

Validation study and setting norms of the Evidence Based Practice Competence Questionnaire for nursing students: A cross sectional study in Poland

Validation study of the Evidence-Based Practice Competence Questionnaire

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ETHICS APPROVAL

The study was approved by the Bioethics Committee of Medical University of Warsaw (Reference Code: AKBE/152/16)

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ABSTRACT

Background

Achieving high quality care through full use of potential stemming from the use of the principles of evidence based practice (EBP) requires adequate shaping of student attitudes towards EBP already at an early stage of education, as well as teaching in the scope of knowledge and skills essential to apply EBP in future professional work. Therefore, nursing educators need a tool to assess competency in EBP. This study aims to present the adaptation of the psychometric test and setting norms to the Polish version of the Evidence Based Practice Competence Questionnaire (EBP-COQ_P).

Methods

Poland-wide multicentre study, cross-sectional validation design, a representative sample of 1,636 nursing students. The EBP-COQ_P was validated in terms of content validity through an expert review. The EBP-COQ_P was administered to evaluate test reliability and validity. Settings norms for the Polish nurse population were also done.

Results

Confirmatory factor analysis demonstrated that 25 items are grouped into three categories which define competences related to EBP: attitude, knowledge, and skills. Cronbach's alpha was 0.856 for the entire questionnaire. EBP-COQ_P had good parameters of absolute stability. EBP-COQ_P was also characterized with external construct validity.

Measurement with the use

of EBP-COQ_P allowed for a good differentiation of the respondents in terms of their expertise in EBP (known-groups validity).

Conclusions

In terms of reliability and validity, EBP-COQ_P is compared with its original version. EBP-COQ_P may be used in educational practice (graduate and postgraduate education). Polish norms set for a representative group of nursing students may serve as a benchmark for the results obtained from individual and group measurements.

Keywords: Evidence-based practice; Questionnaire; Validation; Competence; Students.

1. INTRODUCTION

Benefits stemming from the use of evidence-based practice (EBP) rules by nurses are currently quite well documented (Melnyk & Fineout-Overholt, 2011). It seems that the principles of EBP used by nurses improve the quality and safety of care over patients (Heydari, Mazlom, Ranjbar, & Scurlock-Evans, 2014; Melnyk, Gallagher-Ford, Long, & Fineout-Overholt, 2014). The quality of care as well as safety of patients is therefore to a certain extent dependent on the nurses' professional background in the scope of EBP (Bloom, Olinzock, Radjenovic, & Trice, 2013). Therefore, in order to achieve high quality of care through full use of potential stemming from the use of EBP principles, adequate shaping of students' attitudes towards EBP, as well as teaching in the scope of knowledge and skills necessary to use EBP in the future professional work, is necessary already at an early stage of education (Ruzafa-Martinez, Lopez-Iborra, Armero Barranco, & Ramos-Morcillo, 2016; Ruzafa-Martinez, Lopez-Iborra, & Madrigal-Torres, 2011b; Ruzafa-Martinez, Lopez-Iborra, Moreno-Casbas, & Madrigal-Torres, 2013). The Sicily Consensus Statement on EBP highlighted the need for effective training in each of the five steps of EBP, and future research into valid and reliable instruments to evaluate this training (Dawes et al., 2005; Tilson et al., 2011).

In Poland, there is shortage of adequate tools, enabling the evaluation of effectiveness of education of EBP competences among students of nursing and that allow for a comparison of the achieved results among various countries. The EBP-COQ (Ruzafa-Martinez et al., 2013) has shown adequate psychometric properties and has been used in several Spanish (Mena-Tudela, Gonzalez-Chorda, Cervera-Gasch, Macia-Soler, & Orts-Cortes, 2018), Latin-American (del Pilar Ureña-Molina, López-Medina, & Pancorbo-Hidalgo, 2017), Arabic and Oriental contexts (Labrague et al., 2019) and translated to Turkish (Gu, Ha, & Kim, 2015) and Chinese (Chen, 2015).

1.1. Background

Currently a few standardized scales for assessing EBP in nursing practice are available (Adams & Barron, 2010; Gerrish et al., 2007; Johnston, Leung, Fielding, Tin, & Ho, 2003; Melnyk, Fineout-Overholt, & Mays, 2008; Ruzafa-Martinez, Lopez-Iborra, & Madrigal-Torres, 2011a; Tucker, Olson, & Frusti, 2009; D. Upton & Upton, 2006). They were however designed and validated with a thought to use them among professionally active nurses (Shaneyfelt et al., 2006). In recent years two specific tools created for nursing students were developed: the Evidence-Based Practice Competence Questionnaire (EBP-COQ) (Ruzafa-Martinez et al., 2013) and the Student Evidence-based Practice Questionnaire (S-EBPQ) (P. Upton, Scurlock-Evans, & Upton, 2016). The two questionnaires measure similar concept using distinct approach of EBP. The EBP-COQ assesses competence, theoretical construct defined as the capability to choose and use an integrated combination of knowledge, skills and attitudes with the intention to develop a task in a certain context (Korthagen, 2004), consequently it understands EBP competence as the utilization of EBP in the clinical decision making and it is able to evaluate attitude, knowledge and skills in EBP (Ruzafa-Martinez et al., 2013). Whereas the S-EBPQ evaluate retrieving and reviewing evidence, frequency of use, sharing and applying EBP and attitudes. An important difference is that EBP-COQ was developed originally focus on undergraduate nursing students (Ruzafa-Martinez et al., 2013), meanwhile S-EBPQ is an adaption from the EBPQ developed to measure factors influencing EBP implementation in registered nurses (D. Upton & Upton, 2006). Until now the research literature has shown that the EBP-COQ has a better convergent validity and internal consistency of the attitude dimension and a good responsiveness to change (Ruzafa-Martinez, Lopez-Iborra, et al., 2016; Ruzafa-Martinez, Molina-Salas, & Ramos-Morcillo, 2016). Finally, EBP-COQ dimensions are more common used in the international literature and facilitate the comparison between studies (Albarqouni, Hoffmann, & Glasziou, 2018; Leung, Trevena, & Waters, 2014).

