

# Readability, stability, and internal consistency of a new psychometric inventory on evidence-based practice in physiotherapy

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## Abstract

Evidence-based practice (EBP) has, in the last decade, gained global prominence in health care professions because it provides the framework for lifelong and self-directed learning. These traits are crucial for the continued provision of quality health care. This study sets out to develop a culturally appropriate instrument to measure physiotherapists' knowledge, beliefs, attitudes, and behaviors relative to the use of EBP and establish the instruments' psychometric properties. A 53-item EBP inventory that consisted of seven parts – sociodemographic, EBP competence and behaviors, perceived knowledge of EBP, perceived skills and resources, attitudes about EBP, and barriers related to the use of EBP – was created. The instrument was administered to 25 physiotherapists within a two-week interval on two occasions. The Flesch-Kincaid Reading Ease and Flesch-Kincaid scores for the instrument were 49.5 and 8.3, respectively. Its Cronbach alpha range from "fair" (0.333,  $p < .001$ ) to "almost perfect" (0.837,  $p < .001$ ). The test-retest (stability) scores for the instrument parts were significantly ( $\chi^2 = 4.738$ ,  $p < .038$ ) different for only one (competence on EBP) of the seven factors. The overall findings revealed the instrument is relatively easy to comprehend, highly stable, and internally consistent. The availability of this instrument will promote further studies of EBP in physiotherapy.

**Keywords:** *Evidence-Based Practice, Psychometric Instrument, Readability, Stability, and Internal Consistency*

## Introduction

The roots of evidence-based practice (EBP) started over 3,000 years ago in Egypt with crude experiments to test the effectiveness of bloodletting (Zimmerman, 2013). In 1972, Archie Cochrane advocated testing the effectiveness of health care strategies with randomized controlled studies. Sackett and associates (1966) defined EBP as integrating best research evidence with clinical expertise and patient values to improve patient outcomes. In 2009, Satterfield et al. developed a

trans-disciplinary model that included organizational context as the fourth EBP component (Sackett et al., 1996).

Evidence-based practice is not a static state of knowledge but represents a continually evolving state of information (Sackett et al., 2000). Its inclusion in the healthcare process requires modification in practice, self-directed learning, and a favourable work environment that provides a framework for lifelong and self-directed learning, which is crucial for the continued provision of quality care in physical therapy (Ramírez-Vélez et al., 2015; Jody, 2002). EBP is one of the five core competencies recommended by the USA Institute of Medicine to be included in the curriculum of medical and allied health professions to adequately prepare clinicians to practice in the twenty-first-century healthcare system (Institute of Medicine of the National Academies, 2001; 2003).

Several studies around the world have developed inventories to evaluate the knowledge, attitudes, behaviour's, skills, and resources, and barriers that mitigate against the implementation of EBP in physical therapy (Jette et al. 2003; Iles and Davison, 2006; Akinbo et al., 2008; Da Silva et al., 2014; Yahui 2017; Alshehri et al., 2017). Unfortunately, only one of the previous studies (Alshehri et al., 2017) presented limited information on their inventory's psychometric properties. Thus, the findings from the earlier studies may not be reliable and externally valid. There is an urgent need for an EBP inventory that is easy to understand, accurate, and compelling.

Our primary study objectives were to develop a culturally appropriate instrument to measure the knowledge, beliefs, attitudes, and behaviours of Nigerian physiotherapists relative to EBP and establish the new tool's psychometric properties.

## **Methods**

### ***Sample and Experimental Design***

Twenty-five physiotherapists participated in this test-retest quasi-experimental design study (Cook and Campbell, 1979). We purposively recruited all grade levels of licensed physiotherapists on full-time employment in the clinical and academic settings at the tertiary hospitals in Borno state. Recent graduates and those with less than three years of clinical experience and employed part-time were excluded from the study.

### **Sample size estimation**

Before data collection, we determined the sample size needed for the study under the following conditions. A hypothetical correlation coefficient of 0.60 (substantial correlation), at an alpha (two-tailed) level of 0.05 (threshold probability to reject the null hypothesis - Type I error rate) and  $\beta$  (the likelihood of failing to reject the null hypothesis under the alternative hypothesis - Type II error rate) set at 0.20. Using the UCSF online calculators for these specified conditions, the study will require a minimum sample size of 19 subjects (Kohn and Senyak, 2020). The sample size of 25 physiotherapists in this study exceeded the estimated minimum sample size of 19 required.

