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Exploring the Awareness, Perception, Acceptability and Confidence Level Towards Telerehabilitation among Stroke Patients' Caregivers in the Federal Territory of Malaysia

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ABSTRACT

Telerehabilitation is the ability to provide distance support, evaluation and intervention to individuals who are undergoing rehabilitation therapy through telecommunication. This study aimed to explore the awareness, acceptability and confidence level towards telerehabilitation among caregivers of cerebral stroke patients in the federal territory of Malaysia. A cross-sectional study was conducted amongst stroke patients' caregivers from general hospitals in the federal territory of Malaysia. Descriptive statistics were used to analyse the awareness, acceptability and confidence level towards telerehabilitation technology among stroke patients' caregivers. The correlation between confidence level in using technology devices and their acceptance level of telerehabilitation was assessed by using Spearman correlation analysis. Results showed that 70% of caregivers were aware of the telerehabilitation technology, amongst which 60.5% were willing to use the technology for rehabilitation purposes. Out of all the types of devices, 50% of caregivers demonstrated a high confidence level in using smartphones. However, only 25.7% demonstrated a high confidence level in using video call services for telerehabilitation service. In conclusion, the majority of caregivers in the federal territory of Malaysia demonstrated a positive attitude towards telerehabilitation services for stroke patients.

INTRODUCTION

Stroke is defined as a neurological deficit due to interruption of blood supply to the brain which lasts for more than 24 h (Alrabghi et al., 2018). Stroke can be classified into two categories based on aetiology, which are ischaemic stroke and haemorrhagic stroke. In ischaemic stroke, a neurological deficit occurs due to blockage of blood supply to the brain. This blockage can be caused by atherosclerotic (50%), embolic (25%) or lacunar stroke (25%) (Wittenauer, 2013). Approximately 87% of total stroke cases were recorded as ischaemic stroke (Alrabghi et al., 2018). Haemorrhagic stroke occurs primarily due to sudden rupture of blood vessels in the brain, which accounts for 13% of total stroke cases (Alrabghi et al., 2018). For ischaemic stroke, blood flow to the brain must be immediately restored to minimise the injury. This is done by using a recombinant tissue plasminogen activator (rt-PA) that breaks up the blood clot and allows blood circulation in the brain (Hadley et al., 2020). On the other hand, haemorrhagic stroke treatment aims to regulate bleeding and reduce pressure in the brain via surgical intervention. As there is no cure for stroke since the brain tissue injury is permanent; hence, stroke management is more focused on neurological deficit improvement via rehabilitation therapy (Hadley et al., 2020).

Rehabilitation therapy is a set of interventions to enhance individual functioning and reduce disability that has occurred due to stroke. It enables individuals to be sufficiently independent in daily activities and improve their quality of life (McGlinchey et al., 2018). Rehabilitation can be categorised into three main categories which comprise occupational therapy, physical therapy and speech therapy. Generally, occupational therapy aims to improve the patient's ability to complete tasks so that he can participate in self-care practices, work and everyday tasks. On the other hand, physical therapy focuses on improving the patient's gait, muscle functions and pain management (Beaulieu et al., 2015). Next, speech therapy helps in treating speech issues, for example, communication, vocalisation and swallowing problems (Beaulieu et al., 2015). In Malaysia, implementing constructive rehabilitation therapy needs a collective effort from the stroke unit, which is a team of specially trained staff responsible for coordinating multidisciplinary care for stroke patients (Abdul Aziz et al., 2014). They include neurologists, geriatricians or general physicians with an interest in stroke, rehabilitation physicians, pharmacists, rehabilitation nurses, physiotherapists, occupational therapists and speech therapists (Abdul Aziz et al., 2014). Stroke patients will have access to the stroke unit to monitor their health. Then, rehabilitation will be initiated based on the patient's disability to improve their physical functions (Abdul Aziz et al., 2014).

