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Self-Perceived Pain Assessment Knowledge and Confidence (Self-PAC) Scale for cancer and palliative care nurses: A preliminary validation study

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ABSTRACT

Background: Pain is highly prevalent in all health care settings, and frequently poorly managed. Effective pain management is predicated on a continuous cycle of screening, assessing, intervening and evaluating. Identifying gaps in nurses' self-perceived pain assessment competencies is an essential first step in the design of tailored interventions to embed effective pain assessment into routine clinical practice, and improve patient reported pain outcomes. Yet, few validated instruments focus on the competencies required for undertaking a comprehensive pain assessment, with most focusing on clinician's pain management competencies.

Aim: To examine the validity of the 'Self-Perceived Pain Assessment Knowledge and Confidence' (Self-PAC) Scale, a survey instrument designed to assess nurses' pain assessment knowledge and confidence.

Design: Preliminary validation of the Self-PAC Scale

Setting: Australian cancer and palliative care services.

Participants/subjects: Cancer and palliative care nurses

Methods: The Self-PAC Scale was administered to participants online. Factor Analyses, including Exploratory and Confirmatory, were applied to examine the structural validity, Cronbach's alpha was calculated for internal consistency. Criterion validity was investigated by comparing responses from experienced and non-experienced nurses.

Results: Two components resulted with a single factor structure for pain assessment confidence and a two-factor structure for the knowledge of pain assessment. The factor loading for the subscales ranged from 0.653 to 0.969, and Eigen values of 4.73 and 2.41 with a large proportion of the variances explained by the factors. Cronbach's alpha of the subscales ranged from 0.87-0.92 and significant difference in responses were found between experienced and non-experienced nurses.

Conclusion: Preliminary validation of the Self-PAC Scale suggests that it is a helpful measure for assessing nurse' pain assessment competencies.

Key words: Cancer, Clinical Competence, Nurses, Pain Assessment, Palliative Care, Validation Studies

INTRODUCTION

Pain is one of the most universally feared but common symptoms experienced by people living with chronic illnesses, including cancer. Determining the source of the patients' pain is more complex when there are multiple comorbidities with different pathophysiology (i.e. osteoarthritic or herpes simplex pain in the patient with advanced lung cancer). Pain is experienced by 30-75% of people with cancer and rated as moderate to severe by 40-50%, as severe by 25-30%, and is under-identified and under-treated in up to half of cases (van den Beuken-van Everdingen et al., 2007). Inadequate recognition and/or treatment of cancer pain leads to depression, social isolation, poor sleep, weight loss, unnecessary suffering, and reduction in household income due to an inability to work. In older cancer patients there are added risks of decreased mobility, function and falls (Paice & Ferrell, 2011). The net result of unrelieved pain in the elderly is deconditioning, gait abnormalities, accidents, poly-pharmacy, and/or cognitive decline (Kaye, Baluch, & Scott, 2010).

Pain is a complex multifactorial subjective phenomenon, influenced by a range of physical, social, spiritual and psychological factors. The inherently subjective nature of pain makes seeking patients' self-reports of this experience the best source of primary information (National Comprehensive Cancer Network, 2011). Yet unrelieved cancer pain persists despite international and national guidelines recommending actions that are achievable with minimal resource requirements, such as: implementing routine pain screening and assessment, providing regular and breakthrough analgesia and patient education (Dy et al., 2008; Foley, 2011). Despite the prevalence of cancer pain within specialist cancer and palliative care settings, and the specialist training of clinicians' working in this area, there is often poor compliance with routine pain screening and assessment practices.

Most nurses and clinicians, instead of seeking a patient reported numerical rated pain score (NRS), adopt informal screening approaches and, if a pain intensity rating is sought, it is frequently not documented (Dy et al., 2008; Franck & Bruce, 2009; Miaskowski, 2010). This practice persists despite guidelines recommending the regular use of pain rating scales in ambulatory, primary-community care and acute care settings be adopted (American Geriatrics Society, 2002; Australian Adult Cancer Pain Management Guideline Working Party, 2014a), and evidence that a comprehensive pain assessment improves nurses' understanding of the pain status of individual hospitalised patients (Australian and New Zealand Society for Geriatric Medicine, 2012).

