

# **Development and Validation of a Questionnaire to Assess Evidence-Based Practice and Evidence-Informed Practice Knowledge, Attitudes, Understanding and Behaviour**

## **Abstract**

Good-quality questionnaires are needed to assess the effectiveness of educational programmes on undergraduate healthcare students' knowledge, attitudes, understanding and behaviour regarding evidence-based practice and evidence-informed practice. However, there is currently no available questionnaires designed to evaluate the outcomes of evidence-based practice and evidence-informed practice education. Based on the methods proposed by Streiner et al. (2015), this study developed and validated a questionnaire for assessing evidence-informed practice and evidence-based practice knowledge, attitudes, understanding, self-perceived application and use, and behaviour among undergraduate pre-registration students in the nursing and allied health disciplines. 73 questionnaire items were developed and administered to varied groups of people, including students and academics. Principal component analysis was conducted to reduce dimensions and establish construct validity and internal consistency of the developed questionnaire. Following pilot-testing and expert review, the final validated questionnaire consists of 53 items (8 demographic items, 25 evidence-based practice items, and 20 evidence-informed practice items). The evidence-based practice and evidence-informed practice questionnaire is a valid and reliable tool to measure the outcomes of evidence-based practice and evidence-informed practice education.

**Key words:** Allied health, evidence-based practice, evidence-informed practice, healthcare students, nursing, principal component analysis, questionnaire

## **1.1. Background**

Good-quality questionnaires are needed to assess the effectiveness of educational programmes on undergraduate healthcare students' knowledge, attitudes, understanding and behaviour regarding evidence-based practice and evidence-informed practice. Sackett et al. (1996, p.7) defined evidence-based practice as the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients. The implementation of evidence-based practice means "integration of individual clinical expertise with the best available external clinical evidence from systematic research". Evidence-informed practice, on the other hand, is defined by Nevo and Slovin-Nevo (2011) as an approach to patient care where:

“Practitioners are encouraged to be knowledgeable about findings coming from all types of studies and to use them in an integrative manner, taking into consideration clinical experience and judgment, clients’ preferences and values, and context of the interventions” (p. 18).

While there is a plethora of empirical evidence on evidence-based practice assessment instruments (Hendricson et al., 2011), there is currently a lack of instruments designed to assess the outcomes of evidence-informed practice education. Besides, a review of the literature revealed that the majority of existing instruments used for evaluating the outcomes of evidence-based practice educational programmes were primarily targeted at medical students and practicing healthcare professionals (Patelarou et al., 2017; Shaneyfelt et al., 2006; Rengerink et al., 2013). Thus, there is limited empirical evidence of validated evidence-based practice assessment instruments developed for students in undergraduate nursing and allied health disciplines (such as physiotherapy, occupational therapy, and speech and language therapy).

## **1.2. Aim**

The aim of this study was to develop and validate a questionnaire for assessing evidence-informed practice and evidence-based practice knowledge, attitudes, understanding, and behaviour among undergraduate pre-registration students in the nursing and allied health disciplines.

## **1.3. Methods**

The methods used in developing and validating the questionnaire was based on those proposed by Streiner et al. (2015). Streiner et al. (2015) recommend that prior to the development of a new measurement scale in health sciences, it is essential to first determine whether there are existing measurement scales that might suit the purpose. Hence, Streiner et al. (2015) suggest that researchers first conduct a comprehensive literature search to identify existing questionnaires on the subject matter. If there are existing questionnaires, the next step is to judge the usefulness of existing questionnaires to one’s research. This includes determining whether the tool has been validated and the population it was developed for. If the literature search reveals no existing questionnaires, Streiner et al. (2015) recommend developing a new tool by: first, generating items for the questionnaire; second, pilot testing the items; third, revising items if needed; and fourth, checking for reliability and generalisability of the developed questionnaire.

In the current study, the four processes described by Streiner and colleagues were followed to develop and validate the questionnaire. These processes are presented under two main subheadings: the questionnaire development process, and the questionnaire validation process.

