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# How Do You Feel? Intentions to Use Embodied Interaction in Video-Based Psychotherapy

Felix Kegel
*University of Goettingen*, felix.kegel@uni-goettingen.de

Knut Schnell
*University Medicine Göttingen*, knut.schnell@med.uni-goettingen.de

Kimsey Zajac
*University of Goettingen*, kimsey.zajac@uni-goettingen.de

Lutz M. Kolbe
*University of Goettingen*, lutz.kolbe@wiwi.uni-goettingen.de

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*Completed Research Paper*

**Felix Kegel**
University of Goettingen
Humboldtallee 3, 37073 Goettingen
felix.kegel@uni-goettingen.de

**Knut Schnell**
University Medical Center Goettingen
Von-Siebold-Str. 5, 37075 Goettingen
knut.schnell@med.uni-goettingen.de

**Kimsey Zajac**
University of Goettingen
Humboldtallee 3, 37073 Goettingen
kimsey.zajac@uni-goettingen.de

**Lutz M. Kolbe**
University of Goettingen
Platz der Goettinger Sieben 5, 37073 Goettingen
lutz.kolbe@wiwi.uni-goettingen.de

## Abstract

*The use of video consultations to deliver healthcare has increased spectacularly since the onset of the Covid-19 pandemic, with applications in psychotherapy proving particularly useful. While generally perceived as an adequate substitute for face-to-face interactions, video consultations have proven to aggravate problems related to maintaining strong therapeutic relationships. We build on psychology and IS literature to present an embodied interaction system that can contribute to mitigating the derogatory effects that occur when the potential for nonverbal communication is reduced. Based on an analysis of behavioral intentions, we present initial empirical evidence that potential users are indeed willing to engage with embodied interaction systems in a clinical context. Our results also suggest that potential users expect the adoption of the system to be more arduous relative to traditional interaction systems. We derive implications for research and practice that can be used to improve interaction system designs and quality of care.*

**Keywords:** Embodied Interaction, Telemedicine, Video Consultation, Psychotherapy, Behavioral Intention

## Introduction

The Covid-19 pandemic has had unprecedented effects on people's lives across the globe. To slow down the spread of the virus, and guided by regulatory measures, people had to adapt the way in which they interacted with their peers, in both personal and professional contexts. While these measures were generally successful in containing the pandemic, the resulting social isolation led to a significant surge in the prevalence of mental illnesses. For instance, Peters et al. (2020) found substantial increases in symptom severity of depression and anxiety disorders among German citizens, with more individuals being pushed beyond the cut-off values that define clinical relevance for both conditions. Similarly, Cao et al. (2020) found that almost a quarter of the college students included in their study experienced anxiety due to the pandemic. Besides the personal challenges associated with poor mental health on the individual level, economic challenges arise on a global scale: a report issued by the World Economic Forum just a decade ago, i.e., even *before* the pandemic, estimated the indirect and direct cost of mental health conditions to increase to over

$6 trillion globally by 2030 (Bloom et al., 2011). Considering these challenges, mental healthcare has taken on an increasingly important role in healthcare systems worldwide.

Recently, especially since the onset of the pandemic, telemedicine services have experienced increased popularity in serving the needs of patients in various medical domains, including psychotherapy (Békés & Aafjes-van Doorn, 2020). In Germany alone, the number of video consultations performed by healthcare professionals that could be reimbursed via statutory health insurance increased from a total of only 3,000 in 2019 to over 1.2 million in just the first half of 2020 (Kassenärztliche Bundesvereinigung, 2021). In general, telemedicine aims to improve patients' access to high-quality healthcare over a distance via technological means, thus enabling them to conveniently use services or consult with medical specialists that would otherwise not have been available to them (Hollander & Carr, 2020). Thereby, telemedicine consultations also contribute to reducing regional, often resource-based, healthcare disparities (Hwang et al., 2022). Previous research has shown that telemedicine, e.g., in the form of video consultations, is generally effective in treating patients' conditions while additionally saving cost and travel time (Almathami et al., 2020). At the same time, potential telemedicine users have continuously expressed concerns regarding its potential effects on the patient-doctor relationship (PDR) due to the lack of physical face-to-face contact and reduction of nonverbal cues that normally support PDR development (Almathami et al., 2020; Mühlensiepen et al., 2021). In psychiatric or psychotherapeutic interactions, the relationship between the therapist and patient is particularly important: previous evidence suggests that the therapeutic relationship has larger effects on a patient's therapy outcomes than the methods actually applied by the therapist (Asay & Lambert, 1999). To achieve therapeutic goals, it is therefore imperative for therapists and patients to build strong and trusting relationships with each other. Moreover, therapists need to be able to detect ruptures in the therapeutic relationship so that they can react immediately and restore the trusting relationship with their patients (Safran et al., 2011).

Since the availability of nonverbal communication cues is limited in existing video-based telemedicine applications, building and maintaining a reliable relationship between the therapist and patient in online psychotherapy is a very challenging task. For information systems (IS) researchers, it is a natural question to ask how such relationships might be supported through (additional) technology. For instance, a considerable amount of research has investigated the potential of Internet of Things (IoT) technology in telemedicine (Albahri et al., 2021). Surprisingly, however, none of that research has explicitly considered how IoT might enhance interpersonal interactions in telemedicine settings. Moreover, as of yet, there seems to exist no (IS) research into the potential of tactile technology to improve relationship development. In this research, we therefore build on a combination of psychology and IS literature to discuss the potential of a system for video-based telemedicine that offers an innovative additional communication channel during online psychotherapy. Through the integration of a connected wearable, the system enables its users to exchange information on their emotional state by transmitting tactile stimuli, i.e., through vibrations applied to the arm of the individuals participating in the interaction. We label this additional interaction channel as a form of *embodied communication*. Since – to our knowledge – no comparable system for the intuitive, embodied exchange of information during telemedicine exists, the objective of this initial research on the system is to assess its potential users' willingness to engage with it. To this end, we pose the following research question (RQ):

**RQ:** How does a nonverbal embodied communication channel affect individuals' intention to use video consultation systems in psychotherapy?