There are distinct conceptual differences between screening, assessing and managing pain. Assessing pain, requires an understanding of the disease and its treatment, pain experience

(location, interference, timing, description, aggravating and relieving factors), pain meaning, psychological and cognitive functioning (Australian Adult Cancer Pain Management Guideline Working Party, 2014b) Despite the complexity of assessing these various domains, the most widely used instrument, the "Knowledge and Attitudes Survey Regarding Pain" tool, focuses exclusively on appraising nurses cancer pain management capabilities (Ferrell & McCaffrey, 2012). A comprehensive literature search failed to identify any instruments that focus exclusively on appraising cancer and palliative care nurses' capacity to undertaking a comprehensive pain assessment as a distinct clinical competency. The availability of such an instrument would help identified gaps in nurses' pain assessment practices, inform the development of tailored interventions to address these gaps and as well as detecting changes in their self-perceived pain assessment capabilities over time. This study reports the results of the preliminary validation of an instrument designed to measure the self-perceived pain assessment competencies among cancer and palliative care nurses.

OBJECTIVES

To undertake a preliminary validation of the 'Self-Perceived Pain Assessment Knowledge and Confidence '(Self-PAC) Scale, an instrument designed to measure cancer and palliative care nurses' pain assessment capabilities.

Conceptual Framework

Effective pain management is dependent upon nurses being able to recognise their patients' pain, comprehensively assess each patient's pain experience, and being motivated to act to ameliorate pain (Franck & Bruce, 2009). Nurses also need the confidence to communicate the pain assessment findings to others in a clinically meaningful format and to overcome any personal power issues that may be at play within the interdisciplinary team (Campbell-Yeo, Latimer, & Johnston, 2008). Having the confidence and belief to achieve this desired outcome is shaped by an individual's efficacy expectation or self-efficacy (Bandura, 1977). The constructs of self-efficacy and confidence are strongly linked and underpin an individual's confidence and belief to attain a specific objective and achieve the desired behavioural change (Phillips, Salamonson, & Davidson, 2011). Self-efficacy underpins the comprehensive pain assessment process and influences nurses' confidence to effectively assess and communicate pain assessment findings. Implementing routine screening, undertaking robust assessment and initiating appropriate management tailored to each patient's unique pain experience and evaluating the impact of any pain management strategy requires nurses to apply different clinical knowledge, skills and decision-making capabilities to these distinct but interrelated pain assessment and management processes.

METHODS

Study design: A validation study.

Sample and setting: All registered and enrolled nurses employed within two established specialist palliative care services and five inpatient and/or ambulatory cancer care settings in New South Wales, Australia were invited to participate in the study.

Ethics: Ethical approval from relevant health service and university human ethics research committees was obtained prior to the study commencing.

The design and development of the Self-PAC Scale:

The design of the instrument was based on a comprehensive review of the literature and a desktop review of the assessment recommendations contained with several evidence based international and national clinical practice cancer pain guidelines (Australian Adult Cancer Pain Management Guideline Working Party, 2014a; National Comprehensive Cancer Network, 2011; Ripamonti, Santini, Maranzano, Berti, & Roila, 2012). The assumption underpinning each of these guidelines is that effective cancer pain management is dependent upon all clinicians having the prerequiste 'knowledge' and 'confidence' to assess and diagnose a patients pain(s), before initiating an individually tailored treatment plan, suggesting that knowledge and confidence are central constructs in relation to pain assessment competency.

