Reliability and Validity of the Jefferson Scale of Attitudes Toward Physician-Nurse Collaboration for Nurse Practitioners

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Abstract:

Background: The Jefferson Scale of Attitudes Toward Physician-Nurse Collaboration (JSATPNC) has been used to measure attitudes regarding nurse-physician collaboration. However, psychometric evaluation is lacking for the nurse practitioner (NP) population. Purpose: This study details a confirmatory approach in testing the factor analytic structure of the JSATPNC against previously reported structures. Methods: A Web survey invited 4,673 licensed NPs where 915 responded. Confirmatory factor analysis (CFA) was performed to assess factorial validity. Results: A previously proposed 3-factor model based had significantly better fit compared to a 1-factor structure (Dx2 5 165.3, Ddf 5 3, p , .0001). Cronbach's alpha for the 3 subscales were 0.61, 0.62, and 0.54. Reliability with all 15 items was .72. Conclusions: Three collaboration subscales could have use in measuring attitudes toward physician-NP collaboration.

Keywords: collaboration | nurse practitioner | psychometric | reliability | validity

Article:

Health care organizations are increasingly complex and information is shared so quickly that collaboration becomes elusive and poorly understood between professionals. Health care disciplines often communicate with each other in predetermined ways that runs counter to the spirit collaboration and by being either competitive or subordinate. Much of the influence surrounding communication among health care professionals is derived from both the education and organization settings (Goldman, Zwarenstein, Bhattacharyya, & Reeves, 2009). Interdisciplinary is a term that suggests communication among several disciplines with each discipline having a unique scope of practice. Interprofessional is a term that broadens interdisciplinary to include integrated collaboration among disciplines with a common scope of practice (D'Amour & Oandasan, 2005). A high degree of interprofessional collaboration among diverse health care providers has been shown to impact both the quality of care received by the patient as well as the extent of job satisfaction among providers (Martin,Ummenhofer, Manser,

& Spirig, 2010). The concept of collaboration is elusive and has multiple meanings. However, most health care providers agree that collaboration in the practice setting may be defined as developing a team approach with shared goals, mutual respect, and power sharing (Henneman, Lee, & Cohen, 1995; Orchard, Curran, & Kabene, 2005). Studies conducted to measure collaboration between nurse and physician providers have used quantitative and qualitative methodologies that included surveys, questionnaires, focus groups, and observations. The Jefferson Scale of Attitudes Toward Physician-Nurse Collaboration (JSATPNC; Hojat et al., 1999; Hojat et al., 2003) has been widely used in determining collaboration between registered nurses (RNs) and physicians (Dougherty & Larson, 2005) as well as certified registered nurse anesthetists (CRNAs) and anesthesiologists (Jones & Fitzpatrick, 2009; Taylor, 2009). The scale was originally reported by Hojat et al. (1999) as a way to assess attitudes toward physician-nurse collaboration using an initial 20-item pool that was finalized to 15 items that are reported in many subsequent studies. Figure 1 in Sterchi (2007) gives the 15 items that are commonly assessed for RNs in general. The tool has been adapted to be used in other non-nurse populations as well. For example, the JSATPNC tool was adapted to assess reliability and validity in measuring attitudes toward physician-pharmacist collaboration among a group of pharmacy and medical students (Van Winkle, Fjortoft, & Hojat, 2011). For this study, only results from studies that did not change the number or intent of the items from Hojat et al. and studied nurses are considered further. Thus, we are not comparing our findings to Van Winkle et al. (2011) because they studied a 16-item adaption of the tool for capturing attitudes toward physician-pharmacist collaboration.

Results from previous literature on psychometric evaluation of the JSATPNC have offered varying conclusions. Dillon, Noble, and Kaplan (2009) describe findings from a pretest/posttest study using one overall attitude toward collaboration scale score. Dougherty and Larson (2005) report reliability as if there were one overall scale but then remark on exploratory factor analysis (EFA) findings with six factors. Similarly, despite reporting multiple factors emerged, Yildirim et al. (2005) go on to detail findings based on one overall JSATPNC scale. Ward et al. (2008) give comparisons based on one overall JSATPNC scale score as well but then also describe EFA resulting in three factors. A key idea is if factor analysis supports dimensionality of a tool being multidimensional, then overall (unidimensional) total scores are not potentially appropriate (Brown, 2006; Hatcher, 1994; Polit, 2010; Tabachnick & Fidell, 2007).