To answer our RQ, we set up a research model based on the extension of the Unified Theory of Acceptance and Use of Technology (UTAUT2, Venkatesh et al., 2012). Using survey data from a total of N=102 participants, we estimate a structural equation model to assess the relationships within our model. We find that individuals are generally willing to use the proposed system. Yet, they expect a significant burden to be associated with the use of the novel technology. While these concerns are obviously important in the highly complex context of our study, they mainly highlight the relevance of adequately informing potential users about the benefits of using the novel interaction system to improve the quality of their technology-mediated interactions. Additionally, we find that individuals' general affinity for technology interactions can act as an important facilitator of technology adoption. Overall, we lay the foundation for future investigations of technologically enhanced interactions in video-based psychotherapy and the healthcare sector in general.

## Related Work

### *Telemedicine, Psychotherapy, and the Therapeutic Relationship*

The concept of telemedicine, a subform of telehealth, has been researched and applied for more than half a century. For this paper, we follow Bashshur's (1995) definition of telemedicine, meaning that we understand telemedicine systems as those systems that enable the provision of healthcare services over a geographic distance between the interacting parties (either a healthcare professional with a patient or healthcare providers with each other). Crucially, this interaction is enabled, supported, or enhanced by the use of information and communication technology (ICT). In clinical contexts where healthcare professionals interact with their patients for diagnostic or therapeutic purposes, telemedicine can take different forms that vary by the type (direct vs. indirect) and synchrony of the interaction (synchronous vs. asynchronous). Some use cases might be addressed by using widespread communication technologies such as the phone or e-mail (Sood et al., 2007) while others require more advanced technologies such as videoconferencing tools (LeRouge et al., 2002). Though telemedicine has long been a well-established concept in healthcare, its broader uptake for the delivery of healthcare services has been lacking (Bashshur et al., 2020). More recently, however, catalyzed largely by the onset of the Covid-19 pandemic, telemedicine use has experienced an enormous increase as it has proven an indispensable alternative to in-person clinical interactions (Bashshur et al., 2020; Hollander & Carr, 2020).

A particularly prominent example of telemedicine-enabled interactions are video consultations where the interacting parties can see and talk to each other via secure video and audio communication channels. Generally, users perceive these services as helpful across a variety of medical use cases (Almathami et al., 2020; Cheng et al., 2021). In psychotherapy especially, video consultations have been studied and implemented for a long time, i.e., for at least 60 years (Wittson et al., 1961). Gullslett et al. (2021) studied therapists' perceptions of the use of video consultations. While they generally find that the advantages of video consultations (continuity of care and accessibility of healthcare services) are substantial, considerable concerns remain regarding the process of building and maintaining the therapeutic relationship online with the patient. In general, the therapeutic relationship consists of three building blocks: (1) the degree of the therapist's and patient's agreement on therapeutic goals, (2) the assignment of tasks that need to be performed to achieve these goals, and (3) the bond between both interaction partners (Bordin, 1979). Thus, the relationship describes how successfully the therapist and patient can work together (Horvath et al., 2011). Previous research has shown that therapists have problems establishing strong relationships in video consultations when they cannot rely as much on facial expressions, nuances in voice, and body language (Cataldo et al., 2021). Gullslett et al. (2021) attribute this to the fact that the video setting acts as a barrier to the nonverbal exchange of information on the patient's emotions and condition (Gullslett et al., 2021). Similarly, Roesler (2017) argued that during ICT-enabled interactions in psychotherapy, important information channels get lost, resulting in ruptures of the relationship between the therapist and patient. However, building and maintaining a strong therapeutic relationship with the patient is an essential skill that therapists need to possess (Herpertz & Matzke, 2015). As noted above, the relationship between the therapist and their patient is the second most important factor in determining therapy success – i.e., in importance, it ranks below extratherapeutic changes (e.g., changes in the patient's personal environment) but, crucially, above the therapeutic methods employed by the therapist (Asay & Lambert, 1999).

Still, ruptures within interpersonal relationships are not fundamentally problematic to begin with. They occur even before we learn to verbally express ourselves and are a common phenomenon in human interaction (Bourvis et al., 2018). Thus, naturally, similar ruptures also occur in the relationship between the therapist and patient, even during face-to-face psychotherapy (Safran et al., 2011). Often, these breakdowns of the therapeutic relationship can be attributed to patients' negative affect toward the momentary course or progression of the therapy and are difficult to detect for the therapist. For instance, Regan and Hill (1992) show that the majority of things not explicitly said during psychotherapy are negative. Safran et al. (2011) note patients' apprehension toward their therapist's reaction as an important reason for such behavior. This problem translates into the video consultation context where patients often do not feel confident in expressing their emotions during therapy (Almathami et al., 2020). When such issues occur in face-to-face interactions, the therapist might rely on nonverbal cues to detect the ruptures in the relationship. Previous research has shown that human interaction is a highly complex matter that heavily relies on the nonverbal signals emitted by the individuals involved as a prerequisite for mutual understanding (Gumperz, 1982; Roesler, 2017). The issue that persists with video consultations in psychotherapy is not rooted in the occurrence of relationship ruptures *per se*, but rather in the complexity of detecting them in a context where nonverbal cues are not as readily available to those involved in the interaction.

Thus, in case of video consultations in psychotherapy, all of the above requires researchers to develop innovative ways of transmitting information on individuals' emotional states through nonverbal communication channels. The resulting improvement in attunement of the therapist's and patient's nonverbal communication during video-based psychotherapy will strengthen the therapeutic relationship, leading in turn to improved therapy outcomes, just as in face-to-face psychotherapy (Geerts & Bouhuys, 1998).

### *Embodied Interaction*

As noted above, individuals involved in video-based psychotherapy interactions need to be able to recognize nonverbal communication cues so that therapists, for instance, can react to changes in their patient's emotional states and take adequate therapeutic measures. One potential approach to enhancing technology(-mediated) interactions is through *embodied interaction*. This type of interaction has recently garnered increased research attention. Design researchers, in particular, have called for interaction forms that they describe as *tangible* (Baskinger & Gross, 2010; Beynon-Davies, 2018). These interactions build on the observation that technology is more than a mere enabler of interactions, but rather, it explicitly shapes communication and interaction activities themselves (Germonprez et al., 2011). This perspective is mainly based on the idea that information systems transmit verbal information and meaning embodied in technology, so that social and technical aspects of interaction are heavily intertwined instead of being separate (Mingers & Willcocks, 2014). Such a view of embodied interaction relates well to the fact that we use physical or tactile senses to perceive and interact with our environment (Schultze, 2010). In IS research, this understanding of embodied interaction often translates into the study of embodiment through avatars in digital or virtual environments (Schmeil et al., 2012; Schultze, 2010, 2011).

