

# Investigating the Influence of Information Incongruity on Trust-Relations within Trilateral Healthcare Settings

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**Abstract.** Modern health information technologies (HIT) come with many benefits for healthcare, such as a decrease of necessary clinical visits or independent health monitoring. The deployment of these technologies to support medical treatments expands the traditional patient-physician relationship to a trilateral setting involving patient, physician, and HIT. Whereas patients formerly relied on health-related information given by their physician, the digitization of healthcare as well as increasing levels of individual health literacy represent new sources of information and, thus, call for investigating different forms of trust towards medical experts, technologies, and the patient's own judgements. Information incongruities, however, can lead to new forms of trust issues, thus calling for dedicated research. We propose a vignette study in the form of an online survey to investigate the influence information incongruities can have on different forms of patient-sided trust. For this, we develop hypotheses representing our expected results.

**Keywords:** HIT, Trust, Information Incongruity, Health Literacy, Self-efficacy.

## 1 Introduction

Traditional healthcare settings involve relationships between patients and one or more medical experts such as primary care physicians that are largely based on interpersonal trust, empathy, and satisfaction with treatments [1]. Patient-sided trust in physicians leads to compliance with instructions, assessments, and advices [2], which in turn increases the effectiveness of medical treatments. Whereas traditional patient-physician relationships evolve around the patient following and complying with recommendations and judgements made by the physician, a deliberative relationship model emerged throughout the last decades that calls for a higher degree of patient participation and autonomy regarding clinical processes [3, 4]. This autonomous and deliberative stance becomes more important in the light of modern developments and deployments of technologies for healthcare, often referred to as health IT (HIT) [5].

The implementation of HIT within medical processes and, thus, patient-physician relationships introduces a new source of health-related information. Hence, the medical setting becomes more complex and new relationships are formed. On the one hand, patients interact with mobile, self-managed HIT systems [6] or more complex ones that are deployed in their home environment [7, 8]. For example, they are enabled to

autonomously retrieve information about their health status and the potential need for interventions. Wearable sensors, for instance, can measure the patient's heart rate and cardiac status throughout the day [9]. On the other hand, physicians deploy HIT systems to support patient care, to reduce the number of face-to-face meetings through health status monitoring (gathered by wearable sensors or patient input), or to mediate therapeutic instructions using telemedical tools such as live video sessions [10]. Hence, HIT represents a new 'actor' within healthcare settings, enabling new forms of interaction. A transition from bilateral to trilateral relationships becomes apparent.

However, by dissolving former power-imbalances between patients and physicians through HIT deployment, these new forms of relationships are prone to deteriorations, for instance evoked by informational gaps and differing outcome expectations between patients, experts, and technologies [11]. Since HIT systems represent an additional source of health-related information, new issues arise. The HIT's behaviour and output might contradict the information the patient or physician have, which potentially evokes questions on whether the patient or physician might be wrong in their assessment [11]. This, in turn, might deteriorate prevalent trust-relations. From a patient perspective, three trust-forming relations can be identified, which are trust in the physician [1], trust in the HIT [12], and trust in oneself (regarding knowledge and actions) [13]. A decrease in trust can originate from different forms of information incongruity and resulting skepticism towards the source of information trusted the least [12]. As suggested by Cognitive Balance Theory, imbalances within a trilateral setting (e.g. patient trusts physician and HIT but physician and HIT contradict each other) lead to discomfort [14].

This study's goal is to shed light on the emergence of trust issues within trilateral healthcare settings evoked by information incongruity between involved actors, which delivers implications for HIT design and solutions to hamper the deterioration of trust. Consequently, this study is guided by the following research question (RQ):

**RQ:** *How do information incongruities within a trilateral healthcare setting influence patient-sided forms of trust (trust in physician, a HIT, and in oneself)?*

## **2 Trust in Physician, HIT, and Oneself**

Trust is the willingness of people to be exposed in risky situations [15] and depend on another party [16]. From the patient's perspective within the trilateral setting, trust is their willingness to depend their health on 1) the physician, 2) the health information technology, and 3) their own health knowledge and capabilities.

Trust between a patient and a physician depends on many factors. Among others, significant drivers of interpersonal trust within a patient-physician relationship are perceived empathy, the patient's satisfaction with courses and outcomes of treatments [1], patient-centered communication [17], and autonomy [18] as well as perceived control [19]. Patient-sided trust in recommendations, treatment instructions, and overall assessments made by a physician is expressed through the patient's compliance [2]. Non-compliance can interfere with the patient's health and therapeutic efforts [20]. As a result, the effectiveness and outcome of therapies and medical treatments greatly depend on this relationship and emerging trust-relations.