Telerehabilitation is the ability to provide distance support, evaluation and intervention to individuals who are undergoing rehabilitation therapy through telecommunication services (Laver et al., 2020). It is one of the interventions that offer distance support and is beneficial to both patients and their caregivers. Moreover, it is implemented for stroke recovery worldwide (Laver et al., 2020). A wide range of telerehabilitation programmes such as robot-assisted therapy, virtual reality therapy, games and home-based telerehabilitation programmes are used by stroke patients. These telerehabilitation programmes were the results of innovative development to ensure that patients receive sufficient therapeutic care, especially in the early stage of stroke when complications are more common (Chen et al., 2019). Various technologies are used as mediums for telerehabilitation, such as robotic devices, tablets, virtual reality, games, 3D monitoring, audio-visual, electrical stimulation, static bicycles, video conference, and mobile phones (Appleby et al., 2019; Chen et al., 2019; Nik Ramli et al., 2021; Schröder et al., 2019; Wahyuni et al., 2020). Published studies have demonstrated the effectiveness of using hand-held tablets, personal computers, laptops

and mobile phones as the telerehabilitation mediums and these interventions were reported to be as effective as conventional outpatient rehabilitation for improving functional recovery in stroke patients, and thus they could ease the caregivers' burden (Laver et al., 2020). A recent study concluded that home-based rehabilitation had minimised hospitalisation time, and improved family bonding and the stroke patients' quality of life (Mahmood et al., 2019). Consecutively, this significantly lowers depression levels and anxiety among patients as well as caregivers as compared to hospital-based rehabilitation (Mahmood et al., 2019). Despite these achievements of telerehabilitation, studies to clarify the perspectives of Malaysian stroke patients' caregivers on telerehabilitation are lacking. This study primarily intends to explore their awareness, acceptability and confidence level of telerehabilitation amongst stroke patients' caregivers in the federal territory of Malaysia. Furthermore, their perception of telerehabilitation to review its practicality to the reality of Malaysian stroke patients and their caregivers was explored.

MATERIALS AND METHODS

Study Design and Participants

This was a cross-sectional questionnaire-based study which was conducted among stroke patients' caregivers. Purposive sampling was applied and participants were stroke patients' caregivers at the rehabilitation department of Cheras Rehabilitation Hospital, Putrajaya Hospital and Kuala Lumpur Hospital. Participants were eligible if they were above 18 years old, and able to read, write and comprehend text in English or Bahasa Melayu. The participants were directed to a one-time online survey, whereby they could choose either the English or Bahasa Melayu version via a link or QR code. The information sheet and informed consent form were uploaded on the first page of the survey link. Ethical approval for this study was obtained from the Medical Research and Ethics Committee (MREC), Ministry of Health Malaysia (IEC: IEC: KKM/NIHSEC/P20-2598).

Sample Size

The sample size was calculated by using the Kish sample size formula. Based on a recent study in Southern India, the prevalence of acceptance of telerehabilitation services among stroke patients' caregivers was 92.3% (Mahmood et al., 2019). Considering some potential missing data, the estimated sample size augmented with an average of 20%. Therefore, the measured sample size was 130.

Research Instruments

This study used a validated questionnaire adapted from previous studies, which aimed to assess the awareness and perception of telerehabilitation, acceptability of using telerehabilitation services and confidence level in using telerehabilitation technology. Section 1 of the questionnaire assessed the demographic background of participants while Section 2 asked about their awareness and perception of telerehabilitation (Ullah et al., 2021). Then, Section 3 assessed their acceptability level in using telerehabilitation (Collins et al., 2022). Meanwhile, Section 4 assessed their confidence level in using the different types of telerehabilitation devices for stroke patients who were under their care (Lawford et al., 2017). Section 1 and Section 2 of the questionnaire used multiple-choice closed-ended questions. Meanwhile, Section 3 and Section 4 of the questionnaire were rated on a five-point Likert scale, whereby 5 denotes "Strongly agree" and 1 denotes "Strongly disagree".

Statistical Analysis

Descriptive statistics were used to analyse the data by using Statistical Package for the Social Sciences (SPSS) (IBM Corp., Version 26, Armonk

USA). All data obtained were cross-tabulated to obtain the frequency and percentages presented in the form of a table, pie chart or clustered stacked bar chart. As data did not achieve the normality assumption (Shapiro-Wilk test $p < 0.001$), Spearman correlation analysis was used to assess the correlation between confidence level in using telerehabilitation technology and their acceptance level to telerehabilitation. The value of p <0.05 was deemed to be statistically significant.

