The Impact of Healthcare Provider Characteristics in Telemedicine App Services

Won-jun LEE[1]

1. First Author Professor, Business Department, Cheongju University, Korea. Email: marketing@cju.ac.kr

Abstract

Purpose: his study aims to explore how healthcare provider service characteristics in telemedicine services, which have become more common since the pandemic, affect rapport formation and service satisfaction with healthcare providers. **Research design, data and methodology:** A group of actual telemedicine users underwent data collection and empirical analysis. After analyzing reliability and validity, hypotheses were tested using a structural equation model. **Results:** Key perceived attributes of healthcare providers in telemedicine services were identified as doctor effort, doctor listening, and doctor expertise. Each of these variables had a significant positive impact on trust in telemedicine. Moreover, these attributes significantly positively impacted rapport formation and user service satisfaction, which was mediated by trust. However, the direct impact of rapport formation on service satisfaction was not supported. **Conclusions:** The study's findings have academic and practical implications for expanding telemedicine services. As an initial empirical study on telemedicine services, it confirms the importance of trust and rapport formation even in non-face-to-face medical situations. In order to overcome the limitations of non-physical contact, telemedicine services should strive to develop UI/UX designs that are more interoperable and boost trust in service apps.

Keywords : Telemedicine, Trust, Service satisfaction, Medical service

JEL Classification Code : M31. I12, L86

1. Introduction

One of the most significant challenges and critical issues facing South Korean society today is the innovation in the healthcare services sector, including rising healthcare costs, providing universal healthcare services, and expanding the quantity and quality of medical personnel. Various stakeholder groups, including medical institutions, the government, and related professionals, strive to address the increasing demand for healthcare services due to aging, without compromising the quality of healthcare services or health safety. Challenges remain pervasive despite efforts to establish a more efficient service delivery system. As a solution to improving healthcare services, telemedicine services, which actively utilize the internet and information and communication technologies, have regained significant attention following the COVID-19 pandemic and the endemic phase (Colbert et al., 2020; Hincapiéet al., 2020; Portnoy et al., 2020; Ftouni et al., 2022). In South Korea, various telemedicine apps such as Doctor Now, Ola Care, and Medipangpang have already been providing telemedicine services to patients with mild illnesses and those with mobility issues, especially after the prolonged medical crisis caused by the COVID-19 pandemic in 2020 and the exodus of resident doctors in 2024.

Telemedicine, which has emerged as an innovation in healthcare services, refers to medical services provided remotely using communication technologies such as the Internet (Anthony, 2021). It encompasses simple remote consultations and the pharmaceutical delivery system (Chepesiuk, 1999; Dávalos, 2009). In particular, the provision of healthcare and treatment using non-face-to-face methods via mobile devices like smartphones can offer high-quality medical services to specific population groups, such as those in rural areas or the elderly with mobility difficulties, and it is expected to enhance the quality of interaction and communication between patients and healthcare providers (Harst et al., 2019; Lee & Shin, 2023). South Korea is also experiencing service innovation with the recent development of mobile telemedicine apps (Kim & Kim, 2023), which is anticipated to address the blind spots in healthcare services and adjust the mismatch between demand and supply.

However, the importance of healthcare professionals in ensuring the quality of telemedicine services is still emphasized (Haleem et al., 2021). Although telemedicine services are provided on a non-face-to-face technical media, such as the internet or mobile devices, the roles of patients and healthcare professionals as critical participants in the delivery process are emphasized. Even though non-face-to-face telemedicine services are provided in an online space such as the internet or mobile devices, away from the

physical space of hospitals, the interaction activities between patients and healthcare providers must be an essential process, directly affecting service outcomes. Consequently, the importance of building trust and rapport that patients perceive with their physicians in telemedicine is highlighted, impacting patient satisfaction and treatment outcomes.

Despite the rapid technological advancement of telemedicine, academic discussions on the role of healthcare professionals in effective service delivery have been scarce. This discussion is primarily because the actual introduction, dissemination, and commencement of telemedicine services in the medical field have been relatively recent, following the COVID-19 pandemic, making it challenging to identify and study experienced users of telemedicine services for academic purposes. Therefore, this study aims to bridge the theoretical gap between theory and practice through data collection from actual users and constructing and verifying empirical research models. Specifically, this study empirically analyzes the impact of perceived characteristics factors of healthcare professionals as perceived by actual users of telemedicine services on the overall attitude towards telemedicine, mediated by trust and rapport formation. To achieved the research goals, data collection was conducted on actual users of telemedicine services in South Korea, and the relationships between the related variables were analyzed through structural equation modeling.

2. Theoretical Background

2.1. Telemedicine Characteristics

Telemedicine, more broadly known as telehealth or e-medicine, refers to health-related services provided using communication and electronic information management technologies (Bashur, 1995). This concept includes patients and healthcare professionals, hospitals, and pharmacies involved in providing necessary medical services and prescription medications (Haleem et al., 2021). Telemedicine offers various benefits, such as improving the quality of on-site emergency services, reducing consultation times, lowering medical costs for healthcare providers and patients, and decreasing transportation-related expenses to hospitals (Parimbelli, 2018). Additionally, it helps mitigate the reluctance towards healthcare institutions. Yassa et al. (2022) surveyed the motivations for using telemedicine services among 1,004 users. According to the respondents, reasons included preventing infection during the pandemic (46.3%), discomfort with face-to-face consultations (29.3%), and cost savings on travel and consultation fees (24.4%).