### **1.3.1. *The questionnaire development process***

To identify items for the questionnaire, a comprehensive systematic literature search was conducted (using CINAHL, Medline, ERIC, and PsycINFO databases). The aim of the search was to identify articles reporting on questionnaires designed for the assessment of evidence-based practice and/or evidence-informed practice knowledge, attitudes, understanding and behaviour.

The review identified measurement tools/questionnaires used in assessing the outcome of, particularly, evidence-based practice educational programmes. There were no assessment tools/questionnaires developed for measuring the outcome of evidence-informed practice educational programmes. Consequently, in the current study, the items for the evidence-informed practice questionnaire were developed based on the elements and factors of the evidence-informed practice model (Figure 1.1), originally developed by McSherry (2007) and recently revised in Kumah et al. (2022).

The evidence-based practice questionnaire items, on the other hand, were collated from existing questionnaires on evidence-based practice, including those reported by Johnston et al. (2003), Jette et al. (2003), Bennet et al. (2003), Gerrish et al. (2007), Fritsche et al. (2002), and Thiel and Gosh (2008). Further items were added to the questionnaire to collect respondents' demographic data.

Overall, the initial draft questionnaire comprised of 73 questions contained in 5 sections (i.e., demographics, knowledge, attitudes, understanding, and behaviour). With the exception of the demographic section of the questionnaire, the remaining four sections employed a Likert style response set, containing five options: 'strongly agree', 'agree', 'neutral', 'disagree', and 'strongly disagree'; or 'daily', 'every other day', 'weekly', 'monthly', and 'never'. To avoid response order bias (Lavrakas, 2008), these options were sometimes presented in a reversed manner.

### **1.3.2. Questionnaire validation process**

#### **1.3.2.1. Ethical considerations**

Ethical approval to conduct this study was obtained from the Teesside University School of Health and Life Sciences Research Ethics Committee (study number: 011/18).

#### **1.3.2.2. Recruitment and data collection**

A purposive sampling strategy was employed, in order to select respondents for the validation process.

Eligible participants were full time pre-registration undergraduate and master's level social work students studying in universities across the North of England. The decision to use social work students for the questionnaire validation was informed by literature on evidence-based practice and evidence-informed practice. From a comprehensive literature review conducted by the researchers, the social work profession seemed to have an appreciation towards both evidence-based practice and evidence-informed practice. Relative to other health and social care disciplines, the literature reveals a number of articles on the need for social work practitioners to adopt and implement evidence-informed practice, as opposed to evidence-based practice (See for example, Dodd and Savage, 2016; Nevo and Slovin-Nevo, 2011). Dodd and Savage (2016) had even gone further to develop, define, and describe an evidence-informed practice model within the social work context.

Five universities across the North of England were invited to participate in the study.

#### **1.3.2.3. Content and face validity of the initial draft evidence-based practice and evidence-informed practice questionnaire**

Content validity was tested by experts in the research team. The research team consisted of five academics: a physiotherapist, a professor of nursing and practice development, a professor of psychology, a health economist, and a nurse researcher. The method developed by Lawshe (1975) was used in measuring the content validity of the questionnaire. Lawshe (1975) provides a method for evaluating agreement amongst judges or raters concerning the appropriateness and importance of questionnaire items. Hence, in the current study, the experts reviewed each item of the questionnaire, and the suitability and relevance of each questionnaire item was discussed. Where the majority (two or more) of the experts indicated that a particular item was unnecessary, the item was deleted.

Face validity was measured through a pilot test, using five doctoral level students studying in the field of health sciences, as well as a research associate with many years of experience in

questionnaire development. Among the five doctoral students, two were in their third year of study, two were in their second year of study, and one was in the first year of study. These individuals were asked to provide verbal feedback on the readability and whether or not the questionnaire items were difficult to comprehend. The amount of time used in completing the questionnaire was also recorded.

Feedback received from the expert review and the pilot test was used to revise the questionnaire, reducing the number of items to a total of 67. Of the 67 items, 8 assessed respondents' demographic characteristics, 30 evaluated evidence-based practice education, and 29 assessed evidence-informed practice education.

