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REVIEW ARTICLE

Telecare Services for Elderly: Predictive Factors of Continued Use Intention

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Abstract:

Background:

Several countries have recently attempted to implement telecare information technology to provide health care to older adults. This study applied self-determination theory (autonomy, relatedness, and competence) and the theory of planned behavior (subjective norm, perceived behavioral control, and attitudes toward using tools) to investigate a theoretical model for explaining the predictive factors influencing the intention of elderly patients to continue using telecare services.

Methods:

Elderly patients in Taiwan (N = 160) who used telecare systems and fall-detection systems completed a questionnaire. Hierarchical multiple regression analysis was applied to test hypotheses.

Results:

The results revealed that the main effects related to identification supported the notion that autonomy, relatedness, subjective norm, and attitudes toward using tools positively affect elderly patients' intention to continue using telecare services. But, perceived competence and perceived behavioral control cannot be used as a predictor of intention to adopt telecare services.

Conclusion:

For an aging society, to provide appropriate ways to enhance elderly patients' willingness to use telecare services is important. Our findings indicate that elderly patients' perceived relatedness and subjective norm are both crucial predictors in intention to adopt telecare services. And it means that social influence may play a critical role in elderly patients' intention to adopt telecare services; therefore, researchers can investigate social influence mechanisms in depth and examine them more closely in future research.

Keywords: Continue use intention, Health care to older adults, Self-determination theory, Telecare, Theory of planned behavior.

1. INTRODUCTION

Taiwan is an aging society. The aging population structure has exceeded 11% and was estimated to equal 20% in 2020, and the demand for long-term care of older adults, medical care expenses, and social problems are increasing. Thus, integrating medical care resources and enhancing the willingness of older adults to use these resources are critical. With the rapid development of information technology (IT), an increasing amount of IT technology has been integrated into health care services. For example, telecare has been identified as a possible alternative approach to meeting the demands of aging people (e.g., long-term care) [1, 2]. Telecare is a long-term care system that encompasses

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health care, electronic medical equipment, and communication technology and enables people to receive health care services in their home and community [3]. Several studies have indicated that telecare can improve patients' quality of life and satisfaction and reduce health care costs and the number of emergency accidents [4, 5].

Similar to European countries [6], the development and provision of telecare in Taiwan remains slow [3]. In addition to the government and health care provider concerns [7], the willingness of people to use and continue to use these services greatly influences the development of telecare in Taiwan. Several studies have examined factors influencing the intention to use telecare [8, 9]. For example, Huang [8] conducted an investigation from the perspective of an innovative health care system and used a questionnaire survey to examine how factors influenced telecare acceptance. The results revealed that perceived ease of use, perceived usefulness, personal innovativeness, attitude, and intention predicted the intention of people to use telecare. Furthermore, most related studies have examined influencing factors from the perspective of technological needs and acceptance [8, 10]. Few studies have determined how users perceive telecare [11] or examined what user characteristics may influence their intention to continue using telecare [12]. Thus, the purpose of this study was to evaluate to what degree motivational and social-cognitive factors influence elderly patients' intention to continue using telecare services.

Previous studies have employed the technology acceptance model (TAM) to examine the factors affecting the intention of elderly patients to use telecare services [13]. Some studies have investigated the influences of IT services on elderly health care by examining health-related quality of life [14, 15]. However, these studies have not explained the relationship between older adults' intention to use telecare systems and its effects. For example, Holden and Karsh [16] suggested that the TAM can predict an extensive part of the use or acceptance of health care IT, but new theoretically motivated variables for enhancing older adults' use of health care IT must be investigated. In addition, Djamasbi, Strong, and Dishaw [17] indicated that the TAM occasionally does not sufficiently explain user behavior; thus, based on the aforementioned suggestion, we employed self-determination theory (SDT) and the theory of planned behavior (TPB) and examined the motivation and cognition of elderly patients who use telecare services.

