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Epistemological beliefs of European physiotherapists: a multi-countrycross-cultural adaptation for the DEBQ and the CAEB questionnaires

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Abstract
This article assumes that epistemological beliefs of physiotherapists are an important determinant in improving the concept of evidence-based practice. Little research has been done on epistemological beliefs in physiotherapy. In order to measure the sophistication of epistemological beliefs in future research, two complementary questionnaires (DEBQ and CAEB) were cross-culturally adapted in nine different countries and seven languages in Europe. A standardized seven-step guideline was used to translate and culturally validate the questionnaires. The questionnaires were distributed in the respective countries, resulting in 1386 participants. The psychometric values were analysed in order to verify consistency and validity. Based on the validation process, the instruments are considered to be validly adapted for the countries involved. The uniformity in the adaptation process allows for future comparison of the countries.

Keywords: Cross-cultural adaptation, Evidence-based practice, Epistemological beliefs

Introduction

This study is performing a multi-country cross-cultural adaptation of two complementary questionnaires within the domain of physiotherapy. The domain-specific Epistemological Belief Questionnaire (DEBQ) and the Connotative-Aspects of Epistemological Beliefs (CAEB) can measure, from different perspectives, the domain-specific epistemological beliefs of physiotherapy. This research seeks to answer the following research question: can the DEBQ and the CAEB questionnaires be cross-culturally adapted for different countries within Europe, while keeping the uniformity needed in order to be comparable?

The adapted questionnaires can be used in future research to measure and compare the epistemological beliefs of physiotherapists in various countries in Europe. This introduction first describes the context of this study and then the background of the cross-cultural adaptation.

Context

In physiotherapy one of the main demands is to work within the framework of evidence-based practice.[1] This is a challenge, as the practitioner needs to constantly negotiate both the individual context of the patient as well as the fast growing amount of external evidence. The evidence-based practice (EBP-) movement is facing a number of challenges.[2–6] These challenges are: the suboptimal or even damaging care given to patients,[3] the failure to get new knowledge to professionals,[6] and the growing expenses.[4] This makes a reorientation of the underlying concepts of the EBP movement necessary. The understanding of knowledge is one of the more fundamental but little researched underlying concepts.[7]

The individual thinking of the physiotherapists, and how they develop their expertize, is based on how they define, individually or within the professional community, what relevant knowledge is, and how they access this knowledge.

Knowledge could be considered to be certain and be transferred from an authority to the professional. In this case the main challenge would be how to select the right information and how to transfer it (guidelines, education etc.) to the professional. An opposing view would be to consider knowledge as less certain, changeable and depending on the context and the persons involved. From this perspective, selecting and transferring knowledge would become insufficient, because there is the likelihood of not taking the specifics of the context into consideration. The understanding of the local context and of how other people think would then become increasingly important. Because meaning can differ between persons and can be more or less explicit, communicating and sharing this specificity becomes a key factor.[8] When evidence-based practice was adopted in physiotherapy, little attention was given to the importance of the way knowledge was viewed.[3]

This study aims to contribute to a better understanding of the way physiotherapists view the nature of knowledge, which is a matter that concerns the field of personal epistemology.[9] This research area focuses on what individuals believe about, what counts as knowledge and where it resides, how individuals come to know, and how knowledge is constructed and evaluated.[10] This is called epistemological beliefs. These beliefs can be divided into general beliefs and domain-specific beliefs. In this study, the interest is in the specific beliefs of the domain of physiotherapy.[11] Epistemological beliefs influence how an individual physiotherapist in daily practice resolves competing knowledge claims, evaluates new information and makes decisions.[12] When put on a continuum, it shows on one side naïve beliefs based on the unequivocal and objective nature of knowledge coming from authoritative sources; on the opposite side, a sophisticated perception in which the nature of knowledge is contextual, temporary and coming from a variety of sources.

There are several instruments to measure domain-specific epistemological beliefs.[9] The choice for the questionnaires used has been made because they allow for the gathering of data from a large population with a low financial and time investment. They also allow for an attainable comparison between the respondents.