However, in this research, we understand embodied interactions as something more tangible. We build on the established view that our body substantially influences how we perceive our environment and the interactions that we participate in (Schultze, 2010; Vidolov & Vidolov, 2019). Additionally, we draw on the neuroscientific finding that human information processing and decision-making rely on the perception of emotions through the interpretation of physical signals (Damasio, 1994). In the video consultation systems that are currently used in online psychotherapy, nonverbal cues related to patients' emotional states are reduced due to limitations in video and audio technology, e.g., subtle changes in the tone of facial skin or minimal gaze changes. An additional, tactile communication channel would thus facilitate an intuitive communication of emotional states, thereby giving therapists the opportunity to detect ruptures in the therapeutic relationship more easily. This would enable them to react quickly and appropriately to the needs of their patients during psychotherapy sessions without overloading existing channels of communication (i.e., video and audio). The positive effects of tactile cues have been proven in a variety of application domains and interaction types, as indicated by research in the fields of social robotics and social interaction systems (Huisman, 2017; Sakamoto et al., 2004).

Summarizing, we note that telemedicine is a well-established concept in existing research and that it has become an integral part of healthcare provision during Covid-19. Research indicates that video consultations, in particular, are suitable alternatives for face-to-face clinical interactions. However, they aggravate existing problems for relationship-building due to the reduced availability of nonverbal communication channels. To overcome this pressing issue, design research provides foundations for embodied interaction, in which physical signals and the bodily experience of our environment can be used to enhance interpersonal interaction and relationship quality. Building on this, our study contributes to this diverse body of knowledge by connecting the research findings on telemedicine with findings on interaction design and applying this to the unique context of psychotherapy.

### *UTAUT and Technology Acceptance Research in Telemedicine*

To assess individuals' intention to use a given technology as well as actual use behavior, IS research regularly employs the Unified Theory of Acceptance and Use of Technology (UTAUT). Initially proposed by

Venkatesh et al. (2003), this framework combines eight models previously employed to investigate technology acceptance and posits that four main constructs influence users' behavioral intention: performance expectancy, effort expectancy, social influence, and facilitating conditions. The original UTAUT framework was conceptualized to assess behavioral intentions in an organizational context. This focus was later abandoned when Venkatesh et al. (2012) extended the original model to incorporate additional constructs and adopt a more customer-centric perspective on technology adoption instead. The four constructs listed above remain in the extended UTAUT (UTAUT2) but were reframed to fit the novel application context, i.e., (1) performance expectancy refers to the degree to which an individual perceives a technology as useful; (2) effort expectancy measures the degree to which the technology is perceived as easy to use[1]; (3) social influence measures the degree to which individuals perceive that their social environment wants them to use the technology; and (4) facilitating conditions refer to the degree that an individual perceives they have the resources necessary to perform certain behaviors with or related to the technology (Venkatesh et al., 2012). Moreover, UTAUT2 contains the following additional constructs as determinants of behavioral intention: (5) hedonic motivation, describing the enjoyment that an individual perceives while using the technology; (6) price value which refers to the trade-off that an individual makes between the perceived utility derived from using the technology and the monetary expense associated with that use; and (7) habit, a construct that refers to the degree to which an individual performs a task automatically (Venkatesh et al., 2012).

As noted, both UTAUT frameworks have been applied in a variety of contexts, with research into technology acceptance in healthcare being no exception (Fortagne et al., 2021). Furthermore, a considerable amount of research has investigated telemedicine acceptance using UTAUT, UTAUT2, and relevant extensions (Esser & Goossens, 2009; Fitrianie et al., 2021; Garavand et al., 2022; Kaphzan et al., 2022; Rouidi, Elouadi, Hamdoune, et al., 2022). Given the novelty of the system that we present in this research to extend current channels used in video consultation, as well as the framework's proven effectiveness in analyzing technology acceptance in the telemedicine context, we argue that the initial assessment of users' behavioral intentions can best be performed using the established UTAUT2 framework that abstracts from the organizational focus of the original UTAUT.

## Research Model and Hypothesis Development

To answer our research question, we propose a research model based on UTAUT2 which we adapt to the context of our study (see Figure 1). As noted, in this study, we propose that video-based psychotherapy can be enhanced by improving the communication between the involved individuals through an additional channel that transmits nonverbal, embodied communication cues related to the patient's emotional condition. Specifically, the system we propose allows for embodied interaction through the transmission of vibration patterns that correspond to specific emotional states of the interaction partner. Therefore, nonverbal communication about emotional states is enabled without overloading existing communication channels. With our research model, we aim to assess whether potential users would consider employing such an enhanced system of video consultations in a psychotherapeutic context.

As discussed above, the reduction of nonverbal communication signals in video-based psychotherapy poses a threat to building and maintaining reliable and trusting therapeutic relationships because it becomes more challenging for therapists to infer their patients' emotional state (Gullslett et al., 2021; Roesler, 2017). An introduction of embodied interaction might therefore be beneficial to the detection of ruptures in the therapeutic relationship, to the attunement of both interaction partners to each other and thereby, eventually, to the improvement of therapy outcomes (Geerts & Bouhuys, 1998). Given that the potential users are made aware of these benefits of the novel interaction system, it is sensible to hypothesize the following:

*H1.a: Relative to a traditional video-based psychotherapy system, the proposed telemedicine system has a positive effect on performance expectancy.*

The effect of such an interaction system on effort expectancy, on the other hand, will likely be very different. Previous research suggests that potential users' concerns about technology use might negatively affect their perceptions of the telemedicine experience (Gullslett et al., 2021). Correspondingly, the introduction of a

[1] Note in this definition that, rather unintuitively, high ease of use translates into high effort expectancy.

novel interaction system that individuals have not yet had the chance to engage with is likely to decrease their effort expectancy since they first need to familiarize themselves with the system. We therefore present the following hypothesis:

*H1.b: Relative to a traditional video-based psychotherapy system, the proposed telemedicine system has a negative effect on effort expectancy.*