### **Instrument development**

The investigators developed the EBP instrument evaluated in this study (Appendix). Several items were adopted from previous instruments and modified to improve structure and comprehension. The investigators constructed the items in Parts 1 and 2 of the instruments. Part 1 sought socio-demographic information such as age, years of clinical experience, gender, marital status, highest education, employment, clinical specialty, and employment setting. Part 2 consists of eleven multiple-choice questions designed to assess respondents' actual knowledge (i.e., competence) of

EBP. Each item has a "Yes," "No," or "Don't Know" response option. The minimum competence score is 0, and the maximum possible score is 11. For each subject, we computed the aggregate EBP competence score by adding up the number of correct responses out of eleven questions and expressed as a percentage. The minimum and maximum possible scores are 0 and 100% for the actual knowledge component part. A high aggregate score indicates that the respondent is knowledgeable (competent) about EBP.

The items in Part 3 were adapted from a previous study from Brazil by Da Silva et al. (2014). Part 3 of the instrument is on EBP-related behaviors. It consists of four multiple-choice questions about strategies used for updating self professionally, the database used by respondents for literature search, the frequency of database used in the last six months, and where respondents undertake database search. Part 4 of the instrument is on perceived (self-report) knowledge of EBP. It consists of seven items on which respondents were instructed to indicate their opinion on a five-point Likert scale (1=strongly disagree, 2=partially disagree, 3=neutral, 4=partially agree, and 5=strongly agree). The seven items are:

1. I was not taught EBP during my university training.
2. Since I graduated, I have attended workshops on EBP
3. I currently have an excellent knowledge of EBP.
4. I now implement the core elements of EBP in my clinical practice
5. I have excellent knowledge of research designs.
6. I have an excellent knowledge of statistical data analysis.
7. I do have an interest in gaining additional knowledge of EBP.

We derived for each respondent an aggregate perceived (self-report) knowledge of EBP score by adding up the seven questions. The minimum and the maximum possible score are 7 and 35, respectively. A high aggregate score indicates the individual considers him/herself to be knowledgeable about EBP.

Part 5 is on perceived (self-report) skills and resources and consists of eight items. Respondents indicate their opinion on a 5-point Likert scale (1=strongly disagree, 2=partially disagree, 3=neutral, 4=partially agree, and 5=strongly agree). The eight items are:

1. I have the skills to perform searches through databases.
2. I have the skills to evaluate published scientific articles critically.
3. We are rewarded for implementing EBP in my workplace.
4. I have computer/internet access in the workplace that I use for EBP.
5. I regularly discuss EBP at work with my colleagues.
6. I regularly inform my patients of the effective treatment options.
7. I consider the patient's treatment preferences in my clinical decision
8. I try to use the best scientific evidence in my clinical practice.

We computed each respondent's aggregate perceived (self-report) skills and resources for EBP by adding up the eight questions. The minimum and the maximum possible score are 8 and 40, respectively. A high aggregate score indicates that individual considers themselves to have the skills and infrastructures needed to engage in EBP.

Part 6 is on attitudes about EBP. It consists of five items on which respondents indicate their opinion on a five-point Likert scale (1=strongly disagree, 2=partially disagree, 3=neutral, 4=partially agree, and 5=strongly agree). The eight items were:

1. EBP is essential to my clinical practice.

2. I routinely access online databases to obtain current scientific evidence
3. My clinical decision regarding treatment of patient incorporates EBP
4. Evidence obtained from the literature rather than the opinion of the expert in my hospital is the most crucial factor in my clinical decision.
5. The use of the best current scientific evidence improves the quality of health services and patient care.
6. I have difficulty understanding the technical language and statistics used in published articles

We obtained the aggregate attitude score about the EBP by adding up the six questions. The minimum and the maximum possible score are 6 and 30, respectively. A high aggregate score indicates that the individual considers themselves knowledgeable about EBP.

Part 7 is on barriers related to the use of EBP, and it consists of nine items on which respondents indicate "Yes" or "No." The nine items are:

1. I have difficulty understanding the technical language and statistics used in published articles
2. I have difficulty in obtaining the relevant full journal article
3. I experience lack of time on the job to implement EBP
4. I have difficulty interpreting the results presented in published articles
5. I have difficulty explaining treatment options to my patient
6. My lack of training in EBP is an obstacle to my effectiveness on the job
7. I am not interested in scientific inquiry and EBP
8. Using EBP may lead to higher healthcare cost
9. The unfamiliarity with the databases is an obstacle to my use of current scientific evidence for my patients
10. EBP disregards the patient's treatment preferences

We obtained an aggregate barrier-related score using the EBP by adding the nine questions. The minimum and the maximum possible score are 1 and 10, respectively. A high aggregate score indicates the individual has high barriers to using EBP.