Other researchers have found suggestions of multiple dimensions concerning attitudes toward physician-nurse collaboration. Hojat et al. (2003) emphasize comparisons for each of four subscales of collaboration-(a) Shared education and team work, (b) Caring versus curing, (c) Nurses' autonomy, and (d) Physicians' dominance-but then also report differences using the overall scale scores. Likewise, Sterchi (2007) reported analyses based on both the one overall score and based on the previous four "factor" scores.

A summary of reported reliability from previous studies is given in Table 1. More recent studies have reported lower observed reliability estimates: .60 from Jones and Fitzpatrick (2009), .65 from Taylor (2009), and a range from .57 to .77 from Ward et al. (2008). One obvious reason for this could be that some subscales comprises a fewer number of items. For example, the previously reported subscale "physician's dominance" comprises only of two items (Items 8 and 10 given in Table 2). Using the Spearman-Brown prophecy formula, the product-moment

correlation between these two items would have to be at least .54 to obtain a reliability of at least .70 and at least .67 for a reliability of .80.

TABLE 1. Results of Psychometric Studies of the Jefferson Scale of Attitudes Toward Physician–Nurse Collaboration

Reference	Sample Composition	Sample Size of Nurses	Reliability	Method of Construct Validity	Dimensionality Results	Specifies Item-to-Factor Details?	Simple Structure?[a]	>1 Factor but also Analyzes Total Scores?
Dillon et al. (2009)	Fourth-year generic baccalaureate nursing students	$n = 68$ (pretest)	α range = 0.84 to 0.96	EFA	Four factors	Yes	Yes	Yes
Hojat et al. (1999)	Upper-division baccalaureate nursing students	$n = 86$	$\alpha = 0.85$	PCA	Four factors	Yes	Yes[b]	Yes
Hojat et al. (2001)	Nurses in the United States and Mexico	$n = 372$	α range = 0.74 to 0.86	Does not specify[c]	One factor	Yes	Yes	N/A
Hojat et al. (2003)	Nurses in the United States, Israel, Italy, and Mexico	$n =$ 1,676	α range = 0.70 to 0.79	Not performed	Four factors	Yes	Yes	Yes
Jones & Fitzpatrick (2009)	CRNAs	$n = 208$	$\alpha = 0.60$ (total scale)	EFA	Four factors	No	Unknown	Yes
Sterchi (2007)	All nurses	$n = 72$	Not estimated	EFA	Four factors	Yes	Yes	Yes
Taylor (2009)	Nurse anesthetists	$n = 238$	$\alpha = 0.65$	Not performed	One factor	Yes	Yes	N/A
Ward et al. (2008)	Undergraduate nursing students	$n = 333$	α range = 0.57 to 0.77	PCA	Three factors	Yes	No	Yes
Yildirim et al. (2005)	RNs in Istanbul Public Hospitals	$n = 150$[d]	Test–retest = 0.71 $\alpha = 0.75$	Does not specify[c]	>1 factor[e]	No	No	Yes

Note. EFA = exploratory factor analysis; PCA = principal components analysis; N/A = not applicable; CRNAs = certified registered nurse anesthetists; RNs = registered nurses.

[a]Items load only on one factor each. [b]Item 5 had loadings >.4 on two factors, but Hojat et al. (1999) put this item with Factor 1. [c]They report doing "factor analysis" but do not specify if it is EFA or confirmatory factor analysis. [d]Physicians and nurse subsample (does not specify how many nurses). [e]Did not specify how many factors.

TABLE 2. Item Structure of the Jefferson Scale of Attitudes Toward Physician–Nurse Collaboration (JSATPNC)[a]

Item No.	Question Item	Four-Factor Structure Category[b]	Three-Factor Structure Category[c]	Corrected Item-Total Correlation[d]
x1	An NP should be viewed as a collaborator and colleague with doctors rather than his/her assistant?	S	F1	.398
x2	NPs are qualified to assess and respond to psychological aspects of patient's needs?	C	F2	.408
x3	During their education, medical and NP students should be involved in teamwork in order to understand their respective roles?	S	F2	.421
x4	NPs should be involved in making policy decisions affecting their working conditions?	C	F1	.482
x5	NPs should be accountable to patients for the care they provide?	N	F2	.417
x6	There are many overlapping areas of responsibility between doctors and NPs?	S	F2	.381
x7	NPs have special expertise in patient education and psychological counseling?	C	F2	.313
x8	Doctors should be the dominant authority in all health care matters?[e]	P	F3	.213
x9	Doctors and NPs should contribute to decisions regarding the discharge of patients from acute care?	S	F2	.327
x10	The primary function of the NPs is to carry out the physicians' orders?[e]	P	F3	.299
x11	NPs should be involved in making policy decisions concerning the hospital support services upon which their work depends?	N	F1	.339
x12	NPs should also have responsibility for monitoring the effects of medical treatment?	S	F1, F2	.399
x13	NPs should clarify a doctor's order when they feel it might have the potential for detrimental effects on the patient?	N	F1	.161
x14	Doctors should be educated to establish collaborative relationships with NPs?	S, N	F1	.351
x15	Interprofessional relationships between doctors and NPs should be included in their educational programs?	S	F1	.376

