PERCEIVED LIMITATIONS OF TELEMEDICINE FROM A PHENOMENOLOGICAL PERSPECTIVE

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Abstract In the course of healthcare digitization, the roles of therapists and patients are likely to change. To shape a theoretical based process of technological transformation, a phenomenological perspective on Information and Communication Technology (ICT) is introduced. Therefore, this paper illustrates the benefit of a holistic view on patients and therapists to describe and explain phenomena concerning Human Technology Interaction (HTI). The differentiation between a measurable objective body and a habitual subjective body helps to evaluate and anticipate constituting factors of accepting telemedicine systems. Taking into account findings from a secondary analysis of semi-structured interviews we conducted with primary care physicians, we develop a phenomenological framework for HTI in healthcare. Our aim is to structure future research concerning design implications for ICT and the implementation of telemedicine systems in clinical and primary care.

1   Introduction

As digitization of healthcare services proceeds, different challenges of care are going to be addressed by Information and Communication Technology (ICT), robots, sensory technology, or virtual reality (Krick et al. 2019). Therapists therefore face implementations of care-related technologies and are in need of balancing structural and technological change, professional identity, and a different relationship with patients (Fuller and Hansen 2019). Furthermore, the digitization of healthcare is linked to promises of efficient and innovative care (Hollis et al. 2015) as well as an increasing quality of medical treatments (Mutter et al. 2005). Telemedicine systems appear to play a significant role in the digitization of healthcare, as they are capable of reducing spatial and temporal limitations (Kvedar et al. 2014). Especially in rural areas, telemedicine systems might therefore address rising issues of medical undersupply as a consequence of demographic changes, age related multimorbidity (Demiris and Hensel 2008), and an exodus of healthcare professionals (Thommasen et al. 2001). Although many scientific results point out positive effects of digital technologies in healthcare, theoretical founded research is still rare (Garrett et al. 2018). To shape a theoretically driven process of technological change that can be accepted and catalyzed by both therapists and patients, it is of great interest to understand design-implicating factors of digital technology while taking into account the highly complex patient-therapist relationship and its constituting characteristics. Öberg et al. (2018) e.g. illustrate the necessity to reflect digitization processes in clinical care, as digital technologies are able to cause temporal stress of therapists, affect the relationship between care-giver and care-receiver, and reshape the professional identity of therapists.

To base upcoming research on a theoretical fundament, we propose a phenomenological framework that we build from qualitative empirical insights on Human Technology Interaction (HTI) to formulate implications for design as well as perceived limitations of technology. In IS research, phenomenological perspectives seem to be existent but are underdetermined. For instance, Schultze (2010) states that "the body serves as a frame of reference for the neural processes of the mind" (p. 436) whereof she indirectly proposes a distinguishable nature of the person. In contrast, when Schultze (2010) mentions "what we know about the world is embodied" (p. 436), a phenomenological view on human experience is reflected. Therefore, the objective of this paper is to develop a theoretical framework based

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on phenomenological assumptions concerning the interaction between humans and healthcare technologies. Assuming that a phenomenological perspective on HTI is already existent in IS research, but not differentiated appropriately, the following paper discusses our process of building such a theoretical framework and explore potentials for describing, explaining and predicting relevant phenomena in IS research.

2   Theoretical Background

Phenomenology can be considered a philosophical perspective on the process of gaining knowledge. It might as well be described as a method to obtain ἐπιστήμη (epistimi), which can be translated to 'realization' or 'science'. Stating an insuperable difference between a logical deduction concerning a phenomenon and the real state of the phenomenon, the epistemic objective is translocated from the phenomenon itself to the process of its understanding (Husserl 2019). From this paradigm, phenomenology has affected the development of several scientific methods to collect and analyze data, especially in qualitative research (Neubauer et al. 2019). Therefore, in the research of HTI in healthcare, phenomenology is foremost utilized for methodological issues (Newland et al. 2018; Rosenberg and Nygård 2017). Derived from its general perspective, phenomenology can be applied to scientific research in terms of a theoretical framework as well. It promises an understanding and explanation of human experience, e.g., a patient's experience of a digitally assisted attendance at a physician's practice. Carel (2011) explains the phenomenological view on human experience implying that experience is *"founded on perception"* (p. 35), where *"Perception [sic!], in turn, is itself embodied activity"* (p. 35). In this manner, perceived stimuli of a patient can be seen as contextual and interpretable (Liberati 2019), as well as bodily manifested (Mingers 2001). While enhancing a therapeutic process through digital technology, one might ask:

How exactly does a digital transformation change the perception and the experience of therapeutic activity of patients and therapists and are phenomenological implications useful to formulate boundaries of digital technology in healthcare?