Currently in Poland, as well as in other EU countries, both undergraduate and postgraduate nursing studies curricula take into account training EBP competences, following the EU Directive (European Union, 2013). In line with the Polish educational standards, a 3-year undergraduate study program encompasses education in the scope of selected aspects of methodology of research studies, which form the basis of teaching EBP, i.a.: the basics of empirical data interpretation and inference; critical analysis of published research; utilisation of research results in providing high quality care over a patient. However, requirements pertaining education at 2-year postgraduate studies refer directly to teaching competences in the scope of evidence based medicine (EBM) and evidence based nursing practise (EBNP), including the study of mastering the application of EBNP in one's own professional practice or in a managed team (Minister of Science and Higher Education, 2012). Based on the above mentioned requirements, the nursing study curriculum should ensure knowledge acquisition and development of skills and shaping attitudes in EBP.

1.2. Aim of study

It was decided to conduct a linguistic and cultural adaptation of EBP-COQ, adjusting the tool to Polish conditions, what is more, taking into account the need to apply EBP-COQ in the evaluation of EBP on the state level, new score levels were determined, which will form a point of reference for the measurement results performed in various nursing schools in Poland.

2. METHODS

2.1. Design

A Poland-wide multicentre cross-sectional, psychometric, multi-sample validation study was conducted from April to July 2018.

2.2. *Settings and participants*

The target population for study was 7,600 undergraduate and postgraduate students from all 16 Polish universities that were authorised to run nursing degree programs in 2018 (National Accreditation Council of Nurses and Midwives Schools, 2018; Polish Accreditation Commission, 2018). The consent to participate in the study was obtained from 9 of them. Given the fact that the effects of education involving teaching competences in EBP are applied starting with the third year of undergraduate studies, only students finishing their third year of undergraduate studies (first-cycle studies, Bachelor's degree) as well as first and second year of postgraduate studies (second-cycle studies, Master's degree) were recruited to the study in line with the criteria for inclusion. Total potential number of study participants was 3,080 students from 9 universities (together undergraduate and postgraduate studies). Data package was however received from 1,636 students. The sample was representative of a broader spectrum of Polish nursing students. With this sample size and the number of nursing students in Poland ($N = 7,600$), the error margin was 2.19% (95% confidence level and proportion 0.50). Detailed sample characteristics are presented in Table 1.

<<Insert Table 1 here>>

2.3. *Ethical considerations*

Before taking part in the study, voluntary informed consent to participate was obtained from each participant. The aim of the study, as well as the way of analysis and data storage was delivered to the participants in writing. The participants were also informed that confidential data will be used for scientific purposes only. The Local Personal Data Inspector had no contraindications regarding the data protection of study participants.

2.4. *Instrument*

EBP-COQ is a validated Spanish-speaking tool, devised by Ruzafa-Martinez et al. (2013), serving self-evaluation of nursing students in the scope of their own EBP competences. The questionnaire consists of 25 items, that in the original version make up three separate subscales. Subscale 1: Attitude toward EBP (13 items), e.g.: "The nursing contract should include time to read scientific papers and make critical appraisal of them". Subscale 2: Skills in EBP (6 items), e.g.: "I feel able to make a clinical question to start the searching of the best scientific evidence". Subscale 3: Knowledge in EBP (6 items), e.g.: "I know the different evidence level of the designs of the investigation studies".

The content of the statements contained in all 25 items is evaluated by the respondents on Likert scale: from 1 (strongly disagree) to 5 (strongly agree). Among 25 items, eight are reverse score items. Before adding up the points, the obtained results need to be recoded. The higher the total score the participant obtains, the better is his own evaluation of his EBP competences (greater self-perception of knowledge and skills in EBP, and more positive attitudes towards the EBP). EBP-COQ is characterized with verified psychometric properties in the scope of reliability and validity (Ruzafa-Martinez et al., 2013).

Next to the proper part of the questionnaire containing the above mentioned EBP-COQ, the research tool was complemented with two additional sections. First of them contained questions allowing to gather data about respondents including age, gender, academic level, other degrees, etc. The second section explored the general attitude toward EBP, knowledge and skills in EBP, English language, statistic and computer practice measured on 10-point visual analogue scales. This section pertained data necessary to evaluate the criterion validity.

2.5. *Procedure*

Linguistic–cultural adaptations as well as the determination of psychometric properties of the Polish language version of EBP-COQ was conducted in line with the guidelines devised by Sousa and Rojjanasrirat (Sousa & Rojjanasrirat, 2011) and in line with the protocol of the World Health Organization "Process of translation and adaptation of instruments" (World Health Organization, 2017).

2.6. *Data collection*

The results were obtained with the use of the PAPI method (paper and pen interview). A trained interviewers (trained teachers) conducted the interviews personally with every participant. They provided the aim of the research conducted and presented the instruction of filling out the questionnaire. The interview with a respondent was conducted personally, face to face, and the interviewer was reading the questions and recording the responses on a form. Each university was to collect data from interviews independently of the others, but every time the procedure of the study was identical. In total, several dozen trained interviewers conducted interviews. Data was collected during or after regular seminars or lectures.

2.7. *Validation and data analysis*

To evaluate the psychometric properties of EBP-COQ_P, we assessed: content validity (content validity index); theoretical relevance (confirmatory factor analysis); internal consistency (Cronbach's alpha); test–retest reliability; criterion and known-groups validity.