Note. NP 5 nurse practitioner.

a

All questions are measured on a 1 to 4 scale (strongly disagree, tend to disagree, tend to agree, strongly agree). bSame four factors specified by Hojat et al. (1999) and Hojat et al. (2003) where S 5 Shares education and collaboration, C 5 Caring vs. curing, N 5 Nurse's autonomy, and P 5 Physician's autonomy. c

F1, F2, and F3 are the same

three factors specified by Ward et al. (2008). dCronbach's alpha for the 15 items is a 5
0.72. e
Items x8 and x10 were reverse scored before creating scores in other analyses.

STUDY GOALS AND RESEARCH QUESTIONS

The primary study goal was to examine the psychometric properties of using JSATPNC in measuring collaboration between nurse practitioners (NPs) and physicians. A Web survey using the instrument was conducted inviting all of the licensed NPs in North Carolina. Specifically, factorial validity was examined through confirmatory factor analysis (CFA) and reliability was estimated via internal consistency using Cronbach's alpha. Information gained from this study will help us understand if the JSATPNC can serve as a valid and reliable tool for assessing how NPs view their collaboration with physicians. Assessing reliability and validity in measures of collaboration is a critical first process before assessing how to develop interventions that have the potential to improve communication, which in turn can assist providers in meeting the needs of their patients. This study aimed to take a confirmatory approach through use of CFA in assessing prior hypothesized dimensionality structures of physician-nurse collaboration specifically for NPs in North Carolina and to provide estimates of reliability using the JSATPNC tool. To our knowledge, no previous studies using CFA has been performed for the JSATPNC at this time. Table 1 summarizes results from previous psychometric studies of the tool.

METHODS

Procedure

A cross-sectional, observational design using an Online survey was used to collect data for investigating the psychometric properties of using the JSATPNC to measure collaboration between NPs and physicians licensed in North Carolina. Several practice related and demographic questions were also included in the survey. Names and e-mail address lists of all NPs were obtained from the North Carolina Board of Nursing. The Online survey tool Qualtrics (Qualtrics Labs Inc., Provo, UT) was used to e-mail the information concerning the study, including the consent stating participants would remain anonymous as well as the participant's ability to register separately to win a random drawing for one of 20 Best Buy gift cards each worth $50.00. Time to complete the survey did not exceed 20 minutes. Submitted anonymous surveys were downloaded into statistical software for analysis. The study was first approved by the university's institutional review board (IRB).

Instrument Description, Administration, and Scoring

The JSATPNC was originally reported by Hojat et al. (1999). Table 1 from Hojat et al. reports four factors with salient loadings, where it is notable that the fourth factor had only two items, and one item (Item 5) was allowed to load <. 4 on two factors (Factors 1 and 2). However, Hojat et al. do not italicize this loading on Factor 3 for Item 5 like is done on Factor 1, as if to recommend that this item be attributed to measuring the latent trait for Factor 1 solely. Indeed, other investigators appear to report this item with the same Factor 1 only in subsequent reports (Dillon et al., 2009; Hojat et al., 2003; Sterchi, 2007).

The adaption of the tool for NPs in this study is given in Table 2. Each item is measured on a 4-point Likert-type response format, where the response options are strongly disagree 5 1, tend to disagree 5 2, tend to agree 5 3, and strongly agree 5 4. The 8th and 10th JSATPNC items from Table 2 are reverse scored before analysis, as prescribed from previous literature. Therefore, one overall score could range from 15 to 60 theoretically. Higher sum scores on the JSATPNC indicate more positive attitudes toward physician-nurse collaboration.

