

**YOU LOOK LIKE ME, AND I LIKE YOU: AN EMPIRICAL STUDY ON
THE INFLUENCE OF DOCTOR-PATIENT PERSONALITY
SIMILARITY ON PATIENT SELECTION**

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ABSTRACT

Research on online doctor-patient interaction is vast but has rarely examined its internal factors from a psychological point of view. Drawing on interpersonal attraction theory, this study explores whether potential personality traits of doctors and patients strengthen or weaken the behavior of patient selection and the contingent roles of patient psychological stress and doctor's title in online doctor-patient interaction. We leverage text mining in combination with econometrics techniques and studying the online doctor-patient interaction text data from a total of 245,027 consultations with 961 doctors in a large online health community in China, and we found that doctor-patient personality similarity plays a primary role in inducing patients selection behavior. Particularly, similarities in the openness, conscientiousness, and agreeableness dimensions of personality attract more patient selection, in contrast to similarities in the extroversion and neuroticism dimensions. In addition, patient psychological stress and the doctor's title both strengthen the link between doctor-patient personality similarity and patient selection. Grounded in the perspective of social psychology, this study reveals the mechanism and influence of personality traits on doctors' online services provided to patients, and it implies that doctors and patients with high personality similarities could be productively matched to facilitate high-quality service delivery.

Keywords: Online doctor-patient interaction; Interpersonal attraction theory; Personality similarity; Text mining; Econometrics techniques.

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1. Introduction

Online doctor-patient (D-P) interaction is an important aspect of service in online health community (OHC), and it has increased the convenience of medical consultation for patients and improved the quality of medical service provision to a certain extent (Liu et al., 2020). This convenience also draws more patients to choose online consultation to address minor issues before or after diagnosis. According to CNNIC, the size of online consultation users in China reached 300 million by June 2022 due to the COVID-19 epidemic. In 2021, the number of people accessing online health-related services is more than 1.5 times higher than in previous years, specially the number of consultations by the haodf.com platform increased eight times, indicating a substantial increase in online health services. Online health communities provide people with an important online place where they can search for health information, consult with doctors online, and exchange disease-related treatment experiences (Quan et al., 2019). Especially during the COVID-19, it was not convenient for patients to seek medical treatment offline. Online consultations can not only solve personal health problems to a certain extent, but also relieve the pressure of offline hospitals (Liu et al., 2020). Generally speaking, after entering the online health community, patients need to select a appropriate doctor from many doctors who provide online consulting services according to their own conditions. However, the selection of different doctors and the online information of doctors will cause a certain amount of information load, and cause serious information asymmetry between doctors and patients (Khurana et al., 2019), which affects the selection of patients and increases the risk of their use. How to make a good judgment and select a satisfactory doctor has not only troubled patients but also aroused the interest of scholars.

Some researchers have carried out the factors that affect patient selection, including doctor's title, doctor's reaction speed, social support (information and emotional information support) provided by the doctor at the macro-level (Yang et al., 2015; Zhang et al., 2019; Liu et al., 2020; Chen et al., 2020). However, at the micro-level, such as the inner personality of doctors and patients, few researchers have explored the influence of doctors' inner personalities on patient selection. To examine this influence, we adopt the concept of personality as it is defined in the field of psychology, that is, the internal characteristics of an individual in thinking, emotion, and behavior, and the psychological mechanism behind these characteristics (2009). Personality plays an important role in interpersonal communication. Personality psychology is mainly based on the psychological perspective to study the personality traits of individuals and to explore the relationship of inner personality and the individual's outward behavior (Xue et al., 2018). Numerous studies in fields of psychology and behavioral science have also illustrated that personality traits are the real performance of a person in daily life, including occupational proficiency, economic decisions, and so on (Gou et al., 2014). That is, the behavior of online users can reflect their personality traits (Yin et al., 2020). Similarly, in the process of D-P interaction, the online behavior of doctors and patients is also a performance of their inner personality. This is the case in offline settings, where prior studies have shown that differences between the personality traits of doctors and patients affect patient satisfaction and the D-P relationship (Duberstein et al., 2007). This indicates that there may be communication differences in the process of D-P interaction (Rapkin et al., 2017).

At present, personality traits are mainly measured by the way of subjective self-reporting (i.e., questionnaire or interview) in offline D-P interaction. In online D-P interaction, however, methodologies for studying personality similarities or differences between doctors and patients have yet to be developed. In addition, any approach using subjective self-reporting will face the problem of personal subjectivity and selectivity (Kosinski et al., 2013). As a result of these measurement deficiencies, some scholars have proposed LIWC (LIWC, Linguistic Inquiry and Word Count) (Handelman & Lester, 2007), CLIWC (CLIWC, Chinese Linguistic Inquiry and Word Count) (Natalie et al., 2012), SCLIWC (SCLIWC, Simplified Chinese Linguistic Inquiry and Word Count) (Natalie et al., 2012) and TextMind (Gao et al., 2013). They then extracted personality traits from the abundance of unstructured text data (i.e., microblog or Tweet), which provides the foundation and opportunity for our research (Mairesse et al., 2007; Tausczik & Pennebaker, 2010). Considering the particularity of OHC, this study cannot obtain the personality traits of doctors and patients through questionnaire; it is also necessary to avoid the subjectivity of users. This study will therefore use social media profiles with natural language processing to analyze the personality traits of doctors and patients.

However, as previously mentioned, most existing research focuses on extracting personality traits from social media platforms and carrying out relevant research (Adamopoulos et al., 2018; Al-Samarraie et al., 2017; Shchebetenko, 2019; Xue et al., 2018). Compared with social media platforms, an online D-P interaction platform is more rigorous and professional. On this more professional platform, users are less likely to communicate in ways that might divulge personality traits readily. Moreover, online D-P interaction text is generated around the topic of disease. That is to say, the text information from online D-P interaction involving different doctors and patients with the same kind of disease may be homogeneous. From the literature we reviewed, few scholars have made a thorough analysis on the problem of the personality similarity between doctors and patients in online D-P interaction; likewise, few have used the abundant unstructured D-P interaction text data to explore potential D-P similarity.

Therefore, we will focus on the impact of D-P personality similarity on patient selection in online D-P interaction. For patient selection, we define it as the behavior of patients choosing a particular doctor. Then, we offer guidance and suggestions for improving online D-P interaction at the micro-level and from a psychological point of view. Based on the above discussion, we propose the following two research questions:

Research Question 1: *In online D-P interaction, how does D-P personality similarity affect patient selection (online selection and offline selection)?*

Research Question 2: *In online D-P interaction, does each dimension of a doctor's personality traits have different effects on patient selection?*

We are also mindful that the theory of interpersonal attraction indicates that an individual's personality traits will have affect that person's behavior differently in different situations. Specifically, Bansal et al. (2010) posit that intellectual traits play a moderating role in personality traits and in perceived health information sensitivity among individuals. In order to build on the existing literature, it is important to better understand the specific context of the online D-P interaction. With that in mind, we examine the possible moderating effects of doctor's title, which reflects the status difference between the doctor and their patients and indicates the professional knowledge asymmetry in online interactions. In addition, the individual's personality may be affected by psychological stress, those with higher neuroticism scores exhibited smaller cortisol and cardiovascular stress reactions, whereas participants who were less agreeable and less open had smaller cortisol and cardiac reactions to stress (Bibbey et al., 2013). Kaur et al. (2013) also indicated that the personality traits and coping methods have significant independent and interactive role in the development of high psychological stress in police persons. Therefore, in the process of doctor-patient interaction, the influence of D-P personality similarity and patient selection may also be moderated by the patient psychological stress. As patients experience different types or severity of disease, they face different level of psychological stress, the support they want from their doctors, such as professional and emotional support, will change accordingly (Chen et al., 2020). To sum up, the doctor's title and the patient psychological stress are two factors that may have a direct impact on the patient's decision behavior in addition to the D-P personality similarity. Exploring the moderating effects of these two factors is helpful to define the boundary of the influence of D-P personality similarity on the patient's behavior. Thus, we propose another research objective for this study:

Research Question 3: *Does a patient psychological stress and a doctor's title have moderating effects on the D-P personality similarity and patient selection?*

In order to solve the above research questions, we collected 245,027 consultations with 961 doctors from a large OHC in China. After preprocessing the collected structured and unstructured text data, we verified our hypotheses by combining text mining and empirical analysis. Our findings show that D-P personality similarity does have an important impact on patient selection, and the influence of different dimensions of personality traits on patients' behavior is different. In addition, both patient psychological stress and doctor's title strengthen the link between D-P personality similarity and patient selection.

This study provides several theoretical contributions. First, to the best of our knowledge, our study is one of the first to explore the online D-P interaction mechanism from the micro-level using text mining and econometrics analysis to take advantage of the abundance of unstructured data in online D-P interaction. Second, drawing on interpersonal attraction theory and the Big Five personality model, this study proposes and empirically verifies the mechanism of D-P personality similarity on patient selection behavior. Third, our study provides the theoretical insight that patient psychological stress and doctor's title moderate the effect of D-P personality similarity on patient selection. This study also has important and far-reaching practical implications for the construction of online medical platforms.

This study is organized as follows. Section 2 mainly expounds on the interpersonal attraction theory and the Big Five personality model used in this study. Then, Section 3 demonstrates the research hypotheses and conceptual model of this study from the theoretical perspective. The research methods of this study, including the process of text mining and empirical model, are described in detail in Section 4. Subsequently, the results of empirical analysis are elaborated in Section 5. And in Section 6, we discuss our findings and implications. Finally, we conclude in Section 7.