In order to determine content validity calculated item-level content validity index (I-CVI) and scale-level content validity index (S-CVI) (Polit, Beck, & Owen, 2007). 10 experts were asked to voice their opinions on a 4-degree Likert scale (1=not relevant, 2=somewhat relevant, 3=quite relevant, 4=highly relevant) on the topic of particular items in the context of their meaning in the evaluation of attitudes, knowledge and skills of the students of nursing in

the scope of EBP. Among the experts there were: representatives of the Ministry of Health and the Polish Nursing Association, the Students' Self-Government, the Director for Nursing of the Clinical Hospital, public health experts, and a psychologist. The CVI of more than 0.80 was interpreted as indicating content validity (Polit et al., 2007).

It was investigated whether floor or ceiling effects do not take place in the data gathered. It was adopted, after Terwee et al. (2007) that floor or ceiling effects do not take place if more than 15% of respondents obtained adequately lowest or highest possible score.

Confirmatory factor analysis (CFA) was used in order to estimate the goodness of fit of the obtained results to the imposed structure stemming from theoretical assumptions. The expected values of indices recommended were as follows: χ^2 divided by the degrees of freedom (χ^2/df ratio) ≤ 3.00 ; the Root Mean Squared Error of Approximation (RMSEA); the Comparative Fit Index (CFI) and the Tucker Lewis index (TLI) > 0.90 (Batista-Foguet, Coenders, & Alonso, 2004; Schermelleh-Engel, Moosbrugger, & Müller, 2003). The maximum likelihood estimation technique was used.

Internal consistency analysis of EBP-COQ_P was performed based on a formula proposed by Cronbach (Tavakol & Dennick, 2011). Internal consistency threshold for alpha-Cronbach greater than 0.700 was adopted as satisfactory (Nunnally & Bernstein, 1967). Inter-item correlations, which were indicated for each items within each of the isolated subscales, were evaluated. These correlations should not adopt values < 0.200 .

A test-retest reliability study was planned for a group of 100 nursing students. Results for test-retest analysis were collected using an auditorium method, whereby respondents filled in the questionnaires individually in one room. Retesting with EBP-COQ_P was performed two weeks after the original test. A full set of data was collected from 91 students. Absolute stability was measured calculating the weighted kappa coefficient and intraclass correlation coefficient (ICC) (G. M. Sullivan, 2011).

The criterion validity was also checked through the evaluation of correlation of results for separate subscales EBP-COQ_P and other features of the respondents. A hypothesis was put forward that the competences in the scope of EBP should be connected with the command of English, biostatistics, IT, clinical studies, and research methodology. Besides, it was assumed that competences in the scope of EBP measured with the use of EBP-COQ_P should be correlated with the level of self-perception towards EBP, knowledge and skills in EBP and the sense of approval for the idea of EBP by the professional environment. Self-assessment in this scope was measured on a 10-degree angle scale, where 0 stood for very low, and 10 very high level in a given scope. For the evaluation of correlation r-Pearson coefficient was designated.

Known-groups validity was estimated based on assessment of inter-group differences. In order to do that, a comparative analysis of 2 groups of students depending on their degree (Bachelor vs Masters) and their participation in extracurricular training in EBP or training in Research Methodology (Yes vs No). It was assumed that Master's students and participants of extracurricular trainings should possess higher competences. The comparison was conducted with the use of Student's t test, and effect size was estimated with the use of *d* Cohen coefficient (Gail M. Sullivan & Feinn, 2012).

Identification of norms was the last element of the validation. The obtained total score and results in individual subscales were transformed into sten scores. Standards for the following score ranges were identified: low level (stens 1–3), medium level (stens 4–7) and high level (stens 8–10).

All statistical calculations were performed using the software package STATISTICA version 13.3 and Mplus version 6.12. For all analyses, a P-level of < 0.05 was considered statistically significant.

3. RESULTS

3.1. *Content validity*

Result I-CVI for all items was above the established threshold 0.80. The obtained result S-CVI was satisfactory (data not shown). The panel of 10 experts recommended including all 25 items in the Polish version of EBP-COQ.

3.2. *Item analysis*

Average result obtained for 25-items EBP-COQ_P in the studied sample was 89.5 (SD = 10.37, coefficient of variation = 11.6%) with minimal value of 53.0 and maximal of 125.0. The score was characterized by a small right-sided asymmetry (skew = 0.29) and lack of agreement with normal distribution (Shapiro–Wilk test, $W = 0.990$, $P = 0.000$). For none of the items zero SD was observed. Score for the majority of items was characterized by lack of normal distribution (CR values for skew and kurtosis besides the range $[-2, 2]$) (see details in Supplementary data). No case with lowest possible score (no floor effect) was noted. However, in 0.24% of cases highest possible score was observed (no ceiling effect).

3.3. *Confirmatory factor analysis*

A three factorial solution was in line with the theoretical assumptions for the original EBP-COQ version. As a result of the analysis, the ratio of chi-square statistic to degrees of freedom (χ^2/df) was found to be 7.25 for undergraduate students ($\chi^2 = 1971.97$, $df = 272$) and 5.66 for postgraduate group of students ($\chi^2 = 1539.06$, $df = 272$). The RMSEA was 0.092 (90% CI [0.088-0.096]) and 0.077 (90% CI [0.074-0.081]), respectively. The TLI was 0.78 and 0.91, and the CFI value was 0.76 and 0.90, respectively. Having higher CFI and TLI values over 0.90 means that that model has a good fit. See the details of the CFA on the path diagram (Fig. 1).

<<Insert Figure 1 here>>

3.4. *Internal consistency*

For the three subscales forming the EBP-COQ_P, the obtained value of the Cronbach's alpha coefficient was 0.856 ("Attitude toward EBP"), 0.703 ("Knowledge in EBP"), and 0.734 ("Skills in EBP"), while for the whole EBP-COQ_P the Cronbach's alpha was 0.856. Correlations among individual items and the total scale score minus the individual items ranged between 0.252 and 0.673 (see details in Supplementary data).

3.5. *Test-retest reliability*

Two-week test-retest reliability shows a good stability of scales in individual domains of the EBP-COQ_P. The assumption concerning the equality of the means for the repeated measurements was fulfilled, and the value ranges of weighted kappas and ICCs for the items were satisfactory (see details in Supplementary data).