The choice for the following questionnaires – Domain specific Epistemological Belief Questionnaire (DEBQ) and Connotative-Aspects of Epistemological Beliefs (CAEB) – has been made based on their complementary perspective in terms of measuring the sophistication of the epistemological beliefs. Both questionnaires recognize different dimensions (or factors) in their construct. These factors specify the content and construct, and thus the validity of the instruments.

The DEBQ is based on the assumption that people can make their beliefs explicit. Hofer and Pintrich [9] suggest that the individual beliefs about knowledge and knowing are organized in personal epistemological theories. This offers a way to conceptualize a discipline-specific understanding of epistemology.[9,13,14] This has relevance, as it seems that epistemological assumptions of individuals are grounded in disciplinary contexts. This personal epistemology can also differ in a person when regarding different disciplines.[9] This epistemological theory recognizes five dimensions that group together in the two areas of epistemology: the nature of knowledge and the process of knowing [13] (Table 1).

Table 1. Dimensions of knowledge sophistication.

Nature of knowledge	
Certainty	At lower levels, absolute truth exists with certainty. At higher levels, knowledge is tentative and evolving.
Simplicity of knowledge	On the lower level, knowledge is seen as discrete, concrete, knowable facts; at higher levels individuals see knowledge as more relative, contingent, and contextual.
Process of knowing	
Source of knowledge	At lower levels knowledge resides in external authority. At higher levels knowledge is actively and socially constructed.
Justification of knowledge	At lower levels knowledge is judged through observation, gut feeling or authority at higher levels individuals use rules of inquiry and begin to personally evaluate and integrate the views of different resources.
Attainment of truth	The extent to which experts can attain deep knowledge (i.e., "truth") within their area of expertize. A high level of sophistication would put knowledge more in perspective.

Copied with acknowledgement from the author: Hofer.[13]

Most research share the view that epistemological knowledge consists of declarative beliefs that can be articulated by the individual. This view is challenged by another viewpoint, which asserts that many beliefs are implicit and so less articulated.

Stahl and Bromme [15] introduced the distinction in the interpretation of knowledge between explicit-denotative knowledge and associative-evaluative assumptions. Explicit-denotative knowledge refers to the more distal concept of knowledge *for* practice, which is relatively prescriptive, such as guidelines in physiotherapy or epistemological beliefs about science. The associative-evaluative assumption refers to a more proximal concept of knowledge *of* practice, being more personal, emotional and context dependent.[16] Stahl and Bromme [15] developed a new instrument, the CAEB, to measure these more connotative aspects. Connotative meanings evoke associative and evaluative judgments. The term comes from linguistics where it refers to additional and individual meanings that a person associates with a concept/word. Two dimensions were developed (Table 2).

Table 2. Dimension connotative meanings.

Texture	Beliefs about the structure and accuracy of knowledge. This dimension ranges from beliefs that knowledge is exact and structured to beliefs that it is unstructured and vague.
Variability	Beliefs about the stability and dynamics of knowledge. This dimension ranges from beliefs that knowledge is dynamic and flexible to beliefs that it is stable and inflexible.

Copied with acknowledgement from the author: Stahl and Bromme.[15]

The CAEB has also shown, besides a reliable measurement of the connotative aspects of epistemological beliefs, the way to predict how people critically evaluate (scientific) information.[17,18] This competence is a critical part of evidence-based practice.

In Europe, given the great diversity of cultures, it is interesting to see whether epistemological beliefs are similar between areas. The confirmation of this would set the stage for a further international development of the framework of evidence-based practice.

DEBQ has its origin in the USA; CAEB in Germany. To be able to use the source questionnaires across other countries in Europe, they need to be translated linguistically as well as adapted culturally through a semantic validation to ensure that the source text and the translation are equal. Beaton et al. [19] use the term "cross-cultural adaptation" to emphasize that the adaptation is focused on both language (translation) and culture in the process of preparing a questionnaire to be used in another setting then where it was developed, and maintain the content validity of the instruments across the different cultures.[19]

To keep the ambition attainable, we selected nine countries from the European community of physiotherapy, each representing the northern, central and southern parts of Europe. The questionnaires were translated and culturally adapted for Finland, Denmark, The Netherlands, Italy, Spain and Portugal, and for the German speaking countries Austria, Switzerland and Germany. The created surveys needed to be cross-culturally adapted and also (stay) comparable to each other for further research.

