

Development of domain-specific epistemological beliefs of physiotherapists: A longitudinal study

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Research article

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Abstract

Background Epistemological beliefs (EBs) and therapeutic health concepts are two important factors of influence that affect how healthcare professionals deal with treatment-relevant medical information. A previous investigation compared physiotherapy students' EBs and therapeutic health concepts with those of professionals in a cross-sectional study. That study design, however, did not allow for any conclusions about the temporal development of these concepts. This shortcoming has been addressed in the study presented here. Methods In a longitudinal study, physiotherapists filled in a questionnaire that measured their personal EBs about physiotherapy and about medicine, as well as their biomedical and biopsychosocial therapeutic health concepts. The participants were first examined during their medical training. The follow-up measure was 3 years later when the participants had become professional physiotherapists. We examined the development of their EBs using paired sample t-tests. Results The analysis was based on 41 participants who filled in the questionnaire at both time points and were working as physiotherapists at the time of the second measurement. We found a development of physiotherapy-related and a development of medicine-related EBs: Physiotherapy-related as well as medicine-related EBs were more sophisticated when physiotherapists had already entered the working world than during their physiotherapy training. Due to psychometric problems of the scales, we could not analyze the development of their therapeutic health concepts. Conclusions EBs are an important factor for (lifelong) learning. We found that physiotherapy-related and medicine-related EBs developed similarly in both domains. This is an indication that the temporal development of EBs is an expression of professionalization of healthcare personnel in their occupational field. Our findings demonstrate that the development of EBs is not completed at the end of vocational training; it appears to be a continuing development throughout one's working life.

Background

Health professionals must evaluate medical information in the course of their daily work and take such information into consideration in their treatment decisions. Medical information is often fragile and sometimes ambiguous [1-3]. Dealing with information in general and with medical information in particular is influenced by people's personal beliefs about the characteristics of scientific information. *Epistemological beliefs* (EBs) are one important factor that has an impact on how health professionals deal with medical information [4-6]. EBs "are fundamental assumptions about the nature of knowledge, the certainty of knowing, the criteria and justifications for knowing" [p.29, 7]. As Roex and Degryse [6] pointed out, EBs are especially important for assessing one's own knowledge skills and learning strategies, and thus for making progress in acquiring medical knowledge. Acquiring knowledge is a lifelong process that consists of keeping up with the rapid advances in medical research. In the medical field [7], but also in other domains, such as mathematics [8] or reading comprehension [9], positive relationships between sophisticated EBs and learning success have frequently been observed [for an overview see 10]. EBs can be developed through problem-based learning settings and through arguing about different perspectives [11]. As a consequence of developing more sophisticated EBs, people tend to

consider scientific knowledge to be more tentative, contextual, and subjective. Handling ill-structured problems [5] and dealing with patients with their individual medical histories and concerns are also relevant factors in the development of EBs [4] in medical contexts.

Another important factor that has an impact on how health professionals deal with medical information is their own personal therapeutic health concept [12]. In today's healthcare system, two therapeutic health concepts are relevant: a biomedical therapeutic health concept (*bm* concept) and a biopsychological therapeutic health (*bps* concept). This relevance is reflected in the simultaneous occurrence of the International Classification of Diseases (ICD) [13] (based on the *bm* concept) and the International Classification of Functioning, Disability and Health (ICF) [14] (based on the *bps* concept). The widely used approach of patient-centeredness is closely linked to the *bps* concept [15,16]. Health professionals' personal therapeutic health concepts influence how they communicate with patients [17] and how they deal with treatment-relevant medical information [18,19]. As a physiotherapeutic treatment often focuses on the management of functional limitations with the aim of promoting patients' participation and activity in their daily life, the *bps* concept is more prevalent among physiotherapists than the *bm* concept [20,21]. It is conceivable that the development of therapeutic health concepts could be part of the professionalization process of health personnel. So far, however, not much is known about health professionals' temporal development of *bm* and *bps* concepts.