3.6. *Criterion validity*

External construct validity was determined through the evaluation of correlation between the total score of EBP-COQ_P and its two subscales, and ten other variables, which, as was assumed, should be correlated with the competences in EBP. In Table 2 the results of the analysis are presented. They indicate the existence of positive correlations confirming the above mentioned assumptions. All correlations were statistically significant ($P < 0.05$).

<<Insert Table 2 here>>

3.7. *Known-groups validity*

Known-groups validity was evaluated by comparing students in terms of their degree (Bachelor vs Masters) and their participation in extracurricular courses. According to the assumptions, it was observed that Masters students and participants of training in EBP or training in Research

Methodology (minimum 40h of extracurricular classes) scored higher in subscales than Bachelor students and those not participating in any extracurricular courses (Table 3).

<<Insert Table 3 here>>

3.8. *Setting norms*

After transforming the total score obtained in the measurement with the EBP-COQ_P into a sten scale, standards were identified (Table 4). Due to small differentiation in the age of the respondents and small number of men the norms regarding the demographic variables were not determined.

<<Insert Table 4 here>>

4. DISCUSSION

The psychometric evaluation of EBP-COQ_P presented in this paper, a tool devised for self-perceived competence in EBP in nursing students demonstrated that the Polish version of the scale is characterized by good internal consistency, test-retest reliability, criterion and known-groups validity. The obtained results will allow determining that using EBP-COQ_P yields reliable and valid measurement. Besides, the designated Poland-wide norms will allow the comparison of the obtained results by students studying in various nursing schools in the country. EBP-COQ_P is currently the only standardized questionnaire in Poland, allowing a complex evaluation of the attitudes and skills of students of nursing in the scope of their EBP competences.

In comparison to the Spanish (Ruzafa-Martinez et al., 2013), Turkish (Gu et al., 2015) and Chinese (Chen, 2015) versions of EBP-COQ some difference concerning the CFA analysis was observed. Factor analysis showed that a three-domain structure of the EBP-COQ_P does

not perfectly fit the collected data. However, it was found that the data collected among Master's degree students were fitted to the expected theoretical three factorial solution than those gathered among Bachelor's degree students.

The cause of differences in factorial structure may be conditioned by different manner of teaching EBP in Poland and in Spain. In Polish curricula, EBP is still not a separate subject, and a certain proportion of educational outcomes in this range is executed in the framework of teaching research methodology and various clinical subjects. Possibly respondents participating in the validation perceive knowledge and skills pertaining research and reading scientific literature, or critical evaluation of data, as the field of research methodology connected with the preparation of their dissertation rather than competences connected with EBP. Hence it was decided that the Polish version of EBP-COQ, like the original one, will consist of three separate subscales: attitude toward EBP, skills in EBP, and knowledge in EBP.

Since EBP-COQ_P is designed to be used in a diverse group of students of nursing, a representative validation sample was chosen. It was assumed that the sample will ensure correct evaluations of EBP-COQ_P psychometric parameters and its standardization in groups coming from various regions of the country (Bedyńska & Cypryańska, 2007). Internal consistency of particular domains significantly exceeded the recommended level (Cronbach's alpha for the whole scale was 0.856) (Tavakol & Dennick, 2011). The results are close to the ones obtained in the validation of the Spanish version of the EBP-COQ (Ruzafa-Martinez et al., 2013).

In contrast to the validation performed by Ruzafa-Martinez et al. (2013) the authors of the Polish validation decided to study the robustness of EBP-COQ in the analysis of test-retest reliability. Both ICCs values, and differences between the average values indicate that a two week time interval did not influence the results of the second measurement performed with the use of EBP-COQ_P in the same group of students in a significant manner.

External criterion validity analysis was conducted in line with the idea proposed by Ruzafa-Martinez et al. (2013) for the original version of EBP-COQ. By comparing the obtained results, it can be stated that the calculated correlation coefficients for the Polish version of the scale were higher, and the correlations were marked more clearly than in the Spanish version. The differences may stem, among others, from various quantities and manners of selection of the validation group. The obtained results confirm the results in subscales and the total EBP-COQ_P score is positively correlated with additional features of the respondents.

The evaluation of known-groups validity slightly varied from the one suggested by Ruzafa-Martinez et al. (2013). The analysis of EBP-COQ_P differentiating ability was supplemented with additional comparison of two groups of students (Bachelor vs Masters). Since nursing studies curriculum in Poland accounts for education in the field of EBP on a Bachelor's level to a varying degree (elements of research methodology) and Master's level (EBM and EBNP elements), the measurement performed with the use of EBP-COQ_P should indicate these differences. This assumption was confirmed in the conducted analyses. The remaining comparisons in terms of evaluation of known-groups validity provided results matching those of Ruzafa-Martinez et al. (2013) for the original version of EBP-COQ.

The results of the EBP-COQ_P psychometric analysis allow for an assumption that the scale may be used in practice as a tool for the evaluation of EBP competences of nursing students at both Bachelor's and Master's degree. The results of the analysis may be used for the evaluation of study curricula, which scheme obligatory EBP education. The questionnaire may be also used for designing individual educational curricula, indicating these areas of knowledge and skills that need particular attention in the process of education. A definite advantage of EBP-COQ_P is its short form (25 items), which allows to fill out the questionnaire in less than 10 minutes. EBP-COQ_P may also be easily adaptable to dissemination in electronic form, and score calculation and interpretation is automatized. After adequate modification it may be

therefore implemented for use in e-learning. A big asset of the Polish validation is also the possibility to relate individual scores / measurement results to designated Poland-wide norms. This makes EBP-COQ_P a universal tool designed to be used in a group of all students studying in schools educating nurses in the country. In addition, due to the fact that several language versions of EBP-COQ already exist, it is possible to compare the measurement results obtained with this tool from different countries.