Methods

The methodology for the adaptation was based on the guidelines of Beaton et al. [19] and Isis Innovation.[20]

Description of the selected instruments

Both instruments are self-reported online questionnaires. The DEBQ uses a 5-points Likert scale; ranging from "strongly disagree" to "strongly agree".[13] The CAEB uses a semantic-differential scale with opposite adjectives, with a 7-point Likert scale.**[**15] The proposed factors were used (Tables 3 and 4).

Table 3. DEBQ – Discipline Epistemic Belief Questionnaire.[13]

Items	Factors Hofer *R* = reversed
1. Truth is unchanging in this subject.	Cert.
2. In this subject, most work has only one right answer.	Cert.
3. Sometimes you just have to accept answers from the experts in this field, even if you don't understand them.	Source
4. What we accept as knowledge in this field is based on objective reality.	
5. All professors in this field would probably come up with the same answers to questions in this field.	Cert.
6. The most important part of working in this subject is coming up with original ideas.	
7. If you read something in a textbook for this subject, you can be sure it is true.	Source
8. A theory in this field is accepted as true and correct if experts reach consensus.	
9. Most of what is true in this subject is already known.	Cert.
10. Ideas in this subject are really complex.	
11. In this subject, it is good to question the ideas presented.	Cert. *R*
12. Correct answers in this field are more a matter of opinion than fact.	Just.
13. If scholars try hard enough, they can find the answers to almost anything.	Att. of truth
14. The most important part of being an expert in this field is accumulating a lot of facts.	
15. I know the answers to questions in this field because I have figured them out for myself.	
16. One expert's opinion in this field is as good as another's.	
17. Experts in this field can ultimately get to the truth.	Att. of truth
18. Principles in this field are unchanging.	Cert.
19. Principles in this field can be applied in any situation.	
20. If my personal experience conflicts with ideas in the textbook, the book is probably right.	Source
21. There is really no way to determine whether someone has the right answer in this field.	Just.
22. Expertize in this field consists of seeing the interrelationships among ideas.	
23. Answers to questions in this field change as experts gather more information.	Cert. *R*
24. All experts in this field understand the field in the same way.	Cert.
25. I am more likely to accept the ideas of someone with first-hand experience than the ideas of researchers in this field.	Just.
26. I am most confident that I know something when I know what the experts think.	Source
27. First-hand experience is the best way of knowing something in this field.	Just.

Copied with acknowledgement from the author: Hofer.[13]

Table 4. CAEB – Connotative Aspects of Epistemological Beliefs.

Items	Factors Stahl *R* = reversed
1. Stable–Instable	Variability
2. Objective–Subjective	Texture
3. Confirmable–Unconfirmable	Texture
4. Dynamic–static	Texture
5. Superficial–profound	Texture
6. Temporary–everlasting	Variability
7. Exact–vague	Texture
8. Absolute–Relative	Texture
9. Sorted–Unsorted	Texture
10. Precise–Imprecise	Texture
11. Flexible–Inflexible	Variability
12. Definite–Ambiguous	Texture
13. Negotiated–Discovered	Texture
14. Structured–Unstructured	Texture
15. Completed–Uncompleted	Variability
16. Refutable–Irrefutable	Variability
17. Open–Closed	Variability

Copied with acknowledgement from the author: Stahl and Bromme.[15]

Sample size and characteristics

Each of these countries had the following contributors: an in-country investigator, two translators, one or two back translators and a group of five physiotherapy students. The in-country investigators were all senior lecturers in physiotherapy and teaching methodology. All translators were bilingual and either psychologists and physiotherapists. Back translators were all bilingual with the source language as their mother tongue. For the German language countries (Germany, Austria and Switzerland), a single validation process was performed with a multi-country group of collaborators, to maximize the equivalence between the questionnaire and the original source, while still ensuring each country-specific culture.