We revised the initial draft of the instrument several times to improve the clarity of the questions. Subsequently, three physiotherapists with an average of 15 years of clinical experience reviewed the final draft produced. Several of the items were rewritten to enhance the instrument's comprehension and face validity based on their feedback. The final version of the tool has 53 questions categorized into seven parts. After the peer review process, we determined the readability of the psychometric instrument with the Readable® (2019) web-based software.

## **Procedures**

Following the recruitment of the participating subjects, we briefed them of the study's objectives and obtained their informed consent. Participation was voluntary, and subjects were instructed to answer the questions as honestly and accurately as possible. Subsequently, the instrument was administered to the study participants on two occasions, within a two-week testing interval. We did not impose any time limit for the completion of the survey. Most subjects completed it within 20-25 minutes.

On the second occasion, we provided similar testing conditions and instructions. The same research staff members identified in each of the tertiary hospitals conducted the testing, and we offered no stipends or incentives for participating in this study. Anonymity was guaranteed for the respondents.

We printed the survey questionnaire on two colors (white and green) of paper to distinguish the testing done on days one and two. Questionnaire on white paper signify day one testing and green for day two. The respondents were asked to indicate their date of birth for test-retest matching purposes on both surveys.

### **Statistical analysis**

We analyzed the data collected with the Statistical Package for Social Scientists (SPSS) computer-based software, version 16. We cross-checked our data by running frequency distribution for accuracy before statistical analysis. We computed the Chi-square ( $\chi^2$ ) measure between data collected on test one and test two to judge how stable the respondent's answers were over the two weeks. We also calculated the Cronbach's alpha ( $\alpha$ ) coefficient and the 95% confidence intervals (CI) to evaluate the instrument's internal consistency. We used the guidelines proposed by Landis and Koch (1977) to interpret the Cronbach's  $\alpha$  data. An agreement level between 0–0.2 was described by Landis and Koch (1977) as "poor", 0.2–0.4 "fair", 0.4–0.6 "moderate", 0.6–0.8 "substantial", and 0.8–0.9 "almost perfect".

### **Ethical approval**

The Institutional Review Board at the University of Maiduguri, Nigeria, approved the protocol for the investigation.

### **Results**

#### ***Demographic profile of the study participants***

A total of 25 physiotherapists participated in the study. Their mean age and years of professional work experience were  $37 \pm 11$  and  $9 \pm 9$  years, respectively. The majority of the physical therapists were males (72%), married (64%), bachelor's degree holders (64%), and individuals employed in state/federal government establishments (88%). Similarly, the majority of the study participants were clinicians (84%), those with greater than 20 years of professional work experience (12%), and those employed in orthopedic/sports and neurology practice settings (28%).

#### **Readability of the psychometric instrument**

The readability measures for the EBP instrument are presented in Table 1. The instrument Flesch-Kincaid Reading Ease and Flesch-Kincaid scores were 49.5 and 8.3. The Flesch-Kincaid and the Flesch Reading Ease scores reflect the literacy difficulty level. A Flesch-Kincaid score of 8.3 indicates that a minimum of 8th-grade reading level is required to comprehend the contents of the survey entirely. A Flesch Reading Ease score of 49.5 indicates that the test is relatively easy to understand. The instrument's average grade reading level was 11.8, and it is attainable by age 16, which is equivalent to year 12 of education in the British system on which Nigerian schools are modeled (America International School, 2016).

**Table 1: The readability indices, text quality, reading time and text statistics for the EBI**

S/N	Readability indices	Score
1	Flesch-Kincaid grade level	8.3
2	Gunning-Fog score	10.6
3	Coleman-Liau index	11.0
4	SMOG index	10.9
5	Automated readability index	7.0
6	Average grade level	11.8
7	Flesch-Kincaid Reading Ease	49.5
8	Spache score	5.4
9	New Dale-Chall score	6.9
10	Lix Readability	42.4
11	Lensear Write	87
	<b>Text quality</b>	
10	Sentences > 30 syllables	5
11	Sentences > 20 syllables	10
12	Words > 4 syllables	12
13	Words > 12 letters	3
14	Passive voice count	2
15	Adverb count	37
16	Cliché count	0
	<b>Reading time</b>	
17	Reading time	5.07
18	Speaking time	9.13
	<b>Text statistics</b>	
19	Character count	6,008
20	Syllable count	2,038
21	Word count	1,154
22	Unique word count	402
23	Sentence count	148
24	Paragraph count	120
25	Characters per word	5.2
26	Syllables per word	21.8
27	Words per sentence	7.8
28	Words per paragraph	9.6
29	Sentences per paragraph	1.2
30	Spache Score	5.4