RESULTS

Socio-Demography

A total of 152 caregivers participated in the survey. Most caregivers were between 30 – 39 years old (50.0%), followed by 40 – 59 years old (24.3%) and 24 – 29 years old (17.8%). Many caregivers were female (76.3%) and had a diploma (38.2%) or bachelor's degree (35.5%). Table 1 provides an overview of the respondents' characteristics.

Awareness and Perception of Telerehabilitation

A total of 72 (47.4%) caregivers were aware of the telerehabilitation technology but had not used it. Meanwhile, 33 (21.7%) caregivers were aware of the telerehabilitation technology and have used it on an intermittent basis. However, only one (0.7%) caregiver had good knowledge of telerehabilitation and used it regularly. Forty-six (30.3%) caregivers did not know about telerehabilitation at all. In addition, 66 (43.4%) caregivers believed that telerehabilitation could deliver consultation, and prescription, enable the delivery of required therapy and monitor. Meanwhile, 48 (31.6%) caregivers believed that telerehabilitation could also include the delivery of complex therapies. On the other hand, 38 (25.0%) caregivers expressed their uncertainty about services which can be offered by using telerehabilitation. The majority of caregivers perceived that telerehabilitation service is socially acceptable in Malaysia, whereby 17 (11.2%) participants deemed that it was extremely acceptable, 65 (42.8%) participants perceived that it was very acceptable while 62 (40.8%) participants perceived that it was somewhat acceptable and only 8 (5.3%) participants did not perceive that telerehabilitation was socially accepted in Malaysia. Interestingly, only 65 (42.8%) participants perceived that telerehabilitation is cost-saving, while the rest of the participants thought it may incur similar expenses (16.4%) or more than the face-to-face rehabilitation expenses (17.8%). On the other hand, 35 participants (23.0%) were unsure of the financial cost of telerehabilitation services. Table 2 summarises the distribution of awareness and perception of the stroke patients' caregivers to telerehabilitation.

Acceptability Towards Telerehabilitation

Figure 1 demonstrates the overall acceptance level distributions of telerehabilitation amongst stroke patients' caregivers. Results showed that the majority of caregivers demonstrated a positive attitude to telerehabilitation, whereby 31 (20.4%) caregivers demonstrated very high acceptance and 61 (40.1%) demonstrated high acceptance. Meanwhile, 38 (25.0%) caregivers showed a neutral attitude towards telerehabilitation acceptance, 19 (12.5%) had low acceptance and only 3 (2.0%) were with very low acceptance.

Confidence in the Telerehabilitation Technology

Based on Table 2, the preferred telerehabilitation mediums among caregivers were smartphones (45.4%) and laptops (42.8%) as compared to smart televisions (7.9%) or hand-held tablets (3.9%). When asked about the confidence level of different telerehabilitation technology mediums, the majority of caregivers subsequently showed high confidence in using the smartphone (50.0%) as compared to laptop (32.9%), desktop computer (29.6%) and

hand-held tablet (21.1%). However, only 39 (25.7%) of caregivers showed high confidence in using video call service via the smartphone to deliver or receive telerehabilitation services for their stroke patients. Figure 2 summarises the confidence level distribution among stroke patients' caregivers in using different telerehabilitation technology mediums.

Correlation Study

Table 3 shows poor to fair significant linear relations between the acceptance level of telerehabilitation and confidence level in using smartphones (rs = 0.243, p = 0.003), video call services (rs = 0.312, p = 0.000) and laptops (rs = 0.193, p = 0.017) as compared to desktop computer and hand-held tablet.

DISCUSSION

Stroke commonly results in long-term cognitive and functional disability in patients. Therefore, the main goal of rehabilitation therapy is for stroke patients to regain independence in their daily activities and improve their quality of life (Nor Azlin et al., 2016). As medical caregivers provide coordinated multidisciplinary rehabilitative care, family caregivers also play a significant role in assisting and motivating stroke patients during therapy sessions. Therefore, the success of telerehabilitation depends on the cooperation between these two types of caregivers in facilitating the recovery process. Similarly, findings from previous studies on Malaysian urban district populations reported that there were more female caregivers for stroke patients as compared to male caregivers (Hussain et al., 2014; Tan et al., 2020). This might be due to the higher prevalence of males afflicted with stroke as compared to females, aside from the norms of cultural perception amongst Asians on the social role of females as family caretakers (Chen et al., 2019; Meira et al., 2017). In this study, all caregivers had a formal education background which could be a factor in promoting their awareness about telerehabilitation services. However, nearly half of the caregivers who joined this survey had never heard of telerehabilitation while only less than a quarter of them had experience in using the technology occasionally. Consequently, this justifies the small number of caregivers who perceived complex therapies could also be delivered via telerehabilitation aside from routine monitoring, prescription and consultation. Although telerehabilitation is not yet widely implemented in Malaysia, awareness about telerehabilitation could be further improved to instil confidence amongst Malaysians to opt for this technology in the future (Jafni et al., 2018).