Moreover, we include affinity for technology interaction (ATI) into our model as an approximation for individuals' general affinity for technology. An individual's ability and willingness to deal with novel, innovative digital technology is essential to navigating a world in which technology takes on an increasingly important role (Franke et al., 2019). Including technology affinity into our model is intuitive since, again, we propose an innovative technology that opens up entirely novel ways of nonverbal communication in the psychotherapy context. As Wong et al. (2020) note, increased levels of affinity for technology are associated with increased perceptions of utility and decreased perceptions of the required effort to use a technology; i.e., the more an individual is generally willing to engage with new technology, the more they will expect a benefit from the technology-mediated interaction, and the less they will expect their use of the technology to be arduous. This translates directly into the following hypotheses:

*H2.a: Affinity for technology interaction has a positive effect on performance expectancy.*

*H2.b: Affinity for technology interaction has a positive effect on effort expectancy.*

We next present our hypotheses on the relationships between the explanatory constructs already included in the original conceptualization of UTAUT2 and behavioral intentions. Across numerous studies of technology acceptance that employ UTAUT or UTAUT2, the construct that relates to an individual's perceived utility induced by technology use, i.e., performance expectancy, has proven to be the strongest driver of behavioral intentions (Fitrianie et al., 2021; Fortagne et al., 2021; Godefroid & Plattfaut, 2022; Venkatesh et al., 2012). Since similar results have been found for UTAUT-based investigations of technology acceptance in telemedicine (see, for instance, the review by Rouidi, Elouadi, Hamdoune, et al., 2022), we expect the same positive effect of PE on behavioral intentions in our study, i.e., the more an individual perceives a technology to be useful, the higher the respective use intention. Thus, we hypothesize the following:

*H3.a: Performance expectancy has a positive effect on individuals' intention to use the proposed telemedicine system.*

Similarly, regarding effort expectancy, we hypothesize that the positive relationship suggested by the original UTAUT2 as well as additional research into the acceptance of remote healthcare technology (Rouidi, Elouadi, Hamdoune, et al., 2022; Schmitz et al., 2022; Venkatesh et al., 2012; Venkatesh et al., 2003) will also hold in our study. Thus, the more an individual associates ease with the use of a technology, the higher the respective use intention. This translates into the following hypothesis:

*H3.b: Effort expectancy has a positive effect on individuals' intention to use the proposed telemedicine system.*

Moving on, we include hedonic motivation into our model. Venkatesh et al. (2012) note that the addition of such a construct captures individuals' affect toward and enjoyment associated with the use of a technology. While research on the effect that hedonic motivation has on technology use intentions in the healthcare sector is generally scarce, Schmitz et al. (2022) highlight that engaging in medical consultations through the use of ICT may generate excitement and drive behavioral intentions through a motivational channel despite the obvious finding that seeking medical advice is never pleasant. In their model, they do indeed find a significant positive relation (Schmitz et al., 2022). Moreover, in our research, the prospect of engaging with an entirely new technology might further strengthen individuals' use intentions. Overall, this leads us to the following hypothesis for our model:

*H3.c: Hedonic motivation has a positive effect on individuals' intention to use the proposed telemedicine system.*

Finally, we also include facilitating conditions in our model. In the healthcare context, facilitating conditions are an important driver of individuals' intentions to adopt new technologies (Jewer, 2018). We additionally follow Schmitz et al.'s (2022) reasoning that, when new technologies are being proposed, users' need for support and assistance is elevated during the adoption process. Therefore, we hypothesize:

*H3.d: Facilitating conditions have a positive effect on individuals' intention to use the proposed telemedicine system.*

Summarizing, for this last set of hypotheses (H3.a-H3.d), we do not expect to find differences in the constructs' effects on behavioral intention relative to the ones specified in Venkatesh et al.'s (2012) definition of UTAUT2. Consequently, we expect UTAUT2 to hold in our study's context of enhanced video consultations in telemedicine. Note that we explicitly do not include the other constructs usually used in UTAUT2 analyses, namely social influence, price value, and habit. This is because we do not present individuals with an already existing technology and therefore, an investigation of the effect of the perceived desires of the individual's social environment as well as the influence that habitual use would have becomes futile. Similarly, including price value would not be sensible in our model since the technology is far from being commercially available and thus, no adequate monetary expense can yet be anticipated or studied. This same reason additionally warrants our exclusion of another outcome variable initially included in UTAUT(2), use behavior. Once the system we investigate in this research is realized beyond the prototypical stage, investigations of actual use behavior will entail more value for research and practice.

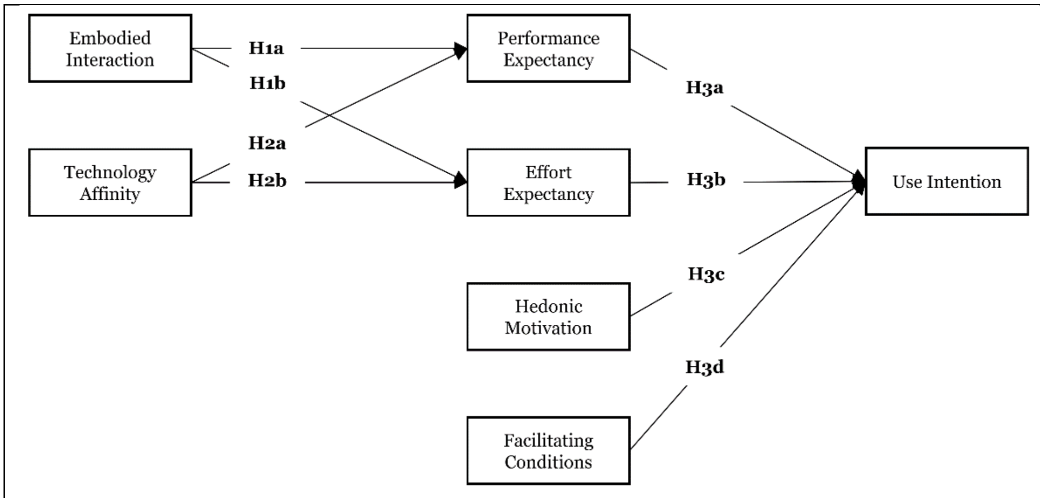


**Figure 1. Research Model**

# Methodology

## *Experimental Design and Data Collection*

To test our research model and the hypotheses described in the previous section, we opted to collect survey data using the online survey tool Qualtrics[2]. Since the novel system we present for video-based telemedicine in psychotherapy concerns both sides of the psychotherapeutic interaction, i.e., both the therapist and the patient, we chose to collect data from both of these subgroups of potential users. Additionally, since we do not believe that the application opportunities of the interaction system are limited to the psychotherapeutic use case, we extended the subgroup of medical service providers from psychologists and psychiatrists to healthcare professionals in general. Participants were recruited from Prolific[3], an online crowdsourcing platform that lets researchers distribute their experiments and surveys to individuals based on predefined filters (e.g., based on demographics or socioeconomic indicators). Survey participants received a monetary reward for their participation.