These guidelines all stress the importance of undertaking a comprehensive assessment, and while there is no one recommended pain assessment tool, the clinician is required to understand each assessment tools' different features and apply the tool according to the patient's clinical status. For example, if the person has cognitive impairement then a pain assessment tool, such as the Abbey Pain Scale (Abbey et al., 2004) which has been validated for this population is recommended, while the Brief Pain Inventory (Cleeland & Ryan, 1994) is recommended for use with people with cancer (Australian Adult Cancer Pain Management Guideline Working Party, 2014b). Cancer and palliative care nurses need to understand the applicability of commonly used pain assessment tools to different populations. In addition to assessing pain severity, the guidelines recommend that the pain experience (location, interference with activities, timining), a description of the aggravating and relieving factors is sought, and that the pain is differentiated as nocieptive or neuropathic pain.

Each pain assessment knowledge and confidence scale item was based on the assessment elements reflected in these various evidence based guidelines (Australian Adult Cancer Pain Management Guideline Working Party, 2014a; National Comprehensive Cancer Network,

2011; Ripamonti et al., 2012). These key assessment elements were translated into the conceptual constructs upon which the items were created. The items were then presented to a small group of cancer and palliative care nurses (n=6) to seek their views on the phraseology, content, and acceptability. Responses on each item obtained were taken into consideration for its suitability to be included in the pool. As a result the wording and contents of some items were modified.

At the end of this item formation exercise, a total of 24 items were generated as the initial item pool in preparation for the psychometric analyses. These items reflected the two main constructs namely: 1) pain assessment knowledge; and 2) confidence to undertake a comprehensive pain assessment. In terms of the format for the responses to these items, an 11-point Likert scale was adopted ranging from no knowledge/not at all confident (0) through to excellent knowledge/very confident (10) to reflect the degrees of self-perceived knowledge or confidence. These scale items were then incorporated into a pen-and-paper and online survey, depending on participants preferences. Also included in the questionnaire were some demographic questions for the purpose of statistical analyses.

Psychometric analyses

Since two constructs (1) cancer pain assessment knowledge; and 2) confidence) were identified *a priori* from the guidelines, and items were generated in accordance to these constructs, these two aspects of the scale were analysed separately. The validity and internal reliability or consistency of the scale was examined. For face validity, the six member panel provided assurance for the face validity of the items. The construct validity, particularly the structural validity of the scale, was investigated using the Classical Test Theory approach with both Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). The reason for the application of the EFA was that the items of the scale had not been subjected to any item analyses or validation process before, although conceptually they were generated from recommendations of several pain assessment guidelines. To ensure the final scale consisted of a set of most parsimonious items, the EFA was applied as an initial screening for the most appropriate items to be included.

Data were analysed using the SPSS V23.0 statistical software. The EFA was conducted after applying the Bartlett's Test of Sphericity and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy. Data were subjected to the EFA using the Maximum Likelihood method for covariance structure analysis with Varimax rotation. A selection criterion of an Eigen value >1.0 was used for the rejection of inappropriate factors. For the empirical determination

of the acceptable number of factors the Scree Plot method was used. A factor loading value of 0.4 was used as selection criteria for the retention of items. Any items with a factor loading of 0.4 or larger on two or more factors were also deemed to be unacceptable. After removal of each unacceptable item from the initial subscales, the EFA was re-run to determine changes in the factor structure. These procedures were iterated until no more items were rejected.

To further examine the factorial structure, Confirmatory Factor Analysis (CFA) was conducted using the path analysis approach with the Maximum Likelihood methods on the sample for each subscale. The goodness-of-fit of the factorial model to the data was examined using multiple criteria. These included the Reduced Chi-squared statistics (χ^2/df), Comparative Fit Index (CFI), Root Mean-Square Error of Approximation (RMSEA), and the Akaike Information Index (AIC) with a χ^2/df <5, CFI>0.90, RMSEA<0.05, and a lower AIC indicating a better fitted model. To determine internal reliability of each aspect of the scale Cronbach's alpha coefficients were calculated. To further examine the criterion validity of each subscale, comparisons of the scores obtained on these subscales were conducted between more experienced (≥11 years) and less experienced (<11 years) nurses. For the multiple outcome measures, the Multivariate Analysis of Variance (MANOVA) technique was applied.