More than 70% of stroke patients' caregivers in this study were aware of telerehabilitation and perceived that this technology could be acceptable to the general population in Malaysia. This may reflect their awareness of the importance of immediate and continuous rehabilitation therapy for stroke patients after hospitalisation. The emergence of the coronavirus (COVID-19) pandemic in 2020 resulted in movement restriction policies across nations. This inevitably hampered patients' access to rehabilitation in hospitals, as seen in the reduced number of acute stroke hospital admissions from 50% to 80% in some countries (Ostrowska et al., 2021). To reduce the risk of COVID-19 infection from in-clinic rehabilitation, a study in Singapore reported implementing home visits by nurses, limiting the number of scheduled appointments as well as teleconsultation and online support activities for home exercises and aphasia therapy, despite the lack of participation from disabled elderly who were not familiar with the use of online services (Venketasubramanian, 2020). There is a growing body of literature which suggests that telerehabilitation is similarly effective as face-to-face rehabilitation in improving the daily living functions of stroke patients (Laver et al., 2020). However, only a few studies from Southeast Asian countries reported the implementation and efficacy of

telerehabilitation, particularly for post-stroke patients (Saito & Izawa, 2021; Leochico et al., 2020; Asano et al., 2021).

The high acceptance level of telerehabilitation amongst stroke patients' caregivers is indeed associated with their preference and confidence level in using video call service via the smartphone or laptop as compared to desktop computers and hand-held tablets. Amongst the four identified studies conducted to explore telerehabilitation in Malaysia, one study used a recorded exercise video for home-based therapy for stroke patients while other studies which conducted telerehabilitation for Parkinson disease, neck pain and spastic children used smartphone-based video conferencing, laptop-based video conferencing and data logging system (Redzuan et al., 2012; Chan et al., 2021; Mani et al., 2021; Zheng & Yang, 2017). Nowadays, the mobile smartphone is deemed as a necessity for communication across different sectors, especially during the COVID-19 pandemic as people need to scan the MySejahtera QR code before entering any premise (Kamaruddin & Nawi, 2020). Both stroke patients and their caregivers were already familiar with this device; hence, promoting the sense of feasibility to use it for telerehabilitation. On the other hand, several qualitative studies had reported mixed views with respect to the feasibility of using hand-held tablets during telerehabilitation, particularly regarding positioning, handling, touch-screen responsiveness and provision of clear instructions via hand-held tablets (Shulver et al., 2017; Kearns et al., 2021).

One of the anticipated advantages of implementing telerehabilitation is to reduce the cost of in-clinic rehabilitation. Interestingly, more than half of caregivers in this study were unsure or perceived that telerehabilitation might not offer a cheaper alternative than the usual in-hospital rehabilitation. The study on the impact of stroke in Malaysia by Mairami et al. (2018) reported that the cost of post-stroke care exhausted the family's financial resources, both from the stroke patients as well as the family caregivers (Mairami et al., 2020). The caregiving responsibilities may sometimes lead to compromised working hours or in the worst-case scenario, abandonment of effective rehabilitation intervention for stroke patients. Patients are often burdened with the huge cost of physical rehabilitation which includes transportation costs to the hospital, mobility aids such as a wheelchair and nursing care/ home helper fees as some of them do not have caretakers (Akhavan et al., 2015). These are all-inclusive of the hospital consultation and physical therapy sessions, all of which financially burden the patients with adding up to a range of costs between 53.50USD to 4,591.60USD (RM218.55 to RM18,756.69) for post-stroke care in Malaysia (Akhavan et al., 2015). Therefore, identifying the technical feasibility tailored to stroke disabilities and the use of low-cost technology are the key areas to explore in future studies of telerehabilitation in low-income and middle-income countries.