4.1. Limitations

The main limitation of the validation was lack of conformity of measurement results performed with the use of EBP-COQ_P with the measurements results obtained with another tool, the so called gold standard questionnaire, the theoretical construct of which would be close to EBP-COQ. Conducting such an analysis was however not possible given lack of existing Polish tool dedicated for the evaluation of EBP competence among students of nursing. In addition, further validation studies should assess the diagnostic ability of the Polish EBP-COQ, by performing research using the tool in educational situations (i.e., pre- and post-test).

CONCLUSION

The results of psychometric analysis of the Polish version of EBP-COQ confirm high quality of the tool. In terms of reliability and validity, EBP-COQ_P is comparable with the Spanish, original version. The questionnaire may be used in educational practice (undergraduate and postgraduate education). The obtained result provides information on the respondent in three domains: attitude, knowledge, and skills. EBP-COQ_P proves good sensitivity to the effect connected with participation in training in EBP and training in research methodology, features internal consistency both as a homogenous scale and also in its three subscales. Polish norms set for a representative group of nursing students may serve as a benchmark for the results obtained from individual and group measurements.

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Figure 1. Structure of the Evidence Based Practice Competence Questionnaire (the left diagram: undergraduate students group; the right diagram: postgraduate students group). Correlations between latent variables and items are represented with arrows. The number next to the items indicates how much variance was explained in the item.

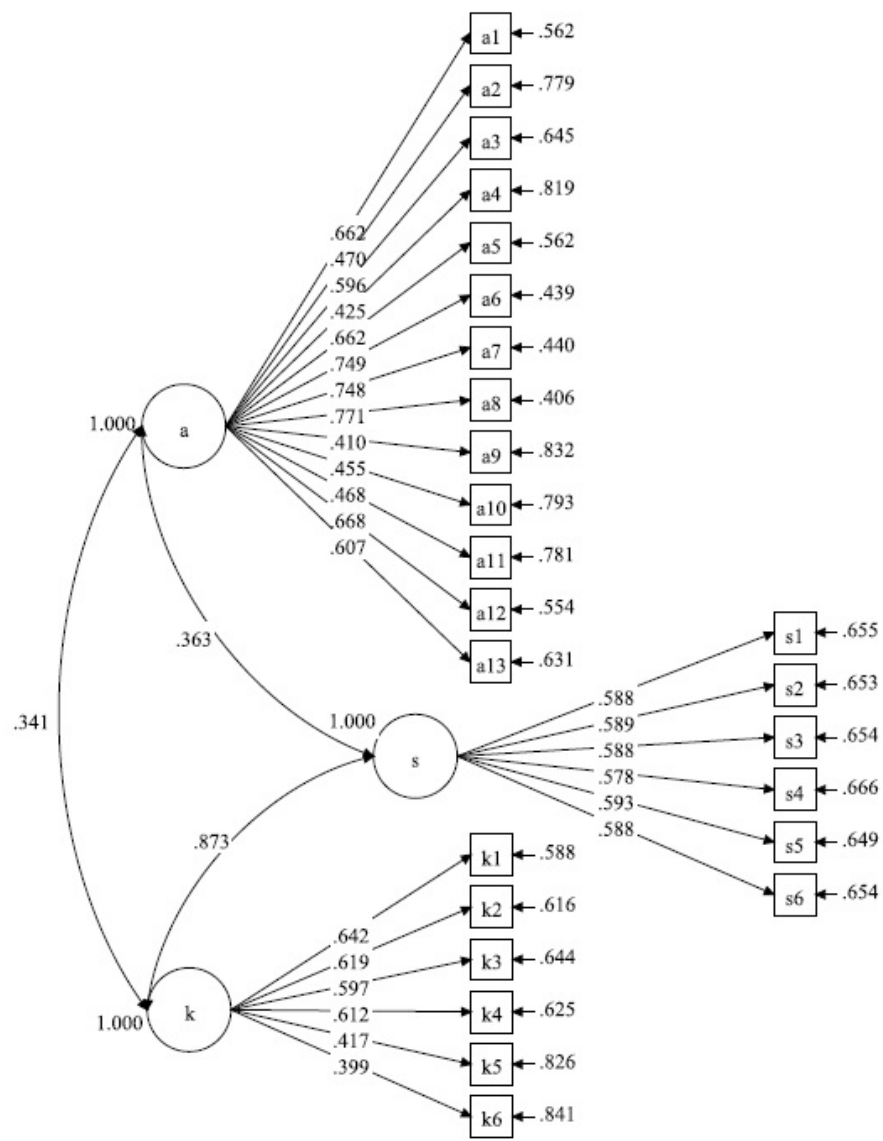
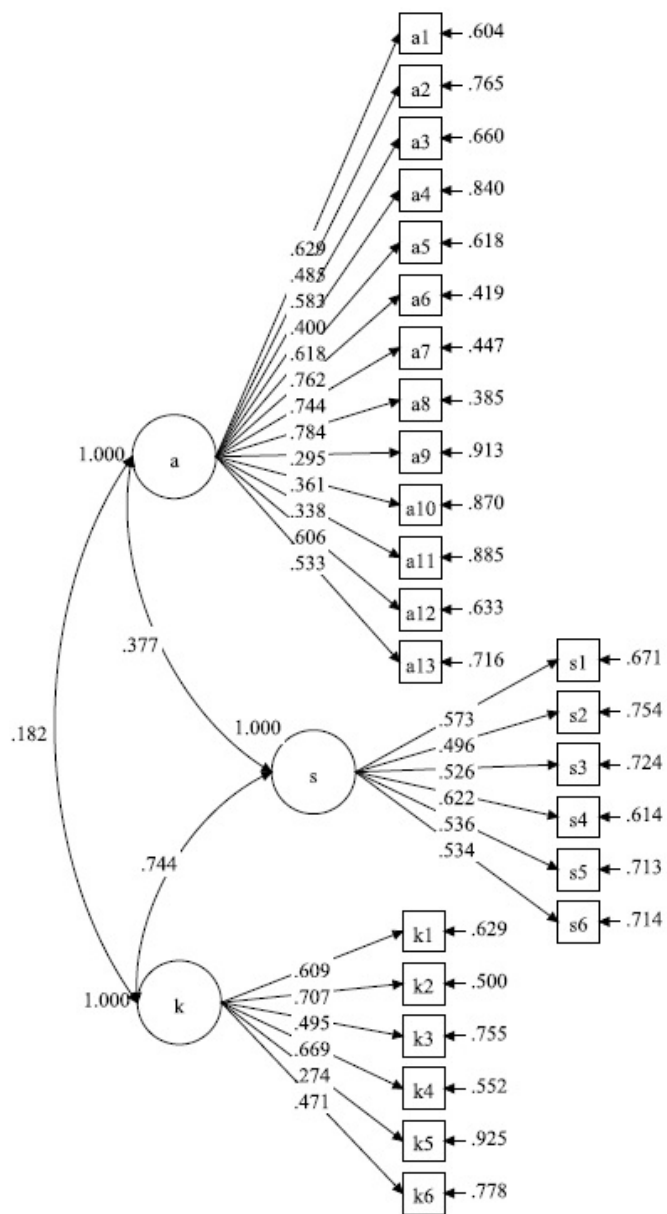