2. Literature Review

2.1. Online D-P Interaction and Interpersonal Attraction

The theory of interpersonal attraction explores and explains the different reasons for people to like one another, also proposes different elements that will lead to or interfere with the attraction between individuals. This theory is the study of the attraction between people, belongs to the field of interpersonal communication. It is the foundation of and reason for all human interactions (Byrne et al., 1967). That is, interpersonal attraction is related to how much one likes or dislikes another person. It can be viewed as a force acting between two people that tends to draw them together and to resist their separation. There are many factors that lead to interpersonal attraction, including physical attractiveness, propinquity (frequency of interaction), familiarity, similarity, complementarity, reciprocal liking, and

reinforcement. Among them, similarity is believed to more likely lead to liking and attraction than differences. The proverb "birds of a feather flock together" has been used to illustrate that similarity is a crucial determinant of interpersonal attraction (Heine et al., 2009). Studies have reported mixed findings on whether or not similarity in personality traits between people in interpersonal relationships (romantic, friendship, etc.) is necessary or essential for relationship satisfaction. Researchers have shown that interpersonal attraction was positively correlated to personality similarity (Goldman et al., 1980).

The theory of interpersonal attraction is widely applied to conjugal relationships, friend relationships, classmate relationships, colleague relationships, business relationships, etc. (Schaubroeck & Lam, 2002; Strauss et al., 2001). As early as 1991, Carli et al. (1991) found a positive effect between personality similarity and roommate relationships. People are inclined to desire romantic partners who are similar to themselves on agreeableness, conscientiousness, extroversion, emotional stability, openness to experience (Botwin et al., 1997), and attachment style (Klohn & Luo, 2003). Decuyper et al. (2012) also illustrated the personality similarity have a positive impact on the conjugal relationship. Nemechek (2006) was the first to test the relationship between marriage adaptation and partners' personality similarity using the Big Five personality model.

In the field of e-commerce, the theory of interpersonal attraction has a wide range of research on consumer decision-making and consumer satisfaction (Brock, 2017). Sun et al. (2019) used an artificial intelligence algorithm to analyze the personality traits using unstructured social media data. In addition, some scholars have explored the theory of interpersonal attraction in the field of medical and health care. Some scholars use an interpersonal attraction perspective to study intelligent consulting systems in healthcare, exploring the impact of the similarity of the system's and the user's communication modes on users' perception of virtual consulting services. The results show that the more the system's communication style matches the user's, the more users the system can attract. Such positive experience with the system may lead users to develop a better sense of social presence and an increased interest in continuing to use advisory services (Li et al., 2013).

Based on the above discussion of the principles and applications of interpersonal similarity theory, we infer that it is still applicable in the scenario of doctor-patient interaction in this study. Because doctor-patient interaction is also a kind of interpersonal communication in medical scenarios, the similarity of personality traits between doctors and patients can also produce similar effects in the field of social media.

2.2. Online D-P Interaction and The Big Five Personality Traits

Personality is a high-level generalization of different individual characteristics of human beings, which is closely related to human behavior (Tlili et al., 2016). Specific to our study, personality also affects people's behavior in social networks (Shchebetenko, 2019). In turn, understanding user behavior within social networks has great value for recommendation systems and personalized advertising. Most of the existing research on social network user personality only uses the statistical characteristics of user data, not the individual characteristics of users (Chen et al., 2016). This is a large research gap because even in the same environment, different people will show different behaviors because they have different personalities. In psychology, personality is usually used to define people's character and explain users' behavior preferences.

In recent years, the description of personality has formed a complete system in the field of psychology, and Abdullah et al. concluded that prospective researchers should study Big Five personality model to measure the personality of an individual (Abdullah et al., 2016). According to the Big Five personality model, human personality traits can be divided into five different dimensions, including openness, conscientiousness, extroversion, agreeableness, and neuroticism (Kayaş et al., 2016). It provides a theoretical basis for the quantification of personality, which to some extent promotes the rise of the field of personality computing. By predicting individual personality traits and inferring individual behavior, businesses can create precise marketing strategies or provide personalized services.

In the healthcare field, the Big Five personality model also has great potential applications. Some scholars have shown that patients with different personality traits have different levels of sensitivity to their own medical information, and patients with characteristics of easygoing, conscientiousness and emotional instability have high sensitivity (Bansal et al., 2010). Some scholars also show that personality specificity may be related to the diagnosis of personality-related diseases, such as paranoia and schizophrenia (Saint-Georges et al., 2011).

2.3. Online D-P Interaction and Patient Selection

Online D-P interaction platforms characteristically span time and distance, which makes healthcare substantially more convenient for patients. The platform can attract more patients to choose online consultation, and there are many factors influencing the behavior of patients. Previous studies have shown that hospital-grade, the title and online reputation of the doctor are important factors that directly affect the patient selection (Liu et al., 2016; Sun et al., 2013). Other factors may include the number of online consultations a doctor has performed, their online rating, and their active online participation (i.e., knowledge sharing, activeness, response speed) (Meng et al., 2021; Kordzadeh, 2019;

Yan et al., 2016; Yang et al., 2015). However, such research only explains the factors that affect patient selection behavior, and it remains unclear why patients make their selections, the reason or mechanism. We are able to fill this knowledge gap because text information can reveal why the patient chooses a particular doctor in online D-P interaction. For example, the social support provided by the doctor to the patient increases the patient's satisfaction, which increases the likelihood the patient will choose that doctor again (Chen et al., 2020). Furthermore, D-P personality similarities can explain at the micro level why patients choose doctors.

Lastly, we note that a doctor's online performance is the true reflection of their internal personality. That is to say, doctors show the same internal characteristics online as they do offline. Therefore, after offline medical treatment, if the patient has been delighted or satisfied with the doctor, they will transfer to the online platform for a follow-up consultation (Fan et al., 2022). Previous studies have used questionnaire surveys to explore the relationship between patients' offline and online healthcare services. They found that patients with high satisfaction in offline healthcare may not be interested in OHC, thus affecting the willingness of patients to adopt the OHC (Zhang et al., 2017). From the above discussion, we summarize that patient selection can be measured from two levels, namely, the online selection behavior of patients and the offline selection behavior of patients.

3. Research Model and Hypotheses

3.1. The Personality Similarity Effect on Patient Selection

Through the theory of interpersonal attraction discussed in the preceding section, we know that in interpersonal communication, personality similarity will produce good feelings on both sides and will simultaneously facilitate in-depth communication. Relevant research shows that personality similarity can improve consumers' purchase behavior (Adamopoulos et al., 2018). Similarly, in healthcare, consultation between doctors and patients is also a transactional process. In offline D-P interaction, the higher the degree of D-P perseverance, the more pleasant the patients will feel, and the more likely they will recognize and remember that doctor and select that doctor for future treatment. Conversely, in settings with longer wait times, age and neuroticism become risk factors for D-P contradiction (Fengdan et al., 2018). That is to say, since offline D-P interaction is a face-to-face interaction, both doctors and patients can feel the mood, expression and other emotions of the other person as they speak to each other in time, which directly affects their interaction experience. Similarly, in online D-P interaction, although there is no face-to-face communication, the interactive text information can still reveal the changes of real personal emotions and behavioral tendencies (Myrick, 2017). Thus, in order to answer the Research Question 1 in Introduction section, we hypothesize:

Hypothesis 1 (H1): D-P personality similarity has a positive effect on patient selection (online selection and offline selection).

In addition, we use the Big Five personality model to measure the personality traits of doctors and patients in this study. As mentioned above, the Big Five personality model comprises five different dimensions (openness, conscientiousness, extroversion, agreeableness, and neuroticism), and each individual will have different scores for these five dimensions. Openness is a symbol of imagination and insight. Conscientiousness includes high levels of thoughtfulness, good impulse control, and goal-directed behaviors. Extraversion is characterized by excitability, sociability, talkativeness, assertiveness, and high amounts of emotional expressiveness. Agreeableness includes attributes such as trust, altruism, kindness, affection, and other prosocial behaviors. Neuroticism is a trait characterized by sadness, moodiness, and emotional instability. The dimensions also have different impacts on individual behavior (Srivastava & Das, 2015). For instance, Tackett et al. (2011) has illustrated that low neuroticism, high agreeableness, and low extroversion are positively correlated with relationship satisfaction in romantic couple relationships. In addition, in the labor market, individuals' extraversion and openness are positively correlated with creativity, while agreeableness, conscientiousness, and neuroticism are the opposite (Abdullah et al., 2016). Also, prior literature has shown that doctors with high openness and conscientiousness have a positive impact on patients' ratings (Duberstein et al., 2007).

Based on the above discussion, we infer that personality similarity in different dimensions will also have different effects on patient selection. Thus, in order to further clarify the Research Question 1 in Introduction section, we also assume:

Hypothesis 2 (H2a): D-P personality similarity (openness) is positively correlated with patient selection (online selection and offline selection).

Hypothesis 2 (H2b): D-P personality similarity (conscientiousness) is positively correlated with patient selection (online selection and offline selection).

Hypothesis 2 (H2c): D-P personality similarity (agreeableness) is positively correlated with patient selection (online selection and offline selection).

Hypothesis 2 (H2d): D-P personality similarity (extroversion) is negatively correlated with patient selection (online selection and offline selection).

Hypothesis 2 (H2e): D-P personality similarity (neuroticism) is negatively correlated with patient selection (online selection and offline selection).

In addition to affecting selection, the five dimensions of personality have an impact on individual behavior and may also affect others. For example, Mroczek et al. (2009) proposed that persons with high neuroticism have weak self-health management awareness and many bad habits, such as smoking and drinking, which increase the risk of death. In addition, openness, conscientiousness, extroversion, and agreeableness can effectively control the frequency of surfing the Internet, while people with high neuroticism are more addicted to the Internet (Kayış et al., 2016). Similarly, prior research findings showed that personality traits are also widely used in the field of knowledge sharing. For example, persons with openness, extroversion, and conscientiousness are more willing to share their knowledge with others, in contrast to neuroticism (Lotfi et al., 2016). As previously discussed, in D-P interaction, doctors' external behavior stems from their real internal personality, and thus doctors' personality traits may affect patient behavior. Thus, we propose Hypothesis 3 (a,b,c,d,e) to test the Research Question 2 in Introduction section.