Data analysis

A significance level of 5% was employed for all hypothesis testing. The dataset was cleaned prior to data analysis, and the completeness of data was examined. Results indicated that there were no missing values in all items that were subjected to the EFA or CFA.

RESULTS

Sample characteristics

The sample characteristics were summarised in Table 1. The Self-PAC Scale was completed by 186 participants, largely composed of female (93%), registered nurses (92%), with a mean age of 40.6 years (SD ± 12.1). Most participants worked within the inpatient setting (85%) and cared for palliative care patients (61%). More than half (69%) had less than 11 years' experience caring for cancer and/or palliative care patients. Nearly all (94%) were involved in managing patients' pain more than once per day. Participants rated the quality of on-site cancer pain education as adequate with mean values of 5.9 (SD ± 2.5) on a scale from 0 to 10.

Insert Table 1

Table 1. Participants' demographics and palliative care experience (N=186)

Structural validity

For the knowledge component of the scale, the KMO value was 0.869 with the Barlett's test yielding a chi-squared value of 565.14.16, df=45 ($p<0.001$), suggesting the items were suitable for Factor Analysis. The results obtained from the EFA on these items suggested a two-factor structure based on the Scree Plot methods in conjunction with the selection criteria of an Eigen value >1.0. Of the 12 items subjected for the FEA, 2 attained a factor loading less than 0.40. After removal of the unqualified items and re-submission of the data for further EFA, 10 items remained in the scale yielding a two-factor structure with a factor loading range from 0.653 to 0.969, and Eigenvalues of 4.73 and 2.41 with 71.43% of the total variance explained (Table 2). These factors, based on the nature of the items included in each factors, reflected two different underlying constructs of knowledge, namely knowledge of pain assessment and knowledge of pain assessment tools, such as the Brief Pain Inventory (Cleeland & Ryan, 1994). For the confidence component, the KMO value was 0.880 and the Barlett's test yielded a chi-squared value of 391.44.16, df=21 ($p<0.001$) suggesting the items were also suitable for Factor Analysis. Results obtained from the initial run of the EFA indicated that four items did not attain a factor loading of 0.40 and they are removed from the analysis. Further EFA yielded a single factor model with items' factor loading ranging from 0.680 to 0.936 with an Eigenvalue of 4.65, and explained 66.36% of the total variance of the data (Table 2). Confirmatory Factor Analyses (CFA) was also conducted on the items of the two sub-scales. The goodness-of-fit statistics of the two models for the subscales are summarised in Table 3. Figure 1 depicts the CFA factor structure diagram of the knowledge subscale, corresponding information for the confidence subscale is presented in Table 2. In comparison to the stated model goodness-of-fit criteria, both the two-factor model for knowledge and the single factor model for confidence fitted well to the data satisfying most of the criteria except the RMSEA. These results further provided evidence for the structural validity of these subscales.

Insert Table 2

Table 2. Factor loadings obtained from the Confirmatory Factor Analysis, item and total correlations, and Cronbach's alpha of each sub-scale (N=186)

Insert Table 3

Table 3. Goodness-of-fit statistic obtained from the Confirmatory Factor Analysis for different model fits

Insert Figure 1

Figure 1. Confirmatory Factor Analysis for the Knowledge Sub-scale using Path Analysis Approach

Internal consistency

The internal consistency of these subscales was also examined resulting Cronbach's alpha values of 0.94 for the pain assessment knowledge subscale, 0.86 for the pain assessment tool knowledge subscale, and 0.91 for the confidence subscale. Table 2 also presents the item and total correlations for the subscales. As shown, the majority of the correlations were high.

Criterion validity

The criterion validity of each subscale was examined based on the hypothesis that participants with more cancer and palliative care nursing experience would have higher levels of pain assessment knowledge, knowledge of pain assessment tools, and pain assessment confidence. Comparisons among groups indicated that there were significant differences in all three domains between groups (Table 4).