Epistemological beliefs and therapeutic health concepts are two important factors of influence that affect how health professionals deal with treatment-relevant medical information. A cross-sectional study found that EBs and therapeutic health concepts differed depending on the participants' training status [22]. Professional physiotherapists showed more sophisticated physiotherapy-related and more sophisticated medicine-related EBs than physiotherapy students. It was also found that professional physiotherapists had a more pronounced *bm* concept than students. Moreover, professional physiotherapists had a more pronounced *bps* concept than first-year students. No conclusions can be drawn about the temporal development of the concepts from such a cross-sectional study. Thus, in the present study we aimed to examine the development of EBs and therapeutic health concepts over time with a longitudinal study design. Based on the previous considerations, we deduced the following hypotheses:

Hypothesis 1: There will be a development of EBs:

1. There will be a development of physiotherapy-related EBs: Physiotherapy-related EBs will be more sophisticated when physiotherapists have already entered the working world than during their physiotherapy training.
2. There will be a development of medicine-related EBs: Medicine-related EBs will be more sophisticated when physiotherapists have already entered the working world than during their physiotherapy training.

Hypothesis 2: There will be a development of the therapeutic health concept:

1. There will be a development of the *bm* health concept: The *bm* health concept will be more pronounced when physiotherapists have already entered the working world than during their physiotherapy training.

There will be a development of the *bps* health concept: The *bps* health concept will be more pronounced when physiotherapists have already entered the working world than during their physiotherapy training

Methods

Participants

Eighty-four participants took part in this longitudinal study at the first measurement point (t1). At that time, they were all students at a school of physiotherapy in Tübingen, Germany (PT Academy). Twenty-nine students were first-year students and 55 were advanced students. At the first measurement point (t1), 80 students (95%) were between 21 and 30 years old, only 4 students (5 %) were between 31 and 40. Fifty-eight were women, 26 were men. Forty-six physiotherapists (55% of those who had participated in the first measurement) filled in the questionnaire at the second measurement point (t2). At that time, they were working in different places (multiple answers were possible): Six were working in a hospital (four in an emergency hospital, two in a rehabilitation center), 37 were employed in a physiotherapy practice, two were self-employed in a physiotherapy practice, and three were working in the sports sector. Two of the participants were not working as physiotherapists at t2. The following analysis is based on those 41 participants who filled in the questionnaire at both measurement points and were working as physiotherapists at the time of t2 (see Figure 1).

Procedure

The data collection at t1 took place at the PT Academy. After informing the students about privacy protection, their right to terminate their participation at any time without any disadvantage, and about the general purpose of the study, they gave written informed consent. Then they were asked to fill in the questionnaire (see below).

The follow-up measurement was conducted online three years later. All participants who were students at the PT Academy at t1 were contacted by e-mail from the secretary's office of the PT Academy. They were asked to fill in an online questionnaire. Participation took about 15 minutes and was compensated with the opportunity to take part in a lottery, where participants could win ten vouchers worth 15 Euros each. The datasets were linked by a code that the participants had created individually following a fixed procedure.

Measurements

As described in the procedure of the cross-sectional analysis [22], the health-related EBs were measured with the Connotative Aspects of Epistemological Beliefs (CAEB) scale [23]. This scale was adapted to the domains of physiotherapy and medicine respectively. The participants assessed the knowledge in the

field of physiotherapy and in medicine on seven-point semantic differential scales. Analogously to the cross-sectional study we used the CAEB-subscale *texture*, in which both domains were described with the same ten pairs of adjectives respectively. Sample items of this scale are “sorted – unsorted” or “absolute – relative”, whereby “unsorted” and “relative” represented sophisticated EBs (see Table 1).

We measured the *bm* and *bps* health concepts following the procedure presented in [12,22]. Participants rated the importance of five representative *bm* terms, such as “diagnosis”, and five characteristic *bps* concepts, such as “functionality”, on six-point Likert scales ranging from 1 (not important) to 6 (very important) (see Table 2).