Assessing Reliability and Validity

Reliability was assessed in this study via internal consistency using Cronbach's alpha. Factorial validity was examined using ordinal CFA through specification and testing of previously reported factor structures of the JSATPNC. Previous literature has reported most findings in three ways: (a) as one overall summated scale of the 15 items, (b) as four summated subscales that correspond to those given in the second column of Table 2, and (c) per the three factors detailed in the third column of Table 2. Therefore, the following hypotheses regarding factor structure were specified in advance: (a) Test if Item 14 from Table 2 loaded on multiple factors akin to Hojat et al. (1999) in a four-factor model or if simple structure did not significantly degrade model fit, (b) Test if Item 12 from Table 2 loaded on multiple factors akin to Ward et al. (2008) in a three-factor model or if simple structure did not significantly degrade model fit, (c) if (a) provided evidence that simple structure was adequate, test if a one-factor model with all 15 items provided adequate fit compared to a four-factor structure, and (d) if (b) provided evidence that simple structure was adequate, test if a one-factor model with all 15 items provided adequate fit compared to a three-factor structure.

Before performing the aforementioned, we sought to describe our sample of NPs and examine the distributions of the ordinal items from the instrument. Descriptive statistics such as frequency, percentage, mean, SD, median, min, and max were used to initially summarize the survey responses. Ordinal CFA was carried out using the method of mean- and variance-adjusted weighted least squares (WLSMV) using Mplus v7.0 (Muthén & Muthén, 1998-2012) to model the polychoric correlations among the JSATPNC items, similar to methods used by previous researchers when tool items have ordinal responses (Tluczek, Henriques, & Brown, 2009). This approach was taken because each item was measured using a 1 (strongly disagree) to 4 (strongly agree) Likert-type response format, and where assumptions of multivariate normality were questionable based on multivariate Q-Q plotting and testing (Mardia skewness x2[df 5 680] 5 29,284.0, p , .001; Mardia kurtosis x2[df 5 1] 5 42,388.7, p , .001). Estimation using WLSMV has been shown to give better results relative to other estimation methods (Flora & Curran, 2004). CFA goodness of fit was assessed (Yu, 2002) using the root mean square error of approximation (RMSEA), the comparative fit index (CFI), and the weighted root mean square residual (WRMR). The x2/df ratio as a measure of fit was not used because of the reasons given in Kline (2011). All chi-square difference testing was performed using the DIFFTEST procedure in Mplus, ands according to Muthén & Muthén (1998-2012) and Brown (2006). A two-sided p value , .05 was considered statistically significant.

RESULTS

Sample Description

There were 915 participants recruited from all 4,673 practicing licensed NPs in North Carolina into this study (20% response rate), whereas 844 provided complete responses and comprise the analysis set for this report. Specialty was available on both the list of all NPs and from the sample survey, where the percentages by each specialty for list versus sample were as follows: Family 52.9% versus 46.2%, Adult 17.3% versus 20.0%, Gerontological 2.1% versus 4.6%, Pediatric 7.1% versus 10.9%, Neonatal 4.5% versus 6.6%, Women 2.9% versus 4.9%, Acute Care 2.8% versus 3.6%, and Psychiatric 2.7% versus 4.0%. Further evaluation of nonresponse was approximated through assessment of response latency. Specifically, continuous response latency was analyzed according to items and scale scores in a Continuum of Resistance (CoR) approach (Blocker, Ip, & McCoy, 2012; Filion, 1976; Fitzgerald & Fuller, 1982; Lin & Schaeffer, 1995). This approach considers late responders as if they are a proxy for nonresponders so that if response latency is strongly associated with study variables, then there might be nonresponse bias present. In this study, this analysis did not suggest presence of bias from late versus early responders. Response latency was not associated with JSATPNC scores (p 5 .4646) and the R2 from this analysis was only .0006, suggesting almost no shared variation was observed between response latency and scores. Similar results were found using the three-factor subscales that are detailed in the following text (all R2 # .01).

Descriptive statistics for the surveyed sample can be found in Table 3. Most NPs were between the ages of 35 and 64 years (82%) and 93% were female. Eighty-nine percent self-identified as non-Hispanic White, 4.9% were African American, 1.7% were Hispanic/ Latino, 0.8% were American Indian, 1.5% were Asian/Pacific Islander, and 1.3% reported being other/mixed. Eighty-seven percent had their NP master's degree, whereas 3.1% had their doctor of nursing practice (DNP) and 2.0% had their PhD. Almost half (47.0%) of respondents reported Family Nurse Practitioner as their primary specialty and 85.0% worked full time.

Measurement

The JSATPNC items as adapted for NPs in this report can be found in Table 2, along with their relation to previously reported factor structures and corrected item-total correlations. All corrected item-total correlations were at least 0.30, except for Item 8 (0.21; "Doctors should be the dominant authority in all health care matters") and for Item 13 (0.16; "NPs should clarify a Doctor's order when they feel it might have the potential for detrimental effects on the patient"). The average inter-item correlation was 0.35 (SD 5 0.08).