[2] https://www.qualtrics.com

[3] https://www.prolific.co

Following a brief introduction, all participants were presented with the general scenario of the survey in which they were asked to imagine that they were undergoing psychotherapeutic treatment and that, due to the Covid-19 pandemic, they needed to change the interaction mode of their therapy sessions. We argue that this scenario is realistic and relatable for our survey participants since they likely encountered similar situations over the last few years, even though not necessarily in the context of psychotherapy. Subsequently, participants were randomly assigned to one of two experimental manipulations. On the one hand, the first manipulation served as the control group and presented participants with a traditional video consultation as the alternative mode of interaction with the therapist. The second group, on the other hand, was presented with a description of the enhanced video consultation system that offers an additional channel for embodied interaction using an innovative wearable. Table 1 contains the exact wording of the scenarios as well as the pictures used to illustrate the interaction systems for the respective manipulations.

Once the data collection phase was finished, we examined the dataset and removed participants that did not pass the manipulation and attention checks that were implemented in the survey. These checks were performed to identify those participants that did not correctly understand the proposed scenario as well as those that were not invested in the survey, and thus exhibited repetitive response behavior, thereby potentially distorting the results. The remaining 102 participants form our final sample. 50 participants indicated working in the healthcare industry. Participants' mean age was 42.36 years (SD = 14.52) and 49.02% of participants identified as male. Items surveyed to collect data on the constructs performance expectancy (PE), effort expectancy (EE), hedonic motivation (HM), facilitating conditions (FC), and behavioral intention (BI) each were operationalized on seven-point Likert scales running from *1 – completely disagree* to *7 – completely agree*. These items were taken from Venkatesh et al.'s (2012) UTAUT2 framework and adapted to fit the context of our research (for the exact wording used, see Table 2). Questions related to the ATI were measured on a six-point Likert scale and then combined into an overall ATI score running from 1.0 to 6.0 as described in Franke et al. (2019), with higher values indicating higher technology affinity. In addition, we collected information on a variety of control variables (age, gender, whether participants had already been in a telemedicine video consultation (68.63%), whether they had undergone psychotherapeutic treatment before (41.18%), and whether they were healthcare professionals (49.02%)).

| General scenario (identical for both groups): |
|---|
| *The emergence of Covid-19 has brought about immense challenges for society. As a result of social distancing measures, many face-to-face interactions in our everyday lives had to be canceled or, alternatively, shifted to digital environments (e.g., video calls).*<br>*This shift of interactions into the digital realm, enabled by advances in internet and communication technologies, also occurred in the healthcare sector.* ***Consultations*** *between healthcare professionals and patients often took place via* ***video call*** *through so-called* ***telemedicine*** *where medical services are provided across a distance. This was especially useful in mental healthcare (i.e., psychotherapy).*<br>*For this survey, we ask you to* ***imagine the following****: you are currently undergoing* ***psychotherapeutic treatment*** *with a therapist you have known for some time. Due to the Covid pandemic, you are required to* ***change your mode of interaction*** *with the therapist into a digital format.* |
| **Scenario for Video Consultation Group (n = 57)** |
| *Your therapist is offering you to continue therapy in the form of* ***video consultations****. For this purpose, he or she will familiarize you with a system that will allow you to have your* ***regular sessions online*** *(see image below for an example). The system allows for* ***secure video and voice communication****, is easy to set up, and the cost is covered by your health insurance.*<br>*From now on, each session of your therapy begins with you* ***connecting to the system*** *using your PC. Then, the video call with your therapist will be initialized and you* ***talk to each other*** *as if you were together in the same room. After the session, you disconnect from the system and shut down your PC.* |

**Scenario for Embodied Interaction Group (n = 45)**

*Your therapist is offering you to continue therapy in the form of* ***video consultations****. For this purpose, he or she will familiarize you with a system that will allow you to have your* ***regular sessions online****. The system consists of* ***two components****, A and B (see images below for an example).*
***A:*** *The system allows for* ***secure video and voice communication****, is easy to set up, and the cost is covered by your health insurance.*
***B:*** *In addition, the system offers an* ***additional communication channel*** *that allows you to share information about emotional states more intuitively: During therapy sessions, by using an app, you have the option to* ***report your emotional state*** *to the therapist using a simple one-tap system. The therapist wears a* ***wearable*** *to which the information is transmitted by means of* ***tactile stimuli****. This allows you to tell the other person how you are feeling without having to interrupt the flow of the therapy session. Your therapist can then decide whether and how to respond to the information provided, thus* ***strengthening the therapeutic relationship*** *and increasing the prospects for therapeutic effectiveness.*

*From now on, each session of your therapy begins with you* ***connecting to the system*** *using your PC and the app that connects to the therapist's wearable. Then, the video call with your therapist will be initialized and you* ***talk to each other*** *as if you were together in the same room. Whenever you feel that a certain topic makes you feel a* ***specific emotion****, you enter it into the app. Your therapist's* ***wearable will transmit that information*** *to him or her via tactile cues and they can react to your (changed) emotional state if they so choose. This can happen multiple times during each session. After the session, you disconnect from the system and shut down your PC.*

**Video consultation image used in both groups**

Image by Freepik

**Image of the wearable used only in the Embodied Interaction Group**

**Table 1. General Scenario and Experimental Treatments**

## Data Analysis and Results

To test our model and hypotheses, we applied a partial least squares structural equation modeling (PLS-SEM) approach. This technique has been used across a variety of disciplines in the social sciences, including IS research, because it allows for the estimation of complex models with numerous constructs and paths in a predictive context (Hair et al., 2019). Since we aim to test a UTAUT2 extension from a prediction point of view and, additionally, our sample size is rather small, we argue that using PLS-SEM rather than a covariance-based approach is adequate in our case (Hair et al., 2021; Hair et al., 2019). To estimate the model, we used the software SmartPLS 4 (Ringle et al., 2022).

