit, using this sample, did not reach acceptable levels on any model fit indices.

Cronbach’s alpha scores for the four item scale from Dobrow and Higgins (2005) were lower in this study (Dobrow & Higgins report .90 and this study .76). EFA and CFA results are not reported by Dobrow and Higgins. In this study one factor was revealed accounting for 62% of the total variance, however, although the GFI was at an acceptable level (> 0.90), all other model indices were below acceptable ranges (Byrne, 2010).

The six item one factor measure of Bennett (2010) was not well reported in the literature and in this study one factor was demonstrated in EFA accounting for 55% of the total variance. All items were weakly to moderately correlated and the model fit is close to acceptable levels in most aspects except for RMSEA (see Table 2).

The measure from Weis and Schank (2009) contained 26 items in five factors however, this factor structure could not be replicated in this study. Only four factors were located in an EFA accounting for 63% of the total variance. The model fit fell somewhat short of acceptable ranges in a CFA and again, could not replicate those published by the authors (see Table 3). The PI measure of Rognstad et al. (2004) however, demonstrated the same factor structure as published for the total sample accounting for 59% of the total variance. The model fit fell just short of acceptable ranges for the total sample although there were no published details for comparison.

One of the broader issues arising from utilising multiple measures is that only some information regarding construction, development and testing is made available to the reader and this is not consistent across studies. Consequently, it is difficult to make comparisons between studies as well as difficult to make assumptions on findings for this study. For example, for those measures that have not reported confirmatory factor analysis are the models constructed here an artefact of this sample or are they representative of a problem between theoretical content and measurement construction?

While it may have been somewhat ambitious to test the psychometric properties of five measures of PI, this study provided a valuable opportunity to assess CMB and trial current assessment tools such as the Harman's test and the Common Latent Factor Method. Recently there has been a call for CMB testing to become a part of psychometric testing with Gorrell et al. (2011) claiming that interpretation of results should normally assume some measure of CMB. According to Gorrell et al. (2011) even a high Cronbach alpha score could now be interpreted as being artificially inflated through CMB. On-line surveys may provide many of the features that can potentially lead to erroneous results from CMB. These could include item content, types of scale, presentation of response scales, response fatigue, desirability, and halo effects (Meade et al. 2007; Podsakoff et al. 2003).

In the end it was not possible to choose one measure above all others as the evidence did not provide strong psychometric support for any. All five measures used in this study varied from details published which could be simply an artefact of the sample, the sample size and the procedures used. Equally, the results here may reiterate the need for further work on theory and measurement of PI in the nursing profession.

Limitations

The response rate for this study appears low at 9 and 13%. Response rates for surveys in social science research however, can depend upon several factors therefore it is not easy to determine what should be an expected response rate. Current issues may include the length and complexity of the survey as well as the type of survey. For example, electronic surveys (on-line surveys) are becoming much more commonplace as a method for eliciting participant responses. The pilot study was conducted toward the end of the university year prior to the examination period which may well have affected the response rate.

Presser and McCulloch (2011) claim that response rates to surveys (any format) have been falling due to increasing pressures on time, rises in social capital, and over surveying with refusal rates doubling in the past 25 years. Figures ranging from as high as 80% to as low as 10% are used in relation to surveying. However, if the variation in figures is due to the specific context of the survey, it is difficult to gauge what an acceptable response rate should be. In a meta-analysis of 35 studies over a 10 year period comparing response rates of electronic and paper surveys, Shih and Fan (2009) found that electronic (email) surveys had a 20% lower surveying was 10% less than paper versions.

Another limitation in this study is the use of a Harman test to indicate whether CMB is artificially inflating relationships. This test is recommended by some authors (see Meade et al. 2007) but at the same time it is recommended only as a last resort by others (Lindell & Whitney, 2001).

CONCLUSIONS

Research into how nurses form their sense of professional identity, and how this can be tested and strengthened, is essential to the development of nursing as the cornerstone of the healthcare workforce. Expected benefits from future research relating to PI would be to inform professional development and socialisation. Confidence in prediction of PI development can contribute to improving recruitment outcomes leading to improvements in healthcare outcomes through knowledge development and ultimately workforce stability. Nursing students may benefit from raised awareness, understanding and sharing of issues that support and foster the development of PI. Other potential benefits may include the assembling (and potential disassembling) of newly constructed identities and changes to nursing program structures in terms of clinical placement issues thereby improving the overall learning environment and student experience.

This study, as a precursor to a larger study, examined the development and dynamic nature of PI. The specific aims were to trial and examine the psychometric properties of five measures designed to test a variety of PI components, and to compare these results across years (1st to 3rd year) of nursing students at one university. Due in part to issues such as theoretical conception, measurement aims and model construction, we were unable to identify a psychometrically strong tool to measure PI within this pilot sample. There were some promising glimpses of models such as the multifactorial model by Weis and Schank (2009) and the tool by Bennett (2010) as a single factor model. Future work such as the creation, development and testing of a new measure, conceptually derived, may be required to evaluate this construct within larger samples of nurses.