Table 1. Participant characteristics

	Bachelor's degree (N = 858)	Master's degree (N = 778)	Total (N = 1636)
Nursing school			
Wroclaw Medical University	38 (4.4)	88 (11.3)	126 (7.7)
Pomeranian Medical University in Szczecin	168 (19.6)	129 (16.6)	297 (18.2)
Medical University of Warsaw	79 (9.2)	52 (6.7)	131 (8.0)
University of Warmia and Mazury in Olsztyn	7 (0.8)	30 (3.9)	37 (2.3)
Medical University of Silesia	92 (10.7)	59 (7.6)	151 (9.2)
Jagiellonian University Medical College	139 (16.2)	155 (19.9)	294 (18.0)
Gdansk Medical University	206 (24.1)	63 (8.0)	269 (16.4)
Medical University of Bialystok	57 (6.6)	149 (19.2)	206 (12.6)
Jan Kochanowski University in Kielce	72 (8.4)	53 (6.8)	125 (7.6)
Gender			
Female	785 (91.5)	725 (93.2)	1510 (92.3)
Male	63 (7.3)	45 (5.8)	108 (6.6)
Missing data	10 (1.2)	8 (1.0)	18 (1.1)
Age [M (SD)]	22.0 (2.22)	30.5 (9.97)	26.1 (8.30)
Other studies			
None	746 (86.9)	433 (55.7)	1179 (72.1)
Technical Diploma	23 (2.7)	18 (2.3)	41 (2.5)
Bachelor	49 (5.7)	251 (32.3)	300 (18.3)
Master	23 (2.7)	55 (7.1)	78 (4.8)
Missing data	17 (2.0)	21 (2.7)	38 (2.3)
EBP training/education			
Yes	170 (19.8)	233 (29.9)	403 (24.6)
No	681 (79.4)	542 (69.7)	1223 (74.8)
Missing data	7 (0.8)	3 (0.4)	10 (0.6)
Research methodology training/education			
Yes	215 (25.1)	248 (31.9)	463 (28.3)
No	634 (73.9)	525 (67.5)	1159 (70.8)
Missing data	9 (1.0)	5 (0.6)	14 (0.9)
Attendance at academic classes during the semester			
<50%	69 (8.0)	105 (13.5)	174 (10.6)
From 50 to 75%	82 (9.6)	120 (15.4)	202 (12.3)
>75%	695 (81.0)	547 (70.3)	1242 (75.9)
Missing data	12 (1.4)	6 (0.8)	18 (1.1)

M – mean, SD – standard deviation

Table 2. Correlations between EBP-COQ_P dimensions and the visual analogue scales

Self-reported	EBP-COQ_P			
	Attitude toward EBP	Skills in EBP	Knowledge in EBP	Total score
Attitude toward EBP	0.543	0.266	0.197	0.495
Knowledge level in EBP	0.256	0.375	0.480	0.459
Skill level in EBP	0.245	0.394	0.481	0.459
Attitude toward promotion	0.420	0.264	0.241	0.435
Perceived mates attitude toward EBP	0.110	0.160	0.197	0.194
Knowledge in English Language	0.076	0.176	0.083	0.136
Knowledge level in computer	0.149	0.250	0.180	0.242
Knowledge level in biostatistics	0.111	0.329	0.350	0.310
Knowledge level in clinical medicine	0.165	0.423	0.438	0.406
Knowledge level in research methodology	0.243	0.458	0.463	0.475

For all correlations P-value = 0.000 (bilateral)

Table 3. Results of the analysis of inter-group differences

	Groups	N	Score (M, SD)	t	P-value*	d (95% CI)
Study levels						
Attitude toward EBP	Bachelor's degree	858	49.7 (6.27)	-4.853	0.000	0.24 (0.14; 0.33)
	Master's degree	778	51.2 (6.41)			
Skills in EBP	Bachelor's degree	858	20.1 (3.49)	-1.425	0.154	0.06 (-0.04; 0.15)
	Master's degree	778	20.3 (3.56)			
Knowledge in EBP	Bachelor's degree	858	18.4 (3.81)	-5.805	0.000	0.29 (0.19; 0.39)
	Master's degree	778	19.5 (3.73)			
Training in EBP						
Attitude toward EBP	No	1243	49.9 (6.24)	-5.094	0.000	0.30 (0.19; 0.41)
	Yes	410	51.8 (6.53)			
Skills in EBP	No	1243	19.9 (3.49)	-4.917	0.000	0.29 (0.17; 0.40)
	Yes	410	20.9 (3.49)			
Knowledge in EBP	No	1243	18.6 (3.77)	-6.125	0.000	0.27 (0.15; 0.38)
	Yes	410	19.9 (3.75)			
Training in Research Methodology						
Attitude toward EBP	No	1178	49.9 (6.13)	-4.608	0.000	0.25 (0.15; 0.36)
	Yes	470	51.5 (6.79)			
Skills in EBP	No	1178	19.8 (3.44)	-6.309	0.000	0.35 (0.24; 0.45)
	Yes	470	21.0 (3.56)			
Knowledge in EBP	No	1178	18.5 (3.74)	-6.362	0.000	0.35 (0.24; 0.45)
	Yes	470	19.8 (3.82)			