TABLE 3. Sample Demographics and Characteristics of the Nurse Practitioner Respondents (n = 844)

Characteristic	*N* (%)
Gender	
Female	785 (93.0)
Male	56 (6.6)
N/A	3 (0.4)
Race	
Asian/Pacific Islander	13 (1.5)
Black or African American	41 (4.9)
White/Non-Hispanic	753 (89.2)
Hispanic/Latino	14 (1.7)
American Indian	7 (0.8)
Other/Mixed	11 (1.3)
N/A	5 (0.6)
Degree	
Certificate	57 (6.8)
Master's	731 (86.6)
DNP	26 (3.1)
PhD	17 (2.0)
Other	13 (1.5)
Primary specialty as nurse practitioner (check all that apply)[a]	
Family	394 (46.7)
Adult	175 (20.7)
Gerontological	38 (4.5)
Pediatric	97 (11.5)
Neonatal	60 (7.1)
Women	40 (4.7)
Acute care	30 (3.6)
Psychiatric	33 (3.9)
Other	42 (5.0)
Employment status	
Full time	717 (85.0)
Part time	100 (11.9)
Flexible time	27 (3.2)

Note. N/A = not applicable.

[a]Respondents could have chosen multiple specialties; however, percentage is still percent of 844.

CFA goodness-of-fit indices and chi-square difference testing for testing study hypotheses are presented in Table 4. Solutions for the four-factor models were improper, where at least one correlation among factors was .1. Therefore, fit indices and all other results from these solutions should be interpreted with caution. For model M1 from Table 2 that allowed Item 14 to load to both "shares education and collaboration" (S) and "nurse's autonomy" (N), this item's estimated standard errors were highly inflated relative to the other items, its squared multiple correlation

was undefined, its residual variance .1, and the correlation between S and N was .1. For the four-factor model with simple structure where Item 14 only loading on S, all standard errors were stable and residual variances ,1, but there were still estimated correlations between factors .1 between S and N, and also between N and "Caring versus curing" (C). Therefore, we do not present results in Table 4 or otherwise for chi-square difference testing with the four-factor models and could not verify if a four-factor model, either with or without complex structure for Item 14, fit substantially better than the other models. Given this, several remedial strategies and sensitivity analyses were carried out post hoc and are detailed next.

One such strategy was to perform the analyses for the four-factor models but after dichotomizing the indicators into 0 for strongly disagree and tend to disagree and 1 for tend to agree and strongly agree similar to Sousa, Kwok, Ryu, and Cook (2008). Doing so and carrying out the prior analyses for the four-factor models still resulted in improper solutions and therefore no further results from these analyses based on dichotomized indicators are detailed.

Another strategy that was carried out was to add model constraints that might possibly be conceptually agreeable to see if such a reduced parameterization led to proper solutions (Wothke, 1993). The first constrained model considered was to constrain factor loadings to be equal (Wothke, 1993). This type of constraint is akin to a one-parameter logistic item response theory (1PL IRT) model for dichotomous items that do not allow item discrimination to vary by item compared to a two-parameter logistic (2PL) IRT model that allows item-specific discrimination parameters to be estimated (Brown, 2006; Glöckner-Rist & Hoijtink, 2009). This constrained model led to a proper solution, but the estimated correlations between N and S and between N and C were extremely high (...; ...), possibly suggesting that these two factors could be tapping into a similar latent trait and potentially be combined. This constrained four-factor model also fit significantly better than a one-factor model with all loadings constrained to be equal (Dx2 5 214.7, Ddf 5 6, p , .0001). This constrained four-factor model was not directly formally compared to an unconstrained one-factor model because they were not nested.

TABLE 4. Goodness-of-Fit Indices From Ordinal CFA in *Mplus* (n = 844)

Model	χ^2 (df)	χ^2 p value	RMSEA	90% CI for RMSEA	CFI	WRMR	Improper Solution?[a]
M1. 4 Factors, 1 complex item[b]	516.983 (83)	<.0001	.079	(.072, .085)	0.860	1.751	Yes
M2. 4 Factors	560.331 (84)	<.0001	.082	(.076, .088)	0.846	1.834	Yes
M3. 3 Factors, 1 complex item[c]	554.545 (86)	<.0001	.080	(.074, .087)	0.849	1.829	No
M4. 3 Factors	554.607 (87)	<.0001	.080	(.074, .086)	0.849	1.832	No
M5. 1 Factor	748.182 (90)	<.0001	.093	(.087, .099)	0.788	2.158	No
Chi-square difference testing[d]	$\Delta\chi^2$	Δdf	p value				
3 Factors: Complex vs. Simple	2.461	1	.1167				
3 Factors vs. 1 Factor	165.337	3	<.0001				

Note. CFA = confirmatory factor analysis; RMSEA = root mean square error of approximation; CFI = comparative fit index; WRMR = weighted root mean square residual.