Hypothesis 3 (H3a): The personality trait (openness) of a doctor has a positive effect on patient selection (online selection and offline selection).

Hypothesis 3 (H3b): The personality trait (conscientiousness) of a doctor has a positive effect on patient selection (online selection and offline selection).

Hypothesis 3 (H3c): The personality trait (agreeableness) of a doctor has a positive effect on patient selection (online selection and offline selection).

Hypothesis 3 (H3d): The personality trait (extroversion) of a doctor has a negative effect on patient selection (online selection and offline selection).

Hypothesis 3 (H3e): The personality trait (neuroticism) of a doctor has a negative effect on patient selection (online selection and offline selection).

3.2. The Moderating Effects of Patient Psychological Stress and Doctor's Title

An individual's behavior not only depends on one's intrinsic personality traits, but it is also affected by the external conditions (Shi et al., 2019). Patients suffering from disease not only have to endure physical pain, but also have to bear great psychological stress (Linton & Shaw, 2011). Sewitch et al. (2002) found that patients with higher psychological burden are more likely to have differences when communicating with their doctors. They also indicated that psychological burden is a vital factor leading to D-P conflict. Meanwhile, previous studies have also indicated that individual's personality traits associated with the psychological stress response and different dimensions of personality trait are associated with different aspects of the stress response (Xin et al., 2017). For example, individuals higher neuroticism predicted higher stress response, more decline of positive affect, whereas, individuals higher in openness and extraversion was associated with lower stress response and less increase of negative affect. Thus, this study argues that the particularity of the nature of psychological stress means that patients for whom experiencing a higher psychological stress is more predominant will need more psychological communication with doctors to provide psychological comfort and support. Hence, more serious psychological stress will strengthen the impact of D-P personality similarity on patient selection. Therefore, we propose the following research hypothesis:

Hypothesis 4 (H4): D-P personality similarity has a greater impact on the selection (online selection and offline selection) of patients experiencing a higher psychological stress.

Prior studies have stated that educational experiences are important for the development of personality traits (Jackson, 2011). Shortening high school caused students on average to be more extroverted and less emotionally stable. It concludes that the educational level plays an important role in shaping individual's personality traits (Dahmann & Anger, 2014). Similarly, from a physician's perspective, doctors with higher professional titles have more affinity and stronger professional ability, which demonstrates that these doctors have a higher level of professionalism (Guo et al., 2017). Meanwhile, that means the doctor has a long career, rich work experience, and served many patients. Studies have illustrated that physician's age, physician's specialty, and the number of prior visits affected the communication between doctors and patients (Buller & Buller, 1987). That is to say, when doctors with higher professional titles communicate with patients, they are easier to get close to patients, and can skillfully translate professional medical knowledge into language that patients can understand more easily, so as to communicate more effectively with patients. Compared with lower professional titles, doctors with higher professional titles will make patients feel that the doctor is professional, responsible, and patient in the process of online doctor-patient interaction. This also makes the patient feel that the personality of the doctor is more similar to one's own, and it is easier to reach a consensus during the interaction. Further, prior study has shown that a physician's professional title makes the effect of professional rewards more obvious, in contrast to material rewards (Zhang et al., 2020). Thus, we propose:

Hypothesis 5 (H5): The positive effect of D-P personality similarity on patient selection (online selection and offline selection) is strengthened when the doctor has a more prestigious title.

The above Hypothesis 4 and Hypothesis 5 answer the Research Question 3 in Introduction section. The conceptual model of this study is summarized in Figure 1.

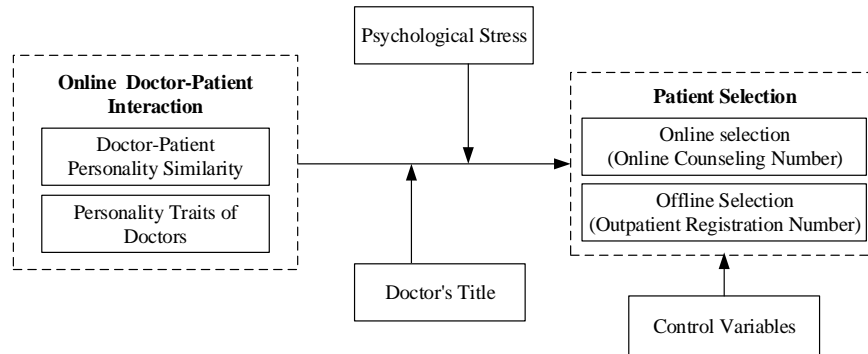


Figure 1: The Conceptual Model of This Study

4. Research Methodology

4.1. Data Sources

Our study focuses on the OHC (haodf.com). Founded in 2006, it has the greatest quantity and quality of authoritative doctors of any internet medical platform in China. In December 2021, more than 240,000 real names registered doctors from 10,000 different hospitals in China joined the platform. These doctors can directly provide online health services for patients through the platform. Currently, more than 60 million patients have participated in online counseling services.

We choose this online platform as the research object for the following reasons. First, because of the difference of doctor-patient interaction at home and abroad, we choose Chinese context as the research object. Specifically, the uneven distribution of medical resources in China leads to serious congestion in large 3-level hospitals, and the average consultation time of each patient is less than 6 minutes. In a short period of doctor-patient interaction, it is easy to produce doctor-patient conflicts due to insufficient doctor-patient interaction. While, the average consultation time of each patient in foreign countries is about 30 minutes, which can be fully interactive between doctors and patients (Savva et al., 2019; Gong, 2014). Therefore, based on the special medical environment in China, this study chooses the largest online health platform in China as the research object. Second, as mentioned above, the platform brings together the largest number of doctors and patients in China to interact directly on the platform, which produces a large number of doctor-patient interaction data, and provides an effective and sufficient data support for our research.

In addition, in order to obtain the data needed for this study, we use Python crawling technology to collect the doctor's home page information and the details page of online D-P interaction from the platform. The doctor's home page provides some basic information about the doctor, including his/her current working hospital, department, field, education experience, etc., as well as online information such as the number of online patients, the score of online patients, the number of patients' gifts, and the patient's thanks letter. The details page of online D-P interaction includes the patient's question information and doctor's reply information, as well as the time and frequency of doctor-patient interaction.

In terms of data set selection, we consider the following factors. First, due to the policy changed of this platform in 2017, voice dialogue function and privacy protection function were added (i.e., patients can set whether the dialogue content with doctors is public or only be visible to themselves according to their personal preference), resulting in some text data missing. In order to ensure the comprehensiveness and effectiveness of text data, we obtain the doctor-patient interactive text data before the policy (January 2015 to December 2016) as the dataset of this study. Secondly, in order to better distinguish the severity of physical and mental diseases, we obtained online consultation data of cardiovascular disease and infertility. Finally, as only one piece of data is regarded as incomplete online D-P interaction data, the invalid data that is not a round of dialogue (i.e., a question but no answer) is excluded. Totally, 245,027 consultations with 961 doctors cross-sectional data are obtained. Figure 2 provide a short example of an online doctor-patient interaction.

In terms of data processing, because online doctor-patient interaction is basically short text, in order to ensure the accuracy of personality traits extraction, we combine the text content of doctor and patient in a complete doctor-patient dialogue, and then extract the personality traits of doctor and patient, respectively. On average, in a complete online doctor-patient interaction, each doctor contains 120 words and each patient contains 419 words, which also ensures the length of character features extracted personality traits from the text.



Figure 2: A Short Example of an Online Doctor-Patient Interaction

4.2. Variables Description

(1) *Independent Variables*: In this study, the independent variables are the personality traits of doctors and personality similarity between doctors and patients (*PerS*). We mainly use the method of text mining to extract the independent variables from D-P interactive text information. The D-P personality similarity was measured by the matching scores of the personality traits of doctors and patients. Please see Section 4.3.1 for the detailed extraction process.

(2) *Dependent Variable*: In this study, the dependent variable is patient selection (*PatientSelection*), that is, patient online selection (*OnlineS*) and patient offline selection (*OfflineS*). Patients' online selection was measured by the number of online consultant patients who select a particular doctor, and the patients' offline selection was measured by the number of patients reporting from an offline hospital to online consultation.

(3) *Moderator Variable*: Patients with different types of diseases (*PStress*) have different demands for doctors' services. In previous studies, many scholars have discussed the influence of patient psychological stress as a moderating variable from different lenses (Yang et al., 2015; Zhang et al., 2019). Ruo et al., (2003) illustrated that the risk of disease is related to physical factors (health status and lack of fitness) and physiological factors (distress and anxiety). From the lens of psychological factors, the psychological stress of cardiovascular disease mainly comes from the individual oneself, whereas, in addition to the psychological stress of individuals, the psychological stress of infertility is more from the outside world, including the social pressure and public opinion of spouses, colleagues, relatives and friends, which brings great pressure to their mental health. Some patients even gradually lose interest in life, which is more stressful than ordinary psychological problems. This will make infertility patients more inferiority, lack of self-confidence, self-esteem, etc. Prior studies indicated that in both men and women, low spousal support, financial constraints, and social coercion in early years of marriage predicts infertility distress (Patel et al., 2018). Furthermore, when couples fail to conceive or miscarry, the women are outrageously blamed for it (Aggarwal et al., 2013). For the male counterparts, childlessness is also equated with sexual incompetence and subjected to greater social ridicule, which contributes to a personal loss of self-esteem and physical, emotional, marital, economic insecurity in them (Singh et al., 2009). Thus, in our study, cardiovascular disease and infertility represent relatively low psychological stress and high psychological stress, respectively. Then, patient psychological stress (*PStress*) is represented by a dummy variable: 1 for infertility; 0 for cardiovascular disease. Another moderator variable, as previously discussed, is doctor's title (*Doctitle*), which represents professional knowledge, personal qualities, work

experience, etc. In this paper, the doctor’s title is represented by a dummy variable: 1 for a high title, that is, chief physician. And 0 for a low title, that is, resident physician, attending physician and associate chief physician. Because compared with other titles, the chief physician is considered to have higher professional capabilities and experience in hospitals (Zhang et al., 2019).