Procedures

Permission to carry out the translation and validation of the instrument was requested from the authors of the original questionnaires.

The project leader instructed the in-country investigator in the adaptation process, which was structured in seven phases, conforming to the guidelines of Isis Innovation.[20] Each phase was supported with blue print forms to ensure attainability and uniformity:

- Forward translation
- Forward translation reconciliation
- Back translation
- Back translation review
- Pilot testing
- Pilot testing review
- Proofreading Forward

The review phases after the translation and the pilot allowed for a dialogue within the team and, in case of differences, the best translation, considering both linguistics and semantics, was chosen.

The project leader ensured harmonization between in-country investigators during the process.[21] The project leader made the survey for both the pilot phase and the final version available in the online environment (Google Forms, www.google.com/drive).

The in-country investigators were selected from members of the European Network of Physiotherapy in Higher Education.[22] They were also asked to distribute the survey in their respective countries.

The final versions of both questionnaires, as distributed per country, are available in the following supplementary material:

- Danish version of the DEBQ and the CAEB
- Finnish version of the DEBQ and the CAEB
- German version of the DEBQ and the CAEB
- Italian version of the DEBQ and the CAEB
- Dutch version of the DEBQ and the CAEB
- Portuguese version of the DEBQ and the CAEB
- Spanish version of the DEBQ and the CAEB

Distribution of the survey

The survey was distributed to the population of physiotherapists and physiotherapy students of each country in order to verify its psychometric qualities. The main distribution strategy was to use the academic network within the country.

The final version of the survey was distributed in seven languages and in nine countries between March and December 2015. For this study, we considered a minimum of 100 responses, from the countries where the survey was distributed, to be included for the psychometric analysis.[23] The statistical analyses for checking the psychometric value of the survey were therefore done for Dutch ($N = 283$), Portuguese ($N = 277$), Italian ($N = 218$), Danish ($N = 151$) Spanish ($N = 229$), Finnish ($N = 105$) and the German-speaking countries ($N = 123$), with in total 1386 respondents.

Data analysis

The data recorded on the Excel databases (per country) were exported to a single database created on the IBM® SPSS® version 22 (Armonk, NY). The internal consistency was assessed using Cronbach's alpha coefficient, where a value between .70 and .95 is considered acceptable and indicates a high reliability.[24]

In order to confirm the construct validity for the DEBQ and CAEB, a Confirmatory Factor Analysis was performed with the factors suggested in the original studies.[13,15] Based on the rule that the initial Eigen values should be >1, in all countries a minimum of the proposed factors were recognized, allowing for a factor analysis.[25] A principal component analysis (with varimax rotation) was performed for both questionnaires.

According to Hair et al.[26] the Measure of Sample Adequacy (MSA), when reporting appropriateness of data for a factor analysis, is satisfactory with values >80. If the MSA was lower, we turned to Bartlett's Test of Sphericity, and when this had an associated p value of <.001, we could continue to perform a valid factor analysis. Solutions were confirmed by successively

omitting items with no substantial factor loadings (<.32).[24] Items were also omitted with high loadings (>.40) on more than one factor.[27]

Results

The DEBQ was cross-culturally adapted for all nine countries. The CAEB was translated and validated for six countries, with the exception of Germany, Austria and Switzerland, since the original version was German.[15] The investigator confirmed, with experts from the three German-speaking countries, the validity of the used linguistics for the cultures of Switzerland and Austria. For the other countries, the English translation of the CAEB was used, which was translated and published by the same research group.

Results analysis of psychometric factors

The MSA was confirmed for the seven languages, as the values were acceptable in combination with Bartlett's test (Table 5).

Table 5. MSA and Bartlett per questionnaire per country.

