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Integration of online and offline health services: The role of doctor-patient online interaction

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ABSTRACT

Objective: This study aims to investigate how doctor-patient online interaction affects the integration of online and offline health services. Drawing on justice theory and the stimulus-organism-response (S-O-R) framework, justice perceptions are conceptualized as online health communication in influencing patient experiences and subsequent responses.
Methods: Data were collected from 241 online consultation patients. Partial least squares structural equation modeling (PLS-SEM) approach was used to test the research model and 12 hypothesized relationships.
Results: Distributive justice, procedural justice, and interpersonal justice significantly affect trust, which in turn affects satisfaction and the continued intention to consult. Distributive justice and informational justice significantly affect satisfaction, which in turn affects the continued intention to consult. Finally, the continued intention to consult significantly affects the behavioral intention to visit.
Conclusion: Doctors can attract patients to visit them in physical hospitals by providing good online health services. Before physically visiting doctors, patients can also search for a suitable doctor that meets their needs through online consultations. To the best of our knowledge, this study is the first to integrate online and offline health services.
Practice implications: From the perspective of health communication, the understanding of doctor-patient online interaction offers doctors and hospitals guidance to improve doctor-patient relationships.

1. Introduction

With the development of the Internet, eHealth is growing rapidly in the health industry and provides a variety of health services, such as consumer health informatics, electronic health records, mHealth (mobile health), e-prescribing, telemedicine, etc. [1] In eHealth services, mHealth can be described as online doctor consultation services. Patients can use mobile devices to consult with medical professionals through the Internet, that is, ask a doctor online. Meanwhile, doctors can directly diagnose symptoms and provide drug prescriptions. According to the eHealth report, the number of eHealth users reached 9.3 million in 2017. eHealth market revenue reached US$47.60 billion in 2018 and is expected to reach US$132.35 million by 2023 [2].

With the advent of online health services, many doctors attempt to attract patients online and invite them to visit physical hospitals [3,4]. If patients trust and are satisfied with the online consultation, they will physically visit the doctors for further diagnosis and treatments. Doctors can also build a reputation by providing good online health services. Before physically visiting doctors, patients may search for doctors on the Internet and understand whether the doctors meet their needs. Therefore, online consultations can help doctors attract patients and help patients identify suitable doctors.

A great deal of past research has explored the factors influencing physician choice [5–7] and found that doctor-patient interaction, also known as health communication, was the major determinant of patients' choice of doctors [8]. However, prior studies focused on offline health communication [9–11]. That is, the communication in prior studies took place in physical hospitals and clinics. None of these studies investigated how online health communication affects patients' offline behaviors (Figs.1 and 2).

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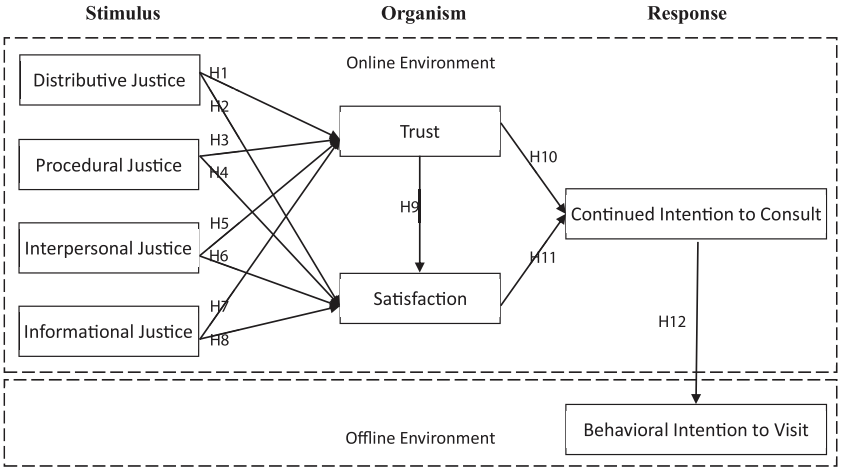

Fig. 1. Research Model.