(4) *Control Variables*: In this study, we used two control variables to eliminate the interference of other factors on the results. Specifically including the scores of a doctor's comprehensive-recommending from patients in OHC (*RecomHeat*), the number of papers published by doctors on OHC (*TotalPapers*).

Table 1 shows the description of the variables in this paper.

Table 1: Description of Variables

Variables	Description
Dependent Variables	
<i>Patient Selection (PatientSelection)</i> : including Patient Online Selection and Patient Offline Selection	
<i>Patient Online Selection (OnlineS)</i>	Number of online consultant patients who select a particular doctor
<i>Patient Offline Selection (OfflineS)</i>	Number of patients reporting from offline hospital to online consultation
Independent Variables	
	The comprehensive matching scores of D-P personality traits (openness, conscientiousness, agreeableness, extroversion, neuroticism) in five dimensions. The calculation formula
<i>D-P Personality Similarity (PerS)</i>	$PerS_{ij} = \frac{\sum_{n=1}^5 (PerTP_{ni} \times PerTD_{nj})}{\sqrt{\sum_{n=1}^5 PerTP_{ni}^2} \times \sqrt{\sum_{n=1}^5 PerTD_{nj}^2}}$ <p>(For a detailed explanation of the formula, see Formula 2 in Section 4.3.1)</p>
	The matching scores of D-P personality traits in the openness dimension. The calculation formula
<i>Openness Similarity D-P (OpenSDP)</i>	$OpenSDP_{ij} = OpenPerTD_j - OpenPerTP_i $ <p>(For a detailed explanation of the formula, see Formula 3 in Section 4.3.1)</p>
	The matching scores of D-P personality traits in the conscientiousness dimension. The calculation formula
<i>Conscientiousness Similarity D-P (ConscSDP)</i>	$ConscSDP_{ij} = ConscPerTD_j - ConscPerTP_i $ <p>(For a detailed explanation of the formula, see Formula 3 in Section 4.3.1)</p>
	The matching scores of D-P personality traits in the extroversion dimension. The calculation formula
<i>Extraversion Similarity D-P (ExtraSDP)</i>	$ExtraSDP_{ij} = ExtraPerTD_j - ExtraPerTP_i $ <p>(For a detailed explanation of the formula, see Formula 3 in Section 4.3.1)</p>
	The matching scores of D-P personality traits in the agreeableness dimension. The calculation formula
<i>Agreeableness Similarity D-P (AgreeSDP)</i>	$AgreeSDP_{ij} = AgreePerTD_j - AgreePerTP_i $ <p>(For a detailed explanation of the formula, see Formula 3 in Section 4.3.1)</p>
	The matching scores of D-P personality traits in the neuroticism dimension. The calculation formula
<i>Neuroticism Similarity D-P (NeuroSDP)</i>	$NeuroSDP_{ij} = NeuroPerTD_j - NeuroPerTP_i $ <p>(For a detailed explanation of the formula, see Formula 3 in Section 4.3.1)</p>
<i>Openness Personality Traits Doctor/Patient (OpenPerTD/P)</i>	Level of the openness personality trait of a doctor/patient

<i>Conscientiousness Personality Traits Doctor/Patient (ConscPerTD/P)</i>	Level of the conscientiousness personality trait of a doctor/patient
<i>Extraversion Personality Traits Doctor/Patient (ExtraPerTD/P)</i>	Level of the extroversion personality trait of a doctor/patient
<i>Agreeableness Personality Traits Doctor/Patient (AgreePerTD/P)</i>	Level of the agreeableness personality trait of a doctor/patient
<i>Neuroticism Personality Traits Doctor/Patient (NeuroPerTD/P)</i>	Level of the neuroticism personality trait of a doctor/patient
Moderator Variables	
<i>Psychological Stress (PStress)</i>	1 for infertility; 0 for cardiovascular disease
<i>Doctor's Title (DocTitle)</i>	1 for professor; 0 for others
Control Variables	
<i>RecomHeat</i>	The scores of a doctor's comprehensive-recommending from patients in OHC.
<i>TotalPapers</i>	The number of papers published by doctors on OHC.

4.3. Research Procedures

The research procedures of our study comprise two main steps: text mining and empirical analysis. Figure 3 shows the research procedure overview.

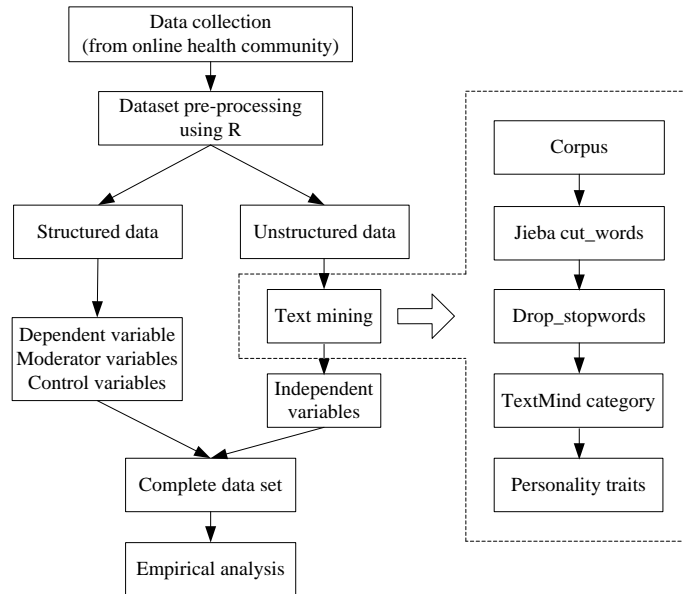


Figure 3: Research Procedure Overview

4.3.1. The Procedure of Extracting Doctor and Patient Personality Traits from Text

The independent variables (i.e., the personality traits of doctors and patients) were extracted from online D-P interactive texts by using R language through text mining. There are five steps in the process of personality feature extraction of doctors and patients: (1) Collect individual corpora; (2) Text Segmentation; (3) Extract lexical features from the texts; (4) Calculate the personality traits of doctors and patients based on the lexical features; (5) Calculate the personality similarity between doctors and patients, then derive the independent variables of this study.

The following sections describe the main procedure of extracting the personality traits of doctors and patients from text in more detail.

(1) **Collect individual corpora:** From the raw text data, we obtain the corpus of doctors and patients, and then use them to extract the personality traits.

(2) **Text segmentation:** In this study, we use the Jieba word segmentation tool in R language to segment the online D-P interactive text data. By using the Jieba word segmentation tool and stop words dictionary, we get a segmented corpus of text from doctors and patients.

(3) **Extract lexical features from the text:** To extract lexical features from text, we need to use TextMind.

(4) **Calculate the personality traits of doctors and patients based on the lexical features:** In this step, we need to fit the extracted lexical features with personality traits and calculate the scores of personality traits. As early as 2007, Mairesse et al. (2007) used the Big Five personality model to quantify the relationship between 71 specific function words and each dimension of the Big Five personality model, that is, the Big Five Marker (BFM). Therefore, in this paper, we used the TextMind system to obtain the statistical data of the function words in the text, fit the personality traits of doctors and patients according to the BFM, then calculate five-dimensional personality trait scores. If the score in any dimension is above average, the person can be said to be high in that dimension (For the corresponding relationships between TextMind function features and BFM, see Appendix Table A.1 (URL: <https://pan.baidu.com/s/1p4jh-pycXZGfbWGdII7x7A>, verification code: igrl)).

In this study, the personality traits (openness, conscientiousness, agreeableness, extroversion, neuroticism) of individual calculation formula is as follows:

$$FDimensionPerT_{ui} = \frac{\sum_{n=1}^{N_i} k_{nu} \times BFM_{ni}}{N_i} \tag{1}$$

Where $FDimensionPerT_{ui}$ is the score of individual u in the i th personality dimension, k_{nu} represents the word frequency of the n th functional word analyzed by TextMind in the text of individual u , BFM_{ni} represents the value of personality traits of the n th functional word in the i th dimension, and N_i represents the total number of functional word features significantly related to the i th personality dimension.

(5) **Calculate the personality similarity between doctors and patients:** Based on our empirical research model, this study measured the D-P personality similarity from two aspects.

① **Overall D-P personality similarity (PerS)**

Cosine similarity is the most common method to calculate similarity. In this paper, cosine similarity is used to measure the overall D-P personality similarity. The calculation formula is as follows:

$$PerS_{ij} = \frac{\sum_{n=1}^5 (PerTP_{ni} \times PerTD_{nj})}{\sqrt{\sum_{n=1}^5 PerTP_{ni}^2} \times \sqrt{\sum_{n=1}^5 PerTD_{nj}^2}} \tag{2}$$

Where $PerS_{ij}$ represents the overall personality similarity between patient i and doctor j , $PerTP_{ni}$ represents the scores of personality traits in the n th dimension of patient i , and $PerTD_{nj}$ represents the scores of personality traits in the n th dimension of doctor j . The closer the value of $PerS_{ij}$ is to 1, the higher the similarity between patient i and doctor j .