Statistical analysis

We performed data analysis using IBM SPSS 20.0 for Windows [24]. Cronbach’s Alpha was calculated to determine internal consistency for all scales. We report all data as means (M) ± standard deviations. For testing the hypotheses, we applied paired sample t-tests. The level of significance was set at $P < 0.050$. Cohen’s d scores were calculated as effect sizes of mean differences.

Ethics statement

This research was performed in accordance with the Declaration of Helsinki. The PT Academy’s administration provided ethical approval for the participation of its students (due to legal specifications, the school administration was responsible for checking and approving the participation of its students). Regarding the follow-up measurement, this study had full approval of the ethics committee of the Leibniz-Institut für Wissensmedien (approval number: LEK 2013/035). All participants took part voluntarily and anonymously. They gave written informed consent and were informed about privacy protection, their right to terminate participation at any time without any disadvantage, and about the general purpose of the study.

Results

Health-related EBs

The internal consistency of the CAEB-subscale *texture* was acceptable in both domains (t1: $\alpha_{phys} = 0.62$, $\alpha_{med} = 0.65$; t2: $\alpha_{phys} = 0.66$, $\alpha_{med} = 0.67$).

Hypothesis 1a predicted a development of physiotherapy-related EBs. This assumption was supported by the data (see Table 3 for means and standard deviations). We found significant differences between the physiotherapy-related EBs at t1 and t2, $t(40) = -4.26$, $P < 0.001$, $d = 0.66$.

In Hypothesis 1b we had predicted a development of medicine-related EBs. This assumption was also supported by the data (see Table 3). We found significant differences between the medicine-related EBs at t1 and t2, $t(40) = -5.04$, $P < 0.001$, $d = 0.79$.

In accordance with the cross-sectional study [22] we found in an additional explorative analysis that first-year students showed greater development ($M_{\text{Diff}}=0.63\pm 0.59$) than the advanced students ($M_{\text{Diff}}=0.38\pm 0.71$) regarding medicine-related EBs, $t(40)=1.97$, $p = .028$, $d=0.70$.

Finally, like at t_1 , $t(40)=3.67$, $p < .001$, $d=0.57$, the EBs regarding physiotherapy were still more sophisticated than EBs regarding medicine at t_2 , $t(40)=2.50$, $p = .009$, $d=0.39$.

Therapeutic health concepts

The internal consistency of the subscale *bm* health concept was poor ($t_1: \alpha = 0.54$; $t_2: \alpha = 0.63$). The same was true of the *bps* health concept scale ($t_1: \alpha = 0.57$; $t_2: \alpha = 0.52$). Due to this psychometric shortcoming, no analyses regarding therapeutic health concepts could be conducted.

Discussion

The aim of this longitudinal study was to contribute to a better understanding of the temporal development of health-related EBs and therapeutic health concepts of physiotherapy students over a period of three years. A previous cross-sectional study found that the EBs differed between students and professionals [22]. Our findings support these earlier results in that they demonstrate that both physiotherapy-related and medicine-related EBs developed over time as people entered the working world. Former first-year students showed greater development of medicine-related EBs than former advanced students. However, this effect did not occur for physiotherapy-related EBs. In accordance with the cross-sectional study [22], at both time points physiotherapists' physiotherapy-related EBs were more sophisticated than their medicine-related EBs. Interestingly, the difference between physiotherapy- and medicine-related EBs were quite similar at both time points ($\text{Diff}_{t_1} = 0.28$, $\text{SD} = 0.49$; $\text{Diff}_{t_2} = 0.21$, $\text{SD} = 0.56$; $t(40) = 0.64$, $p = .262$). Similar developmental trajectories in EBs in different disciplines call into question the assumption that different domain-specific EBs tend to develop asynchronously [25]. Physiotherapy-related and medicine-related EBs emerged equally in both domains. Based on the data presented here we cannot conclude that this result would be transferable to other health domains or to other healthcare professionals. This is an aspect that should be addressed in future research.