Countries	DEBQ MSA plus Bartlett	CAEB MSA plus Bartlett
The Netherlands	.751–.000	.798–.000
Portugal	.753–.000	.905–.000
Denmark	.715–.000	.805–.000
Italy	.739–.000	.822–.000
Spain	.767–.000	.840–.000
Finland	.634–.000	.802–.000
German SC	.651–.000	.786–.000

The Eigen values were sufficient for performing a factor analysis for both questionnaires (Table 6).

Table 6. Total variance explained.

(a) DEBQ – confirmatory factors

	Factor 1		Factor 2		Factor 3		Factor 4		
Country	Eigen value	% Variance	Eigen value	% Variance	Eigen value	% Variance	Eigen value	% Variance	Total explained variance %
NL	3.78	13.88	2.07	7.65	2.02	7.48	1.96	7.27	36.30
PT	3.82	14.13	2.26	8.39	2.14	7.93	1.99	7.39	37.85
DK	3.58	13.25	2.90	10.74	2.29	8.49	2.08	7.69	40.17
IT	2.99	11.06	2.95	10.93	2.53	9.37	2.34	8.66	40.02
ES	3.91	14.50	2.87	10.62	2.03	7.51	1.90	7.02	39.64
FI	3.82	14.16	2.93	10.84	2.38	8.81	2.01	7.44	41.24
GSC	2.88	10.68	2.61	9.68	2.28	8.46	2.27	8.41	37.23

(b) CAEB – confirmatory factors

	Factor 1		Factor 2		
Country	Eigen value	% Variance	Eigen value	% Variance	Total explained variance %
NL	4.05	23.80	2.67	15.72	39.52
PT	4.63	27.23	4.43	26.04	53.27
DK	4.54	26.69	3.30	19.42	46.11
IT	4.10	24.09	3.22	18.94	43.03
ES	4.66	27.44	2.98	17.55	44.99
FI	4.42	26.00	2.81	16.53	42.54
GSC	4.50	26.46	2.66	15.66	42.19

DEBQ

The overall result from the DEBQ showed a consistent result with a Cronbach alpha with omitted items between .70 and .77 in the countries. For all countries, the four factors from the original article were reproduced; however, the loading of the items did not occur consistently compared with the original study and between the countries. The Cronbach alphas from the factor Certainty/Simplicity show an equal or higher number (between .67 and .79) compared to .66 in the original study. For the other three factors, the Cronbach alpha was low for all countries (Table 7).

Table 7. DEBQ – Cronbach alpha factor analysis.

Country	Total	Omitted items	Factor certainty/simplicity	Factor attainment of truth	Factor source	Factor justification
NL	.750	.736 (25)	.769	.567	.541	.268
PT	.740	.746 (24)	.779	.601	.507	–
DK	.754	.738 (23)	.759	.684	.479	.615
IT	.793	.749 (21)	.671	.412	.649	.586
ES	.796	.777 (23)	.762	.663	.380	–
FI	.686	.709 (25)	.746	.645	.481	.454
GSC	.691	.729 (18)	.644	.473	.366	.355

CAEB

The Cronbach alpha from the CAEB shows satisfactory to good internal consistency (between .70 and .92). Items, when accepted, showed a 100% consistency based on which factor they load between countries. Items 1 and 15 loaded consistently on the texture factor, while, according to the original study, in terms of content they belonged to the variability factor. Item 4 also loaded consistently opposite as suggested in the original study, but in terms of the variability factor. The factor variability in the Finnish questionnaire lacks consistency (Table 8).

Table 8. CAEB – Cronbach alpha factor analysis.

Country	Total	Omitted items (amount)	Factor texture	Factor variability
NL	.782	.793 (14)	.823	.727
PT	.904	.916 (14)	.908	.821
DK	.852	.820 (14)	.838	.769
IT	.822	.821 (15)	.819	.760
ES	.809	.816 (15)	.848	.776
FI	.732	.701 (11)	.804	.531
GSC	.832	.839 (16)	.837	.752

Correlation between the questionnaires

The instruments showed some convergent validity in negative low correlations found between the DEBQ certainty/simplicity factor and the CAEB texture factor. Given the opposite direction in scoring the items of the CAEB texture factor, this negative correlation could be expected. Between the DEBQ certainty/simplicity factor and the CAEB variability factor, a weak correlation was only found for the Netherlands (.134, $p = .026$) and for the total (.130, $p = .000$) (Table 9).