② **Personality differences between doctors and patients in five dimensions**

Since the Big Five personality dimensions reflect different individual traits, we also explore the influence of D-P similarity in five different personality dimensions on patient selection. In this study, we use the absolute value of the difference between doctors and patients in five dimensions to measure the similarity between them in each dimension. The specific calculation formula is as follows:

$$SPD_{nij} = |PerTD_{nj} - PerTP_{ni}| \Rightarrow \begin{cases} OpenSDP_{ij} = |OpenPerTD_j - OpenPerTP_i| \\ ConscSDP_{ij} = |ConscPerTD_j - ConscPerTP_i| \\ AgreeSDP_{ij} = |AgreePerTD_j - AgreePerTP_i| \\ ExtraSDP_{ij} = |ExtraPerTD_j - ExtraPerTP_i| \\ NeuroSDP_{ij} = |NeuroPerTD_j - NeuroPerTP_i| \end{cases} \tag{3}$$

Where SPD_{ijn} represents the personality similarity in the n th dimension between patient i and doctor j , $PerTP_{ni}$ represents the scores for personality traits in the n th dimension of patient i , and $PerTD_{nj}$ represents the scores for personality traits in the n th dimension of doctor j . The higher the SPD_{ijn} value, the lower the similarity between patient i and doctor j in the n th personality dimension. $OpenSDP_{ij}$, $ConscSDP_{ij}$, $AgreeSDP_{ij}$, $ExtraSDP_{ij}$ and $NeuroSDP_{ij}$ represent the personality similarity (openness, conscientiousness, agreeableness, extroversion, and neuroticism), respectively, between patient i and doctor j . $OpenPerTD_j$, $ConscPerTD_j$, $AgreePerTD_j$, $ExtraPerTD_j$ and $NeuroPerTD_j$ represent the scores of personality traits (openness, conscientiousness, agreeableness, extroversion, and neuroticism) of doctor j . $OpenPerTP_i$, $ConscPerTP_i$, $AgreePerTP_i$, $ExtraPerTP_i$ and $NeuroPerTP_i$ represent the scores of personality traits (openness, conscientiousness, agreeableness, extroversion, and neuroticism) of patient i .

(6) **Pairwise combinations of personality traits between doctors and patients:** In order to examine the different effects of each dimension of personality traits between doctors and patients on patient selection, we try to match each

dimension of personality traits of doctors and patients in groups (Adamopoulos et al., 2018). The four groups generated by pairwise combinations of personality traits of doctors and patients can be represented by the two-dimensional (2D) quadrant diagram, as shown in Table 2. For example, if $OpenPerTD_j > mean(OpenPerTD)$ and $OpenPerTP_i > mean(OpenPerTP)$, then pairwise combinations of personality traits between doctor j and patient i should belong to the first quadrant of the 2D coordinate system. Similarly, $OpenPerTD_j < mean(OpenPerTD)$ and $OpenPerTP_i > mean(OpenPerTP)$ are located in the second quadrant; $OpenPerTD_j < mean(OpenPerTD)$ and $OpenPerTP_i < mean(OpenPerTP)$ are located in the third quadrant; and $OpenPerTD_j > mean(OpenPerTD)$ and $OpenPerTP_i < mean(OpenPerTP)$ are located in the fourth quadrant. The 2D quadrant method is presented in Figure 4. To illustrate, Group 1 (LL) represent both the doctor and patient with low scores in each dimension of personality traits; Group 2 (LH) represents the doctor with low scores and patient with high scores in each dimension of personality traits; Group 3 (HL) represents the doctor with high scores and patient with low scores in each dimension of personality traits; and Group 4 (HH) represents both the doctor and patient with high scores in each dimension of personality traits.

Table 2: Pairwise Combinations of Personality Traits Between Doctors and Patients

		Patients personality traits	
		Low	High
Doctors personality traits	Low	Both the doctor and patient with low scores in each dimension of personality traits	The doctor with low scores and patient with high scores in each dimension of personality traits
	High	The doctor with high scores and patient with low scores in each dimension of personality traits	Both doctor and patient with high scores in each dimension of personality traits

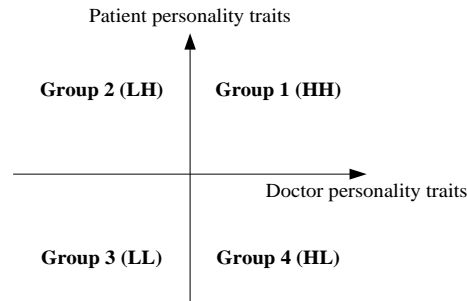


Figure 4: 2D Quadrant of the Personality Traits of Doctors and Patients

4.3.2. Empirical Analysis

In the process of empirical analysis, we mainly use the ordinary least squares (OLS) method to test our hypotheses. First, we verified the influence of D-P personality similarity on patient selection (model 1). Secondly, the moderating effects of patient psychological stress and doctor's title on the D-P personality similarity and patient selection were examined (model 2). Third, we test the effects of each dimension of D-P personality similarity and the personality traits of doctors on patient selection in Model 3. Finally, robustness is tested by group matching (Model 4). The equations are as follows:

(1) Effect of D-P personality similarity on patient selection:

$$PatientSelection_{ij} = \beta_0 + \beta_1 PerS_{ij} + \beta_2 Control_{ij} + \varepsilon_{ij} + \mu_{ij} \tag{4}$$

Where i represents patient, j represents doctor, *PatientSelection* includes online selection (*OnlineS*) and offline selection (*OfflineS*), *OnlineS* represents the number of patient online selection who select a particular doctor, *OfflineS* represents the patient offline selection, this measures by the number of patients who moved from an offline to an online healthcare setting and then online consultation, *PerS* represents the personality similarity between patient i and doctor j as discussed in Section 4.3.1, *Control* represents control variables, including the scores of a doctor's comprehensive-recommending from patients in OHC (*RecomHeat*) and the number of papers published by doctors on OHC (*TotalPapers*).

(2) Moderating effect of patient psychological stress and doctor's title on D-P personality similarity and patient selection:

$$\begin{aligned}
 PatientSelection_{ij} = & \beta_0 + \beta_1 PerS_{ij} \\
 & + \beta_2 PerS_{ij} * DocTitle_j + \beta_3 PerS_{ij} * PStress_i \\
 & + \beta_4 Control_{ij} + \varepsilon_{ij} + \mu_{ij}
 \end{aligned} \tag{5}$$

Here, $DocTitle_j$ represents doctor's title, $PStress_i$ represents patient psychological stress, and the interpretation of other variables is the same as equation (4).

(3) The effect of each dimension of personality traits on patient selection:

In addition to verifying the overall effects of D-P personality similarity on patient selection, we also examine (i) the effect of D-P similarity in each personality dimension on patient selection and (ii) the effect of the doctor's personality traits on patient selection. The model is:

$$\begin{aligned}
 PatientSelection_{ij} = & \beta_0 + \beta_1 OpenSDP_{ij} + \beta_2 ConscSDP_{ij} \\
 & + \beta_3 AgreeSDP_{ij} + \beta_4 ExtraSDP_{ij} + \beta_5 NeuroSDP_{ij} \\
 & + \beta_6 OpenPerTD_j + \beta_7 ConscPerTD_j \\
 & + \beta_8 AgreePerTD_j + \beta_9 ExtraPerTD_j + \beta_{10} NeuroPerTD_j \\
 & + \beta_{11} Control_{ij} + \varepsilon_{ij} + \mu_{ij}
 \end{aligned} \tag{6}$$

Where $OpenSDP_{ij}$ represents the openness dimension of personality similarity between patient i and doctor j . Similarly, $ConscSDP_{ij}$, $AgreeSDP_{ij}$, $ExtraSDP_{ij}$, and $NeuroSDP_{ij}$ represent the conscientiousness, agreeableness, extroversion, and neuroticism dimension of personality similarity between patient i and doctor j , respectively. $OpenPerTD_j$ represents the openness dimension of doctor j 's personality. Similarly, $ConscPerTD_j$, $AgreePerTD_j$, $ExtraPerTD_j$, and $NeuroPerTD_j$ represent the conscientiousness, agreeableness, extroversion, and neuroticism dimension of doctor j 's personality, respectively. The interpretation of other variables is the same as in equation (4).

(4) The effect of D-P pairwise combinations of personality traits on patient selection:

$$\begin{aligned}
 PatientSelection_{ij} = & \beta_0 + \beta_1 PerS_{ij} \\
 & + \beta_2 \sum_{n=1}^5 Group\ 1\ (HH)_{nij} + \beta_3 \sum_{n=1}^5 Group\ 2\ (LH)_{nij} \\
 & + \beta_4 \sum_{n=1}^5 Group\ 3\ (LL)_{nij} + \beta_5 \sum_{n=1}^5 Group\ 4\ (HL)_{nij} \\
 & + \beta_6 Control_{ij} + \varepsilon_{ij} + \mu_{ij}
 \end{aligned} \tag{7}$$

Where $Group1(HH)_{nij}$ represents both doctor j and patient i with high scores in the n th dimension of personality, $Group2(LH)_{nij}$ represents doctor j with low scores and patient i with high scores in the n th dimension of personality, $Group3(LL)_{nij}$ represents both doctor j and patient i with low scores in the n th dimension of personality, $Group4(HL)_{nij}$ represents doctor j with high scores and patient i with low scores in the n th dimension of personality (see Section 4.3.1 (6) for more details). The interpretation of other variables is the same as in equation (4).

5. Data Analysis and Results

5.1. Data Analysis

In this study, Stata was used for data analysis. Table 3 shows the results of the descriptive statistical analysis.