To understand the impact of these implications completely, it is necessary to describe the theoretical interrelation between a phenomenological perspective on human experience and the meaning of presence for mediated interaction between humans. The concept of presence has been used for decades in IS research to objectify the human experience of virtual worlds. Lombard and Ditton (1997) conclude that presence has several facets but can be basically defined as *"the perceptual illusion of nonmediation"* (section 6). The definition of Lombard and Ditton (1997) therefore implies a close relationship between presence and perception. Further, considering their conclusion on presence as a multidimensional construct, the dimensions transportation, impression of translocation, and immersion, the degree of submergence into an artificial environment, appear to be one of the most important characteristics for telemedicine mediated patient-physician interaction (Skalski 2011). In the context of healthcare, several studies emphasize the importance of presence for clinical effectiveness and consider presence a main constituting factor for a realistic artificial environment (Garrett et al. 2018; Londero et al. 2010; Price and Anderson 2007; Riva et al. 2002; Viciana-Abad et al. 2004). To ensure a multidimensional feeling or sense of presence, the creation of a mediated reality is oriented on an asymptotic convergence of the artificial and the real world (Heeter 1992). Similarly, perception can be thought of as a multidimensional construct as well. Loomis (1992) argues for a more subjective view on perception while stating that the 'real' world is generally mediated, which leads to the differentiation of naturally and artificially mediated worlds or environments. The realization of a world constructed through our senses (Loomis calls it the *"phenomenal world"*) helps us to understand why technologically mediated experience is capable of activating an actual sense of perception. Nonetheless, it is important to note that there still is a difference between a natural, directly mediated interaction and an artificially, technology-driven interaction. A phenomenological perspective on such a complex interaction helps to enlarge our understanding by expanding the interrelation between presence and perception through the relevance of experience, e.g. a diagnostic or interventional process. From a phenomenological view, experience itself is bound to the bodily characteristics of humans because the body is the foundation of our perception (Carel 2011). The subjective nature of perception, that can be deduced from Loomis (1992), and the corresponding subjective nature of experience emerging from the phenomenological perspective, lead to the *"body as lived"* (Carel 2011, p. 33): an impression of the human body that can only be experienced and is highly contextual. Nonetheless, measurement and

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normalization of the human body creates an objectiveness of the body. The result is a dualism of the human body (Carel 2011). Although techniques and technologies exist to measure objective data of the human body (that is medical data), an interpretation of the data is closely linked to an experience of such a measurement. In our context, the relationship and interaction between physician and patient creates a defined space for a joint experience. Findings from our empirical investigations therefore reflect the distinction of a subjective and objective body and help us understand that the use and acceptance of specific technologies, such as telemedicine systems, are embedded in specific contexts.

3   Method

In our primary study to explore factors influencing a digitally enhanced relationship between patient and therapist (Mueller et al. 2020) we conducted seven semi-structured interviews with primary care physicians in rural areas to explore their perception on healthcare digitization, especially on potentials of telemedicine systems. Therefore, our major focus of the interviews was physicians' technology acceptance of such telemedicine systems. The interviews took 75 minutes on average. We engaged three female and four male interviewees. In our convenient sample, age ranged between 41 and 66 years (mean 52), while job experience ranged between 15 and 34 years (mean 25). In the main part of our interviews, we discussed the use of three different telemedicine systems (capable of 1. basic audio-visual communication, 2. audio-visual communication and real-time transfer of medical patient data via specific sensors, 3. the aforementioned features, but with automatized pre-analysis of medical patient data). To explore circumstances under which therapists tend to accept or reject the implementation of digital technology, we asked the participants about their hypothetical use of these telemedicine systems in their own practice. Exemplary questions were *"What kind of benefits or risks do you expect from a telemedicine system?"* or *"Under which circumstances would you likely accept such a telemedicine system?".* In our process of primary analysis, we noticed that physicians basically tend to reject a specific telemedicine system when they had the impression that the telemedicine system limited their own sensory perception of the patient (Mueller et al. 2020). To follow up on our impression that a limited perception through digital technology might lead to a physician's rejection of telemedicine systems, we evaluated the key concept of limiting factors concerning telemedicine system use separately. Originally following an approach with three steps of coding

(open, axial, and selective coding) (Corbin and Strauss 2015), we therefore conducted a second, informed analysis of our transcripts and filtered codes that represented limitations of telemedicine systems perceived by physicians. We then examined the content-related accordance between our secondary findings and our theoretical prepositions explicated in section 2.