Furthermore, Uscher-Pines et al. (2020) argued that a user group finds non-face-to-face consultations more psychologically comfortable and preferable compared to face-to-face consultations.

Telemedicine services provide benefits not only to users but also to healthcare providers. Medical professionals can quickly expand their contact opportunities with patients in isolated areas such as rural regions and increase the number of patients per consultation hour (Dávalos et al., 2009). Additionally, through collaborations with specialists located overseas or in remote areas, they can improve the quality of consultations and adopt flexible work systems by working from home or offering remote education for training future healthcare professionals (Yassa et al., 2022). Another advantage is that telemedicine services can immediately and clearly document and visualize healthcare professionals' instructions and test results. This characteristic helps prevent miscommunication between healthcare providers and patients due to language barriers, distractions, or interpretation errors, thereby contributing to an efficient and error-free healthcare delivery system (Olowoyo et al., 2024).

Despite these advantages, numerous challenges still need to be addressed for the widespread adoption of telemedicine. Even though the government, medical institutions, and academia have made efforts to establish hardware and software standards required by telemedicine, a reliable and standardized service has yet to be established (Thimbleby, 2013; Olowoyo et al., 2024). Yassa et al. (2022) identified several potential threats, including the difficulty of reaching patients in areas with poor internet infrastructure, challenges for patients to describe their conditions in a non-face-to-face environment, difficulties in conducting detailed examinations remotely, the impossibility of performing physical diagnostics and surgeries, and concerns over patient privacy.

Moreover, a significant issue is that introducing telemedicine within the current medical system and practices can affect the interests of various stakeholder groups, leading to considerable professional tension (Kane and Gillis, 2018). Unlike patients who benefit from an expanded range of healthcare options through telemedicine, many healthcare professionals perceive it as a disruptive model that could weaken the traditional healthcare service system and harm their professional interests (Nittari et al., 2020). Ultimately, despite its many advantages, the widespread adoption of telemedicine services will be challenging without efforts to understand and implement these services in the medical field. This reality underscores the importance of the role of healthcare providers in developing and expanding telemedicine services.

2.2. Service Provider Characteristics

Considering the significance of medical practices that deal with human diseases and life, the demand for high-quality medical practices and superior service quality is naturally required. Healthcare service quality is fundamentally understood as the continuous effort to meet the needs for health improvement and provide satisfaction by consistently delivering effective medical services with the curative potential to patients (Mosadeghrad, 2013). However, the factors affecting healthcare service quality are diverse and involve complex interrelations (Lee & Shin, 2023). Mosadeghrad (2014) identified 182 different characteristics of high-quality healthcare services, categorizing them into three dimensions: patient factors, healthcare provider factors, and environmental factors. Patient factors include demographic characteristics such as disease prevalence, medical history, nutritional status, gender, and age, which can affect healthcare services. Policy factors encompass healthcare policies and regulations, establishing healthcare systems, and expanding relevant partnerships. Lastly, healthcare provider factors include physicians' motivation, training level, and competence.

Among these various factors, healthcare provider factors deserve special attention. In general, services are produced through complex interactions between service providers and users, and users tend to become psychologically immersed in these interactions, as demonstrated in various industries (Crosby & Stephens, 1987). Additionally, if users are satisfied with service encounters through these interactions, they are likely to establish long-term relationships with the service providers, and this process is no exception in healthcare services (Gutek et al., 1999; Wu et al., 2023). Unlike patients who participate passively in the service process due to limited medical knowledge, healthcare providers, as the direct and final service providers, actively influence the quality of healthcare services and determine the level of service provision, thereby underscoring their importance (Endeshaw, 2020). If healthcare providers who form the core of telemedicine services exhibit negative attitudes towards the new telemedicine service, it will adversely affect the quality of telemedicine healthcare services.

Therefore, it is essential to identify and explore the characteristics of healthcare providers that influence the service to provide high-quality telemedicine services. Brown et al. (2013) studied the competencies of healthcare providers in the rapidly changing digital healthcare domain and suggested that healthcare providers need to become more mobile technology-friendly and improve their related information skills. They argue that healthcare providers must adapt to rapidly evolving technologies like

telemedicine and integrate their skills and expertise into mobile healthcare services (Qudah & Luetsch, 2019). However, despite these studies, research on healthcare provider service quality has been limited. Thus, this study aims to identify variables that can promote telemedicine's dissemination and success by focusing on healthcare providers' characteristics.

2.3. Trust and Rapport

Building relationships is emphasized across society and in all industrial sectors, especially in healthcare services, where frequent contact and long-term relationships between patients and healthcare providers are crucial (Marchand et al., 2020). Understanding successful relationship building necessitates focusing on trust between the interacting parties and the harmonious, close rapport derived from mutual empathy (Weitz et al., 2004). In healthcare service delivery, the fundamental need for trust and close rapport between healthcare providers and patients cannot be overlooked (Chung & Park, 2017; English et al., 2022). Rapport begins from the first interaction between the healthcare provider and the patient and aids in establishing respect and empathy towards the healthcare provider, achieving positive medical outcomes (Duchan & Kovarsky, 2011; Ross, 2013).