Insert Table 4

Table 4. Results on the comparisons of each subscales scores by year of nursing experience

DISCUSSION

An analysis of the Self-PAC Scale suggests that it is an instrument with the potential to appraise cancer and palliative care nurses' pain assessment knowledge and their self-perceived confidence to systematically and comprehensively assess pain. Using data collected as part of two recently completed palliative care (blinded) and cancer pain assessment translational research studies (blinded), this validation study has demonstrated that the Self-PAC Scale has good face validity, content validity, construct validity, predictive validity and internal consistency, based on the EFA, comparisons, and Cronbach's alpha.

These nurses had moderately high levels of general pain assessment knowledge, but lower levels of pain assessment tool knowledge. As could be expected, they were most familiar with the tools used to capture patient reported pain scores, such as the Visual Analogue and Categorical Pain Scales, which are essentially screening and not assessment tools. Whereas, they had much less knowledge about the Brief Pain Inventory, the comprehensive pain

assessment tools recommended in various evidence based cancer pain guidelines (Australian Adult Cancer Pain Management Guideline Working Party, 2014a; National Comprehensive Cancer Network, 2011) or pain assessment tools that are suitable for use with people with cognitive impairment (Abbey et al., 2004). Despite these knowledge gaps, these nurses were confident that they had the required capabilities to assess their patients' pain.

In this sample, nurses who had more cancer and/or palliative care experience scored higher on the scale conferring confidence in the psychometric properties of the Self-PAC Scale. It is logical that nurses who have been working longer in the specialist cancer or palliative care settings where pain is a common symptom, ought to demonstrate better pain assessment capabilities compared to nurses' with less specialist complex pain care experience.

The unique attribute of the Self-PAC Scale is that it focuses solely on the domains of effective pain assessment practices. The few identified instruments assessing pain competencies were configured to assess overall pain management capabilities, as opposed to just pain assessment, and were either discipline specific (Ferrell & McCaffrey, 2012; Whedon, 2010) or a disease specific inventory (Brophy, Dalton, & White). The most commonly quoted instrument, The 'Knowledge and Attitudes Survey Regarding Pain' tool has established content validity, internal consistent reliability (alpha $r > .70$) and test-retest reliability ($r > .80$), when used to assess nurses and other health professionals as a pre and post-test evaluation measure for pain management educational programs (Ferrell & McCaffrey, 2012). There is no published evidence that the other similar pain management instruments have undergone any form of validation (Brophy et al.; Whedon, 2010). The brevity and simplicity of the 17 item Self-PAC Scale, which is much shorter and quicker to administer than other similar measures, makes it a potentially relevant and appealing instrument, especially if the outcome of interest is clinicians' pain assessment capabilities either at baseline or as a pre-post-test evaluation measure.

Limitations

This sample was composed of mostly registered nurses within two specialist palliative care and five cancer care services in one State in Australia, which may limit the generalisability of these results to other disciplines and clinical specialties. The quasi-experimental design of the translational research projects from which this validation data was collected prevented completion of test-re-test validity, but evaluating this aspect of the tool in future validation is recommended. A correlation with other relevant validated instruments is required to further

validate the Self-Pac Scale's psychometric properties. Other checks, such as concurrent validity using another pain assessment instruments, should also be conducted to provide further evidence for the validity of this newly developed scale.

IMPLICATIONS FOR NURSING

The Self-PAC Scale is, to our knowledge, the only instrument to focus exclusively on nurses' pain assessment capabilities as a stand-alone clinical competency. Identifying gaps in nurses' self-perceived pain assessment competencies is a critical first step in the design and development of tailored interventions to embed effective pain assessment into routine clinical practice, and improve patient reported pain outcomes. There is potential to utilise the Self-PAC scale for professional development initiatives targeting pain assessment and management practices in other clinical settings.