* Student's t test

M – mean, SD – standard deviation, 95% CI – 95% confidence interval, d - Cohen's d effect size

Table 4. Ranges of EBP-COQ_P scores for the low, medium and high level of competence in EBP

Level of competence in EBP	EBP-COQ_P			
	Attitude toward EBP	Skills in EBP	Knowledge in EBP	Total score
Low	13-45	6-17	6-17	25-79
Medium	46-55	18-22	18-22	80-99
High	56-65	23-30	23-30	100-125

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Resources **Elżbieta Grochans:** Resources **Maria Kózka:** Resources **Halina Kulik:** Resources **Jolanta**
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Review & Editing **Joanna Gotlib:** Project administration, Supervision

Appendix

Polish and English version of the Evidence Based Practice Competence Questionnaire

Item	Polish statement	English statement	5	4	3	2	1
A1	EBP pomaga podejmować decyzje w praktyce klinicznej.	The EBP helps to make decisions in clinical practice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A2	Istnieje możliwość krytycznej oceny jakości artykułów naukowych.	I'm confident that I will be able to evaluate critically the quality of a scientific article	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A3	Zastosowanie EBP pozwoli lepiej zdefiniować zawodową rolę pielęgniarki.	The practice of EBP will help to have a better definition of the nurse roll	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A4	Umowa o pracę dla pielęgniarek powinna obejmować czas poświęcany na czytanie i krytyczną analizę literatury naukowej.	The nursing contract should include time to read scientific papers and make critical appraisal of them	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A5	Zastosowanie EBP powinno zwiększyć autonomię zawodową pielęgniarek.	The widespread EBP implementation will allow to increase nursing autonomy from others professions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A6	Bardzo bym chciała/chciał wykorzystywać EBP w trakcie mojej pracy zawodowej.	When I work as a nurse I will pleased if the PBE will be in practice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A7	Zastosowanie EBP poprawia jakość opieki nad pacjentem.	The application of EBP improves patient's healthcare outcomes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A8	W przyszłości chciałabym/chciałbym móc wykorzystywać EBP.	In the future I wish to contribute to apply the EBP	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A9*	Czytanie artykułów naukowych mnie nie interesuje.	I do not like reading scientific articles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A10*	Zmiany, jakie zajdą w opiece po zastosowaniu EBP, będą minimalne.	The patient care will experiment minor changes with the EBP application	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A11*	Cieszę się, że EBP będzie tylko teoretycznym nurtem, którego nie wprowadza się w praktyce.	It pleased me that the EBP is only a theoretical movement that does not takes in practice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

A12	Gdybym miał/a okazję, uczestniczyłabym/uczestniczyłbym w kursie EBP.	If I will have the opportunity I would assist to an EBP course	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A13	Chciałabym/chciałbym mieć lepszy dostęp do opublikowanych dowodów naukowych z zakresu pielęgniarstwa.	I would like to have better access to published nursing scientific evidences	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
S1	Potrafię zadać pytanie kliniczne w celu wyszukiwania najlepszych dowodów naukowych.	I feel able to make a clinical question to start the searching of the best scientific evidence	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
S2*	Nie potrafię w sposób usystematyzowany wyszukiwać dowodów naukowych w bazach bibliograficznych (np. PubMed, itd. ...).	I do not feel able to search for scientific evidences in the principles health sciences data bases	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
S3*	Nie czuję się pewnie w wyszukiwaniu dowodów naukowych w takich źródłach jak wytyczne praktyki klinicznej czy przeglądy systematyczne.	I do not feel able to search for the scientific information about the subject in the most important bibliographic indexes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
S4	Potrafię ocenić krytycznie jakość artykułu naukowego.	I feel able to evaluate critically the quality of a scientific article.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
S5*	Nie potrafię ocenić, czy wyniki uzyskane w badaniu naukowym są cenne.	I do not feel able to analyze if the obtained results of a scientific study are valid	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
S6	Potrafię ocenić użyteczność wyników badania naukowego w kontekście ich zastosowań w praktyce klinicznej.	I feel able to analyze the practical utility of a scientific study	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
K1	Wiem jak formułować ustrukturyzowane pytania kliniczne zgodne z formatem PICO (pacjent, interwencja, porównanie i wynik).	I know how to make clinical questions organize in the PICO format	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
K2	Znam główne źródła pozyskiwania sprawdzonych danych naukowych, które są odpowiednio skatalogowane (np. Conchrane Library, itd. ...).	I know the principal sources that offer the information revised and catalogued behind the evidence point of view	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
K3*	Nie znam kryteriów metodologicznych dotyczących jakości badań naukowych.	I do not know the most important characteristics of the principal investigation designs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
K4	Znam hierarchię ważności dowodów naukowych pochodzących z badań klinicznych.	I know the different evidence level of the designs of the investigation studies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
K5*	Nie mam wiedzy na temat zaleceń dotyczących zastosowania określonych procedur lub metod	I do not know the different recommendation grades about the adoption of a	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	interwencyjnych w zakresie zdrowia.	determined procedure or health intervention					
K6	Znam główne wskaźniki (np. RR, OR, itd. ...) oraz parametry wpływu (NNT, NND, redukcja ryzyka względnego, itd...) umożliwiające ocenę wielkości wpływu analizowanego czynnika w badaniach klinicznych.	I know the principal measures of association and potential impact that allow to evaluate the magnitude of the analyzed effect in investigation studies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