Trust and rapport are essential in face-to-face consultations and telemedicine processes (Poulsen et al., 2015). Elliott et al. (2020) found that when rapport is established during remote medical consultations, it enhances the relationship experience with the healthcare provider and the overall user experience evaluation. Rossi et al. (2022) confirmed that rapport formation in telemedicine positively impacts patient satisfaction and treatment outcomes. Additionally, the study by Smith and Johnson (2021) demonstrated that a strong rapport between healthcare providers and patients could enhance the efficiency and effectiveness of healthcare services. Anderson and Smith (2021) emphasized the necessity of developing and maintaining rapport even in telemedicine-based healthcare environments, providing useful insights into rapport-building strategies amidst the unique opportunities and challenges the digital online healthcare environment faces.

Nonetheless, forming rapport in the telemedicine environment, characterized by non-face-to-face and online interactions, is not as easily achieved as in face-to-face settings involving physical contact. The absence of physical contact between patients and healthcare providers is an obstacle to rapport formation, and this difficulty is exacerbated for patients with a high need for physical contact (Lee & Shin, 2023). Johnson and Brown (2019) highlighted the challenge for healthcare professionals in

the online, digital era to address the direct face-to-face desires of patients. Researchers like Patterson (2013) and Kelly et al. (2018) emphasized the importance of contact and rapport formation during mobile healthcare diagnostics and consultations. These findings underscore the significance of rapport formation in telemedicine environments and suggest the need for in-depth strategies and approaches to address this aspect effectively.

3. Research Model

3.1. Research Framework

This study examines the impact of trust and rapport with healthcare providers as critical factors influencing user attitudes toward telemedicine. Accordingly, a research model was constructed to explore the structural relationship between trust and rapport with healthcare providers and the perceived quality of telemedicine services. To this end, the study analyzes the impact of healthcare provider-related attributes of telemedicine on trust in healthcare providers and examines how these factors structurally influence the perception of telemedicine service quality.

3.2. Hypotheses

Parasuraman et al. (1985) argued that trust in the service provider is a critical factor in the quality of service delivery, implying that service providers must protect user information and provide services honestly and faithfully (Coulter & Coulter, 2002). In the healthcare sector, it is recognized as essential for healthcare providers and service providers to enhance interactions and form bonds with patients or clients. The empathy and efforts of healthcare providers to solve patient problems help build a strong emotional bond, which plays a crucial role even in the use of telemedicine services (Chung & Park, 2017). Furthermore, when healthcare providers actively assist patients and express confidence in the treatment, patients feel more reassured and can have higher expectations for treatment outcomes (Mosadeghrad, 2014). Considering these prior studies, the following hypothesis can be established:

H1: Doctor Effort has a positive impact on Trust in Telemedicine.

Listening to others' words is seen as a foundation for trust in the counterpart. This is no exception in the healthcare sector. Robb and Greenhalgh (2006) argued that the listening attitude shown by healthcare providers towards

patients and interpreters in a clinical environment involving a language interpreter induces voluntary trust. Ward (2018), after reviewing 200 related papers, found that the communication efforts of healthcare providers have a significantly higher impact on building patient trust than other trust determinants, such as knowledge about the patient. Through clinical surveys in hospitals, Biglu et al. (2017) confirmed that the conversational ability of healthcare providers affects trust and satisfaction. Moreover, studies have suggested that perceived verbal attention behaviors between patients and healthcare providers positively impact clinical outcomes just by demonstrating interest (Beck et al., 2001). Considering these prior studies, the following hypothesis can be established:

H2: Doctor Listening has a positive impact on Trust in Telemedicine.

The overall quality and performance of healthcare services depend on healthcare providers' professional knowledge, skills, and clinical experience (Mosadeghrad, 2013, 2014). Van Dijck and Alinehad (2020), while proposing an institutional model for scientific communication, argued that healthcare professionals' scientific expertise is necessary to persuade and build trust among the general public, who are non-experts, regarding COVID-19 responses. Saibene et al. (2021) argued that an expert system should be introduced in the healthcare sector, and the enhanced expertise of healthcare providers would positively affect user trust in the overall service. Considering these prior studies, the following hypothesis can be established:

H3: Doctor Expertise has a positive impact on Trust in Telemedicine.

Rapport formed between service providers and users is based on solid trust (Weitz et al., 2004). Elliot et al. (2020) argued that there is a close correlation between trust and rapport formation, even in a telemedicine environment. More directly, Kayeser and Razzaque (2014) confirmed that trust in service providers is a direct driver of rapport formation. Considering these prior studies, the following hypothesis can be established:

H4: Trust in telemedicine positively impacts Rapport formation.

Trust in services is claimed to positively impact user behaviors, such as satisfaction and loyalty (Parasuraman et al., 1985), and this is also observed in the healthcare sector (Chang et al., 2013). Through a literature review, Ward (2018) argued that trust in healthcare providers positively affects patient satisfaction in the healthcare sector. Additionally, Orrange et al. (2021) confirmed through empirical research on experiences during the COVID-19 pandemic that strong trust in healthcare providers significantly impacts patient satisfaction. Considering these prior studies, the following hypothesis can be established:

H5: Trust in telemedicine positively impacts Customer Satisfaction.