#### **1.3.2.4. Sample size**

In this study, the respondent-to-item ratio proposed by Gorusch (1983) was used to estimate the sample size. As proposed by Gorusch (1983), 5 respondents were used to validate each item on the questionnaire. Thus, we expected to recruit at least 335(= 67x5) respondents for the validation study.

#### **1.3.2.5. Construct and Criterion Validity of the evidence-based practice and evidence-informed practice questionnaire**

Construct validity measures the extent to which a questionnaire represents the domain or construct that it intends to measure. Construct validity is essential for determining the overall validity of an assessment tool (Middleton, 2019). In this study, construct validity was tested by conducting principal component analysis for each item set using direct oblimin oblique rotation, with pairwise deletion of missing values. The Keiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity were used to assess the factor loadings. Questionnaire items with a factor loading less than 0.4 were deleted.

Criterion validity, on the other hand, assesses the extent to which the results of a questionnaire correspond to the results of a different test (Middleton, 2019). In this study, however, criterion validity was not explicitly addressed. This is because, as reported in the background section of this paper, there is no existing measurement tool that assesses the outcomes of evidence-based practice and evidence-informed practice education on undergraduate pre-registration nursing and allied health students.

### **1.4. Analysis and Results**

All statistical tests and data analyses were performed using the SPSS software version 24.

#### **1.4.1. Participants**

Of the five invited universities, only one agreed to participate in the study. Hence, a total of 200 undergraduate and 34 master's pre-registration social work students who had enrolled in the 2017/2018 academic year were invited to participate in the study; of whom 46 agreed to participate. This translated into a response rate of 19.7%. The sample was highly disproportionate in respect to gender, as majority of the respondents were female (91.3%). However, this result reflects the distribution of social work students in the study setting. The majority of respondents were between the age range of 26-30. The median age of respondents was 31.50. Table 1.1 presents the characteristics of respondents.

#### **1.4.2. Questionnaire readability test results**

To assess the readability ease of the questionnaire, the questionnaire items were entered into a readability test tool (the Flesch reading ease test tool), available at <https://www.webfx.com/tools/read-able/check.php>.

The Flesch reading ease test score of the questionnaire was 57.8. This implies that the questionnaire should be easily understood by 14- to 15-year-olds (i.e., pupils in secondary school year 10 in England).

#### **1.4.3. Principal Component Analysis**

Principal component analysis was conducted on questionnaire items with the Likert response options; 'strongly agree', 'agree', 'neutral', 'disagree', 'strongly disagree'; and 'daily', 'every other day', 'weekly', 'monthly', 'never'. In all, 49 questionnaire items were included in the analysis, of which 25 were evidence-based practice items and 24 were evidence-informed practice items. Separate analysis was conducted for the evidence-based practice and the evidence-informed practice set of items.

Under each of the concepts, the questionnaire items were grouped based on their response options (i.e., 'strongly agree', 'agree', 'neutral', 'disagree', 'strongly disagree'; and 'daily', 'every other day', 'weekly', 'monthly', 'never') and separate principal component analysis was performed. The rationale for this is that, as stated by Jolliffe and Cadima (2016), the properties of principal component analysis have some undesirable features if items with different response options (units of measurement) are included in the same analysis. Principal component analysis is defined by a criterion (variance) that is reliant on response options; hence, principal components based on the covariance matrix  $S$  will change, if the response options on one or more of the items are different (Jolliffe and Cadima, 2016).

The questionnaire items included in the analysis are presented in Table 1.2.

#### **1.4.3.1. Principal component analysis: evidence-based practice**

Following the initial principal component analysis, a total of 5 evidence-based practice items with the response options, 'strongly agree', 'agree', 'neutral', 'disagree', 'strongly disagree', were deleted as they did not meet the minimum criteria of having at least one correlation with another variable (item), where the correlation coefficient ( $r$ )  $\geq 0.3$ . In addition, the deleted items had a primary factor loading less than 0.4. However, all the items with the response option, 'never', 'monthly', 'weekly', 'every other day', 'daily', were retained.