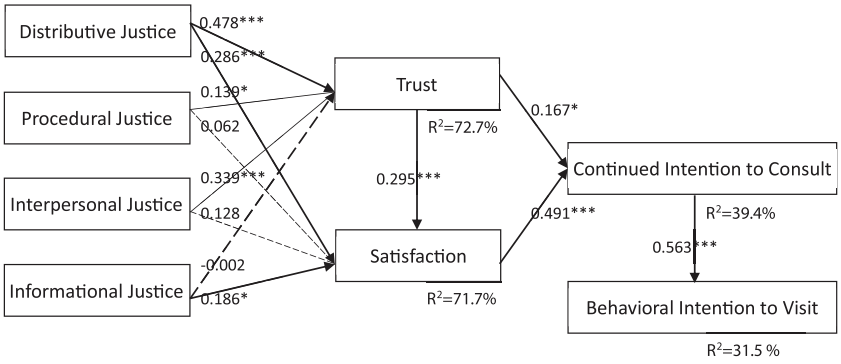

Fig. 2. Results.

Current research on eHealth suggests that trust is the antecedent of customer satisfaction and behavioral intentions [12,13]. Trust in an offline environment refers to the extent to which a patient trusts a doctor's competence to diagnose and treat him/her while trust in an online environment refers to the belief that doctors offer professional guidance and confidential conversations. When doctors can only offer consultation services on the Internet, patients and doctors may not know each other. Thus, trust must be built up through online communication. However, few studies on health communication have discussed the relationship between doctor-patient online interaction and trust [14–17].

When doctors exchange professional knowledge for reputation and potential patient visits, doctor-patient online interaction can be seen as a social exchange. Justice theory has been widely used to explain human exchange behavior and posits that, when an individual feels justice during a social exchange, he/she will be satisfied and will tend to repeat this action. Scholars have also validated the importance of justice perceptions on customer trust, satisfaction, and behaviors [18]. Therefore, this study employs justice theory to examine online consultation procedures leading to outcome (procedural justice), friendly interaction with doctors (interpersonal justice), doctors' explanation of diseases (informational justice), and consultation outcomes (distributive justice).

This study also focuses on two different behavioral intentions, namely the continued intention to consult online doctors and the behavioral intention to visit doctors. Thus, we draw upon the stimulus-organism-response (S-O-R) framework as another theoretical foundation. We suggest that justice perceptions can act as the stimuli in influencing patient experiences (i.e., trust and satisfaction) and subsequent responses (i.e., the continued intention to consult online doctors and the behavioral intention to visit doctors). Since patient behaviors can be extended from online consultations to offline visits, this study aims to investigate how doctor-patient online interaction affects the integration of online and offline health services. The understanding of doctor-patient online interaction offers doctors and hospitals guidance to improve doctor-patient relationships in the context of health communication. Therefore, we address the following research questions:

(1) How do patients' justice perceptions toward online doctors influence their trust and satisfaction with doctors?
(2) How do patients' trust and satisfaction influence their continued intention to consult online doctors?
(3) Howe does patients' continued intention to consult online doctors influence their behavioral intention to visit doctors?

2. Theoretical model

Health communication aims to improve patient health and medical care and to promote health information between doctors and patients [19]. Because doctor-patient online interaction influences patients' organic experiences, distributive justice, procedural justice, interpersonal justice, and informational justice

are operationalized as the stimuli for online health communication. Trust and satisfaction with doctors reflect the perception of organism. The continued intention to consult online doctors and the behavioral intention to visit doctors represent patients' behavioral responses. Therefore, this study integrates justice theory and the S-O-R framework to investigate how doctor-patient online interaction affects patient experiences and subsequent behaviors.