Telerehabilitation is a two-way communication between the healthcare provider and stroke patients. Recent studies by Brouns et al. (2019) reported that willingness to use telerehabilitation amongst stroke patients' caregivers and their family caregivers was indeed positively associated with the expected benefits, such as reduced cost, increased motivation, adherence to therapy and health outcomes regardless of patients' knowledge to use the technology. In contrast, the medical caregivers considered factor feasibility to be the most important, particularly regarding the technological support for patients in receiving instructions to ensure that effective therapy is achieved (Brouns et al., 2019). It is also important to acknowledge the variations in factors which influence the willingness to use telerehabilitation across different cultures and healthcare systems and tailor the implementation of technology according to the end users' needs (Brouns et al., 2020).

LIMITATION

This study has some limitations for consideration when the results are interpreted ed. Firstly, caregivers were approached during the stroke patients' clinic appointments, which were between April 2021 and June 2021. Therefore, the study might not capture patients who did not attend hospital appointments during that time. Secondly, this study focused on caregivers who were attending public general hospitals which did not capture patients who had attended private rehabilitation clinics in the federal territory of Malaysia. However, this was the first study which provided information on caregivers' attitudes towards telerehabilitation in the federal territory of Malaysia.

CONCLUSION

In this study, the majority of caregivers surveyed were aware of telerehabilitation technology. They indicated a high acceptance level and were confident in using video call service via the smartphone for stroke patients under their care. The level of acceptability to telerehabilitation is significantly correlated with the type of preferred telecommunication medium. Telerehabilitation may offer cost-saving complementary services to enhance long-term support and rehabilitation needs for stroke patients, particularly when in-person rehabilitation is not accessible. Therefore, efforts to educate the Malaysian population on telerehabilitation service for stroke patients should continue so that they could receive the benefits, and thus improve their physical status as well as quality of life.

ETHICAL STATEMENT

Ethical approval for this study was obtained from the Medical Research and Ethics Committee (MREC), Ministry of Health Malaysia, approval number KKM/NIHSEC/ P20-2598.

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AUTHOR CONTRIBUTION

N.N.N.R., A.F.K.B., A.P.S.A., and D.S. have made substantial contributions to the conception and design, or acquisition of data, or analysis and interpretation of data. N.N.N.R., A.P.S.A., and A.F.K.B. have been involved in drafting the manuscript or revising it critically for important intellectual content. N.N.N.R. gave final approval for the version to be published.

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Table 1 Socio-demographic characteristics of the stroke caregivers

Sample characteristics		***n***	**%**
Gender	Male	36	23.7%
	Female	116	76.3%
Age	18 – 23 years old	2	1.3%
	24 – 29 years old	27	17.8%
	30 – 39 years old	76	50.0%
	40 – 59 years old	37	24.3%
	60 – 69 years old	9	5.9%
	70 years old and above	1	0.7%
Education	Primary education	6	3.9%
	Secondary education	23	15.1%
	Diploma	58	38.2%
	Bachelor's degree	54	35.5%
	Postgraduate degree	9	6.0%
	Others professional	2	1.3%

Table 2 Survey on awareness and perception towards telerehabilitation

Survey Questions		*n*	%
Are you aware about telerehabilitation?			
Do not aware about telerehabilitation.		46	30.3%
Aware of the technology but have not used it.		72	47.4%
Aware of the technology and use it on intermittent basis.		33	21.7%
Good awareness and use it on regular basis.		1	0.7%
In your opinion, what are the services that can be offered using telerehabilitation?			
Consultation, prescription, delivery of required therapy and monitoring.		66	43.4%
Multiple services including consultation, prescription, delivery of complex therapies, monitoring evaluation.		48	31.6%
Not sure.		38	25.0%
In your opinion, how far is telerehabilitation is socially acceptable in Malaysia?			
Not acceptable.		8	5.3%
Somewhat acceptable.		62	40.8%
Very acceptable.		65	42.8%
Extremely acceptable.		17	11.2%
What is your nearest estimate of telerehabilitation expenses as compared to face-to-face rehabilitation?			
Less than the current expenses.		65	42.8%
Same as the current expenses.		25	16.4%
More than the current expenses.		27	17.8%
Not sure.		35	23.0%
	N=	152	