Finally, two separate principal component analysis was conducted: one for the 13 items with response options, 'strongly agree', 'agree', 'neutral', 'disagree', 'strongly disagree', and another for the 7 items with response options, 'daily', 'every other day', 'weekly', 'monthly', 'never'. Before the analysis, a number of criteria were used to assess the suitability of principal component analysis. Firstly, inspection of the correlation matrix indicated that all the remaining questionnaire items recorded at least one correlation coefficient greater than 0.3. This suggests a reasonable level of correlation among the items. Secondly, the overall Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.740 for the 13 set of items and 0.772 for the 7 set of items. Individual KMO measures for both sets of items were all greater than 0.6, which is good or "middling" according to the Kaiser's (1960) classification of measure values. This indicates adequacy of sampling and supports the inclusion of each set of items in the analysis. Moreover, the diagonals of the anti-image correlation matrix for both sets of items were all over 0.5. In addition, the communalities for both sets of items were all above 0.4, suggesting that each item shared some common variance with other items. Bartlett's test of sphericity was statistically significant for both set of items (i.e.,  $\chi^2(78) = 239.02$ ,  $p < 0.05$ , for the 13 set of items; and  $\chi^2(78) = 239.02$ ,  $p < 0.05$  for the 7 set of items), signifying that principal component analysis was appropriate for the data set.

Principal component analysis of the 13 and 7 sets of items revealed four and two components, respectively. All the four components produced by the 13 set of items had eigenvalues greater than 1, which explained 35.7%, 15.8%, 10.4%, and 8.8% of the total variance, respectively. Visual inspection of the scree plot also confirmed that all the four components should be retained. There were strong loadings of 'attitudes towards evidence-based practice' items on Component 1 (5 items), 'knowledge in evidence-based practice' items on Component 2 (3 items), 'understanding of evidence-based practice' items on Component 3 (3 items), and a

fourth Component revealed through the analysis, included items about 'application and personal use of evidence-based practice' (2 items).

The two components produced by the 7 set of items had eigenvalues greater than one, which explained 59.5 and 16.0 of the total variance, respectively. Both components were retained because they met the interpretability criterion. In addition, inspection of the scree plot suggested that the two components should be retained. Five (5) items measuring 'behaviour towards evidence-based practice' loaded strongly on Component 1, while Component 2 included 2 items regarding 'application and personal use of evidence-based practice'. Component loadings and communalities of the rotated solutions for the 13 and 7 sets of items are presented in Table 1.3 and Table 1.4, respectively.

#### **1.4.3.2. *Principal component analysis: evidence-informed practice***

After the initial principal component analysis, a total of 9 (out of the 21) evidence-informed practice items with the response options, 'strongly agree', 'agree', 'neutral', 'disagree', 'strongly disagree', were deleted. This is because, they had a factor loading less than 0.4 and failed to meet the minimum criteria of having at least one correlation with another variable (item), where  $r \geq 0.3$ . Nonetheless, all the 3 items with the response options, 'daily', 'every other day', 'weekly', 'monthly', 'never', were retained.

Consequently, 12 items with response options, 'strongly agree', 'agree', 'neutral', 'disagree', 'strongly disagree'; and 3 items with response options, 'daily', 'every other day', 'weekly', 'monthly', 'never' were included in the final analysis. Separate principal component analysis was conducted on these sets of items using direct oblimin oblique rotation. The appropriateness of principal component analysis was assessed prior to the analysis. The results produced by the correlation matrix table indicated that, in both sets of items, there was a high correlation among the items, with a correlation coefficient of at least 0.3. Moreover, the diagonals of the anti-image correlation matrix for both sets of items were all over 0.5. Also, the communalities for both sets of items were all above 0.5, suggesting that each item shared some common variance with other items. The overall KMO measure was 0.750 for the 12-items set and 0.687 for the 3-items set, with individual KMO measures for both sets of items all greater than 0.6; classifications of middling to mediocre, as described by Kaiser (1960). The Bartlett's test of sphericity results for both sets of items were statistically significant (i.e.  $\chi^2(66) = 289.06, p < 0.05$ , for the 12 set of items, and  $\chi^2(3) = 106.08, p < 0.05$  for the 3 set of items), indicating that principal component analysis was appropriate for the data set.