4   Findings

As an important insight of the conducted interviews and a result of our secondary analysis, therapists mentioned the importance of a bodily presence of the patient to guarantee therapeutic success. We noticed that therapists considered the absence of bodily presence a main negative aspect of telemedicine systems. Participants especially viewed the inability to make bodily contact as one factor limiting their perception of the patient: *"You are feeling it, don't you? And that's absent in a video […] you can't touch [the patient]."* (Interviewee 1) or *"Because personal contact is very important, especially for elderly patients or those in need for home visits being helpless* […]" (Interviewee 7). Noteworthy, the first part of interviewee 1's quotation points to an intuitional aspect of medical care, reflecting the phenomenon of the (experienced) therapist's ability to bring several complex medical information into a relevant diagnostic concept. The ability to touch a patient seems to be a part of this process. As interviewee 7's statement claims the importance of bodily contact as well, another dimension can be noticed from the quotation. An additional social dimension can be considered since humans express their social relation with bodily contact (i.a.). Besides the described general necessity to be able to touch a patient, two participants mentioned the importance of physical contact to better diagnose a patient: *"When someone recently said, 'I felt dizzy and weak…' - that might be anything. For this, I have to auscultate heart and lungs, I have to palpate him."* (Interviewee 5) or *"That is most important, to palpate* […]" (Interviewee 3). The quotations of interviewees 5 and 3 point out an important fact with regard to the process of a primary care physician's diagnostic process. To actually make a possible diagnosis from relatively unspecific data, i.e., a subjective expression of symptoms made by a patient, the characteristics of diagnostic technologies (e.g., auscultation or palpation) require a direct physical contact to the patient. Therefore, these quotations complement the already mentioned aspect of intuitional affected diagnosis with the physical measurement and interpretation of patient-related medical data. Although intuition describes an opaque process, auscultation or palpation can be viewed as mostly structured and standardized

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diagnostic processes. Interestingly, this leads to the impression that diagnostic (and interventional) processes are composed of subjective and objective aspects. Furthermore, the bodily presence of patients in a conversation, especially at the first acquaintance, was considered important: *"To gather the medical history I would prefer to talk to a patient face-to-face."* (Interviewee 4) or *"It's not working without getting to know each other […] it's not possible without personal contact. I can't imagine being able to do sound work without."* (Interviewee 7). Although the interviewees did not mention detailed reasons for their statements, a social component of the patient-physician relationship evolves especially from the quotation of interviewee 7. The perceived necessity of a patient's bodily presence might be interpreted with regard to the already mentioned complexity of diagnostic processes. To make a reasonable diagnosis, physicians need to gather contextual information about a patient. Especially interviewee 7's quotation leads to the impression that without bodily contact, a reconstruction of a patient's relevant living conditions is not adequate.

5   Discussion

Following the interpretation of these statements, the perceived limitations of telemedicine technology include (1) a bodily absence of the patient in terms of a lack of body signals, possibly irritating the intuitional perception of the therapist, (2) an inability to shape the social relationship between patient and therapist through bodily contact, and (3) an obstacle to measure necessary physical parameters of the patient. As a constituting factor of a (subjectively perceived) successful relationship between patient and therapist, bodily contact might be something digital technology is per definition not able to replace. A phenomenological perspective on these issues helps to understand that the difference between bodily contact and biomedical measurements in medical care can be used to formulate implications for technological design as well as a reflective orientation for the process of digitization in healthcare. Carel (2011) differentiates an "objective body" and the "body as lived" (p. 33). Both impressions of the body are connected. The "objective body" can be associated with primarily physical characteristics (the auscultation of lungs, measurement of blood pressure etc.) and the "body as lived" with habitual, social, and subjective characteristics. In real-life experience of a person, it seems clear that these two impressions or perceptions of the body cannot be fully separated.