CONCLUSIONS

Appraising levels of perceived pain assessment capability is a tangible and viable approach to assessing the capacity of clinicians to comprehensively assess their patients' reports of pain. The Self-PAC Scale is a short, easy to administer instrument with good psychometric qualities that provides insights into clinicians' pain assessment capabilities, identifying clinicians' pain assessment strengths and areas that ought to be the focus of targeted continuing professional development or practice change, or translational research endeavours.

Further evaluation of the Self-PAC Scale instrument in other professional groups and settings is warranted given the increasing importance of developing targeted interventions designed to improve patient reported pain outcomes.

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Table 1. Participants' demographics and palliative care experience (N=186)

Demographics and experience	**Frequency (%) or Mean (s.d.)/Median**
Sex	
Female	173 (93%)
Male	13 (7%)
Age	
Mean (s.d)	40.6 (12.1)
Median	40.0
Discipline	
Registered Nurse	171 (92%)
Enrolled Nurse	15 (8%)
Specialist Palliative Care setting	
Inpatient unit	158 (85%)
Community	28 (15%)
Years caring for palliative care patients	
<11 years	128 (69%)
≥11 years	58 (31%)
Frequency of palliative patients' pain management	
≤ once per day	11 (6%)
≥ several times per day	174 (94%)

Table 2. Factor loadings obtained from the Confirmatory Factor Analysis, item and total correlations, and Cronbach's alpha of each sub-scale (N=186)

Items	**Description**	**Pain assessment knowledge**		**Pain assessment tool knowledge**		**Pain assessment confidence**	
		Factor Loadings	Item correlation	Factor Loadings	Item correlation	Factor Loadings	Item correlation
1	Measuring changes in pain severity over time	0.855	0.92**				
2	Identifying neuropathic pain	0.836	0.84**				
3	Assessing the location of the pain	0.824	0.89**				
4	Applying the psychosocial elements of pain assessment	0.808	0.85**				
5	Categorical pain scale (mild, moderate or severe)	0.797	0.81**				
6	Assessing the patient's understanding of their pain	0.771	0.92**				
7	Visual analogue scale (0-10)	0.744	0.76**				
8	Brief Pain Inventory (BPI)			0.969	0.92**		
9	Abbey Pain Scale			0.739	0.90**		
10	McGill Pain Questionnaire			0.653	0.63**		
11	Conducting a comprehensive pain assessment					0.936	0.92**
12	Documenting your pain assessment findings					0.898	0.89**
13	Identifying if a patient is in pain					0.824	0.83**
14	Reassessing your patients' pain					0.813	0.84**
15	Responding to patient reports of pain					0.796	0.79**
16	Reporting pain assessment findings to the doctor					0.725	0.81**
17	Differentiating between nociceptive and neuropathic pain					0.680	0.79**
Cronbach's alpha			0.944		0.846		0.912
Eigen value		4.73		2.41		4.65	
Variance explained		47.33%		24.10%			
Total Variance explained		71.43%			66.36%		

**p<0.01

Table 3. Goodness-of-fit statistic obtained from the Confirmatory Factor Analysis for different model fits

Models	χ^2/df	CFI	RMSEA	AIC	AIC of Independent Model
Knowledge					
Two-factor Model	2.45	0.914	0.140	145.33	646.85
Confidence					
Single factor Model	2.66	0.940	0.150	79.26	426.93

Table 4: Results on the comparisons of each subscales scores by year of nursing experience

Subscale	Mean (s.e)	Results on comparisons
Pain assessment knowledge		
<11 years	6.6 (0.1)	$F_{(1,184)}$ =12.92, p<0.001
≥11 years	7.6 (0.2)	
Pain assessment tool knowledge		
<11 years	3.1 (0.3)	$F_{(1,184)}$ =11.04, p=0.010
≥11 years	4.7 (0.4)	
Confidence		
<11 years	7.2 (0.1)	$F_{(1,184)}$ =9.54, p=0.002
≥11 years	7.9 (0.2)	