### *Measurement Model*

The experimental manipulation, i.e., which video consultation system a participant was presented with, is incorporated into our model using a binary variable, and general technology affinity is integrated as a mean score as described above. All other variables are measured as reflective constructs. Thus, before moving to the analysis of the structural model, the suitability of these constructs is validated.

Indicator reliability is verified via the factor loadings that each item possesses for its respective construct. Hair et al. (2019) highlight that these loadings need to be greater than .708. Table 2 shows that, for all items except one, this criterion is met in our model. We therefore drop item "FC4" from our dataset for further analysis. Next, we assess construct reliability via Cronbach's alpha (α) and composite reliability (CR) as criteria, both of which are met if the respective values exceed .7 (Hair et al., 2011; Hair et al., 2019). Again, in Table 2, we see that the constructs in our model meet these criteria. Finally, we investigate convergent validity, measured in terms of the average variance extracted (AVE) that should exceed the threshold of .5 (Hair et al., 2019). As documented in Table 2, our measurement model meets this criterion.

| **Constructs** | **Factor Loadings** |
|---|---|
| Behavioral Intention (Venkatesh et al., 2012) | |
| *BI1. If offered, I would intend to use the system.* | .901 |
| *BI2. I would always try to use the system in a psychotherapeutic context, if offered.* | .905 |
| *BI3. I would plan to use the system frequently.* | .922 |
| α = .895; CR = .935; AVE = .827 | |
| Performance Expectancy (Venkatesh et al., 2012) | |
| *PE1. I find the system potentially useful in a psychotherapeutic context.* | .821 |
| *PE2. Using the system will increase the chances of achieving the patients'/ therapists' psychotherapeutic goals.* | .937 |
| *PE3. Using the system will help achieve psychotherapeutic goals more quickly.* | .925 |
| *PE4. Using the system will help achieve psychotherapeutic goals more efficiently.* | .922 |
| α = .923; CR = .946; AVE = .815 | |
| Effort Expectancy (Venkatesh et al., 2012) | |
| *EE1. Learning how to use the system will be easy for me.* | .940 |
| *EE2. My interaction with the system will be clear and understandable.* | .961 |
| *EE3. I will find the proposed system easy to use.* | .963 |
| *EE4. It will be easy for me to become more skillful at using the system.* | .842 |
| α = .945; CR = .961; AVE = .861 | |
| Hedonic Motivation (Venkatesh et al., 2012) | |
| *HM1. Using the system will be fun.* | .960 |
| *HM2. Using the system will be enjoyable.* | .956 |
| *HM3. Using the system will be very entertaining.* | .914 |
| α = .939; CR = .961; AVE = .891 | |
| Facilitating Conditions (Venkatesh et al., 2012) | |
| *FC1. I have the resources necessary to use the system.* | .809 |
| *FC2. I have the knowledge necessary to use the system.* | .873 |
| *FC3. The system will be compatible with other technologies I use.* | .806 |
| ~~*FC4. I can get help from others when I have difficulties using the system.*~~ | ~~.670~~ |
| α = .800; CR = .871; AVE = .629 | |
| Note: α = Cronbach's alpha, CR = composite reliability, AVE = average variance extracted | |

**Table 2. Indicator Reliability, Construct Reliability, and Convergent Validity**

Next, we assess discriminant validity which measures the degree to which the constructs included in the model empirically differ from one another (Fortagne et al., 2021; Hair et al., 2019). We apply the two most commonly used techniques to check for discriminant validity: (1) the Fornell and Larcker (FL) criterion (Fornell & Larcker, 1981), which requires the square root of a construct's AVE to be larger than the correlation of this construct with all other constructs; and (2) the heterotrait-monotrait (HTMT) ratio of the correlations (Henseler et al., 2015), which should not exceed the threshold of .9. As can be seen in Table 3, discriminant validity is given in our measurement model. Finally, we also check our data for the occurrence of common method bias (CMB). Hair et al. (2019) discuss a method to check for CMB by inspecting the variance inflation factors (VIFs) associated with the constructs. The model can be assumed to be free of CMB when all VIFs are below (or equal to) 5, which holds in our case. Thus, we do not detect CMB issues in our model.

| | BI | PE | EE | HM | FC |
|---|---|---|---|---|---|
| **BI** | **.909** | *0.831* | *0.474* | *0.794* | *0.400* |
| **PE** | .757 | **.903** | *0.395* | *0.713* | *0.337* |
| **EE** | .437 | .371 | **.928** | *0.481* | *0.854* |
| **HM** | .730 | .665 | .456 | **.944** | *0.412* |
| **FC** | .352 | .303 | .767 | .370 | **.883** |

Note: FL-criterion in bold, HTMT in italics, correlations in regular font; BI = behavioral intention, PE = performance expectancy, EE = effort expectancy, HM = hedonic motivation, FC = facilitating conditions; note that after exclusion of the item FC4, the AVE of the construct FC increases to .780

**Table 3. Discriminant Validity**

## *Structural Model*

To test our structural model, we use a bootstrapping approach with 10,000 subsamples so that the path coefficients' statistical significance can adequately be assessed (Hair et al., 2019). Moreover, we tested for potential effects of our control variables (age, gender, video consultation experience, psychotherapy experience, healthcare professional) on the significance of the main paths in our model (as hypothesized in the original UTAUT2 model; Venkatesh et al., 2012) and on behavioral intentions directly. Except for one main path, namely the influence of hedonic motivation on behavioral intention which loses statistical significance, including the control variables does not affect the signs or significance levels of the path coefficients. The control variables also do not significantly affect behavioral intentions and do not moderate any of the main paths significantly. However, the model that includes the control variables seems to perform better in terms of explaining the variance in behavioral intentions ($R^2$ of .750 compared to .684 in the model without controls). Therefore, we keep the control variables in the model.