To extend previous studies that have applied the TAM in examining the factors influencing elderly patients' intention to continue using telecare services, we followed the humanity perspective on psychosocial factors and determined whether these factors can be used to promote elderly patients' use of telecare services. The purpose of this study was to identify the psychosocial factors influencing elderly patients' intention to continue using telecare services in Taiwan. This study examined a use intention model according to two social-psychological theories that have been used to investigate health care-related behavior: SDT and the TPB. These theories are useful because evidence has suggested that psychosocial factors can explain variance in health care-related behavior and the processes and mechanisms by which these factors influence such behavior [18]. This study advances the understanding of what influences elderly patients' intention to continue using telecare services.

2. THEORETICAL BACKGROUND AND HYPOTHESES

2.1. Self-determination Theory and Continued Use Intention

The core premise of SDT is that all individuals have an inherent tendency to experience a unified sense of self. When people expend effort on activities in which they feel motivated, they experience exercising a personal choice and self-control from their actions [19]. Central to SDT is the distinction between autonomous and controlled motivation [20]. Autonomous motivation refers to the motivation to engage in behavior with a sense of volition, choice, and control over the action. Two types of autonomous motivation have been identified. One type is intrinsic motivation, which refers to an individual engaging in an activity for his or her own interest, in other words, because they enjoy the process [21]. The other type is external motivation, which refers to people engaging in an activity because of external reinforcement such as obtaining a reward or avoiding punishment [21]. Most research has shown that self-determined motives positively affect behavioral engagement [22] and that intrinsic motivation improves performance, persistence, and satisfaction in various domains (*e.g.*, education and behavioral health) more than does extrinsic motivation [23].

According to SDT, people are intrinsically rather than extrinsically motivated because they satisfy the three basic psychological needs of autonomy, competence, and relatedness [21]. The need for autonomy refers to people's desire for self-control over their actions and to act according to a sense of volition [24]. The need for competence, which is similar to the concept of self-efficacy [25], refers to people's desire to be successful in their interactions with various environments when they perform an activity [26]. The need for relatedness concerns feeling connected and supported by salient others [26] such as parents, friends, and family members. The core principle of SDT suggests that these three

needs are complementary for people's optimal functioning and that their satisfaction is provoked by social context [24].

Research has shown strong links between autonomous motivation and behavioral insistence in various health contexts (e.g., physical activity, weight control, and dental care) [27, 28]; however, few studies have applied SDT to examine their influence on user's intention to adopt telecare services. For instance, in the preventative health care context, empirical evidence has shown that autonomy-supportive behaviors could enhance the possibility of people endorsing autonomous motivation, which is the key motivational factor in intention to engage in health preventive behaviors [29]. In addition, according to SDT, autonomous motivation can be promoted through autonomy-supportive behaviors offered by salient others in social contextual conditions, which is related to the perception of need for relatedness [24]. When individuals perceive autonomy-supportive behaviors from salient others, such as providing suggestions, a personal rationale for performing an activity, and providing competence-related feedback, they are more likely to become intrinsically motivated to engage in the behavior [30], which fosters autonomous motivation [31]. Findings have shown that people's perceptions of autonomy support at a clinic were positively related to the satisfaction of patients' psychological needs [27] that perceived autonomy support indirectly influenced intentions by attitudes, and that less perceived autonomy support and more controlling interpersonal situations directly affected intentions [32].

Because telecare services should be supported by information and communication technology [33], ensuring that elderly patients experience a sense of self-efficacy, which is perceived as the ability to use telecare services, is crucial. According to SDT, the need for competence is similar to the concept of self-efficacy [25]. Self-efficacy has been reported as a critical factor for new system acceptance, and evidence has shown that it positively affects system usage [34]. In addition, self-efficacy has been reported as positively affecting perceived usefulness [35], and that perceived usefulness increases the intention to adopt telecare services [35, 36]. Accordingly, Hypotheses 1, 2, and 3 were proposed.

H1: Elderly patients' perceived autonomy positively affects their intention to continue using telecare services.

H2: Elderly patients' perceived competence positively affects their intention to continue using telecare services.