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Table 1. Scales and/or Measures of Professional Identity

Name of the tool	Source	Description	Number of items and factors	of Items and responses	Internal consistency (Cronbach's alpha)	Validity	N	Main dimensions assessed
Professional Identity Scale	Adams, Sturgis & Macleod 2006	Hean, Clark & Brown et al in 1986 Based on a previous 'identification' scale by Clark Brown et al in 1986	9 items 1 factor 2 negatively worded items	5-point Likert type scale	0.79	Construct EFA only	599	Professional Identity
Nurses Professional Values Scale – Revised NPVS-R	Weis and Schank 2009	Professional values and professional socialisation as hypothesised components of a PI	26 items 5 factors	5-point Likert type scale	0.92	Construct EFA & CFA	782	Caring, activism, trust, professionalism and justice
Clarity of Professional Identity	Dobrow and Higgins 2006	Developed from Super's 1957 theory of PI and research of Markus and Nurius (1986)	4 items 1 factor 2 negatively worded items	7-point Likert type scale	0.90	Not reported	136	Professional identity development
Values survey	Rognstad, Nortwedt and Aasland 2004	Socialisation and building professional identity	8 items 2 factors	5-point Likert type scale	0.64	Construct EFA only	301	Altruism and Acknowledgement
Not named	Bennett 2010	Part of a 17 factor model to assess professional development characteristics	6 items 1 factor	7-point Likert type scale	Not reported	Not reported	194	Professional Identity

Note: EFA = Exploratory Factor Analysis; CFA = Confirmatory Factor Analysis

Table 2. Hypothesised Uni-Dimensional Measures Means, EFA, CFA and Details

	<u>Adams, Heane, Sturgis & Macleod Clark 2006</u>			<u>Dobrow and Higgins, 2005</u>			<u>Bennett 2010</u>		
	1 st year (n=82)	3 rd year (n=80)	Total (n=162)	1 st year (n=82)	3 rd year (n=80)	Total (n=162)	1 st year (n=82)	3 rd year (n=80)	Total (n=162)
Scale mean & SD	4.09 & 0.56	4.10 & 0.54	4.09 & .54	4.73 & 1.16	4.68 & 1.09	4.71 & 1.12	5.80 & .86	5.77 & .83	5.78 & .84
Chronbach Alpha	0.77	0.79	0.78	0.75	0.78	0.76	0.77	0.80	0.79
Correlation	Some items weak to non-significant			Some items weak to non-significant			Some items weak to non-significant		
Factor Analysis (EFA)	All communalities above 0.5	Item X < 0.5	Item 2 & 8 < .5	Item 2 < .4	Item 2 < .5 No rotation	Item 2 < .4 No rotation	Items 4 & 6 ↓.40	Items 1 & 6 ↓.40	Items 1 & 6 ↓.50
All conducted using PCA & Varimax or no rotation	3 factors 3 items in each. TVE = 70%	3 factors 3 items in each. TVE = 72%	3 factors 3,4,2 items in each TVE = 69%	1 factor TVE = 62%	1 factor TVE = 63%	1 factor TVE = 62%	1 factor TVE= 55%	1 factor TVE= 55%	1 factor TVE= 55%
(CFA) on total sample only	Chi ² = 277.917, df = 27, p = .000, GFI = .712, RMSEA = 0.240			Chi ² = 23.29, df = 2, p = .000, GFI = .935, RMSEA = 0.257			Chi ² = 20.05, df = 9, p = 0.25, GFI = .929, RMSEA = 0.117		
Interpretation notes	Higher mean scale score represents higher PI Harman's test – not significant (37% of variance in one factor)			Harman's test not useful here as there is only one factor			Harman's test not useful here as there is only one factor		

Note: PCA = Principal Component Analysis; TVE = Total Variance Explained

Table 3. Hypothesised Multi-Dimensional Measures Means, EFA, CFA and Details

	<u>Weis and Schank (2009)</u>			<u>Rognstad, Nortvedt and Aasland (2004)</u>		
	1 st year (n=82)	3 rd year (n=80)	Total (n=162)	1 st year (n=82)	3 rd year (n=80)	Total (n=162)
Scale mean & SD	4.26 & .53, 3.80 & .67, 4.26 & .49, 3.93 & .67, 4.23 & .56	4.09 & .56 3.71 & .71 4.19 & .59 3.77 & .64 4.05 & .67	4.18 & .55 3.76 & .69 4.23 & .54 3.85 & .66 4.14 & .62	4.31 & .50	4.12 & .54	4.21 & .523
Chronbach Alpha	.83, .85, .70, .85, .67 TSS= .93	.84, .89, .85, .83, .80 TSS= .95	.84, .87, .79, .84, .75 TSS= .94	.782	.817	.806
Correlation	Non sig to moderate throughout	Non sig to moderate throughout	Non sig to moderate throughout	Weak to moderate throughout 8 items	Weak to moderate throughout 8 items	Weak to moderate throughout 8 items
Factor Analysis (EFA)	2 items with communalities <.50	1 item with Communality <.50	3 items with communalities <.50	Item 7 communality score is <.30	Item 1 & 4 communality score is <.50	Item 4 & 7 communality score is <.50
All conducted using PCA & Varimax rotation (CFA) on total sample only	5 factors TVE = 65%	4 factors TVE = 69%	4 factors TVE = 63% Factor structure not the same	2 factor model = 1,2,3 then 4,5,6,7,8 TVE= 58%	2 factors 1,2,3,4,5, then 6,7,8, TVE= 61%	2 factors 1) items 1,2,3,5 2) items 4,6,7,8. 31% & 28% TVE= 59%
	Chi ² =721.076, df=289, p= .000, GFI= .740, RMSEA = 0.096			Chi ² =77.30, df=20, p= .000, GFI= .890, RMSEA = 0.133		
Interpretation notes	The model in the paper is not the model they ran their CFA on. Harman's test – not significant (42% of variance in one factor)			The model just about works on this sample for the 3 rd year group Chi ² =32.10, df=20, p=0.042, GFI= .908, RMSEA = .088 Harman's test – not significant (45% of variance in one factor)		

Note: PCA = Principal Component Analysis; TVE = Total Variance Explained.