[a]At least one error term was estimated to be negative (Heywood case) or correlation(s) among factors >1. [b]Item 14 specified to load on Factor 1 (Items 1, 3, 6, 9, 12, 14, and 15) and Factor 3 (Items 5, 11, 13, and 14). [c]Item 12 specified to load on Factor 1 (Items 1, 4, 11, 12, 13, 14, and 15) and Factor 2 (Items 2, 3, 5, 6, 7, 9, and 12). [d]Null hypothesis: The fit of the reduced model (each listed second here) does not have significantly degraded fit (Brown, 2006).

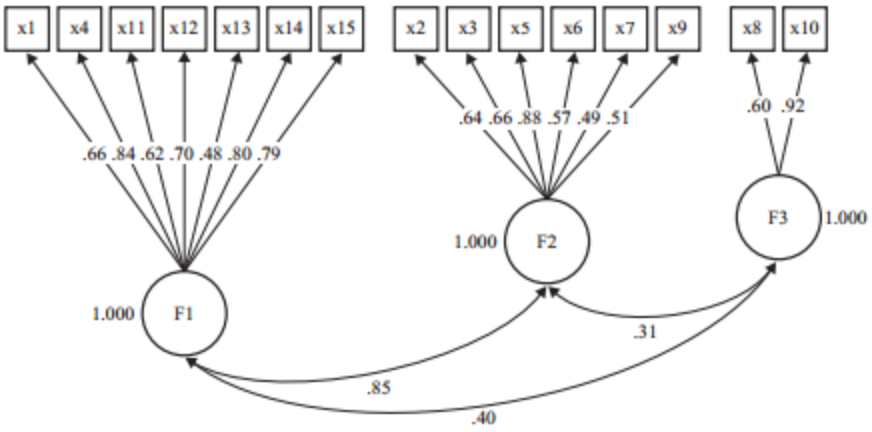

Figure 1. Estimated path diagram for CFA of JSATPNC with three factors, standardized solution.

Returning attention to other results from proper solutions, chi-square difference testing for the previous three-factor model from Ward et al. (2008) suggested a model with simple structure where Item 12 only loads to Factor 1 does not significantly degrade model fit compared to a model that allows complex structure (Dx2 5 2.461, Dxdf 5 1, p 5 .1167). This simple structure three-factor model was then formally compared to the one-factor model. The fit of a one-factor model was significantly degraded compared to the three-factor model (Dx2 5 165.3, Ddf 5 3, p , .0001). The absolute model fit of this three-factor structure was borderline (RMSEA 5 .080; 90% CI for RMSEA5 .074, .086; CFI 5 .85). The absolute model fit of the one-factor model was poorer (RMSEA 5 .090; 90% CI for RMSEA 5 .087, .099; CFI 5 .79). The path diagram of the standardized solution for this three-factor model is given in Figure 1. All items had an estimated standardized loading of at least 0.48, and all were statistically significant (all $p < .0001$).

Although we do not emphasize an overall score for 15 JSATPNC items, Cronbach's alpha (a) for the 15 items was .72. The estimated reliabilities for the three-factor model subscales were 0.61 for Factor 1, 0.62 for Factor 2, and 0.54 for Factor 3. Descriptive statistics (mean 6 SD [min, max]) for summated scores for each of these subscales were as follows: 23.16 6 1.33 (11, 24) for Factor 1, 22.41 6 1.69 (8, 24) for Factor 2, and 6.70 6 1.15 (2, 8) for Factor 3. These reliability estimates are lower than desired but consistent with previous studies that suggested multiple factors within the JSATPNC (Jones & Fitzpatrick, 2009; Ward et al., 2008).

DISCUSSION

Findings from CFA suggested that a three-factor structure of attitudes toward physician-NP collaboration among NPs had improved fit relative to a one-factor structure consistent with Ward et al. (2008). Previous researchers examining the JSATPNC with anesthesiologists and CRNAs concluded that reliability of an overall score was adequate whereas reliability of subscales was not acceptable (C. Taylor, personal communication, February 14, 2011), similar to this study. We also found reliability results consistent with Ward et al. (2008) reporting a three-factor structure of the JSATPNC.