H3: Elderly patients' perceived relatedness positively affects their intention to continue using telecare services.

2.2. Theory of Planned Behavior and Continued Use Intention

The TPB has been used in behavioral medicine to explain the social-cognitive factors and decision making underlying peoples' health-related behavior [37]. The core concept of the TPB is that people's intentions control their engagement in future behavior. Behavior intention has been regarded as a critical variable in behavior, influencing whether people who intend to engage in one behavior are likely to complete it [38]. Three belief-based perceptions of behavior are attitudes toward the behavior, subjective norms, and perceived behavioral control (PBC) [39]. Attitudes toward the behavior refers to a person's evaluation of the target behavior in the future. Subjective norms reflect social pressures from salient others for the individual to engage in the behavior. PBC represents a person's overall assessment of whether they have the capacity to engage in the behavior.

The TPB model has been used in several health-related studies, such as myopia prevention [29], dietary change [40], and exercise [41]. In addition, research has provided empirical evidence that the TPB can predict clients' intention to self-monitor health-related behaviors [42]. However, relatively few studies have employed the theory to examine the intention of adopting telecare services. According to theoretical and practical TPB-based evidence, we suggested that the TPB may be used to predict elderly adults' intention to adopt telecare services. Thus, we hypothesized the following:

H4: Elderly patients' attitude toward telecare systems positively affects their intention to continue using telecare services.

H5: Elderly patients' subjective norm positively affects their intention to continue using telecare services.

H6: Elderly patients' perceived behavioral control positively affects their intention to continue using telecare services.

3. METHOD

3.1. Participants

In this study, a convenience sample was taken from the sole provider of telecare at a hospital in Central Taiwan. For

inclusion in the study, participants must have (a) used telecare or telehealth services for 2 years, (b) paid for the telecare or telehealth services, and (c) not been living with family. Of 170 people using telecare services in the region, 160 were older people who fulfilled the inclusion criteria. A total of 160 valid questionnaires were collected, representing a response rate of 100%. Among the participants, 52.5% were women, more than 80% had received 9 years or less of formal education, 72.2% lived with family, 27.8% lived alone, and 78.7% had been diagnosed with two or more chronic diseases.

3.2. Measures

A questionnaire was designed according to the constructs of SDT [19], the TPB, and intention [43]. The SDT construct comprised autonomy (six items), competence (three items), and relatedness (three items). The TPB constructs comprised subjective norm (two items), attitude (three items), and perceived behavioral control (two items). The intention construct comprised two items. A 5-point Likert-type scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), was used. We collected data from May 2012 to September 2012. Investigators visited participants and helped them complete the survey by reading the measurements. If the respondents had any questions about the measurement, the investigators answered immediately. We calculated Cronbach’s α to examine the reliability of the questionnaire. In this study, all concepts of Cronbach α were between 0.792 and 0.948, indicating that all concepts had favorable internal consistency.

4. RESULTS

4.1. Descriptive Statistics and Correlation Among Study Variables

The average scores for the questionnaire items were calculated. Subsequently, the Statistical Package for the Social Sciences Version 18 was used to obtain descriptive statistics and perform linear regression analysis of the sample. Descriptive statistics analysis revealed that men and women accounted for 47.5% (76 people) and 52.5% (84 people) of the participants, respectively. Patients aged 71 to 80 years accounted for 41.3% (66 people) of participants, followed by those aged 81 to 90 years (31.3%, 50 people). Regarding education level, 46.3% (74 people) of the patients had a low education level, whereas 41.3% (66 people) were classified as illiterate. Among the participants’ primary caregivers, 38.1% (31 people) were their spouses and 32.5% (52 people) were their children. The descriptive statistics and correlations among variables are shown in Table 1.

Table 1. Descriptive statistics and correlations among the study variables.