2.1. Stimulus: justice perceptions

According to the S-O-R framework, this study conceptualizes the four justice dimensions as the stimuli for doctor-patient online interaction. Distributive justice refers to the evaluation of the fairness of economic and socio-emotional outcomes. Since a patient needs to spend money and time to get a doctor's advice, the patient evaluates whether the outcomes of the online consultation meet his/her expectations. If the outcomes the patient received are fair, then the patient's trust and satisfaction with the doctor will be improved. Procedural justice refers to the perceptions of fairness with regard to the processes and procedures of the online consultation. If the online consultation process is fair, the patient will trust and be satisfied with the doctor. Interpersonal fairness refers to the extent to which a patient is treated with politeness, dignity, and respect by the doctor. The patient cares about how he/she was treated during the online consultation (e.g., courteously or rudely). If the doctor treats the patient in a fair manner, the patient will tend to trust and feel more satisfied with the doctor. Information justice refers to the explanations provided to convey the reasoning behind the online consultation. After consulting a doctor, the patient will judge the information or explanation provided by the doctor. Thus, information quality is an important antecedent to trust and satisfaction. Previous studies have proposed all of the four justice dimensions: distributive justice, procedural justice, interpersonal justice, and informational justice have a positive impact on trust [20,21] and satisfaction [22,23]. Therefore, this study hypothesizes that justice perceptions influence trust and satisfaction.

2.2. Organism: trust and satisfaction

Trust in this study refers to a patient's expectation of the doctor's motive and behavior. When trusting a doctor, the patient is more likely to adhere to the doctor's advices than otherwise. As a result, symptoms may be alleviated more effectively and result in higher satisfaction. Since a patient seeking medical advices may have to explain symptoms that she/he may not want to disclose, only the doctor who can win the patient's trust can entice the patient to ask their advices again. Similar viewpoints have been echoed by several studies researching trust, satisfaction, and online patient consultation [24–27]. Therefore, this study hypothesizes that trust influences satisfaction and the continued intention to consult online doctors.

Satisfaction is considered to be a strong predictor of customer loyalty [28]. In the context of e-commerce, satisfied customers will have a higher loyalty than dissatisfied customers. Satisfaction in this study refers to a patient's affect with (feelings about) the doctor. If a patient is satisfied with the doctor because of high service quality, then he/she will enhance his/her continued intention to consult the online doctor. On the contrary, a dissatisfied patient will be more likely to switch to another doctor. Previous studies have demonstrated this relationship between satisfaction and the continued intention [29–31]. Therefore, this study hypothesizes that satisfaction influences the continued intention to consult online doctors.

2.3. Response: continued intention and behavioral intention

The continued intention to consult refers to a patient's intention to continue consulting online doctors while the behavioral intention to visit refers to a patient's intention to visit doctors in physical hospitals. A patient who intends to consult the doctor online is more likely to visit the doctor offline because he/she transfers his/her online motivation to offline motivation. A review of the literature suggests that the halo effect can provide a framework for online-offline integration [32]. Based on the halo effect, some studies have shown that customers' behavioral intentions toward one channel are likely to affect their behavioral intentions toward another channel [33–36]. Therefore, this study hypothesizes that the continued intention to consult online doctors influences the behavioral intention to visit doctors.

3. Methods

3.1. Ethics statement

The study was approved by Wenzhou People's Hospital, and all participants signed informed consent forms before they were enrolled in the study.

3.2. Participants and procedures

A cross-sectional study was conducted based on the proposed model in Zhejiang from January to June 2017. Respondents were collected from the Good Doctor website (haodf.com), which provides online consultation services. Patients can consult a doctor online and further schedule an offline medical service with the doctor. In order to investigate respondents' behavioral intention to visit doctors, only respondents who consulted online doctors were included in the data analysis. With the assistance of the doctors from Wenzhou People's Hospital, 800 questionnaires were distributed to online consultation patients. We received 241 questionnaires with a response rate of 30.1%.