Also, item analysis suggested that corrected total item correlations were lower than desired for two items: Item 8 and Item 13. This could potentially be so because of the presence of dimensionality among the items, so that based on this study an overall total score may not be

appropriate. The overall total did have improved reliability (a 5 0.72) relative to the three subscales, but based on CFA results suggesting multiple factors, this finding might be most explained by the greater number of items comprising an overall score.

Another interesting finding for the three-factor structure was that the estimated correlation among Factors 1 and 2 was .85, whereas this was lower for Factors 1 and 3 (...) and Factors 2 and 3 (...). This might possibly suggest enough overlap between Factors 1 and 2 so that they might be combined because they could be tapping into the same latent trait. An additional post hoc analysis where these two factors were combined was performed and this two-factor structure formally compared to the one-factor model. The model fit of the two-factor structure was still significantly better than the one-factor model structure (Dx2 5 130.0, Ddf 5 1, p , .0001). Taken together with the corrected item-total results, these findings suggest that Items 8 and 10, which were previously labeled as a "physician's dominance" subscale, may ask about a different aspect of attitudes toward collaboration than the rest of the items and suggest a distinct dimension that is manifesting itself in the CFA results presented here.

Strengths of the study include a large sample size obtained from an attempted statewide census of all practicing NPs in North Carolina, and a confirmatory approach. Study limitations include a lower response rate, and only NPs were surveyed (not physicians additionally). Studying collaboration levels among physicians also motivates future study, so that comparisons to attitudes of NPs can be explored. Invariance testing could also be conducted to see if the proposed measurement model from this study is consistent across physicians and NPs potentially.

Evidence of construct validity for the JSATPNC using overall three collaboration subscale scores was suggested by this study, but reliability was lower than desired. For the latter, this is probably indicated because of the number of items per subscale so that perhaps augmenting the tool with additional but similar items in those subscales could help. This tool could potentially provide a useful measure for future studies examining collaboration as a means to foster evidence-based practice. Future studies are needed to replicate these findings regarding validity and reliability.

References:

Blocker, J. N., Ip, E., & McCoy, T. P. (2012, July). Evaluating nonresponse bias in a survey of high-risk drinking among college students using a continuous measure of response latency. Poster session presented at Joint Statistical Meetings of the American Statistical Association, San Diego, CA.

Brown, T. A. (2006). Confirmatory factor analysis for applied research. New York, NY: Guilford Press.

D'Amour, D., & Oandasan, I. (2005). Interprofessionality as the field of interprofessional practice and interprofessional education: An emerging concept. Journal of Interprofessional Care, 19(Suppl. 1), 8-20. http://dx.doi.org/10.1080/13561820500081604

Dillon, P. M., Noble, K. A., & Kaplan, L. (2009). Simulation as a means to foster collaborative interdisciplinary education. Nursing Education Perspectives, 30(2), 87-90.

Dougherty, M. B., & Larson, E. (2005). A review of instruments measuring nurse-physician collaboration. The Journal of Nursing Administration, 35(5), 244-253. http://dx.doi.org/00005110-200505000-00008

Filion, F. (1976). Exploring and correcting for nonresponse bias using follow-ups of nonrespondents. Pacific Sociological Review, 19, 401-408.

Fitzgerald, R., & Fuller, L. (1982). I hear you knocking but you can't come in: The effects of reluctant respondents and refusers on sample survey estimates. Sociological Methods and Research, 11(1), 3-32.

Flora, D. B., & Curran, P. J. (2004). An empirical evaluation of alternative methods of estimation for confirmatory factor analysis with ordinal data. Psychological Methods, 9(4), 466-491.

Glöckner-Rist, A., & Hoijtink, H. (2009). The best of both worlds: Factor analysis of dichotomous data using item response theory and structural equation modeling. Structural Equation Modeling, 10(4), 544-565.

Goldman, J., Zwarenstein, M., Bhattacharyya, O., & Reeves, S. (2009). Improving the clarity of the interprofessional field: Implications for research and continuing interprofessional education. The Journal of Continuing Education in the Health Professions, 29(3), 151-156. http://dx.doi. org/10.1002/chp.20028

Hatcher, L. (1994). A step-by-step approach to using SAS for factor analysis and structural equation modeling. Cary, NC: SAS.

Henneman, E. A., Lee, J. L., & Cohen, J. I. (1995). Collaboration: A concept analysis. Journal of Advanced Nursing, 21(1), 103-109.