Considering the cited statements of the participants, the perceived limitations of telemedicine technology (regarding the interviewed physicians) can be differentiated. First, there are concerns about the ability of telemedicine technology to render complex physical signals of a patient, associated with the objective body. To counter underlying assumptions of decreasing quality of care and negative effects on the patient-physician relationship, the design of technological artefacts mainly has to consider questions of feasibility and practicability. Second, there are concerns about the ability of telemedicine technology to shape a bodily relationship between patient and physician, associated with the subjective body. In accordance with our theoretical explanations, we propose the following theoretical framework to explicate a phenomenological perspective on our objective:
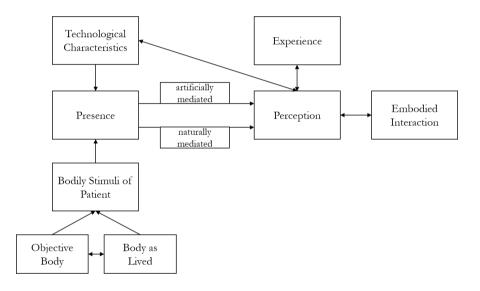

Figure 1: Therapeutic Interaction between Patient and Physician from a Phenomenological Perspective in the Context of Telemedicine

From Figure 1, the meaning of a phenomenological perspective on patient-physician interaction and its technological moderation can be derived. First, the differentiation of an objective body and the body as lived helps to understand that the presence and the perception of a patient depends on a contextualization or interpretation of objective medical data (concerning the objective body) through the entirety of bodily stimuli: feelings, emotions, or self-interpretation of a patient are substantial factors to form presence and the perception of a physician. Second, technological

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characteristics and boundaries change the way physicians perceive the presence of a patient: e.g., visual and auditory quality of telemedicine systems affect an interactive experience of patient and physician. Technological characteristics are able to shape the perception of a physician through artificially mediated presence or in a natural way. Third, perception is bound to our own bodily senses and therefore affected by our embodied interactions. Finally, the interaction between patient and physician (processes of diagnosis or intervention), based on perception, can be considered a bodily experience more than a technological process.

As a result, to evaluate the acceptance of telemedicine technology (in context of both patients' and physicians' use), an important factor from a phenomenological perspective is the context in which the technology is embedded. A separation between reason of design and implementation of technology therefore appears irrational. To anticipate technological acceptance, it is reasonable to consider questions like: what appears to be the main purpose of a specific telemedicine system? Is the telemedicine system used to extend primary care or is it used to replace bodily contact between patient and therapist? From a phenomenological perspective, we deduce two different insights from our findings: (1) the replacement of bodily therapeutic processes with technology mediated processes possibly causes a physician's discontent or resistance to use such a technology. This might be evened through a preferably perfect illusion of bodily interaction. (2) The replacement of a therapeutic process concerning the subjective body of a patient (e.g., the meaning and interpretation of medical data) with a process concerning the objective body of a patient (e.g., algorithm-based thresholds of medical data for medical interventions) possibly causes a physician's discontent.

6   Conclusion and Outlook

A phenomenological view on digitally enhanced healthcare inspires a reflective discussion about essential constructs of technology use, such as embodiment or presence in the context of telemedicine systems, and their importance for practical implementation. While phenomenological research methods are already present to explore patients' experiences with healthcare technology (Kallmerten and Chia 2019), a phenomenological interpretation concerning antecedents of technology use constitutes an innovative theoretical approach to interpret the interaction between humans and technology. In our context of telemedicine use to overcome spatial and

temporal limitations of primary care in rural areas, a phenomenological approach demands a differentiation of specific functions of a telemedicine system. The reflection of human experience that is closely related to our bodily existence, leads to specific implications. The following principles can be interpreted as the most important ones for practice: (1) be careful about replacing a partial process of therapeutic interaction that involves bodily experience with a technology mediated interaction that is not capable of a(n) (almost) perfect illusion of bodily experience. (2) be careful about replacing a partial process of therapeutic interaction that affects both the subjective and the objective body of a patient with a technology mediated interaction that is only capable of affecting the objective body of a patient. These principles occur through (1) the importance of a bodily dimension of human experience and (2) the importance of a contextualization of objective data in medicine. Antecedents derived from these principles might be helpful for both research and practice.

Taking into account the provocative nature of our findings, we are aware that the relatively small sample size of our qualitative research limits the validity of our proposed principles. Hence, for future research, we have to examine the empirical validity of our findings. In a further study about optimization of physician-assistant-delegation, we are going to explore underlying patterns of perceived usefulness through asking healthcare professionals to sequence both everyday and innovative technologies. In a subsequent process, we then use multidimensional unfolding to explore physicians' and physician assistants' perception of similarities and dissimilarities between these technologies. Through additional qualitative interviews with physicians and physician assistants, we like to develop a more differentiated model of our phenomenological approach that can be tested deductively in a comprehensive study. Furthermore, preliminary data from interviews with patients that have been part of telemedical treatment promises additional insights on theoretical relevance from a contrary perspective. Regarding our joint results, we are intending to develop a comprehensive phenomenological framework of HTI to structure future research concerning design implications of ICT and the implementation of telemedicine systems in clinical and primary care.

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