Table 9. DEBQ–CAEB correlations.

Country	Pearson's *R* – correlation (significance/*p*-value)
	DEBQ certainty and simplicity–CAEB texture
NL	−.314 (.000)
PT	−.143 (.017)
DK	−.321 (.000)
IT	–
ES	−.168 (.011)
FI	−.369 (.000)
GSC	−.263 (.003)
Total	−.217 (.000)

Discussion

The discussion begins by addressing the general process and the limitations of the parallel adaptation of the two questionnaires, followed by the psychometric analysis.

Adaptation process

The adaptation process followed the guidelines from Isis Innovation.[20] For practical reasons the guidelines' recommendation to conduct two back translations with bilingual professionals was not followed. Instead, one translation per country was performed, and the country collaborators assessed its similarity with the original translation. When considered necessary, a second translation was performed, which only happened for the Portuguese version. Beaton et al.[19] described the expert team (in this study the project leader and the country teams) to being composed of a methodologist, a health professional and a language professional. The absence of a language professional in most of the teams was a shortcoming in the process.

Every adaptation process has its own dynamics and timeframe. Doing a multi-country cross-cultural adaptation to compare outcomes between different countries poses a challenge between the cultural adaptation in one specific country and the aim of keeping the products comparable for the studies that follow. The main subjects of discussion during the process are presented below.

The different phases in the adaptation process per country influenced how and whether the different countries would affect each other. In the Dutch translation, the decision was made not to use the phrase "in this field" as it was too abstract, and "anchor" for the term "ons vakgebied", which literally translates to "our discipline". This seemed to improve the understanding of the questionnaire significantly. This was, partly and in retrospective, confirmed by the study of Muis et al.[28], which advises the use of the term of the specific profession, e.g. physiotherapist, instead of the term "expert", to improve validity. This adjustment, considered to be a general improvement, was not implemented in all countries because at the time of this deliberation, some questionnaires were already distributed. The discussion around the meaning and the translation of the words "expert", "professors" and "scholars" in the DEBQ was resolved in deliberation with the project leader to ensure the same meaning, and then considered within the specific language.

English translation was used for the translation of de CAEB. Although published in English in many peer-reviewed articles, to our knowledge, the questionnaire has never been formally adapted for the English language. The translation was discussed within the German team and proven to be satisfactory. The interpretation of the meaning of the terms of the CAEB was, generally speaking,

a source of difficulty for both translators and the respondents in the pilot phase. The most common feedback was the feeling that the questionnaire was fairly "abstract". Some terms seemed to be repetitive but phrased differently, and particularly the term "Negotiated-Discovered" was not always clearly understood. Since the nature of a semantic differential is to judge about a topic in an associative and evaluative way, the more abstract character was considered to be a part of the construct. It was also hypothesized that the difficulty in giving meaning to some of the terms could have been the result of a more naïve epistemological belief. In this study, the choice was made to stay as close as possible to the wording used in the original article.

Psychometric analysis

In general, research in epistemological beliefs has shown a low consistency and the factor structure does not always appear to be stable.[11,29] Conceptually, there is still a debate about the number and the nature of the dimensions (factors) and the philosophical considerations that the concept is based upon.[28] Further investigation is required to establish this validity. This study revealed flaws in psychometric values, which are common in other comparable studies.[7,11,30] The general low consistency was confirmed in the adaptation process for the DEBQ. The stability of the CAEB factors turned out to be more consistent than expected based on the difficulties of other studies trying to reproduce the same factors.[30,31]

The DEBQ and the CAEB showed a low-explained variance, which indicated that adding more factors and developing the content validity of the questions could increase this number. Here, the questionnaires are individually discussed in more detail and alternative strategies are presented.