* Negatively phrased items were reverse-scored before analysis

Descriptive statistics for EBP-COQ_P

Item	Mean	SD	Skew	CR	Kurtosis	CR
EBP-COQ_A1	4.0	0.74	-0.27	-4.49	-0.25	-2.09
EBP-COQ_A2	3.8	0.71	-0.14	-2.30	-0.19	-1.61
EBP-COQ_A3	3.9	0.75	-0.41	-6.85	0.17	1.43
EBP-COQ_A4	4.0	0.92	-0.73	-12.21	0.11	0.85
EBP-COQ_A5	4.1	0.76	-0.68	-11.45	0.86	7.18
EBP-COQ_A6	3.9	0.76	-0.29	-4.77	-0.00	-0.04
EBP-COQ_A7	4.0	0.72	-0.31	-5.20	-0.19	-1.59
EBP-COQ_A8	3.9	0.76	-0.41	-6.93	0.28	2.27
EBP-COQ_A9*	3.9	0.95	-0.99	-16.48	0.80	6.61
EBP-COQ_A10*	3.4	0.87	-0.31	-5.16	0.10	0.80
EBP-COQ_A11*	3.5	0.94	-0.36	-6.06	-0.02	-0.19
EBP-COQ_A12	3.9	0.79	-0.65	-10.87	0.70	5.79
EBP-COQ_A13	4.2	0.73	-0.81	-13.54	0.96	7.97
EBP-COQ_S1	3.5	0.82	-0.41	-6.79	-0.10	-0.88
EBP-COQ_S2*	3.3	1.01	-0.35	-5.84	-0.76	-6.34
EBP-COQ_S3*	3.0	1.01	0.05	0.77	-0.92	-7.68
EBP-COQ_S4	3.4	0.84	-0.37	-6.19	-0.16	-1.34
EBP-COQ_S5*	3.4	0.88	-0.47	-7.82	-0.37	-3.09
EBP-COQ_S6	3.6	0.75	-0.65	-10.80	0.39	3.22
EBP-COQ_K1	3.2	0.97	-0.24	-4.01	-0.53	-4.47
EBP-COQ_K2	3.1	1.01	-0.07	-1.21	-0.80	-6.71
EBP-COQ_K3*	3.1	0.97	-0.08	-1.31	-0.71	-5.91
EBP-COQ_K4	3.1	0.95	-0.06	-0.98	-0.65	-5.47
EBP-COQ_K5*	3.4	0.94	-0.54	-9.10	-0.31	-2.65
EBP-COQ_K6	3.1	1.11	0.02	0.30	-0.80	-6.75

* reverse score items

SD - standard deviation, CR - critical ratio

Correlation item-total results

Item	Correlation item-total
Subscale "Attitude toward EBP"	
EBP-COQ_A1	0.575
EBP-COQ_A2	0.410
EBP-COQ_A3	0.520
EBP-COQ_A4	0.340
EBP-COQ_A5	0.585
EBP-COQ_A6	0.661
EBP-COQ_A7	0.640
EBP-COQ_A8	0.673
EBP-COQ_A9*	0.404
EBP-COQ_A10*	0.450
EBP-COQ_A11*	0.462
EBP-COQ_A12	0.583
EBP-COQ_A13	0.538
Subscale "Skills in EBP"	
EBP-COQ_S1	0.413
EBP-COQ_S2*	0.506
EBP-COQ_S3*	0.515
EBP-COQ_S4	0.452
EBP-COQ_S5*	0.515
EBP-COQ_S6	0.423
Subscale "Knowledge in EBP"	
EBP-COQ_K1	0.494
EBP-COQ_K2	0.538
EBP-COQ_K3*	0.432
EBP-COQ_K4	0.527
EBP-COQ_K5*	0.252
EBP-COQ_K6	0.364

* reverse score items

Test-retest reliability

Items	Weighted kappas ^a	ICCs ^b	Domain ICCs (95% CI)	Mean difference (95% CI) ^c
EBP-COQ_A1	0.83	0.901		
EBP-COQ_A2	0.93	0.958		
EBP-COQ_A3	0.86	0.913		
EBP-COQ_A4	0.80	0.930		
EBP-COQ_A5	0.97	0.987		
EBP-COQ_A6	0.96	0.976	0.938	0.011
EBP-COQ_A7	0.91	0.947	(0.891; 0.963)	(-0.155; 0.177)
EBP-COQ_A8	0.93	0.958	P = 0.000	P = 0.895
EBP-COQ_A9*	0.91	0.964		
EBP-COQ_A10*	0.89	0.953		
EBP-COQ_A11*	0.97	0.988		
EBP-COQ_A12	0.97	0.982		
EBP-COQ_A13	0.96	0.978		
EBP-COQ_S1	0.91	0.968		
EBP-COQ_S2*	0.94	0.986		
EBP-COQ_S3*	0.81	0.950	0.907	0.132
EBP-COQ_S4	0.81	0.936	(0.879; 0.931)	(-0.030; 0.294)
EBP-COQ_S5*	0.87	0.961	P = 0.000	P = 0.109
EBP-COQ_S6	0.93	0.971		
EBP-COQ_K1	0.95	0.982		
EBP-COQ_K2	0.88	0.966		
EBP-COQ_K3*	0.88	0.962	0.926	-0.121
EBP-COQ_K4	0.91	0.977	(0.904; 0.946)	(-0.266; 0.024)
EBP-COQ_K5*	0.87	0.960	P = 0.000	P = 0.101
EBP-COQ_K6	0.96	0.990		

* reverse score items

^a Kappa values ≥ 0.80 were taken to represent excellent agreement

^b For ICCs, values more than 0.75 indicated good reliability

^c Student's t test to compare mean differences in two measurements

ICCs - intraclass correlation coefficients, 95% CI - 95% confidence interval