Besides trust in the human expert, trust in HIT itself plays a role in shaping the trilateral setting. Trusting beliefs in a specific technology is shaped by trust in its functionality, reliability, and helpfulness [21]. The formation of trusting beliefs in IT can be explained by ease of use, system quality perceptions, uncertainty avoidance culture, and institution-based trust [22]. Furthermore, the formation of trust in technology is influenced by the performance, process, and purpose of the IT artifact itself [23]. Trust is not only a desirable condition within a medical setting itself, but an important precondition for a successful adoption of “risky” and novel technologies [24].

The third trust relationship of interest is the patients’ trust in their own competence to assess the appropriateness of a medical treatment and/or to carry out the medical treatment by themselves (e.g. physiotherapeutic activities at home). This trust relationship can be represented by the constructs of ‘self-efficacy’ and ‘health literacy’. Self-efficacy deals with one’s “*judgment of their capabilities to organize and execute courses of action required to attain designated types of performance*” [25] (p. 391). Studies indicate that self-efficacy related to health practices shows strong relationships with health behavior [13]. Besides this, computer self-efficacy could additionally play a significant role within the trilateral setting, since the patient is expected to use technology [26]. Similarly but from a more dispositional perspective, health literacy is “*the ability to understand and interpret the meaning of health information in written, spoken or digital form*” [27] (p. 144). Health literacy is an essential factor when it comes to the deployment of HIT, since their success depends on the effective communication with different audiences, who have unique needs and capacities [28].

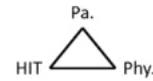
### 3 Hypotheses

Based on the trilateral setting including patient, HIT, and physician, we derived the following hypotheses (Table 1):

**Table 1.** Hypotheses (Pa.=Patient, Phy.=Physician; solid=congruent, dashed=incongruent)

<i>Hypothesis</i>	<i>Illustration</i>
<b>H1:</b> Information incongruity between patient, HIT and physician negatively influences trust in patient, HIT, and physician.	
<b>H2a:</b> Information congruity between patient and HIT and information incongruity between patient or HIT and physician negatively influences trust in physician.	
<b>H2b:</b> Information congruity between patient and physician and information incongruity between patient or physician and HIT negatively influences trust in HIT.	
<b>H2c:</b> Information congruity between HIT and physician and information incongruity between HIT or physician and patient negatively influences trust in patient (self-efficacy).	

**H3:** Information congruity between patient, HIT and physician positively influences trust in patient, HIT, and physician.



## 4 Method and Outlook

To empirically test our hypotheses, we plan to conduct a between-subjects vignette study with an online survey given out to a self-selected convenient sample consisting of patients. To acquire a sample of sufficient size, we distribute the survey link via a network of regional primary care physicians as well as via social media. Each of the five conditions within the trilateral setting (cf. Table 1) is represented by two vignettes. To ensure external validity, we interview primary care physicians in a preliminary step. In doing so, we aim for constructing viable vignettes that depict common treatment scenarios that often occur among patients with chronic conditions. Since trust forms over time, the investigation of such conditions seems promising. Hence, we target participants who have experienced chronic treatments.

We aim for constructing two vignettes. The first vignette describes a scenario in which the participant is instructed by a HIT to take pills and receives congruent (or incongruent) information. The second vignette describes a more complex scenario in which the participant has to carry out a physiotherapeutic exercise. Following each vignette, the participant has to answer the same questionnaire. The two vignettes are presented in a random order. The reasons for presenting two vignettes per condition is to account for external validity and to alter the degree of scenario complexity, since trust is especially relevant in complex situations [29].

For the questionnaire, we plan to adapt the eleven items of the “Trust in Physician Scale” [19] to measure interpersonal trust between participants and the physician. For the participants’ trust in HIT, we adapt the eleven “Trust Belief in Specific Technology” items from McKnight et al. [21]. For participants’ trust in themselves, we adapt relevant items from the SRAHP scale [30] and the European Health Literacy Questionnaire (HLS-EU-Q) [31]. We further include demographic and control variables. For data analysis, we plan to conduct three separate 2 (simple vs. complex scenario) x 5 (trilateral trust settings depicted in Table 1) mixed ANOVAs with complexity as within-subject factor, information congruity as between-subject factor, and the three forms of trust (trust in physician, the HIT, and in oneself) as dependent variables.

Based on the results of this study, we plan to derive and empirically evaluate technology design implications to deal with the matter of trust. Although the trilateral setting described in this paper is a simplified model, we believe that considering potential information incongruities in the design of health information technologies will increase trust in and the acceptance of digital healthcare interventions.

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