Variables	Mean	S.D.	1	2	3	4	5	6	7
1. Autonomy	4.12	.641	1						
2. Competence	4.15	.476	.41**	1					
3. Relatedness	4.50	.578	.47**	.18*	1				
4. Attitude	4.18	.637	.49**	.45**	.52**	1			
5. Subjective norm	4.20	.811	.28**	.24**	.28**	.30**	1		
6. Perceived behavioral control	4.59	.527	.34**	.24**	.36**	.48**	.15*	1	
7. Continued use intention	4.34	.699	.50**	.32	.39**	.57**	.45**	.30	1

Note: ** $p < .01$, * $p < .05$

Table 2. Regression of continued use intention on autonomy, competence, and relatedness.

Variables	Continued Use Intention				
	Not SD. coefficient	SD. coefficient	T value	p	VIF
Autonomy	0.359	0.326	3.985	0.000***	1.533
Competence	0.113	0.130	1.788	0.076	1.218
Relatedness	0.231	0.174	2.290	0.023*	1.320
R^2 adjusted 0.322					

Note: * $p < 0.05$, *** $p < 0.001$

4.2. Prediction of Autonomy, Competence, Relatedness, and Continued Use Intention

Table 2 presents the regression results for testing of H1-3. Variance inflation factor (VIF) values lower than 10 indicate no collinearity problem. Regression analysis revealed that perceived autonomy and relatedness were determinants of intention to continue using telecare services. Perceived autonomy was positively related to the elderly

users' continued use intention ($T = 3.985, p < .01$), supporting H1. In addition, the results reveal that perceived relatedness was positively related to the elderly users' continued use intention ($T = 2.290, p < .01$), supporting H3.

4.3. Prediction of Attitude, Subjective Norm, Perceived Behavioral Control, and Continued Use Intention

Table 3 presents the regression results for testing of H4-6. VIF values lower than 10 indicates no collinearity problem. The results indicate that the subjective norm was positively related to the elderly users' continued use intention ($T = 4.448, p < .01$), supporting H4. The results also indicate that attitude was positively related to the elderly users' continued use intention ($T = 6.088, p < .01$), supporting H5.

Table 3. Prediction of attitude, subjective norm, perceived behavioral control, and continued use intention.

Variables	Continued Use Intention				
	Not SD. coefficient	SD. coefficient	T value	p	VIF
Attitude	0.539	0.446	6.088	0.000***	1.438
Subjective norm	0.321	0.295	4.448	0.000***	1.180
Perceived behavioral control	0.042	0.029	0.410	0.682	1.313
R^2 adjusted 0.408					

Note: *** $p < 0.001$

5. DISCUSSION

This study analyzed the predictive factors influencing the intention of elderly patients to use telecare services. Thus, we employed the SDT model and TPB model to identify the roles of perceived autonomy, perceived competence, and perceived relatedness as well as attitude, subjective norm, and perceived behavioral control on elderly patients' intention to continue using telecare services.

The results show that both the SDT and TPB models were effective predictors for the elderly patients' intention to adopt telecare services. The elderly patients exhibited an increased intention to adopt telecare services when they perceived autonomy and relatedness, which suggests that the participants experienced the freedom of volition and perceived that they could select the telecare services independently (perceived autonomy). In addition, they felt connected and supported (perceived relatedness) by salient others, which increased their willingness to use telecare services. These findings are consistent with SDT [21] and some previous studies [44] that have implied that creating an autonomy-supportive context in telecare services may promote the likelihood of elderly patients endorsing autonomous motivation for adopting telecare services, which is the critical motivational variable of intention to adopt telecare services. Therefore, creating an autonomy-supportive environment is likely an effective means of increasing self-determined motivation in health care contexts [45]. However, this proposal contradicts hypotheses asserting that perceived competence nonsignificantly affects intention to adopt telecare services. According to SDT, people tend to be motivated to perform target behavior when they feel competent in it [19]. The finding is inconsistent with SDT and prior studies that have suggested that perceived competence predicts persistence in behaviors [30, 46]. One possible explanation for this effect could be that because the participants in this study had already been using telecare services for at least 2 years, using these services may have become routine among the participants, thus reducing their perceived competence. This finding raises an appealing research question of whether motivation for adopting telecare services differs between users with and without using experience. To provide strategies to satisfy the needs of elderly patients, considering this influencing factor is critical.