Table 3: The Results of Descriptive Statistical

Variables	Objects	Mean	Std.Dev.	Min	Max	VIF
<i>OnlineS</i>	245027	9464.92	10709.25	1	53650	1.87
<i>OfflineS</i>	245027	2426.614	3242.94	0	16069	1.86
<i>RecomHeat</i>	245027	4.143	.459	3	5	1.38
<i>TotalPapers</i>	245027	56.247	123.828	0	2153	1.29
<i>PStress</i>	245027	.841	.365	0	1	1.16
<i>DocTitle</i>	245027	.523	.499	0	1	1.02
<i>PerS</i>	245027	.653	.061	0	1	1.02
<i>OpenPerTD</i>	245027	49.522	10.404	0	100	1.38

<i>ConscPerTD</i>	245027	3.767	3.944	0	100	1.27
<i>AgreePerTD</i>	245027	93.409	5.699	0	100	1.61
<i>ExtraPerTD</i>	245027	43.427	12.176	0	100	1.63
<i>NeuroPerTD</i>	245027	3.03	3.787	0	100	1.28
<i>OpenPerTP</i>	245027	63.322	6.524	0	100	1.44
<i>ConscPerTP</i>	245027	5.994	5.425	0	100	1.16
<i>AgreePerTP</i>	245027	96.147	3.226	0	100	1.18
<i>ExtraPerTP</i>	245027	41.415	8.192	0	100	1.52
<i>NeuroPerTP</i>	245027	5.504	5.478	0	100	1.06
<i>OpenSDP</i>	245027	15.302	9.707	0	100	1.09
<i>ConscSDP</i>	245027	3.762	5.572	0	100	1.44
<i>AgreeSDP</i>	245027	4.355	5.45	0	100	1.34
<i>ExtraSDP</i>	245027	10.34	7.939	0	100	1.11
<i>NeuroSDP</i>	245027	3.746	5.655	0	100	1.37

In the empirical analysis, we mainly use the ordinary least squares (OLS) method to verify the influence of D-P personality similarity on patient selection (online selection and offline selection), and the impact of psychological stress and doctor's title. The results of empirical analysis are shown in Table 4. Table 4 (Model 2 and Model 5) indicate that D-P personality similarity is positively related to patient online selection ($\beta = 0.745, p < .001$) and offline selection ($\beta = 0.688, p < .001$), respectively. Therefore, Hypothesis 1 is supported. Table 4 (Model 3 and Model 6) demonstrate that patient psychological stress strengthens the link between D-P personality similarity and patient selection ($\beta = 0.663, p < .001$ (OnlineS), $\beta = 1.643, p < .001$ (OfflineS)), respectively. Thus, Hypothesis 4 is supported. Meanwhile, Table 4 (Model 3 and Model 6) also illustrate that doctor's title enhances the link between D-P personality similarity and patient selection ($\beta = 1.765, p < .001$ (OnlineS), $\beta = 2.154, p < .001$ (OfflineS)), respectively. Hence, Hypothesis 5 is supported.

Table 4: The Results of D-P Personality Similarity on Patient Selection

	PatientSelection					
	Model 1	OnlineS Model 2	Model 3	Model 4	OfflineS Model 5	Model 6
TotalPapers	0.289*** (0.001)	0.287*** (0.001)	0.270*** (0.001)	0.230*** (0.003)	0.229*** (0.003)	0.199*** (0.002)
RecomHeat	1.021*** (0.004)	1.010*** (0.004)	1.013*** (0.004)	2.192*** (0.007)	2.182*** (0.007)	2.188*** (0.007)
PerS		0.745*** (0.028)	0.797*** (0.028)		0.688*** (0.048)	0.699*** (0.048)
PerS * PStress			0.663*** (0.081)			1.643*** (0.131)
PerS * DocTitle			1.765*** (0.055)			2.154*** (0.093)
Constant	3.525*** (0.018)	3.092*** (0.024)	3.226*** (0.024)	-3.010*** (0.030)	-3.410*** (0.043)	-3.134*** (0.043)
R-squared	0.390	0.392	0.466	0.375	0.376	0.454
N	245027	245027	245027	245027	245027	245027
F	56732.79	38292.86	33401.08	66177.25	44136.93	37468.09

* p<0.05, ** p<0.01, *** p<0.001

Table 5 illustrates the results of (i) the influence of D-P personality similarity in each dimension (openness, conscientiousness, agreeableness, extroversion, neuroticism) on patient selection, and (ii) the influence of personality traits of doctors on patient selection. Table 5 (Model 2 and Model 4) indicate that D-P similarity in the openness ($\beta = 0.537, p < .01$ (OnlineS), $\beta = 7.636, p < .001$ (OfflineS)), conscientiousness ($\beta = 0.020, p < .001$ (OnlineS), $\beta = 0.001, p < .01$ (OfflineS)), and agreeableness ($\beta = 0.002, p < .001$ (OnlineS), $\beta = 0.001, p < .01$ (OfflineS)) dimensions is positively related to online and offline patient selection, respectively, in contrast to, D-P similarity in the extroversion ($\beta = -7.288, p < .001$ (OnlineS), $\beta = -1.983, p < .01$ (OfflineS)) and neuroticism ($\beta = -0.009, p < .001$ (OnlineS), $\beta = -0.010, p < .001$ (OfflineS)). Therefore, Hypothesis 2 is supported.

In addition, Table 5 summarizes the results of the influence of the doctor's personality traits (openness, conscientiousness, agreeableness, extroversion, neuroticism) on patient selection. Table 5 (Model 2 and Model 4) illustrate that the openness ($\beta = 1.028, p < .001$ (OnlineS), $\beta = 7.750, p < .001$ (OfflineS)), conscientiousness ($\beta = 0.092, p < .001$ (OnlineS), $\beta = 10.799, p < .001$ (OfflineS)), and agreeableness ($\beta = 0.133, p < .001$ (OnlineS), $\beta = 10.825, p < .001$ (OfflineS)) of doctors have a positive effect on online and offline patient selection. In contrast, extroversion ($\beta = -1.129, p < .01$ (OnlineS), $\beta = -2.573, p < .001$ (OfflineS)) and neuroticism ($\beta = -0.039, p < .01$ (OnlineS), $\beta = -5.982, p < .001$ (OfflineS)) have a negative effect on online and offline patient selection. Hence, Hypothesis 3 is supported.

Table 5: The Effects of Each Dimension of Doctors' Personality on Patient Selection

	PatientSelection			
	OnlineS			OfflineS
	Model 1	Model 2	Model 3	Model 4
OpenSDP	0.211** (0.340)	0.537** (0.270)	7.658*** (0.551)	7.636*** (0.451)
ConscSDP	0.024*** (0.003)	0.020*** (0.002)	0.020*** (0.004)	0.001** (0.004)
AgreeSDP	0.030*** (0.003)	0.002*** (0.002)	0.024*** (0.005)	0.001** (0.004)
ExtraSDP	-2.353*** (0.498)	-7.288*** (0.397)	-7.803*** (0.797)	-1.983** (0.628)
NeuroSDP	-0.006*** (0.001)	-0.009*** (0.001)	-0.027*** (0.002)	-0.010*** (0.002)
OpenPerTD	0.241*** (0.305)	1.028*** (0.237)	12.235*** (0.501)	7.750*** (0.411)
ConscPerTD	1.267*** (0.201)	0.092*** (0.158)	14.602*** (0.339)	10.799*** (0.273)
AgreePerTD	1.333*** (0.200)	0.133*** (0.157)	14.733*** (0.338)	10.825*** (0.273)
ExtraPerTD	-0.854** (0.459)	-1.129** (0.362)	-6.652*** (0.739)	-2.573*** (0.593)
NeuroPerTD	-0.678*** (0.112)	-0.039** (0.088)	-8.074*** (0.188)	-5.982*** (0.152)
TotalPapers		0.280*** (0.001)		0.208*** (0.002)
RecomHeat		0.985*** (0.004)		2.100*** (0.007)
Constant	8.416*** (0.011)	3.514*** (0.020)	6.670*** (0.018)	2.735*** (0.033)
R-squared	0.061	0.402	0.080	0.400
N	245027	245027	245027	245027
F	1811.462	11036.12	2000.517	12886.94

* p<0.05, ** p<0.01, *** p<0.001

The results of hypothesis testing in this study are shown in Table 6.

Table 6: The Results of Hypothesis Testing

Hypothesis	Results
H1: D-P personality similarity → patient selection	Supported
H2a: D-P personality similarity (openness) → patient selection	Supported
H2b: D-P personality similarity (conscientiousness) → patient selection	Supported
H2c: D-P personality similarity (agreeableness) → patient selection	Supported
H2d: D-P personality similarity (extroversion) → patient selection	Supported
H2e: D-P personality similarity (neuroticism) → patient selection	Supported
H3a: The personality trait (openness) of a doctor → patient selection	Supported
H3b: The personality trait (conscientiousness) of a doctor → patient selection	Supported
H3c: The personality trait (agreeableness) of a doctor → patient selection	Supported
H3d: The personality trait (extroversion) of a doctor → patient selection	Supported
H3e: The personality trait (neuroticism) of a doctor → patient selection	Supported
H4: Patient psychological stress → D-P personality similarity and patient selection	Supported
H5: Doctor’s title → D-P personality similarity and patient selection	Supported

In addition, we draw interaction diagrams to show the results of interaction effects more clearly, as shown in Figure 5(a, b, c and d). Figure 5a shows that the effect of D-P personality similarity on patient online selection (OnlineS) was found to be positive for both infertility and cardiovascular disease patients, but for infertility patients (dotted line), Online selection increases faster than it does for cardiovascular disease patients (solid line). This indicates that infertility increases the positive effect of D-P personality similarity on patient online selection. As shown in Figure 5b, for infertility patients (dotted line), Offline selection increases faster than it does for cardiovascular disease (solid line), illustrating that infertility strengthens the link between D-P personality similarity and patient offline selection (OfflineS). Figure 5c also suggests that the effects of D-P personality similarity on patient online selection (OnlineS) are strengthened when a doctor has a high title (dotted line). As shown in Figure 5d, when doctor’s title is high (dotted line), offline selection increases more rapidly than it does when doctor’s title is low (solid line), showing that a high title strengthens the link between D-P personality similarity and offline selection.