The text quality was 5 and 10 for sentences greater than 30 and 20 syllables, respectively. The reading time was 5.07 minutes, and the speaking time was 9.13 minutes. The EBI text character and syllable counts are 6,006 and 2,038, respectively. The average word per sentence was 7.8. We

evaluated its psychometric properties based on the satisfactory readability indices that indicate the instrument is relatively easy to comprehend.

### **Test-retest reliability (stability) of the instrument**

The Chi-square test results comparing the data collected on test day one with test two revealed no significant difference in six of the tool's seven parts (Table 2). Six of the seven parts of the instrument are stable. Only the test-retest (stability) score for the EBP competence was significantly ( $\chi^2 = 4.738$ ,  $p < .038$ ) different, i.e., unreliable. The other six items showed no statistically significant difference ( $p > .05$ ) between testing day one and day two assessments. The latter findings signify the stability of the items.

**Table 2: Median score test retest (stability) data on day one and day 2 (N=25)**

<b>Instrument component parts</b>	<b>Test day 1</b>	<b>Test day 2</b>	<b><math>\chi^2</math></b>	<b>p-value</b>
Actual knowledge (competence) on evidence-based practice (*10)	8.0	7.0	4.738	0.030
Strategies to upgrade level of professionalism (*5)	3.0	4.0	0.065	0.799
Search engine use in evidence-based practice (*5)	1.0	1.0	0.000	1.000
Perceived (self-report) knowledge of EBP (*35)	26.0	25.0	1.384	0.239
Perceived (self-report) skills and resources in evidence-based practice (*40)	28.0	30.0	0.164	0.685
Attitudes about evidence-based practice (*35)	23.0	22.5	0.159	0.690
Barriers-related to evidence-based practice (*10)	3.0	2.0	0.015	0.901

### **Internal consistency of the instrument**

The Cronbach alpha for the different components of the instrument is presented in Table 3. Three of the seven component parts of the instrument showed “almost perfect” ( $ICC = 0.4 - 0.6$ ;  $p < 0.001$ ) correlation and another three parts showed “substantial” ( $ICC = 0.6 - 0.8$ ;  $p < 0.001$ ) correlations. Only one of the parts (search engine used in EBP) showed poor correlation.

**Table 3: Cronbach's alpha for the component parts of the evidence-based practice instrument**

<b>Instrument component parts</b>	<b>Cronbach's alpha value*</b>	<b>95% CI** Lower and upper bands</b>	<b>Interpretation***</b>
Actual knowledge (competence) on evidence-based practice (*10)	0.837	0.631-0.928	Almost perfect
Strategies to upgrade level of professionalism (*5)	0.703	0.327-0.869	Substantial
Search engine use in evidence-based practice (*5)	0.333	0.514-0.706	Poor
Perceived (self-report) knowledge of EBP (*35)	0.619	0.135-0.832	Substantial
Perceived (self-report) skills and resources in evidence-based practice (*40)	0.761	0.458-0.895	Substantial
Attitudes about evidence-based practice (*30)	0.803	0.544-0.915	Almost perfect
Barriers-related to evidence-based practice (*10)	0.814	0.569-0.919	Almost perfect

\*ICC =Intra-class correlation coefficient; p<0.001; \*\*CI = Confidence interval; \*\*\*Landis and Koch (1977)

The Cronbach's alpha for actual knowledge (competence) on EBP was 0.837 for actual knowledge (competence) on evidence-based practice, 0.703 for strategies to upgrade level of professionalism, 0.333 for search engine use in EBP, 0.619 for perceived (self-report) of EBP, 0.761 for perceived (self-report) skills and resources in EBP, 0.803 for attitudes about EBP and 0.814 for barriers-related to EBP.