Concerning therapeutic health concepts, the scale of the *bm* and *bps* measure had to be excluded due to psychometric flaws. The research question as to whether there is temporal development of the *bm* and *bps* concepts cannot be answered with this study. Furthermore, the generalizability of the results might be reduced by the fact that all of the participating students were recruited from the same school of physiotherapy. As often is the case in longitudinal studies that take several years to complete, we had a substantial dropout rate that could potentially have biased the study results (in terms of a selection bias). As we found the same pattern of results as in the cross-sectional study, however, it is quite unlikely that the findings in this study result merely from a selection bias.

Conclusions

As has been shown in several knowledge domains, EBs are an important factor that has an impact on how people deal with information. It is a key factor for (lifelong) learning, and the temporal development of EBs seems to be an expression of the professionalization of an individual in her or his working field. Our findings demonstrate that the development of EBs is not completed at the end of vocational training: it is rather a continuing development in people's working life. In order to foster the development of EBs during the education process, it might be an option to confront students with close-to-reality learning settings. The finding that both physiotherapy-related and medicine-related EBs developed comparably in both domains could be a hint that the temporal development of EBs is discipline-specific and can be interpreted as an indicator of professionalization.

Declarations

Ethics approval and consent to participate

This research was performed in accordance with the Declaration of Helsinki. The PT Academy's administration provided ethical approval regarding participation of its students (due to legal specifications, the school administration was responsible for checking and approving the participation of its students). Regarding the follow-up measurement this study had full approval by the ethics committee of the Leibniz-Institut für Wissensmedien (approval number: LEK 2013/035). All participants took part voluntarily and anonymously. They gave written informed consent and were informed about privacy protection, their right to terminate participation at any time without any disadvantage, and about the general purpose of the study.

Consent for publication

Not applicable

Availability of data and material

Data are available on request to the authors.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

MB and JK contributed to the conception and design of this study. MB made substantial contributions to the acquisition of data and performed the statistical analysis. MB and JK were responsible for drafting the article. UC contributed to its critical revision. All authors approved the final manuscript for publication.

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Tables

Table 1 - The texture subscale of the Connotative Aspects of Epistemological Beliefs (CAEB) scale

Knowledge in the domain of physiotherapy [or medicine respectively] is ...			
1	objective	ò-ò-ò-ò-ò-ò-ò	subjective
2	confirmable	ò-ò-ò-ò-ò-ò-ò	unconfirmable
3	superficial	ò-ò-ò-ò-ò-ò-ò	profound
4	exact	ò-ò-ò-ò-ò-ò-ò	vague
5	absolute	ò-ò-ò-ò-ò-ò-ò	relative
6	sorted	ò-ò-ò-ò-ò-ò-ò	unsorted
7	precise	ò-ò-ò-ò-ò-ò-ò	imprecise
8	definite	ò-ò-ò-ò-ò-ò-ò	ambiguous
9 ^r	negotiated	ò-ò-ò-ò-ò-ò-ò	discovered
10	structured	ò-ò-ò-ò-ò-ò-ò	unstructured

Seven-point semantic differential scales for measuring EBs about physiotherapy and medicine (texture subscale); reversely coded items are marked with a superscript 'r'.

Table 2 - Therapeutic health concepts scale

How important are the following subjects for your therapeutic thinking and acting?	
1	Functionality
2*	Diagnosis
3*	Science
4*	Evidence-based methods
5	Limited activity of a patient
6*	Standardized tests
7	Limited participation of a patient (in the social environment)
8*	Medical guidelines
9	Mental health of a patient
10	Requirements of the patient's everyday life

Six-point Likert scales for measuring the bm and bps concepts; bm items are marked with an asterisk (*).