According to prior research, when rapport with service providers is established, users tend to perceive the service as higher quality (Chung & Park, 2017). Compeau et al. (1998) argued that belief in social exchange relationships, such as rapport, positively affects service outcomes. Biglu et al. (2017) argued that healthcare providers should actively receive communication training because the positive relationships established through adequate communication impact hospital service satisfaction. More specifically, respect and empathy formed through rapport with healthcare providers help create positive medical outcomes (Duchan & Kovarsky, 2011; Ross, 2013). Considering these prior studies, the following hypothesis can be established:

H6: Rapport formation positively impacts Customer Satisfaction.

Six hypotheses were established based on the above hypotheses and prior research, as illustrated in <Figure 1>.
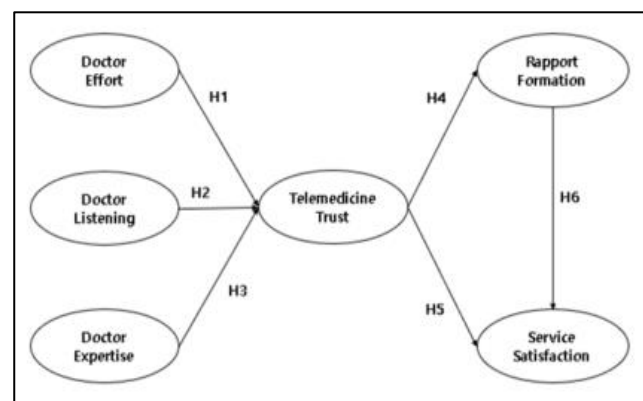

Figure 1: Research Model

4. Empirical Research

4.1. Data Collection

To test the proposed hypotheses and research model, a survey targeted respondents in their 20s and 30s who had used mobile app-based telemedicine services at least once in the past year. Although telemedicine services are still in the early stages of dissemination, the Korean government allowed remote consultations and online prescriptions during COVID-19 due to social distancing, which has continued to date. As a result, many people can access mobile app-based telemedicine services. While all age groups use telemedicine services, respondents in their 20s and 30s were selected as the sample group because previous studies on information technology and user acceptance have emphasized the importance of this age group as early adopters and diffusers of innovative services through word-of-mouth (Shankar & Narang, 2020). To rapidly and effectively overcome technological constraints and spread telemedicine, it is essential first to penetrate the segment of technology innovators.

The survey was conducted over two weeks in May 2024 by building and distributing an online site. A total of 151 individuals participated in the survey. To ensure eligibility, respondents were asked in advance whether they had experience using a telemedicine mobile app. Excluding those who responded negatively, data from 145 participants were used for analysis. The average age of respondents was 23.15 years, with 42.1% male and 57.9% female participants. Among them, 105 respondents (72.4%) reported having had remote consultations and prescriptions within the past six months, while the remaining 27.6% had relevant experiences within the past year.

4.2. Reliability and Validity

Before testing the hypotheses, evaluating the reliability and validity of the measurement items used is essential. In this study, all items were derived from existing literature to ensure basic reliability. They were translated into Korean and modified to fit telemedicine research, as shown in <Table 1>. All scales were measured using a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The appropriateness of the translation and modifications was confirmed through peer researchers' evaluations.

The variables and measurement items used in the study were statistically validated through reliability analysis and confirmatory factor analysis. First, to confirm the reliability of the measurement items, Cronbach's alpha scores and composite reliability values were measured according to the procedures adopted in numerous previous studies, and the average variance extracted (AVE) values were also checked (Nunnally, 1978). According to the results presented in <Table 2>, Cronbach's alpha and composite reliability were above 0.7, and the AVE values were above 0.5, indicating that all measurement values exceeded the threshold, confirming reliability.

Table 1: Constructs and Items

Construct	Items
Doctor Effort Bechwati & Xia (2003)	The doctor made the best effort to provide treatment. The doctor worked hard to take care of the patient.
Doctor Listening Ramsey & Sohi (1997)	The doctor asked detailed questions to issue the online diagnosis. The doctor did not interrupt or disrupt the patient while they explained their symptoms. The doctor made every effort to listen to the patient's symptoms.
Doctor Expertise Ohanian (1990)	The doctor is likely to have a high level of expertise. The doctor is likely to be highly experienced. The doctor is likely to be highly skilled in medical techniques.
Telemedicine Trust	The telemedicine service is honest and trustworthy. The telemedicine service can be completely trusted. The telemedicine service will never disappoint.
Rapport Formation Ashley et al. (2014)	During the telemedicine process, I established a desirable relationship with the doctor. During the telemedicine process, I had a productive consultation with the doctor. During the telemedicine process, I maintained a good relationship with the doctor.
Service Satisfaction	Overall, the telemedicine service provided was satisfactory. Overall, the promised telemedicine service was well delivered. Overall, the telemedicine service provided was satisfactory.