Principal component analysis of the 12-items set revealed three components that had eigenvalues greater than one and explained 74.54% of the total variance of the data. The 3-items set, on the other hand, extracted only one component with eigenvalues greater than one, and explained 83.78% of the total variance. Visual inspection of the scree plots for both sets of items showed that all the extracted components (i.e., three components for the 12-item set and one component for the 3-items set) should be retained. The extracted components were consistent with the domains that the questionnaire was designed to measure. The component loadings and communalities of the rotated solution for the 12-items and 3-items sets are presented in Table 1.5.

#### **1.4.4. Reliability results**

The reliability of the developed questionnaire was tested by assessing the internal consistency of the sorted set of items, using Cronbach's alpha. Separate analysis was conducted for the evidence-based practice and the evidence-informed practice questionnaire items.

The Cronbach's alpha value for 'knowledge in evidence-based practice' was 0.57; 0.73 for 'understanding of evidence-based practice'; 0.87 for 'attitude towards evidence-based practice', and 0.90 for 'behaviour towards evidence-based practice'. Two separate internal consistency analyses were conducted for the domain, 'personal application and use of evidence-based practice', based on their response options ("strongly agree", "agree", "neutral", "disagree", "strongly disagree"; and "daily", "every other day", "weekly", "monthly", "never"). The Cronbach's Alpha values for these sets of items were 0.60 for the items with the response options, "strongly agree", "agree", "neutral", "disagree", "strongly disagree", and 0.64 for the items with the response options, "daily", "every other day", "weekly", "monthly", "never".

These values indicate an acceptable level of internal consistency (DeVellis, 2003). The corrected item-total correlation for all the domains were greater than 0.2, suggesting a high level of correlation between the items in each domain.

Cronbach's Alpha for "knowledge in evidence-informed practice" was 0.93; 0.78 for "understanding of evidence-informed practice; and 0.90 for "behaviour towards evidence-informed practice". These values demonstrate a high level of internal consistency for the domains (DeVillis, 2003). All the items in the assessed domains were highly correlated, as determined by corrected item-total correlations of 0.3 and above. The internal consistency of the 'Attitude' domain was not assessed as it only contained one item.

### **1.5. Discussion**

This paper presents the processes used in developing and validating the evidence-based practice and evidence-informed practice questionnaire. The questionnaire was designed to measure the outcomes of evidence-based practice and evidence-informed practice education among undergraduate pre-registration students in the nursing and allied health disciplines (including midwifery, physiotherapy, social work, occupational therapy, operating department practice studies, diagnostic radiography, dental hygiene and dental therapy, dental nurse practice, and paramedic practice). Principal component analysis was conducted to reduce dimensions and establish construct validity and internal consistency of the developed questionnaire.

The questionnaire was found to be a valid and reliable tool to measure the outcomes of evidence-based practice and evidence-informed practice education. The final questionnaire consists of 53 items, after 14 items were deleted, because they each recorded cross-loadings less than 0.3 (Peterson, 2000) and component loadings  $\leq 0.4$  (Merenda, 1997). The remaining 53 items loaded strongly on the appropriate factor and each item produced a cross-loading of 0.3 or greater, with a factor loading  $> 0.4$ , indicating a simple structure. Of the 53 questionnaire items, there are 8 items on demographic characteristics, 25 items measuring the outcomes of evidence-based practice, and 20 items on evidence-informed practice.