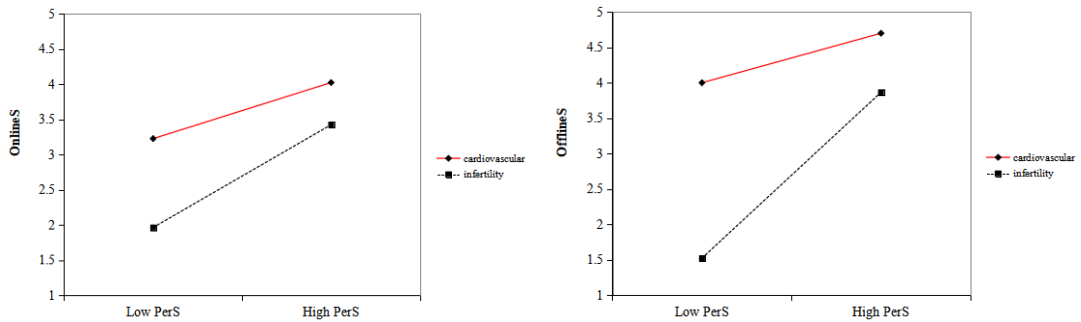


Figure 5(a, b): Interaction Diagram of the Moderating Effect of Patient Psychological Stress

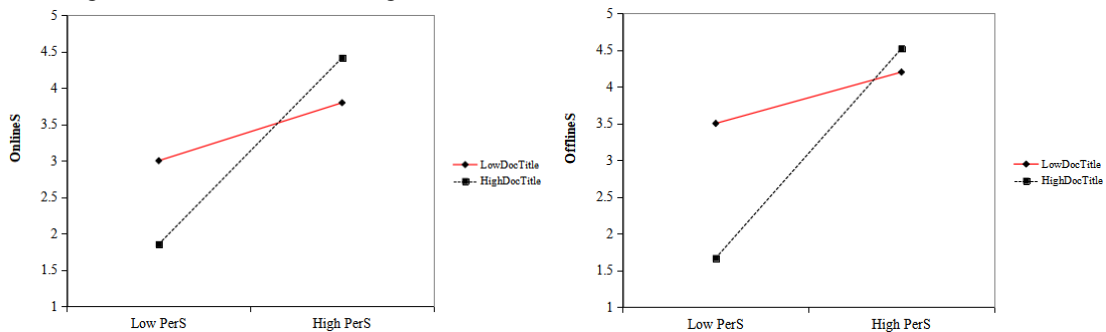


Figure 5(c, d): Interaction Diagram of the Moderating Effect of Doctor’s Title

5.2. Robustness Checks

In order to verify the robustness of the results of this study, we used three different methods.

First, we tested the robustness of our study by combining the effects of D-P personality similarity and personality traits of doctors on patient selection. In this section, we still use OLS method to verify the results of robustness test. The results in Table 7 show that the influence of doctor-patient personality similarity on patients' selection are consistent with the models 2, 3, 5 and 6 in Table 4. In addition, the results in Table 7 also illustrate that the effect of doctors' personality traits on patient selection are consistent with the models 2 and 4 in Table 5.

Table 7a: Robustness Check: The Results of D-P Personality Similarity and Personality Traits of Doctors on Patient Selection

	PatientSelection			
	OnlineS	Model 2	OfflineS	Model 4
	Model 1	Model 2	Model 3	Model 4
PerS	0.644*** (0.052)	0.012** (0.040)	0.703*** (0.082)	0.261*** (0.064)
OpenPerTD	0.923** (0.294)	0.633** (0.223)	14.311*** (0.479)	11.211*** (0.383)
ConscPerTD	2.162*** (0.205)	0.256*** (0.161)	16.207*** (0.350)	11.285*** (0.284)
AgreePerTD	2.237*** (0.204)	0.311*** (0.160)	16.314*** (0.349)	11.320*** (0.283)
ExtraPerTD	-1.725*** (0.375)	-5.120*** (0.303)	-9.324*** (0.616)	-3.819*** (0.493)
NeuroPerTD	-1.173*** (0.114)	-0.129*** (0.089)	-8.961*** (0.195)	-6.248*** (0.157)
TotalPapers		0.284*** (0.001)		0.228*** (0.002)
RecomHeat		0.991*** (0.004)		2.134*** (0.007)
Constant	8.082*** (0.039)	3.525*** (0.034)	6.473*** (0.062)	-2.516*** (0.056)
R-squared	0.040	0.398	0.042	0.386
N	245027	245027	245027	245027
F	2032.586	16056.82	2201.709	18157.49

* p<0.05, ** p<0.01, *** p<0.001

Table 7b: Robustness Check: The Results of Moderator Effects of PStress and DocTitle between D-P Personality Similarity, Personality Traits of Doctors and Patient Selection

	OnlineS	OnlineS	OnlineS	OfflineS	OfflineS	OfflineS
PerS	0.012* (0.040)	0.077* (0.039)	1.262*** (0.054)	0.261*** (0.064)	0.229*** (0.063)	0.663*** (0.077)
OpenPerTD	0.633** (0.223)	1.782*** (0.223)	2.566*** (0.332)	1.211*** (0.383)	1.349*** (0.390)	0.303* (0.502)
ConscPerTD	0.256* (0.161)	1.423*** (0.158)	0.263* (0.233)	1.285*** (0.284)	1.167*** (0.292)	6.124*** (0.353)
ExtraPerTD	-5.120*** (0.303)	-4.776*** (0.302)	-3.940*** (0.431)	-3.819*** (0.493)	-3.765*** (0.492)	-2.897*** (0.643)
AgreePerTD	0.311* (0.160)	1.358*** (0.157)	0.270* (0.232)	1.320*** (0.283)	1.208*** (0.292)	6.055*** (0.352)
NeuroPerTD	-0.129* (0.089)	-0.804*** (0.088)	-0.129 (0.129)	-6.248*** (0.157)	-6.184*** (0.162)	-3.385*** (0.196)
TotalPapers	0.284*** (0.001)	0.267*** (0.001)	0.289*** (0.001)	0.228*** (0.002)	0.200*** (0.002)	0.236*** (0.002)
RecomHeat	0.991*** (0.004)	0.990*** (0.004)	0.993*** (0.004)	2.134*** (0.007)	2.141*** (0.007)	2.161*** (0.007)
PStress*PerS		1.650*** (0.128)			0.818*** (0.214)	
PStress*OpenPerTD		5.430*** (0.623)			3.666*** (1.009)	
PStress*ConscPerTD		8.262***			1.501	

		(0.471)			(0.767)	
PStress*ExtraPerTD		-3.727***			-5.862***	
		(0.869)			(1.416)	
PStress*AgreePerTD		8.273***			1.363*	
		(0.469)			(0.764)	
PStress*NeuroPerTD		-4.596***			-0.846*	
		(0.261)			(0.426)	
DocTitle*PerS			3.447***			1.379***
			(0.084)			(0.136)
DocTitle*OpenPerTD			5.644***			7.131***
			(0.444)			(0.744)
DocTitle*ConscPerTD			0.783*			7.900***
			(0.320)			(0.544)
DocTitle*ExtraPerTD			5.369***			4.229***
			(0.600)			(0.970)
DocTitle*AgreePerTD			0.725*			8.107***
			(0.318)			(0.543)
DocTitle*NeuroPerTD			-0.406*			-4.390***
			(0.178)			(0.302)
Constant	3.525***	3.780***	4.418***	2.516***	2.244***	2.352***
	(0.034)	(0.034)	(0.045)	(0.056)	(0.056)	(0.066)
R-squared	0.398	0.474	0.411	0.386	0.464	0.405
N	244978	244978	244978	244978	244978	244978
F	16056.82	12559.22	10070.21	18157.49	13725.7	10783.01

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Second, we tested the robustness of the main effect model by pairwise combinations of D-P personality similarities in groups. The results in Table 8 (a, b) are basically consistent with those in Table 4 (Models 2, 5). These results also reveal some interesting phenomena. First, for the openness, conscientiousness, and agreeableness dimensions of personality, the effects of D-P similarity on patient selection are stronger for high-high pairings (Group 1 (HH)) than they are for low-low pairings (Group 3 (LL)). In contrast, for the extroversion and neuroticism dimensions of personality, a high-high pairing (Group 1 (HH)) weakens the effects of D-P personality similarity on patient selection. In addition, we put the five dimensions pairwise combinations of personality traits variables into the OLS model, and the results are consistent with the results of single dimension pairwise combinations of personality traits (To save space, these results are not provided here).

Table 8a: Robustness Check: The Results of Pairwise Combinations of D-P Personality Similarity (Openness, Conscientiousness, Agreeableness)

	Open		Consc		Agree	
	OnlineS	OfflineS	OnlineS	OfflineS	OnlineS	OfflineS
PerS	0.704***	0.576***	0.842***	0.302***	0.679***	0.548***
	(0.028)	(0.049)	(0.030)	(0.055)	(0.030)	(0.052)
Group2(LH)	-0.052***	-0.005	0.035***	0.349***	-0.065***	0.119***
	(0.005)	(0.009)	(0.005)	(0.008)	(0.006)	(0.013)
Group4(HL)	0.005	0.121***	-0.001	0.137***	0.017*	0.037**
	(0.005)	(0.008)	(0.005)	(0.008)	(0.007)	(0.012)
Group1(HH)	0.032***	0.065***	0.066***	0.117***	0.005***	0.068***
	(0.005)	(0.008)	(0.005)	(0.009)	(0.006)	(0.012)
TotalPapers	0.288***	0.231***	0.288***	0.218***	0.289***	0.231***
	(0.001)	(0.003)	(0.001)	(0.003)	(0.001)	(0.003)
RecomHeat	1.010***	2.180***	1.010***	2.174***	1.007***	2.178***
	(0.004)	(0.007)	(0.004)	(0.007)	(0.004)	(0.007)
Constant	3.136***	-3.381***	3.032***	-3.198***	3.165***	-3.254***
	(0.024)	(0.043)	(0.025)	(0.046)	(0.026)	(0.046)
R-squared	0.392	0.377	0.392	0.380	0.394	0.378
N	245027	245027	245027	245027	245027	245027
F	19155.98	22101.49	19269.76	22621.32	19395.9	22093.61

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 8b: Robustness Check: The Results of Pairwise Combinations of D-P Personality Similarity (Extroversion, Neuroticism)