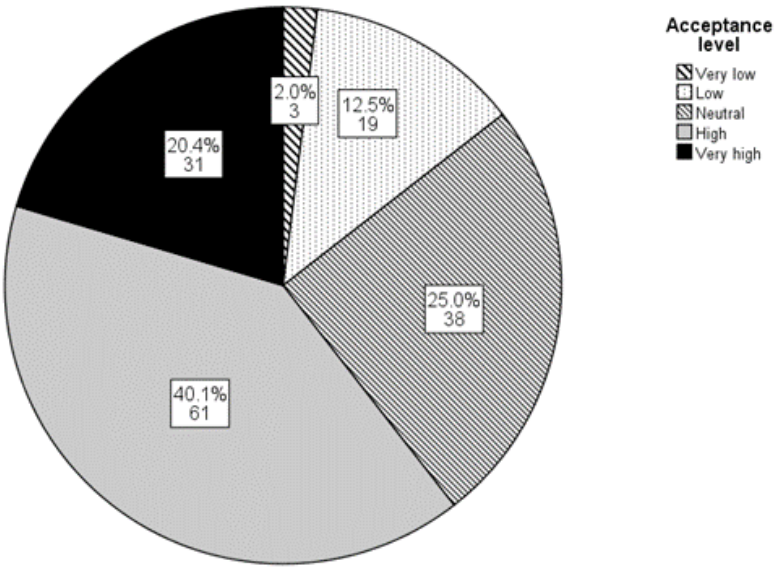

Figure 1 The acceptance levels towards telerehabilitation among stroke patients caregivers

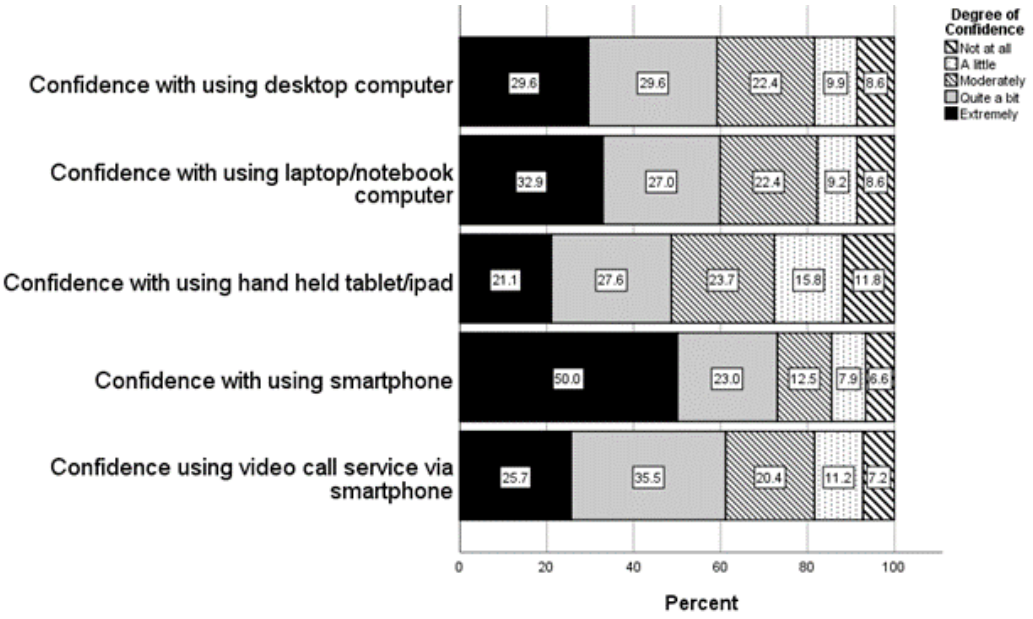

Figure 2 Confidence with technology for telerehabilitation

Table 3 Results of Spearman correlation analyses on the relationship between technology familiarity and the level of acceptance towards telerehabilitation

Characteristics	r_s	P-value
Confidence in using desktop	0.119	0.146
Confidence in using laptop	0.193	0.017
Confidence in using hand-held tablets	0.141	0.082
Confidence in using smartphone	0.243	0.003
Confidence in using video call	0.312	0.000