Table 2: Reliability and AVE

Constructs	Cronbach Alpha	Compositr Reliability	AVE
Doctor Effort	0.907	0.909	0.840
Doctor Listening	0.849	0.848	0.653
Doctor Expertise	0.905	0.912	0.774
Telemedicine Trust	0.893	0.808	0.586
Rapport Formation	0.892	0.860	0.675
Service Satisfaction	0.906	0.872	0.697

In addition to reliability assessment, it is necessary to analyze the validity of the measurement items. Confirmatory factor analysis was conducted to assess the validity of this study. Factor analysis can be conducted as exploratory factor analysis or confirmatory factor analysis. Since all variables and measurement items in this study were adopted from previously validated and reliable studies, confirmatory factor analysis was deemed more appropriate (Suhr, 2006). According to the analysis results presented in <Table 3>, the factor loadings of each item significantly exceeded the threshold of 0.7 at the $p<0.05$ level, demonstrating convergent validity. The major fit indices of the confirmatory factor analysis were $x2=237.744$, d.f=104.000, p=0.000, CFI=0.937, NFI=0.895, GFI=0.855, SRMR=0.041, and RMSEA=0.094. Despite the p-value of x2, the overall fit was deemed acceptable.

Table 3: Confirmatory Factor Analysis

Constructs	Items	Loadings(Std.)	S.E	t-value	p-value
Doctor Effort	a1	0.909	0.062	10.847	0.000**
	a2	0.913	0.061	11.823	0.000**
Doctor Listening	b1	0.776	0.058	11.856	0.000**
	b2	0.817	0.055	14.050	0.000**
	b3	0.831	0.055	13.678	0.000**
Doctor Expertise	c1	0.839	0.054	12.322	0.000**
	c2	0.925	0.053	13.923	0.000**
	c3	0.784	0.058	13.350	0.000**
Telemedicine Trust	d1	0.826	0.060	11.666	0.000**
	d2	0.914	0.057	11.671	0.000**
	d3	0.895	0.061	12.045	0.000**
Rapport Formation	e1	0.913	0.061	13.578	0.000**
	e2	0.816	0.060	13.442	0.000**
	e3	0.846	0.062	11.407	0.000**
Service Satisfaction	f1	0.821	0.056	14.107	0.000**
	f2	0.899	0.067	10.554	0.000**
	f3	0.897	0.059	13.606	0.000**

4.3. Hypothesis Test

After successfully validating the reliability and validity of the scales, the hypothetical relationships between the variables were analyzed. A covariate-based structural equation model (SEM) was used to test the hypotheses. For analyzing causal relationships in models that include mediating variables, such as this study, PLS (partial least square) analysis or SEM is typically used. SEM was chosen for this study because it allows for calculating fit indices under more strict assumptions. The main fit indices of the research model were $x2=439.586$, d.f=113.000, p=0.000, CFI=0.847, NFI=0.806, and RMSEA=0.141. The results of the hypothesis testing are shown in <Table 4>.

Table 4: Test Results

Hypothesis	Estimates(Std.)	S.D	t-value	p-value
H1. Doctor Effort → Trust	0.355	0.067	3.599	0.000**
H2. Doctor Listening → Trust	0.338	0.082	3.376	0.001**
H3. Doctor Expertise → Trust	0.621	0.087	6.074	0.000**
H4. Trust → Rapport	0.719	0.088	9.468	0.000**
H5. Trust → Service Satisfaction	0.689	0.128	5.719	0.000**
H6. Rapport → Service Satisfaction	0.195	0.107	1.677	0.096

The analysis showed that all hypotheses were accepted at the significance level ($p<0.05$), except for Hypothesis 6. Specifically, the characteristics of healthcare providers (doctor effort, doctor listening, and doctor expertise) positively impacted trust in telemedicine services. Additionally, trust in telemedicine positively influences the rapport between healthcare providers and patients and customer satisfaction with the service. However, contrary to expectations, the impact of rapport on customer satisfaction was insignificant. Moreover, the mediating effect of trust in telemedicine was confirmed to be significant. The results of the mediation effect analysis are presented in <Table 5>.

Table 5: Mediation Test

Mediation Relationship	Estimates(Std.)	S.D	t-value	p-value
Effort →Trust → Rapport	0.255	0.076	3.36	0.001**
Effort →Trust → Satisfaction	0.244	0.091	2.699	0.007**
Listening →Trust → Rapport	0.243	0.091	2.663	0.008**
Listening →Trust → Satisfaction	0.233	0.108	2.146	0.032**
Expertise →Trust → Rapport	0.446	0.100	4.450	0.000**
Expertise →Trust → Satisfaction	0.428	0.133	3.213	0.001**

5. Conclusions

5.1. Academic Implications

Telemedicine was temporarily permitted in South Korea starting on February 14, 2020, to respond to COVID-19. Although it began as a temporary measure, the scope and target of telemedicine have been adjusted according to the healthcare market situation, and it continues. Given the advancement of information and communication technology, the demand for high-quality healthcare services, and the chronic shortage of healthcare services in remote areas and among the elderly, telemedicine is expected to continue. Additionally, according to the theory of path dependency, which posits that past decisions have lasting impacts on the future, it is unlikely that the already established telemedicine services will be discontinued (Kay, 2005). Therefore, this study is expected to provide various academic and practical implications related to telemedicine.

Firstly, this study is valuable as one of the initial empirical studies that examine the actual experiences of telemedicine users, which has a concise history of being permitted in South Korea. It analyzes the process by which trust mediates the impact on outcomes. The study identifies the importance of the characteristics and roles of healthcare providers perceived during remote consultations for more effective and safe telemedicine service usage and diffusion. This finding implies that healthcare providers' active participation and efforts are crucial even in a digital healthcare environment, providing a significant theoretical foundation for future telemedicine service quality improvements.