DEBQ

The proposed 4-factor structure in de DEBQ was present for all seven languages. The low-explained variance, the Kaiser-criterion and the amount of omitted items in the questionnaire seemed to indicate a possibility for the existence of other relevant factors. However, in the analysis of the questions of the DEBQ many questions, especially in the factors of "source" and "justification", seem to be multi-interpretable, jeopardizing the construct validity of the instrument. Focussing on cognitive validity could reinforce the interpretation of the researchers about the respondents' opinions. A thorough research of cognitive validity is recommended, using self-report surveys and relying on the interpretation of intrinsically abstract constructs, such as epistemology.[32] Muis et al. [28] have indicated a quite consistent cognitive validity of the DEBQ questions; however, they also state that it can be improved significantly.

CAEB

The CAEB also revealed an opportunity to add a factor based on the Eigen values of the proposed factors in SPSS® version 22 (Chicago, IL) and based on the content analysis that showed for all countries low loadings on the same four items. It was hypothesized that the lower consistency on the Variability factor for Finland was due to the comparatively low response. This should be further researched.

The relation between the DEBQ and the CAEB

The CAEB and the DEBQ were both employed in order to measure the same construct: sophistication of epistemological beliefs. However, they measured different layers in the concept. Some convergent validity was to be expected, as the certainty/simplicity dimension was similar to the "texture" and "variability" dimensions in the CAEB.[30] The hypothesized correlations between the two instruments on these variables showed weak correlations. Although the

correlation was present, its weakness could be explained by the difference between the denotative and connotative nature of the questionnaires (Table 9).

The relation between the countries

The construct validity of the DEBQ and the CAEB is strengthened by the comparable internal consistency of the DEBQ and CAEB questionnaires in total, as well as for the factors showing consistency. The same reasoning is valid for the slight variance in item loading for the CAEB.

Conclusion

All instruments have maintained their initial structure and content allowing for comparison between countries in the future. The two questionnaires DEBQ and CAEB are based on their psychometric properties, sufficiently cross-culturally adapted for their countries. The problems regarding the stability of the factor loading occur in a similar way as in the original instruments. Only those factors with a sufficient consistency can be used in further research, which seems to be different per context and therefore should be treated accordingly.

The existence of the adapted questionnaires could be used to measure the development of the sophistication of epistemological beliefs as a determinant for evidence-based physiotherapy practice in national contexts. The CAEB could also be used in predicting how physiotherapists critically evaluate information within evidence-based practice. Because of the comparability between countries, differences between countries could facilitate dialogue and evoke international development of the underlying concepts of the evidence-based practice movement.

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References

[1] Dijkers MP, Murphy SL, Krellman J. Evidence-based practice for rehabilitation professionals: concepts and controversies. Arch Phys Med Rehabil. 2012;93:S164–S176.
[2] Graham ID, Logan J, Harrison MB, et al. Lost in knowledge translation: time for a map? J Contin Educ Health Prof. 2006;26:13–24.
[3] Marks DF. Perspectives on evidence-based practice, Health Development Agency Public Health Evidence Steering Group. 2002;1–53.
[4] Greenhalgh T, Howick J, Maskrey N. Evidence based medicine: a movement in crisis? BMJ. 2014;348:g3725.
[5] Grol RP, Grimshaw J. From best evidence to best practice: effective implementation of change in patients' care. Lancet. 2003;362:1225–1230.
[6] Grimshaw JM, Eccles MP, Lavis JN, et al. Knowledge translation of research findings. Implement Sci. 2006;7:50.
[7] Bientzle M, Cress U, Kimmerle J. Epistemological beliefs and therapeutic health concepts of physiotherapy students and professionals. BMC Med Educ. 2014;14:208.
[8] Gabbay J, LeMay A. Practice-based evidence for healthcare: clinical mindlines. New York (NY): Routledge; 2011.
[9] Hofer BK, Pintrich PR. The development of epistemological theories: beliefs about knowledge and knowing and their relation to learning. Rev Educ Res. 1997;67:88–140
[10] Hofer BKG. Personal epistemology and culture. In: Myint Swe K, editor. Knowing, knowledge and beliefs. Dordrecht: Springer; 2008.
[11] Schraw G. Conceptual integration and measurement of epistemological and ontological beliefs in educational research. ISRN Educ. 2013;2013. doi:10.1155/2013/327680.