## **Discussion**

We set out to develop a paper and pencil instrument to measure Nigerian physiotherapists' actual knowledge (competence), perceived (self-report) knowledge (competence), perceived (self-report) skills and resources, attitudes, and behaviours toward EBP and to establish the new tool's psychometric properties. Of all the previous studies (Jette et al. 2003; Iles and Davison, 2006; Akinbo et al., 2008; Da Silva et al., 2014; Yahui 2017) that assessed physiotherapists knowledge of EBP, only one study conducted in Saudi Arabia presented limited information on their instrument's psychometric properties (Alshehri, 2017). Their tool's internal consistency (Cronbach's alpha) was 0.780, and the reliability coefficients were 0.805 for knowledge, 0.601 for behaviour, 0.954 for attitudes, 0.934 for awareness, 0.584 for EBP training, and 0.800 for knowledge barriers. The internal consistency property of their instrument aligned with the findings in our study. However, our study investigated the new instrument's psychometric properties and evaluated its readability properties. None of the previous EBP studies assessed the readability of their tools.

In 2007, Nelson and Steele conducted a national online survey of mental health practitioners in the USA to identify correlates of self-reported EBP use in clinical practice. Two hundred fourteen



mental health practitioners from 15 states and diverse clinical settings participated in the study. The results found the viable predictors of self-reported EBP use were taking a class in EBP, the perceived support of the clinical facility toward EBP, and the clinician attitudes toward intervention research. Attitudes toward intervention research partially mediated the relationship between the clinical facility and EBP use. Negative attitudes toward intervention research partially mediated the relationship between clinician training and self-reported EBP use.

In a systematic review in 2014, Da Silva and associates contextualized the current evidence on physiotherapists' EBP knowledge, skills, behaviour, opinions, and barriers. They found that of the 12,392 potentially eligible studies, only 12 studies met the review criteria (pooled sample = 6411 participants). Of the 12 relevant studies, three analysed knowledge, and 21-82% of respondents claimed to have received formal education on EBP. In two studies that examined skills and behaviour, about 50% of the sample had used databases to support clinical decision-making. Most of the physiotherapists considered EBP necessary in six of the 12 studies investigating opinions. The primary barriers most frequently cited by the physiotherapists were time constraints, inability to understand statistics, lack of support from the employer, lack of resources, limited interest, and lack of generalization of results. The majority of physiotherapists had a favourable opinion about EBP and believed that they needed to improve their knowledge, skills, and behaviour towards EBP.

Our study is the second investigation to assess both actual (competence) and perceived (self-reported) EBP knowledge of physiotherapists. The findings in previous studies on physiotherapists' perceived knowledge of EBP (Jette et al. 2003; Iles and Davison, 2006; Akinbo et al., 2008; Da Silva et al., 2014; Yahui 2017) should be applied with caution. This admonition is warranted because existing literature in education and marketing has firmly established that perceived (self-report) knowledge and actual knowledge (competence) are distinctly different constructs (Bacon, 2016). Sitzmann, Ely, Brown, and Bauer (2010) provided compelling evidence supporting the difference between actual learning and perceived (self-reported) learning constructs. Their meta-analysis study found a correlation of .34 between perceived (self-reported) knowledge and actual knowledge (competence). However, the association was zero between self-reported knowledge gain (perceived learning) and actual knowledge. Thus, physiotherapists who think they are competent about EBP may be unaware of their limited knowledge and unlikely to seek educational training to improve their understanding and skills about EBP (Drass et al., 1989). The potential misperception of EBP knowledge raises fundamental questions regarding applying the findings in previous studies (Jette et al., 2003; Iles and Davison, 2006; Akinbo et al., 2008; Da Silva et al., 2014; Yahui 2017) to provide consistent EBP. Our tool will find a useful application in future studies...

## **Conclusion**

This investigation is a correlational study and no "cause and effect" conclusion should be inferred from any of the findings. The instrument Flesch-Kincaid score of 8.3 indicates that a minimum of 8th-grade reading level is required to comprehend the contents of the survey entirely. Six of the seven parts of the instrument are stable. Only the EBP competence component is unreliable. The Cronbach alpha for three of the seven component parts of the instrument showed "almost perfect" correlation and another three parts showed "substantial" correlations. Only one of the parts (search engine used in EBP) showed "poor" correlation. The Cronbach's alpha for actual knowledge (competence) on EBP ranges from 0.333 for search engine use in EBP to 0.837 for actual knowledge (competence) on evidence-based practice. The overall findings from our study revealed that the psychometric instrument developed is relatively easy to comprehend, highly stable, and

internally consistent. The availability of this instrument will promote further evaluative studies of EBP in physiotherapy.

### **Conflict of Interest**

The authors declare no conflict of interest

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