The questionnaire was originally designed to measure evidence-based practice and evidence-informed practice knowledge, attitudes, understanding, and behaviour. However, principal component analysis revealed that the evidence-based practice questionnaire items measured five distinct domains: 1) knowledge in evidence-based practice, 2) attitudes toward evidence-based practice, 3) understanding of evidence-based practice concepts, 4) behaviour towards evidence-based practice, and 5) self-perceived application and use of evidence-based practice. Contrarily, the evidence-informed practice questionnaire items assessed four domains of evidence-informed practice: 1) knowledge in evidence-informed practice, 2) attitudes toward evidence-informed practice, 3) understanding of evidence-informed practice concepts and 4) behaviour towards evidence-informed practice.

The items contained in the new evidence-based practice domain, “self-perceived application and use of evidence-based practice”, were initially hypothesised to be measuring “behaviour towards evidence-based practice”. However, principal component analysis revealed that the items were more associated with the uptake and implementation of evidence-based practice. This is not surprising, because “behaviour” is a broad concept that can further be recategorised. Moreover, as emphasised by Novak and McIntyre (2010), positive behaviour

towards evidence-based practice results in enhanced uptake and application of evidence-based practice.

Out of the 53 questionnaire items, 35 items (20 evidence-based practice items and 15 evidence-informed practice items) are scored on a Likert-style scale of 5 to 1. A higher score indicates greater knowledge and understanding in evidence-based practice and evidence-informed practice, as well as more positive attitudes and behaviour toward evidence-based practice and evidence-informed practice.

Cronbach's alpha for evidence-based practice understanding, behaviour, and attitudes were  $> 0.7$ . This result signifies adequate psychometric properties, similar to that of previous studies reported by researchers including Ruzafa-Martinez et al. (2013), Rice et al. (2010), and Johnston et al. (2003). However, the evidence-based practice domains, "knowledge" and "self-perceived application and use", recorded relatively low Cronbach's alpha values of 0.5 and 0.6, respectively. The reason for these low alphas may be due to the limited number of items in the domains. Downing (2003) justifies that in reliability testing, the Cronbach's alpha values are affected by the number of items in the scale (domain) designed to measure a particular construct. Thus, the more items there are in a domain, the more reliable the measurement scale. Another reason for the low alphas may be that one or more items do not measure the same domain as the other items (Hendricson et al., 2011). Regarding the evidence-informed practice items, Cronbach's alpha for all the assessed domains were  $> 0.7$ , with the knowledge and behaviour domains recording alpha values of 0.9, which indicates a high correlation among the items in the domains.

### **1.6. Limitations of the study**

The current study has potential limitations. The main limitation is with regards to the small sample size. The researchers expected to recruit a minimum of 335 respondents for the validation study, however, only 46 respondents agreed to participate in the study. Hence, the statistical results of this study may not be generalisable as the sample is not representative of the population. There may also be a possibility of recall bias regarding issues with definitions/understanding of key terms related to evidence-based practice/evidence-informed practice, which may have affected the results of the study. Furthermore, due to the lack of literature on evidence-informed practice assessment instruments, the evidence-informed practice questionnaire items developed for this study was entirely new. The validity and reliability results of this study indicate that the questionnaire items are suitable for measuring the outcomes of evidence-informed practice education. However, there is a need for further research in the area of evidence-informed practice educational programmes, as well as tools used in assessing the outcomes of the educational programmes.

### **1.7. Conclusion and relevance for clinical practice**

While only social work students participated in the questionnaire validation process, it is important to note that the validated questionnaire is applicable to all undergraduate pre-registration nursing and allied health disciplines and can be used for assessing students' competencies in applying evidence into clinical practice following completion of an evidence-based practice and evidence-informed practice course.

The questionnaire is a valid and reliable tool to measure knowledge, attitudes, understanding and behaviour of undergraduate pre-registration nursing and allied health students regarding evidence-based practice and evidence-informed practice. In addition, the evidence-based practice questionnaire items can be used to assess the uptake and implementation of evidence-based practice among undergraduate students. It is anticipated that the questionnaire developed in this study will be a valuable tool to healthcare educators, curriculum designers, and training institutions, for measuring the effectiveness of evidence-based practice as well as evidence-informed practice educational programmes among undergraduate students.

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## 1.8. References

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