Hojat, M., Fields, S., Veloski, J., Griffiths, M., Cohen, M., & Plumb, J. (1999). Psychometric properties of an attitude scale measuring physician nurse collaboration. Evaluation & the Health Professions, 22(2), 208-220.

Hojat, M., Gonnella, J. S., Nasca, T. J., Fields, S. K., Cicchetti, A., Lo Scalzo, A., ... Torres-Ruiz, A. (2003). Comparisons of American, Israeli, Italian, and Mexican physicians and nurses on the total and factor scores of the Jefferson scale of attitudes toward physician-nurse collaborative relationships. International Journal of Nursing Studies, 40(4), 427-435. http://dx.doi.org/S0020748902001086

Hojat, M., Nasca, T. J., Cohen, M. J., Field, S. K., Rattner, S. L., Griffiths, M., ... Garcia, A. (2001). Attitudes toward physician-nurse collaboration: A cross-cultural study of male and female physicians and nurses in the United States and Mexico. Nursing Research, 50(2), 123-128.

Jones, T. S., & Fitzpatrick, J. J. (2009). CRNA-physician collaboration in anesthesia. AANA Journal, 77(6), 431-436.

Kline, R. (2011). Principles and practice of structural equation modeling. New York, NY: Guilford Press.

Lin, I.-F., & Schaeffer, N. (1995). Using survey participants to estimate the impact of nonparticipation. Public Opinion Quarterly, 59, 236-258.

Martin, J. S., Ummenhofer, W., Manser, T., & Spirig, R. (2010). Interprofessional collaboration among nurses and physicians: Making a difference in patient outcome. Swiss Medical Weekly, 140, w13062. http://dx.doi.org/10.4414/smw.2010.13062smw-12648

Muthén, L. K., & Muthén, B. O. (1998-2012). Mplus User's Guide (7th ed.). Los Angeles, CA: Muthén & Muthén.

Orchard, C. A., Curran, V., & Kabene, S. (2005). Creating a culture for interdisciplinary collaborative professional practice. Medical Education Online, 10.

Polit, D. F. (2010). Statistics and data analysis for nursing research (2nd ed.). Upper Saddle River, NJ: Pearson.

Sousa, K. H., Kwok, O.-M., Ryu, E., & Cook, S. W. (2008). Confirmation of the validity of the HAQ-DI in two populations living with chronic illnesses. Journal of Nursing Measurement, 16(1), 31-42.

Sterchi, L. S. (2007). Perceptions that affect physician-nurse collaboration in the perioperative setting. AORN Journal, 86(1), 45-57. http://dx.doi.org/10.1016/j.aorn.2007.06.009

Tabachnick, B., and Fidell, L. (2007). Using Multivariate Statistics, 5th ed. Needham Heights, MA: Allyn & Bacon.

Taylor, C. L. (2009). Attitudes toward physician-nurse collaboration in anesthesia. AANA Journal, 77(5), 343-348.

Tluczek, A., Henriques, J. B., & Brown, R. L. (2009). Support for the reliability and validity of a six-item state anxiety scale derived from the state-trait anxiety inventory. Journal of Nursing Measurement, 17(1), 19-28.

Van Winkle, L. J., Fjortoft, N., & Hojat, M. (2011). Validation of an instrument to measure pharmacy and medical students' attitudes toward physician-pharmacist collaboration. American Journal of Pharmaceutical Education, 75(9), 178. http://dx.doi.org/10.5688/ajpe759178

Ward, J., Schaal, M., Sullivan, J., Bowen, M. E., Erdmann, J. B., & Hojat, M. (2008). The Jefferson scale of attitudes toward physician-nurse collaboration: A study with undergraduate nursing students. Journal of Interprofessional Care, 22(4), 375-386. http://dx.doi. org/10.1080/13561820802190533

Wothke, W. (1993). Nonpositive definite matrices in structural modeling. In K. A. Bollen & J. S. Long (Eds.), Testing structural equation models. Newbury Park, CA: Sage.

Yildirim, A., Ates, M., Akinci, F., Ross, T., Selimen, D., Issever, H., ... Akgün, M. (2005). Physician-nurse attitudes toward collaboration in Istanbul's public hospitals. International Journal of Nursing Studies, 42(4), 429-437. http://dx.doi.org/10.1016/j.ijnurstu.2004.07.007

Yu., C. Y. (2002). Evaluating cutoff criteria of model fit indices for latent variable models with binary and continuous outcomes. Doctoral dissertation, University of California, Los Angeles.

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