[12] Roex A, Clarebout G, Dory V, et al. Can ill-structured problems reveal beliefs about medical knowledge and knowing? A focus-group approach. BMC Med Educ. 2009;9:62.
[13] Hofer BK. Dimensionality and disciplinary differences in personal epistemology. Contemp Educ Psychol. 2000;25:378–405.
[14] Hofer BK, Sinatra GM. Epistemology, metacognition, and self-regulation: musings on an emerging field. Metacogn Learn. 2010; 5:113–120.
[15] Stahl E, Bromme R. The CAEB: an instrument for measuring connotative aspects of epistemological beliefs. Learn Instr. 2007;17:773–785.
[16] Clarke CL, Wilcockson J. Seeing need and developing care: exploring knowledge for and from practice. Int J Nurs Stud. 2002;39:397–406.
[17] Feinkohl I, Flemming D, Cress U, et al. The impact of epistemological beliefs and cognitive ability on recall and critical evaluation of scientific information. Cogn Process. 2016;17:213–223.
[18] Feinkohl I, Flemming D, Cress U, et al. The impact of personality factors and preceding user comments on the processing of research findings on deep brain stimulation. A randomized controlled experiment in a simulated online forum. J Med Internet Res. 2016;18:1–15.
[19] Beaton D, Bombardier C, Guillemin F, Ferraz MB. Recommendations for the cross-cultural adaptation of health status measures. American Academy of Orthopaedic Surgeons, Institute for Work & Health; 2002.
[20] Isis Innovation. ISIS outcomes translation and linguistic validation guidelines, ISIS outcomes; 2010.
[21] Wild D, Grove A, Martin M, et al. Principles of good practice for the translation and cultural adaptation process for patient-reported outcomes (PRO) measures. Value Health. 2005;8:95–104.
[22] Enphe.org. [Internet]. European Network for Physiotherapy in Higher Education. [updated 2016; cited 2016 Apr 10]. Available from: http://enphe.org/.
[23] Ferguson E, Cox T. Exploratory factor analysis: a user's guide. Int J Select Assess. 1993;1:84–94.
[24] Maroco J, Garcia-Marques T. What is the reliability of the Cronbach? Old questions and new solutions. Laboratório De Psicologia. 2006;4:65–90.
[25] Comrey AL, Lee HB. A first course in factor-analysis. 2nd ed. Hillsdale (NJ): Lawrence Erlbaum Associates; 1992.
[26] Hair JF, Anderson RE, Tatham RL, Black WC. Multivariate data analysis. 5th ed. Upper Saddle River (NJ): Prentice-Hill; 1998
[27] Brown JD. Questions and answers about language testing statistics: choosing the right number of components or factors in PCA and EFA. JALT Testing & Evaluation SIG Newsletter. 2009;13:19–23.
[28] Muis KR, Duffy MC, Trevors G, et al. What were they thinking? Using cognitive interviewing to examine the validity of self-reported epistemic beliefs. Int Educ Res. 2014;2:17–32.
[29] Clarebout G, Elen J, Luyten L, et al. Assessing epistemological beliefs: Schommer's questionnaire revisited. Educ Res Eval. 2001;7:53–77.
[30] Kienhues D, Stahl E, Bromme R. Changing epistemological beliefs: the unexpected impact of a short-term intervention. Br J Educ Psychol. 2008;78:545–565.
[31] Pieschl S, Stallmann F, Bromme R. High school students' adaptation of task definitions, goals and plans to task complexity – The impact of epistemic beliefs. Psychol Topics. 2014;23:31–52.
[32] Karabenick SA, Woolley ME, Friedel JM, et al. Cognitive processing of self-report items in educational research: do they think what we mean? Educ Psychol. 2007;42:139–151.