Results of the bootstrapped PLS-SEM estimation are presented in Figure 2. Table 4 additionally summarizes the model results regarding the hypotheses. As is evident from both representations of our results, only four of our eight hypotheses are supported with the available dataset. Interestingly, the prospect of being able to interact using nonverbal cues in video-based psychotherapy with the proposed telemedicine system has a significant effect on performance expectancy, but the direction of the effect contrasts with what we had hypothesized in H1.a, even though the path coefficient is just barely significant. This result indicates that individuals do not anticipate the benefit of such a system relative to a traditional video-based interaction system. H1.b, contrarily, is supported by our analysis, indicating that the participants expect higher effort levels when adopting the proposed enhanced interaction system than when engaging in a traditional video consultation. Moving on, we find support for both hypotheses related to individuals' overall level of technology affinity (H2.a and H2.b): higher levels of technology affinity increase both the utility and ease of use associated with the telemedicine interaction systems. Moving to the established UTAUT2 relations (H3.a-H3.d), surprisingly, we find that in our study, only the effect of performance expectancy on behavioral intentions is positive and significant. Thus, our model results provide support for hypothesis H3.a. This indicates that, on average, the higher the utility that an individual expects to derive from a technology's use, the more likely they are to exhibit actual intentions to use that technology. While the direction of the effects of the other UTAUT2 constructs on behavioral intentions is in accordance with our hypotheses (H3.b-H3.d), they are far from reaching statistical significance, and thus, no reliable results can be inferred.

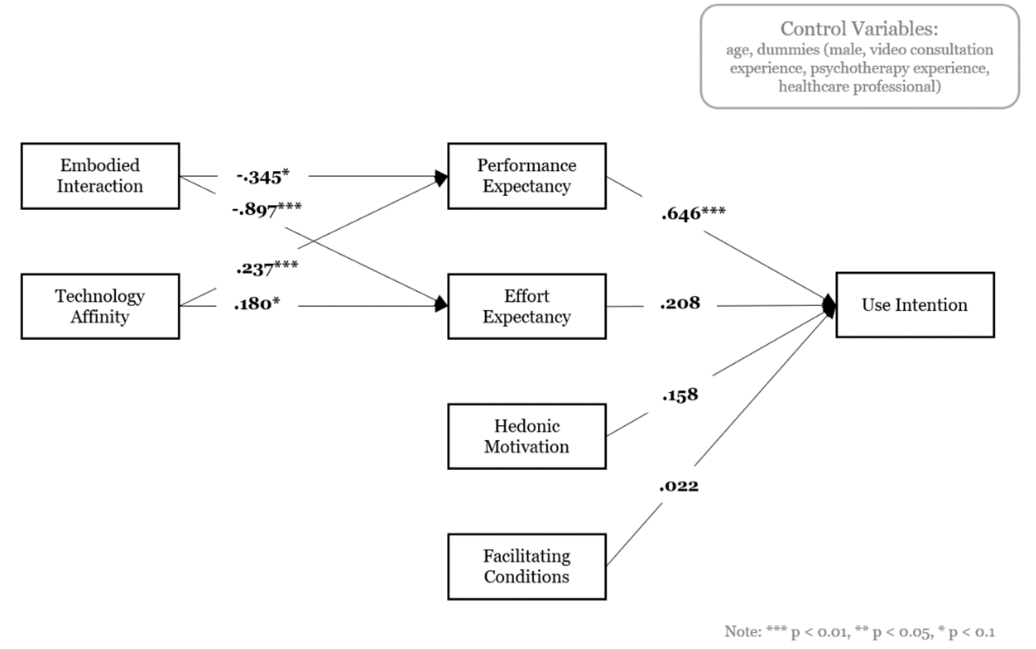


**Figure 2. Structural Model**

| Hypothesis | Path | Coefficient | p-value | Supported / Rejected |
|---|---|---:|---:|---|
| *H1.a* | EI -> PE | -.345 | .074 | rejected |
| *H1.b* | EI -> EE | -.897 | < .000 | supported |
| *H2.a* | ATI -> PE | .237 | .006 | supported |
| *H2.b* | ATI -> EE | .180 | .090 | supported |
| *H3.a* | PE -> BI | .646 | < .000 | supported |
| *H3.b* | EE -> BI | .208 | .494 | rejected |
| *H3.c* | HM -> BI | .158 | .505 | rejected |
| *H3.d* | FC -> BI | .022 | .939 | rejected |

Note: EC = embodied interaction rather than traditional video consultation, BI = behavioral intention, PE = performance expectancy, EE = effort expectancy, HM = hedonic motivation, FC = facilitating conditions, ATI = affinity for technology interaction

**Table 4. Overview of Hypothesis Tests**

# Discussion

In their current form, video consultations in psychotherapy seem to aggravate problems in the therapeutical relationship that already occur in face-to-face interactions between therapists and patients. We hypothesize that through the introduction of an additional communication channel that facilitates the nonverbal exchange of information on individuals' emotional states, these problems can be mitigated. To shed light on this hypothesized relationship, we set up a UTAUT2-based analysis of data collected through an online survey. In the following sections, we discuss implications of our results, for both research and practice. Additionally, we point to limitations of our study and present avenues for future research.

## *Contributions to Literature*

First, to the best of our knowledge, this study represents the first attempt to build knowledge on embodied interaction in video consultations for psychotherapy. As noted by Roesler (2017), any extension of the psychotherapeutic encounter using technology has a profound impact on the interaction itself as well as on the relationships that derive from it. We have previously discussed that the quality of the interpersonal relationship and the therapist's ability to detect and react to ruptures in this relationship are essential factors that determine psychotherapy outcomes (Asay & Lambert, 1999; Herpertz & Matzke, 2015; Safran et al., 2011). Our main result highlights that the proposed embodied interaction system is expected by its potential users to be significantly more arduous to adopt than traditional video consultation systems that lack the additional channels for improved nonverbal communication. Also, the negative path coefficient for H1.a indicates that users perceive the novel interaction system as less useful relative to the traditional system. We attribute this finding to the fact that potential users are likely familiar with regular video consultations and their benefits. Therefore, it is challenging to convey the benefits of the embodied interaction system in such a way that its performance expectancy exceeds that of the traditional system. Thus, unsurprisingly, individuals expect more effort to be associated with the use of a more complex interaction system. Our analysis additionally shows that these two factors are significantly affected by an individual's general affinity for technology. Thus, when investigating the (potential) introduction of innovative technologies, scholars need to carefully examine the ways in which benefits and challenges related to the adoption of those technologies are being presented to study participants in target user groups, depending on the level of technology affinity that persists within the groups. In that sense, providing information on a technology's advantages in a given application context only in the form of textual scenario snippets might not suffice to adequately transmit all relevant information. As is evident from our results, such an approach could increase perceptions of the effort required to adopt the technology, while decreasing the utility that individuals associate with technology use. Regardless of the results on H1.a, we still posit that a system that can transmit nonverbal communication cues more easily via an additional channel will be perceived as useful by both groups involved in the interaction and drive behavioral intentions. Indeed, when we run the model only on data from the subgroup of participants in the embodied interaction group, the path coefficient shows the hypothesized positive relation between performance expectancy and behavioral intention. Thus, we present initial evidence on the suitability of embodied interaction systems to enhance video consultations in psychotherapy. As noted above, the relationship between healthcare providers and their patients is also relevant in medical domains beyond psychotherapy (Hojat et al., 2011; Mühlensiepen et al., 2021). Currently, we cannot conceive of reasons why similar interaction systems could not be used in other clinical contexts.