3.3. Measures

A survey method was conducted to collect data. The items for the four justice dimensions, including distributive justice, procedural justice, interpersonal justice, and informational justice, were adapted from Colquitt [37]. The items for trust were adapted from Jarvenpaa [38]. The items for satisfaction and the continued intention to consult were adapted from Bhattacherjee [29]. The items for the behavioral intention to visit were adapted from Venkatesh et al. [39]. All items were measured on a seven-point Likert scale with anchors from strongly disagree (1) to strongly agree (7). Appendix A lists the 26 items used in this study.

4. Results

4.1. Demographic characteristics

Among the respondents, 138 were male (57.3%), 130 were between 26–35 years old (53.9%), 160 had a bachelor's degree (66.4%), and 94 had a monthly income between 3001–6000 yuan (39%). All respondents have online consultation experiences and consult online doctors at least once a month. Table 1 lists the respondents' demographics.

4.2. Reliability and validity of constructs

Partial least squares (PLS) is used to evaluate convergent validity and discriminant validity. Convergent validity is assessed

Table 1
Profile of respondents.

Measure	Items	Frequency	Percent (%)
Gender	Male	138	57.3
	Female	103	42.7
Age	18-25 years	27	11.2
	26-35 years	130	53.9
	36-45 years	62	25.7
	46-55 years	17	7.1
	56-65 years	3	1.2
	Over 65 years	2	0.8
Education	Senior high school	62	25.7
	University	160	66.4
	Master	18	7.5
	Doctor	1	0.4
Monthly income	Less than 1500 yuan	26	10.8
	1501-3000 yuan	41	17.0
	3001-4500 yuan	47	19.5
	4501-6000 yuan	47	19.5
	6001-7500 yuan	23	9.5
	7501-9000 yuan	17	7.1
	9001-10,500 yuan	16	6.6
	More than 10,500 yuan	24	10.0
Online consultation experience	Less than 1 year	130	53.9
	1 year	55	22.8
	2 years	28	11.6
	3 years	13	5.4
	4 years	4	1.7
	5 years	4	1.7
	More than 5 years	7	2.9
Online consultation frequency (Monthly)	1 time	15	6.3
	2 times	23	9.5
	3 times	113	46.9
	4 times	46	19.1
	5 times	17	7.1
	More than 5 times	27	11.2

using item loading, composite reliability (CR), and average variance extracted (AVE) [40]. Table 2 shows that all item loadings range from 0.79 to 0.95, exceeding 0.7. CRs for each construct range from 0.89 to 0.96, all greater than 0.7. AVEs for each construct range from 0.73 to 0.90, which are above 0.5. Discriminant validity is assessed using the measure that the square root of AVE for each construct is larger than its correlations with other constructs. As shown in Table 3, correlations among all constructs range from 0.47 to 0.80, which are below the threshold of 0.85 [41]. Thus, convergent validity and discriminant validity are supported.

Table 2
Reliability and convergent validity.

Construct	Item	Factor loading	Mean	S.D.	Composite reliability	AVE
Distributive Justice (DJ)	DJ1	0.83	6.23	0.84	0.90	0.75
	DJ2	0.90				
	DJ3	0.88				
Procedural Justice (PJ)	PJ1	0.87	6.32	0.74	0.89	0.73
	PJ2	0.82				
	PJ3	0.87				
Interpersonal Justice (ITJ)	ITJ1	0.90	6.31	0.80	0.91	0.78
	ITJ2	0.92				
	ITJ3	0.83				
Informational Justice (IFJ)	IFJ1	0.79	6.33	0.78	0.92	0.74
	IFJ2	0.89				
	IFJ3	0.88				
	IFJ4	0.89				
Trust (TR)	TR1	0.88	6.28	0.81	0.92	0.80
	TR2	0.89				
	TR3	0.91				
Satisfaction (SA)	SA1	0.88	6.26	0.84	0.94	0.81
	SA2	0.91				
	SA3	0.91				
	SA4	0.90				
Continued Intention to Consult (CIC)	CIC1	0.95	5.82	1.14	0.96	0.90
	CIC2	0.95				
	CIC3	0.95				
Behavioral Intention to Visit (BIV)	BIV1	0.90	6.15	0.95	0.94	0.84
	BIV2	0.92				
	BIV3	0.93				