Table 3 - Health-related EBs

EBs	EBs (texture) regarding knowledge in physiotherapy	EBs (texture) regarding knowledge in medicine
Time of measurement		
First measurement	M = 3.37 ± 0.62	M = 3.09 ± 0.57
Follow-up measurement	M = 3.82 ± 0.59	M = 3.60 ± 0.57

Figures

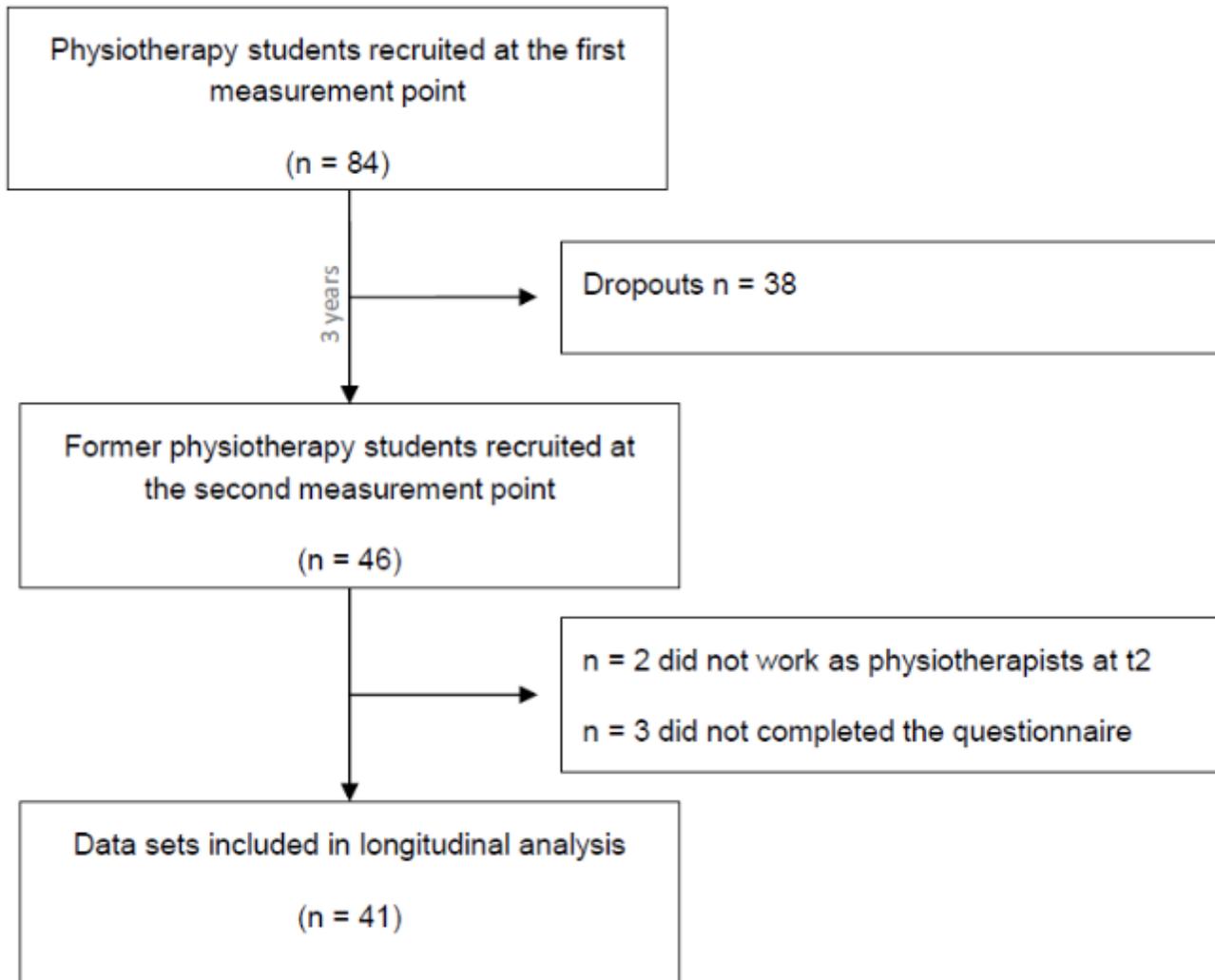


Figure 1

Flow diagram of study design