Secondly, the interaction between healthcare providers and patients is a key factor in enhancing service quality in telemedicine services. This study confirms that doctor effort, listening, and expertise influence trust. It clearly shows that trust and rapport are critical elements of telemedicine services. This empirical evidence demonstrates the impact of building trust and rapport between healthcare providers and patients on overall service satisfaction, emphasizing the need for academic research focused on trust and rapport formation in service provision.

Thirdly, trust in telemedicine services positively affects rapport formation and customer satisfaction. Despite being non-face-to-face, the possibility of rapport formation through telemedicine services provides direction for the future expansion and qualitative improvement of non-face-to-face healthcare services. For instance, implementing a home doctor system through mobile apps or effective matching considering the characteristics of healthcare providers and patients can help form long-term rapport and achieve high treatment efficacy.

Fourthly, contrary to expectations, the direct impact of rapport formation on service satisfaction was not supported. Several possible reasons can be inferred. One possibility is that telemedicine services are limited to mild illnesses or non-urgent chronic diseases. Consequently, the urgent need for strong and close rapport formation between healthcare providers and patients may not be mutually highlighted. The formed rapport might be based more on simple human intimacy rather than the need for physical contact-based medical services like physiotherapy. If telemedicine expands to more severe diseases through technological advancements and improvements in the future, the impact of rapport on service satisfaction might present different results.

Fifthly, this study promotes the academic expansion of telemedicine research. In the rapidly expanding application of technology in the healthcare sector post-pandemic, this study provides practical and specific guidelines and directions for academic research on service quality management and improvement in a digital healthcare environment.

5.2. Managerial Implications

The practical implications of this study are as follows. Firstly, as with face-to-face consultations in general healthcare settings, highly competent healthcare providers' effort and service provision are essential factors for user trust in non-face-to-face telemedicine. However, the limited virtual consultation environment through mobile apps makes it difficult for users to perceive the listening and efforts of healthcare providers. Typically, consultation

activities on mobile apps are conducted through video calls or brief remote consultations, which limits users' perception of healthcare providers' presence and the duration of consultations compared to in-person settings. Therefore, future telemedicine service environments must improve user-friendly app UI/UX to enable close interactions similar to in-person consultations. Additionally, qualitative improvements in interactions between healthcare providers and users in virtual spaces and supplementary service provision devices, such as personalized services to address the lack of face-to-face interactions, are required.

Secondly, to ensure the success of telemedicine services, developing and implementing educational programs to enhance healthcare providers' expertise and listening skills centered around medical schools and institutions is necessary. Through these programs, healthcare providers can effectively communicate with patients and build trust in a digital environment. Additionally, telemedicine service providers should concretely establish and apply strategies for building trust and rapport. This will be crucial in increasing patient satisfaction and promoting long-term service use.

Thirdly, to provide high-quality telemedicine services to users, the government and medical institutions must collaborate to standardize and ensure the quality of telemedicine services. This value cocreation will enable the provision of more consistent and reliable telemedicine services. Furthermore, a management system that can continuously monitor and improve the quality of telemedicine services should be established. Reflecting patient feedback is essential for improving service quality.

5.3. Limitation and Further Research

Despite the various implications, this study has certain limitations and areas that require further research. Firstly, this study could be generalized with a larger sample size. The sample is relatively small and primarily consists of individuals in their 20s, given the early stage of telemedicine services and the limited number of experienced users. Although these samples are valid as early adopters of innovative information and communication services, as telemedicine becomes more widespread, it will be necessary to secure additional samples and expand the age range of participants to generalize the research findings.

Secondly, the characteristics of healthcare providers in Telemedicine should be considered. While it is valid to consider the characteristics of healthcare providers as service providers, the diversity of these characteristic variables can be more complex or varied than those presented in this study. Future research should involve more studies or meta-analyses on related topics to organize and

develop an integrated framework for these characteristic variables.

Thirdly, the unsupported relationship between rapport formation and service satisfaction suggests the possible existence of unexamined moderating variables. Future empirical studies should identify additional variables that may play a moderating role, such as the severity of the illness, information technology literacy, service efficacy, and demographic characteristics. By addressing these research limitations and future directions, it is anticipated that the significance and implications of this study will be expanded.

References

Anthony Jnr, B. (2021). Integrating telemedicine to support digital health care for the management of COVID-19 pandemic. *International Journal of Healthcare Management, 14*(1), 280-289.

Ashley, C., & Noble, S. M. (2014). It's closing time: Territorial behaviors from customers in response to front line employees. *Journal of Retailing, 90*(1), 74-92.

Bacon, L. D. (1999). *Using LISREL and PLS to measure customer satisfaction*. In Proceedings of Sawtooth Software Conference (pp. 305-306). La Jolla, California.

Bashshur, R. L. (1995). On the definition and evaluation of telemedicine. *Telemedicine Journal, 1*(1), 19-30.

Bechwati, N. N., & Xia, L. (2003). Do computers sweat? The impact of perceived effort of online decision aids on consumers' satisfaction with the decision process. *Journal of Consumer Psychology, 13*(1-2), 139-148.

Beck, R. S., Daughtridge, R., & Sloane, P. D. (2002). Physician-patient communication in the primary care office: a systematic review. *The Journal of the American Board of Family Practice, 15(*1), 25-38.