4.3. Structural equation modeling (SEM)

PLS is used to examine the structural model. Distributive justice ($\beta = 0.478$, $p < 0.001$), procedural justice ($\beta = 0.139$, $p < 0.05$), and interpersonal justice ($\beta = 0.339$, $p < 0.001$) have a significant effect on trust. However, informational justice (β= -0.002, $p > 0.05$) has no significant effect on trust. The four justice dimensions explain 72.7% of the variance of trust.

Distributive justice ($\beta = 0.286$, $p < 0.001$), informational justice ($\beta = 0.186$, $p < 0.05$), and trust ($\beta = 0.295$, $p < 0.001$) have a positive effect on satisfaction. Procedural justice ($\beta = 0.062$, $p > 0.05$) and interpersonal justice ($\beta = 0.128$, $p > 0.05$) have no significant effect on satisfaction. The model accounts for 71.7% of the variance of satisfaction.

Trust ($\beta = 0.167$, $p < 0.05$) and satisfaction ($\beta = 0.491$, $p < 0.001$) have a positive effect on continued intention to consult. The two paths account for 39.4% of the variance of continued intention to consult. Continued intention to consult ($\beta = 0.563$, $p < 0.001$) has a positive effect on behavioral intention to visit. The model accounts for 31.5% of the variance of behavioral intention to visit.

5. Discussion and conclusion

5.1. Discussion

This study investigates factors that affect patients' trust and satisfaction, and understands the integration between online and offline health services. Drawing on justice theory and the S-O-R framework, distributive justice, procedural justice, and interpersonal justice significantly affect trust, which in turn affects satisfaction and the continued intention to consult. Furthermore, distributive justice and informational justice significantly affect satisfaction, which in turn affects the continued intention to consult. Finally, the continued intention to consult significantly affects the behavioral intention to visit.

Informational justice has no significant effect on trust. The insignificant effect of informational justice is consistent with Martinez-Tur et al. [10]. A possible explanation is that paying patients have reviewed the professional reputation and rating of the selected doctor and then consulted the doctor. Once a patient trusts the doctor, the doctor's explanations and manner are no longer issues for the patient. There is less possibility of distrust and unfairness during the online consultation. Another explanation may be that trust and satisfaction compensate for each other. Informational justice directly affects satisfaction rather than trust.

Procedural justice has no significant effect on satisfaction. This finding is consistent with prior studies [16,42,43]. One possible explanation is that patients are more familiar with the processes and procedures of the online consultation. Once a patient pays to

Table 3
Discriminant validity.

Construct	DJ	PJ	ITJ	IFJ	TR	SA	CIC	BIV
DJ	**0.87**							
PJ	0.61	**0.86**						
ITJ	0.71	0.63	**0.88**					
IFJ	0.69	0.75	0.74	**0.86**				
TR	0.80	0.64	0.76	0.68	**0.89**			
SA	0.78	0.65	0.73	0.72	0.79	**0.90**		
CIC	0.59	0.47	0.50	0.49	0.55	0.62	**0.95**	
BIV	0.61	0.51	0.57	0.56	0.58	0.63	0.56	**0.92**

consult a doctor, the Good Doctor website requests that the doctor answers the patient within 24 h. Thus, patients are not worried about the unfairness of the procedure. In addition, the procedures, policies, or methods of the Good Doctor website are well established. When patients understand the complete information, procedural justice is no longer important in affecting patient satisfaction.