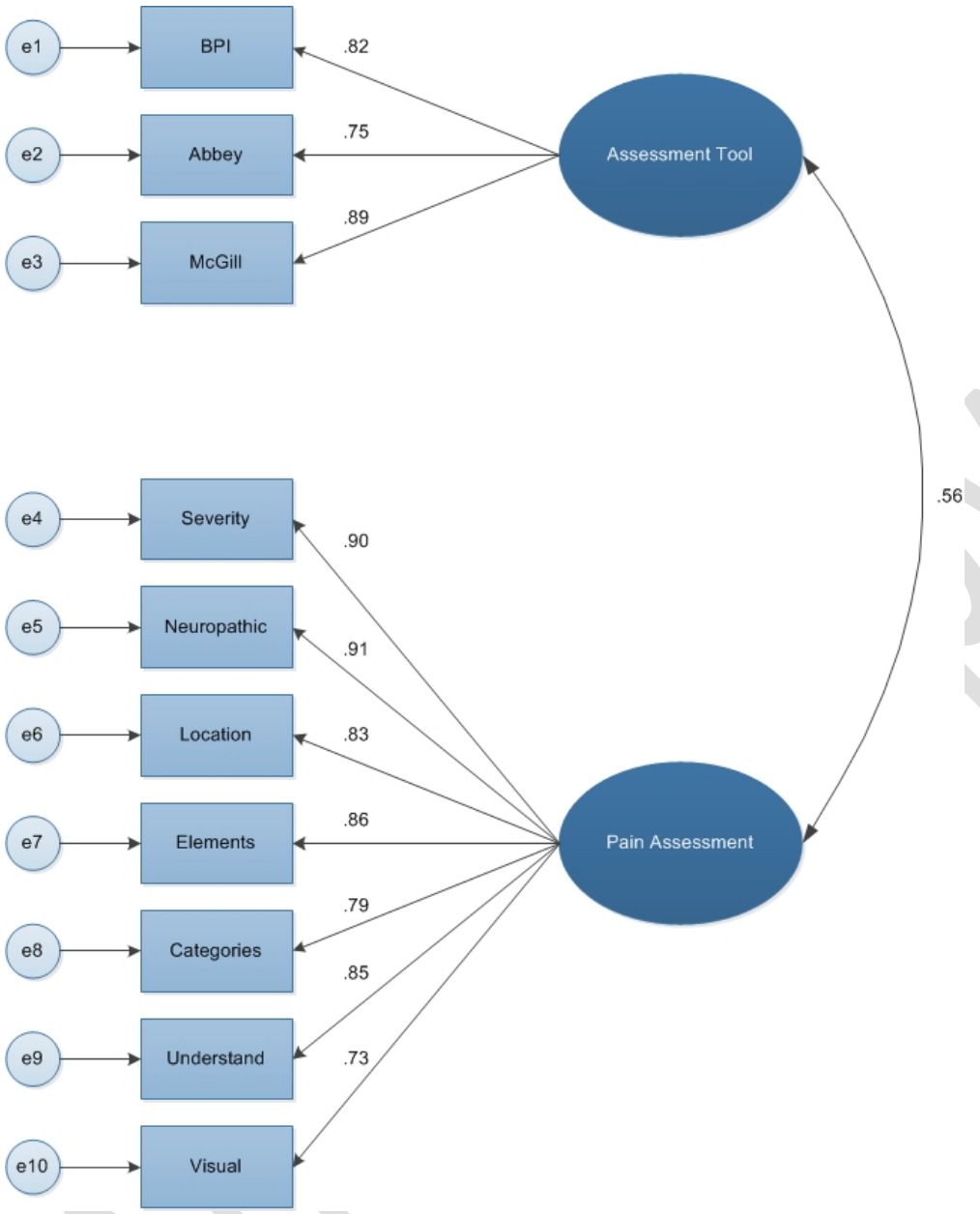

Figure 1. Confirmatory Factor Analysis for the Knowledge Sub-scale using Path Analysis Approach