	Extra		Neuro	
	OnlineS	OfflineS	OnlineS	OfflineS
PerS	0.635*** (0.034)	0.627*** (0.054)	0.889*** (0.033)	0.648*** (0.059)
Group2(LH)	-0.111*** (0.005)	-0.211*** (0.009)	0.012** (0.005)	0.287*** (0.009)
Group4(HL)	-0.044*** (0.005)	-0.031*** (0.008)	0.001 (0.005)	0.157*** (0.009)
Group1(HH)	-0.050*** (0.005)	-0.093*** (0.008)	-0.064*** (0.005)	-0.214*** (0.010)
TotalPapers	0.288*** (0.001)	0.229*** (0.003)	0.288*** (0.001)	0.217*** (0.003)
RecomHeat	1.009*** (0.004)	2.179*** (0.007)	1.011*** (0.004)	2.173*** (0.007)
Constant	3.169*** (0.026)	-3.427*** (0.045)	3.000*** (0.026)	-3.010*** (0.048)
R-squared	0.392	0.376	0.392	0.379
N	245027	245027	245027	245027
F	19244.96	22169.23	19232.21	22577.36

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Finally, we used a different dataset to verify the robustness of our results. Specifically, we collected datasets from another online healthcare community (chunyuyisheng.com), which comprised a total of 308,968 consultations with 2,000 doctors. In this dataset, (1) we use the number of online consultant patients who select a particular doctor as patient online selection (OnlinePatientS) in chunyuyisheng.com platform. The results in Table 9 are consistent with those in Table 4 (Model 2). (2) As the data of patients reporting from an offline hospital to online consultation online did not display in the chunyuyisheng.com platform, we further used We use the number of gifts (GiftNum) and doctors' good scores (GoodRating) to represent online patient selection behavior because these two variables capture patients' voluntary behaviors toward doctors after their consultations. At the same time, these two variables are used as the patient's selection behavior to further verify the universality of our research results. The results in Table 10 are consistent with those in Table 4 (Model 2).

Table 9: Robustness Check: Alternative Dataset (OnlinePatientS)

	OnlinePatientS Model 1	OnlinePatientS Model 2
FansCount	0.027*** (0.002)	0.026*** (0.002)
Price	0.408*** (0.080)	0.432*** (0.080)
ThanksLetter	4.839*** (0.441)	5.469*** (0.452)
PerS		2.667** (0.440)
Constant	3.766*** (0.189)	8.177*** (0.680)
R-squared	0.270	0.273
N	2000	2000
F	215.2	164.5

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 10: Robustness Check: Alternative Dataset (GiftNum and GoodRating)

	GiftNum Model 1	GiftNum Model 2	GoodRating Model 3	GoodRating Model 4
FansCount	0.275*** (0.018)	0.274*** (0.018)	-0.438*** (0.021)	-0.440*** (0.021)
Price	0.034*** (0.002)	0.034*** (0.002)	-0.021*** (0.001)	-0.021*** (0.001)
ThanksLetter	0.005*** (0.000)	0.005*** (0.000)	0.006*** (0.000)	0.006*** (0.000)
PerS		1.381*** (0.220)		5.210*** (0.381)
Constant	-1.352*** (0.073)	-2.624*** (0.215)	98.436*** (0.096)	93.638*** (0.373)
R-squared	0.045	0.045	0.011	0.012
N	308968	308968	308968	308968
F	1419.462	1077.114	1167.223	883.994

* p<0.05, ** p<0.01, *** p<0.001

6. Discussion

6.1. Key Findings

Our findings have implications for D-P interaction from the perspective of social psychology, which can be summarized into three key insights. First, D-P personality similarity is positively correlated with patient selection (online selection and offline selection). This indicates that no matter whether the interaction is online or offline, the more personality similarity there is between doctors and patients, that is, the more pleasant the patient feels during the interaction, the more patients may be inclined to choose the doctor for future medical services. Research on the influence of personality traits and trust on information sharing behavior in an online social network environment has also obtained similar conclusions (Deng et al., 2017). In particular, D-P similarity in the openness, conscientiousness, and agreeableness were positively correlated with patient selection, while D-P similarity in the extroversion and neuroticism were negatively correlated with patient selection. These results are also similar to prior research findings (Srivastava & Das, 2015; Tackett, 2011).

Second, doctors' traits in different dimensions of personality have different effects on patient selection. openness, agreeableness, and conscientiousness have a positive effect on patient offline selection. By contrast, extroversion and neuroticism have a negative effect on both online and offline patient selection. The results show that when patients consult doctors through OHC, they not only hope to obtain professional support from doctors but also need a positive attitude and spiritual support from doctors. The results are basically consistent with the results of the study on doctors' openness, conscientiousness, and patients' ratings in the longer-term D-P relationship (Duberstein et al., 2007).

Finally, we also found that patient psychological stress and doctor's title strengthen the positive moderating effects of D-P personality similarity on patient selection. One possible explanation is that patients with higher psychological anxiety and mental pressure, like those experiencing infertility, not only expect doctors to provide effective treatment but also need them to provide mental comfort. These results are similar to those reported on the moderating effect of psychological stress on patient involvement and doctor involvement (Liu et al., 2020), and they are also similar to the findings on the moderating effect of physician professionalism on online informational unfairness and the quality of D-O relationship (Zhang et al., 2019).

6.2. Theoretical Implications

This study provides several theoretical insights for the literature of D-P interaction from the micro perspective. First, using the methods of text mining and econometric analysis, our findings enrich the research on online D-P interaction from the micro level. Some studies have explored the behavior of doctors or patients in online D-P interaction (Chen et al., 2020; Yang et al., 2015; Zhang et al., 2019; Zhao et al., 2022), but these literature mainly focused on the macro-level factors and ignored the micro-level factors. This study verified the influence mechanism of personality traits on doctors' online service for patients from social psychology and the theory of interpersonal attraction perspective.

Second, this study extends the interpersonal attraction theory and the Big Five personality model to the literature of online D-P interaction by incorporating personality traits in investigations of D-P behavior. As we all know, interpersonal attraction theory is widely used in interpersonal communications, especially in the field of marketing and social media (Al-Samarraie et al., 2017; Mahmud et al., 2013; Guo et al., 2022). Although some studies have

explored the role of personality traits in the medical field (Clack et al., 2004; Feng-dan et al., 2018; Tola et al., 2019), few studies have focused on the influence of personality traits on online D-P behavior. We have verified the important role of potential D-P personality similarity in online and offline patient selection, and there is certain heterogeneity in different dimensions of personality. Our work deeply analyzes the mechanism of online D-P interaction from the micro-level, which has the potential to enrich the application of the theory of interpersonal attraction in the online medical field.

Third, this study enriches the research on patient psychological stress and doctor's title in understanding patients' online and offline selection behaviors from the psychological perspective. Previous studies have analyzed the moderating role of patient psychological stress and doctor's title from different dimensions (Yang et al., 2015; Zhang et al., 2019). However, the specific moderating role of patient psychological stress and doctor's title in the relationship between D-P personality similarity and patient selection remains to be further explored. Our study provides a theoretical support for the impact of these moderator variables.

6.3. Practical Implications

This study also has the following three practical implications. First, it is possible to use individual personality traits to carry out personalized matching between doctors and patients so as to provide personalized services and improve the service quality. Because in online D-P interaction, doctors and patients who share potentially similar traits will be more likely to develop relationships based on mutual understanding and avoid mutual contradictions.

Second, our findings shown that D-P personality has a positive effect on patient selection can provide guidance for OHC platform construction. For example, a platform could create a personality traits analysis database for doctors and patients and match individuals with similar traits in the follow-up intelligence.

Third, our findings could inform intelligent dialogue reminder functions for OHC platforms. For example, given a doctor's and a patient's personality traits, patient disease characteristics, and other factors, such an intelligent guidance system could help both sides to communicate by providing personalized reminders about personality differences, about what kind of speech may be the most helpful, etc., in order to facilitate effective communication between the two parties.

6.4. Limitations and Future Research

Although we were able to successfully substantiate our hypotheses, there are still several points that can be further explored in future research. First, although we have tried our best to improve the accuracy of personality trait extraction from the abundance of unstructured online D-P interaction text, there may still be some deviations in the accuracy of personality trait extraction. This is because this platform's patient privacy protection, the names and contact information of patients are hidden. One limitation, then, is that we cannot track and contact the patients themselves in order to conduct questionnaire surveys to measure their real personality traits. Thus, in this paper, we can only extract the potential personality traits of doctors and patients by using text mining on a large volume of text interactions. In the future, we hope to use a group of doctors and patients whose personality traits we can also test with questionnaires (Big Five personality inventory) and combine with the online text data as a training set. This method may improve the accuracy of personality trait prediction using supervised machine learning method to evaluate the interactive text of doctors and patients. Second, in this study, we only collected two kinds of diseases (infertility and cardiovascular disease) to test the moderator role of patient psychological stress. Future research can obtain more kinds of diseases to measure patient psychological stress, so as to increase the universality of the research findings. Finally, in terms of variable measurement, since we cannot fully track the information of offline patients, we only measure the patient offline selection behavior by the number of patients reporting from an offline hospital to the online consultation. Here may not all offline consultation patients will be reported online, so it is inevitable that there will be some deviation in the measurement. In future research, we hope to improve this part of the data to improve the accuracy of variable measurement.

7. Conclusion

This paper innovatively integrates text mining into empirical analysis to explore the influence of D-P personality similarity on patient selection in online D-P interaction. We collected online D-P interaction text data from a large OHC in China, including a total of 245,027 consultations with 961 doctors. The results indicate that D-P personality similarity plays an important role in patient selection. Particularly, similarities in the openness, conscientiousness and agreeableness dimensions of personality have a positive effect on patient selection, while similarities in the extroversion and neuroticism dimensions of personality similarity have a negative effect on patient selection. In addition, the openness, conscientiousness and agreeableness of doctors could attract more patients, in contrast to extroversion and neuroticism of doctors. Further, both patient psychological stress and doctor's title strengthen the link between D-P personality similarity and patient selection. From the perspective of social psychology and the theory of interpersonal attraction, this study reveals the mechanism and influence of personality traits on the online services

doctors provide for patients. Our results may provide guidance for the construction of online medical platforms, which may be able to create a personality analysis database for doctors and patients. Such a database could intelligently match doctors and patients with similar personalities for interactive services.

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