Biglu, M. H., Nateq, F., Ghojazadeh, M., & Asgharzadeh, A. (2017). Communication skills of physicians and patients' satisfaction. *Materia socio-medica, 29*(3), 192.

Brown III, W., Yen, P. Y., Rojas, M., & Schnall, R. (2013). Assessment of the Health IT Usability Evaluation Model (Health-ITUEM) for evaluating mobile health (mHealth) technology. *Journal of Biomedical Informatics, 46(*6), 1080-1087.

Chang, C. S., Chen, S. Y., & Lan, Y. T. (2013). Service quality, trust, and patient satisfaction in interpersonal-based medical service encounters. *BMC Health Services Research, 13*, 1-11.

Chepesiuk, R. (1999). Making house calls: using telecommunications to bring health care into the home. *Environmental Health Perspectives, 107*(11), A556-A560.

Chung, H., & Park, S. (2017). Relationship among patients perception toward service encounters emotional expression, rapport and satisfaction. *Global Business & Finance Review, 22*(1), 8-22.

Colbert, G. B., Venegas-Vera, A. V., & Lerma, E. V. (2020). Utility of Telemedicine in the COVID-19 era. *Reviews in Cardiovascular Medicine, 21*(4), 583-587.

Compeau, L. D., Grewal, D., & Monroe, K. B. (1998). Role of prior affect and sensory cues on consumers' affective and cognitive responses and overall perceptions of quality. *Journal of Business Research, 42*(3), 295-308.

Coulter, K. S., & Coulter, R. A. (2002). Determinants of trust in a service provider: the moderating role of length of relationship. *Journal of Services Marketing, 16*(1), 35-50.

Crosby, Lawrence A. and Nancy Stephens(1987), "Effects of Relationship Marketing on Satisfaction, Retention, and Prices in the Life Insurance Industry," *Journal of Marketing Research, 24(*November), pp. 404-411.

Dávalos, M. E., French, M. T., Burdick, A. E., & Simmons, S. C. (2009). Economic evaluation of telemedicine: review of the literature and research guidelines for benefit–cost analysis. *Telemedicine and e-Health, 15*(10), 933-948.

Duchan, J. F., & Kovarsky, D. (2011). Rapport and relationships in clinical interactions. *Topics in Language Disorders, 31*(4), 297.

Elliott, T., Tong, I., Sheridan, A., & Lown, B. A. (2020). Beyond convenience: patients' perceptions of physician interactional skills and compassion via telemedicine. *Mayo Clinic Proceedings: Innovations, Quality & Outcomes, 4*(3), 305-314.

Endeshaw, B. (2020). Healthcare service quality-measurement models: a review. *Journal of Health Research, 35*(2), 106-117.

English, W., Gott, M., & Robinson, J. (2022). The meaning of rapport for patients, families, and healthcare professionals: a scoping review. *Patient Education and Counseling, 105(*1), 2-14.

Ftouni, R., AlJardali, B., Hamdanieh, M., Ftouni, L., & Salem, N. (2022). Challenges of Telemedicine during the COVID-19 pandemic: a systematic review. *BMC Medical Informatics and Decision Making, 22*(1), 207.

Gutek, B. A., Bhappu, A. D., Liao-Troth, M. A., & Cherry, B. (1999). Distinguishing between service relationships and encounters. *Journal of Applied Psychology, 84*(2), 218.

Haleem, A., Javaid, M., Singh, R. P., & Suman, R. (2021). Telemedicine for healthcare: Capabilities, features, barriers, and applications. *Sensors International, 2*, 100117.

Harst, L., Lantzsch, H., & Scheibe, M. (2019). Theories predicting end-user acceptance of telemedicine use: systematic review. *Journal of Medical Internet Research, 21*(5), e13117.

Hincapié, M. A., Gallego, J. C., Gempeler, A., Piñeros, J. A., Nasner, D., & Escobar, M. F. (2020). Implementation and usefulness of telemedicine during the COVID-19 pandemic: a scoping review. *Journal of Primary Care & Community Health, 11*, 2150132720980612.

Kane, C. K., & Gillis, K. (2018). The use of telemedicine by physicians: still the exception rather than the rule. *Health Affairs, 37*(12), 1923-1930.

Kay, A. (2005). A critique of the use of path dependency in policy studies. *Public Administration*, 83(3), 553-571.

Kayeser Fatima, J., & Abdur Razzaque, M. (2014). Roles of trust on rapport and satisfaction in services. Asia Pacific *Journal of Marketing and Logistics, 26*(4), 566-578.

Kelly, M. A., Nixon, L., McClurg, C., Scherpbier, A., King, N., & Dornan, T. (2018). Experience of touch in health care: A meta-ethnography across the health care professions.

Qualitative Health Research, 28(2), 200-212.

Kim, E. J., & Kim, J. Y. (2023). The metaverse for healthcare: trends, applications, and future directions of digital therapeutics for urology. *International Neurourology Journal, 27*(Suppl 1), S3-12.

Lee, W-J, & Shin, S. J. (2023). *Telemedicine using mobile healthcare apps: Rapport formation and service evaluation.* 54th Decision ScienceI nstitute Annual Conference, Atlanta,U.S.