Second, our research contributes to the growing body of literature on technology acceptance in telemedicine. Especially since the onset of the pandemic, numerous studies have investigated facilitators and barriers of technology adoption for the provision of remote healthcare services, often using established IS research models such as the technology acceptance model (Davis, 1989), UTAUT(2) or relevant extensions (Fortagne et al., 2021; Garavand et al., 2022; Rouidi, Elouadi, & Hamdoune, 2022; Rouidi, Elouadi, Hamdoune, et al., 2022). Our results show that the extent to which established constructs drive individuals' behavioral intentions varies by the context in which they are investigated. In our research, performance expectancy exhibited the hypothesized statistically significant effect on behavioral intentions (H3.a). This result is in accordance with previous research that also identified performance expectancy as a key driver of behavioral intentions to use technology in the healthcare context (Schmitz et al., 2022). However, no empirical evidence could be found for the hypothesized positive effects of effort expectancy, hedonic motivation, and facilitating conditions (H3.b-H3.d). In line with previous research (Schmitz et al., 2022), we argue that the lack of support for hypotheses H3.b and H3.d could stem from the fact that participants had to imagine using an unknown technology in a hypothetical scenario which can generally be considered a difficult task. Regarding hedonic motivation (H3.c), we again point out that medical consultations are never enjoyable but rather constitute a necessity, thereby reducing the impact that enjoyment has on behavioral intentions. Even though the dominance of adoption models (such as UTAUT) in IS research has been criticized (Jiang et al., 2022), we argue that it is sensible to apply this framework in our study's context. Our study was designed as an initial assessment of behavioral intentions of an entirely novel system, which can be achieved through the analysis UTAUT-based research model. This point of view is strengthened by the fact that the model accounts for 75% of variance in behavioral intentions. Overall, our results show that testing the established (UTAUT-)relationships in novel application contexts with innovative technologies remains a relevant and useful endeavor. Future analyses can be based on our study and analyze data from actual users to explore other drivers of use (intentions) of embodied interaction systems.

### Practical Contributions

Our research also bears practical relevance. First, we provide additional evidence that potential users of telemedicine recognize the benefits of digital technology to complement or, to a certain extent, replace face-to-face interactions in healthcare. As a result, intentions to use telemedicine remain high. Since pre-pandemic telemedicine adoption rates have been lacking relative to the technology's overall potential in healthcare (Bashshur et al., 2020), service designers should remain focused on designing telemedicine systems that provide tangible benefits for their users. Crucially, this process needs to be accompanied by the development of effective communication measures, so that the users become aware of the advantages that the systems present to them in the clinical context. Second, and more importantly, we provide evidence regarding potential ways to incorporate means of embodied, nonverbal communication between the actors involved in telemedicine consultations. As noted above, in the psychotherapeutic context especially, offering an additional communication channel can help therapists and patients build stronger relationships and eventually improve treatment outcomes. Our analysis suggests that potential users are generally open to engaging with such systems to support social relationships in the medical context. This finding should encourage developers of consultation and interaction systems in the healthcare sector to consider forms of embodied interaction for implementation into their systems. This requires the specific design of systems that aim to overcome the well-known problems of telemedicine interactions and their derogatory effects on building trusting clinical relationships. This will subsequently allow users to exploit the full potential of interaction systems in which interaction participants are more well-attuned to each other, and ultimately improve quality of care overall.

### Limitations and Future Research

Our study has several limitations that need to be addressed in future research. First, and most importantly, our study is limited in the sense that it only presents the interaction system in a hypothetical scenario in text-based form. Schmitz et al. (2022) have highlighted that imagining using an unknown, novel system can be a very challenging task and thus, a lack of understanding of the system's functionality may have prevented some of the results from our analysis from supporting our hypotheses. On a similar note, in line with Almathami et al. (2020), finding ways through which users of the proposed embodied interaction system can be trained in using it effectively additionally represents an important avenue for future research. Second, it might be interesting to run distinct analyses for both groups of potential users, i.e., therapists and patients. This is because, especially in the psychotherapeutic context investigated in this research, these groups will likely interact with the system in different ways. A first step to improving the current study in this regard could be to adapt the framing with which the general scenario of the survey was introduced to different groups of potential users. Therapists and patients might need to be presented with different descriptions of the system because, especially in the psychotherapeutic context investigated in this research, these groups will likely interact with the system in different ways. Consequently, the survey design could be adapted to reflect both of these perspectives: On the one hand, the therapist will mostly need to use the system to infer the patient's emotional state through the embodied communication signals transmitted to them with the wearable to detect and subsequently repair ruptures in the therapeutic relationship (Safran et al., 2011). The patient, on the other hand, will have to actively engage with the system to communicate their emotional states to their therapist in the first place. Therefore, different analyses are required to identify different users' needs and eventually integrate both perspectives into the design of embodied interaction systems in a way that benefits all parties involved in the interaction. Third, the sample used for the analysis in this paper is of rather moderate size (N = 102). Future research should aim to extend the sample to obtain more statistically valid results. Finally, future research needs to address the gap between use intentions and the actual use behavior of the proposed interaction system, more so because research on use behavior in the context of wearable devices in the healthcare sector is scarce (Lee & Lee, 2020).

## Conclusion

This research aimed to investigate the behavioral intentions of potential users of video-based psychotherapy to engage with an innovative interaction system for enhanced video consultations. To this end, we presented literature from psychology and information systems to highlight the relevance of high-quality interactions in digital psychotherapy encounters. We discuss the concept of embodied interaction as a promising way through which technology can contribute to improving the quality of the therapeutic relationship between therapists and patients. Our analysis provides initial empirical evidence that potential users are generally willing to engage in interactions through such a system in the psychotherapeutic context. Researchers as well as telemedicine system developers can build on our results to design interaction systems that enhance the relationship between healthcare provider and patient and, thereby, increase the overall quality of care.

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