The findings from the TPB model suggest that attitude and subjective norms were critical predictors for intention to adopt telecare services. The results indicate that a positive attitude toward the use of telecare services leads to a higher willingness of use. Therefore, the willingness of elderly patients to adopt telecare services can be increased by improving their attitude regarding using such services. The results also imply that, when elderly patients have a positive attitude toward the use of telecare services, their willingness to adopt increases [8]. In addition, we determined that the subjective norms directly affected the intention to adopt, indicating that the intention to adopt was affected by the support of salient others such as friends and family members. This finding implies that increasing elderly patients' intention to adopt telecare services by acquiring social support from salient others, including critical messages from physicians or family members, may be crucial. These findings are consistent with most previous studies in other contexts [29, 47]. However, PBC, which represents people's beliefs regarding whether they have the capacity to use telecare services, cannot be used as a predictor of intention to adopt telecare services. This finding is inconsistent with our hypothesis and findings from previous studies [29, 47]. The results are similar to the perceived competence factor in

the SDT model, which was likely because our participants had experience using telecare services and performed to their capacity in using telecare. Therefore, PBC may reflect actual control over behavior; it can thus predict behavior directly [37] and would not be a critical predictor for intention to continue using telecare services.

CONCLUSION

Taiwan's Telecare Pilot Project has been promoted for nearly a decade, but its development and expansion have been quite slow [3]. Therefore, investigating the influencing factors affecting elderly patients' intention to adopt telecare service is necessary. The current research builds upon previous studies that have applied the TAM by examining psychological needs rather than technological needs. We achieved this by applying SDT and TBP models and empirically examining the factors that affect elderly patients' intention to use telecare services. The results show that the elderly patients' perceived autonomy, relatedness, subjective norm, and attitude toward telecare may play a critical role in their intention to adopt telecare services. This research provides insights to telecare providers for integrating various strategies to provide appropriate strategies to enhance elderly patients' willingness to use telecare services. The results of this study suggest that future research related to telecare service in Taiwan must be conducted.

Although the findings of this research provide some valuable insights, some research limitations must be mentioned. First, the study stressed on elderly patients' intention to use telecare services without considering the users needed to be able to use it when they encounter crisis. Therefore, service providers build robust social networks and connected with the services' center, ambulance or police department to respond the crisis immediately, it may enhance patients' trusts and intentions to use the telecare services. In addition, by providing high-tech system such as wearable devices not only record physiological functions but provide suggestions for health improvements, the services' quality and motivate patients' use intention would be increased. Further research investigates variables such as degree of social networks connected or quality of services would be helpful in understanding key factors that impact elderly patients' intentions on using telecare services. Second, because we collected data through a survey, all of the variables were included in the same questionnaire and measured through self-report, thus confounding the risk of common method bias. Third, several measure concepts employed in this study were subjective (motivation and cognition); this seemed to be the only means of conducting the measurement. In addition, the samples were collected from a hospital in Central Taiwan, which may constrain the generalizability of the results. Additional studies could examine the generalizability of the model in various subjects by including samples from participants from different use experience groups, occupations, and cultural backgrounds. Finally, this study examined the factors influencing intention to adopt telecare services from the users' perspective and did not consider the providers of telecare services, families of patients, or policymakers; therefore, the implications of the findings may be limited. Future research could integrate information from various respondents to determine the optimal means of motivating elderly patients to adopt telecare services.

The findings indicate that elderly patients' perceived relatedness and subjective norm are both crucial predictors in intention to adopt telecare services. Furthermore, these results reveal that social influence [48] may play a critical role in elderly patients' intention to adopt telecare services; therefore, researchers can investigate social influence mechanisms in depth and examine them more closely in future research.

CONFLICT OF INTEREST

The authors confirm that this article content has no conflict of interest.

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