Marchand, K., Foreman, J., MacDonald, S., Harrison, S., Schechter, M. T., & Oviedo-Joekes, E. (2020). Building healthcare provider relationships for patient-centered care: a qualitative study of the experiences of people receiving injectable opioid agonist treatment. *Substance Abuse Treatment, Prevention, and Policy, 15*, 1-9.

Mohammad Mosadeghrad, A. (2013). Obstacles to TQM success in health care systems. I*nternational Journal of Health Care Quality Assurance, 26*(2), 147-173.

Mosadeghrad, A. M. (2014). Factors influencing healthcare service quality. *International Journal of Health Policy and Management, 3*(2), 77.

Nittari, G., Khuman, R., Baldoni, S., Pallotta, G., Battineni, G., Sirignano, A., ... & Ricci, G. (2020). Telemedicine practice: review of the current ethical and legal challenges. *Telemedicine and e-Health, 26*(12), 1427-1437.

Ohanian, R. (1990). Construction and validation of a scale to measure celebrity endorsers' perceived expertise, trustworthiness, and attractiveness. *Journal of Advertising, 19*(3), 39-52.

Olowoyo, K. S., Esan, D. T., Adeyanju, B. T., Olawade, D. B., Oyinloye, B. E., & Olowoyo, P. (2024). Telemedicine as a tool to prevent multi-drug resistant tuberculosis in poor resource settings: Lessons from Nigeria. *Journal of Clinical Tuberculosis and Other Mycobacterial Diseases*, 100423.

Orrange, S., Patel, A., Mack, W. J., & Cassetta, J. (2021). Patient satisfaction and trust in telemedicine during the COVID-19 pandemic: retrospective observational study. *JMIR Human Factors, 8*(2), e28589.

Parasuraman, A., Zeithaml, V. A., & Berry, L. L. (1985). A conceptual model of service quality and its implications for future research. *Journal of Marketing, 49*(4), 41-50.

Parimbelli, E., Bottalico, B., Losiouk, E., Tomasi, M., Santosuosso, A., Lanzola, G., ... & Bellazzi, R. (2018). Trusting telemedicine: a discussion on risks, safety, legal implications and liability of involved stakeholders. *International Journal of Medical Informatics, 112*, 90-98.

Patterson, M. M. (2012). Touch: vital to patient-physician relationships. *Journal of Osteopathic Medicine, 112*(8), 485-485.

Portnoy, J., Waller, M., & Elliott, T. (2020). Telemedicine in the era of COVID-19. *The Journal of Allergy and Clinical Immunology: In Practice, 8*(5), 1489-1491.

Poulsen, K. A., Millen, C. M., Lakshman, U. I., Buttner, P. G., & Roberts, L. J. (2015). Satisfaction with rural rheumatology telemedicine service. *International Journal of Rheumatic Diseases, 18*(3), 304-314.

Qudah, B., & Luetsch, K. (2019). The influence of mobile health applications on patient-healthcare provider relationships: a systematic, narrative review. *Patient Education and*

Counseling, 102(6), 1080-1089.

Ramsey, R. P., & Sohi, R. S. (1997). Listening to your customers: The impact of perceived salesperson listening behavior on relationship outcomes. *Journal of the Academy of Marketing Science, 25*, 127-137.

Robb, N., & Greenhalgh, T. (2006). "You have to cover up the words of the doctor" The mediation of trust in interpreted consultations in primary care. J*ournal of Health Organization and Management, 20*(5), 434-455.

Ross, L. (2013). Facilitating rapport through real patient encounters in health care professional education. *Australasian Journal of Paramedicine, 10*, 1-11.

Saibene, A., Assale, M., & Giltri, M. (2021). Expert systems: Definitions, advantages and issues in medical field applications. *Expert Systems with Applications, 177*, 114900.

Shankar, V., & Narang, U. (2020). Emerging market innovations: Unique and differential drivers, practitioner implications, and research agenda. *Journal of the Academy of Marketing Science, 48*, 1030-1052.

Suhr, D. D. (2006). Exploratory or confirmatory factor analysis?, *Statistics and Data Analysis, Paper 200-31*, 1-17.

Thimbleby, H. (2013). Technology and the future of healthcare. *Journal of Public Health Research, 2*(3), jphr-2013.

Uscher-Pines, L., Sousa, J., Raja, P., Mehrotra, A., Barnett, M. L., & Huskamp, H. A. (2020). Suddenly becoming a "virtual doctor": Experiences of psychiatrists transitioning to telemedicine during the COVID-19 pandemic. *Psychiatric Services, 71*(11), 1143-1150.

Van Dijck, J., & Alinejad, D. (2020). Social media and trust in scientific expertise: Debating the Covid-19 pandemic in the Netherlands. S*ocial Media+ Society, 6*(4), 2056305120981057.

Ward, P. (2018). Trust and communication in a doctor-patient relationship: a literature review. *Arch Med, 3*(3), 36.

Weitz, B. A., Castleberry, S. B., & Tanner, J. F. (2004). *Selling: building partnerships,* Irwin/McGraw Hill.

Wu, Y., Groth, M., Zhang, K., & Minbashian, A. (2023). A meta-analysis of the impact of customer mistreatment on service employees' affective, attitudinal and behavioral outcomes. *Journal of Service Management, 34*(5), 896-940.