Interpersonal justice has no significant effect on satisfaction. This finding is in agreement with prior studies [42]. A possible explanation is that patients have little time to interact with doctors through the Internet. A patient will only be satisfied if he/she receives a response in a timely and acceptable manner. In addition, it is difficult to establish a deep relationship with doctors in a short-term online service. Therefore, both of these effects lead to an insignificant relationship between interpersonal justice and satisfaction.

5.2. Conclusion

Doctor-patient online interaction is critical for enhancing health in health communication. From the perspective of health communication, the purpose of this study is to examine the role of doctor-patient online interaction on patient behaviors. Our results show that justice perceptions are important factors influencing patient experiences, that is, trust and satisfaction. Trust and satisfaction further influence patients' continued intention to consult online doctors and their behavioral intention to visit doctors. Although there have been many studies focusing on online health services, little research has been devoted to examining the integration of online and offline health services. Thus, the results of this study contribute to the existing research on health communication. The findings also provide useful suggestions for improving doctor-patient relationships in the context of health communication.

5.3. Practical implications

The results of this study offer suggestions to doctors for understanding how to interact with patients online and attract patients to visit them offline. First, a higher continued intention to consult an online doctor can enhance the patient's behavioral intention to visit the doctor in personal. Thus, doctors should be aware of the critical effect of online consultations on patients' intention to visit doctors. In order to increase the continued intention to consult online doctors, doctors can attempt to emphasize the roles of trust and satisfaction.

Second, improving patients' trust belief helps to attract more patients to continually consult online doctors. This study suggests that doctors should try to establish an impression that they are kind to their patients and care about patients' needs. The doctors with a good image should also proactively maintain their reputation and build trust with patients. In addition, patients who are satisfied with services provided by doctors will be loyal to the doctors. This study suggests that doctors should pay attention to their consultation quality and understand patient experiences to improve their satisfaction.

Third, in order to increase patients' trust belief and satisfaction, doctors should pay attention to the four justice perceptions. This study suggests that doctors should strive to meet patient expectations to ensure fair online consultation outcomes. In addition, doctors should put greater emphasis on responding to patients in a timely and accurate manner, including fast responses to patient questions and problems. During online consultations, doctors should also strive to provide patients with high-quality information and explanations. Good doctor-patient communications help to build good doctor-patient relationships. Therefore, doctors should improve patients' interactive experiences in a polite manner with dignity and respect.

Appendix A. Measurement items of constructs

Construct	Measurement items
Distributive justice	1 The outcome reflects the effort I put into consulting the doctor. 2 The outcome of the doctor's consultation is similar to my expectations of it. 3 The outcome of the doctor's consultation is justified, given the case details.
Procedural justice	1 The procedure of the doctor's consultation is applied consistently. 2 The procedure of the doctor's consultation is free of bias. 3 The procedure of the doctor's consultations is based on accurate information.
Interpersonal justice	1 The doctor treated me with dignity. 2 The doctor treated me with respect. 3 The doctor treated me in a polite manner.
Informational justice	1 The doctor was candid in communications with me. 2 The doctor explained my consultation thoroughly. 3 The doctor's explanations regarding my consultation was reasonable. 4 The doctor communicated details in a timely manner.
Trust	1 This doctor' is trustworthy. 2 This doctor wants to be known as one who keeps promises and commitments. 3 I trust this doctor keeps my best interests in mind.
Satisfaction	1 The doctor's consultation makes me feel good. 2 The doctor's consultation is beneficial to me. 3 I like the doctor's consultation. 4 Overall, the doctor's consultation makes me feel satisfied.
Continued intention to consult	1 I intend to continue consulting the doctor rather than discontinue its use. 2 My intentions are to continue consulting the doctor than any alternative means. 3 If I could, I would like to discontinue consulting the doctor (reverse code).
Behavioral intention to visit	1 I intend to visit this doctor in the hospital in the future. 2 I predict I would visit this doctor in the hospital in the future. 3 I plan to visit this doctor in the hospital in the future.

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