EXPLORATION OF TELEMEDICINE ACCEPTANCE AMONG GREEK PATIENTS WITH MUSCULOSKELETAL DISORDERS

The effect of sociodemographic and clinical characteristics

Paraskevi Theofilou

Supervisor/s: Savvas Anastasiadis, Aristotle University of Thessaloniki

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Dedication / Acknowledgements

The researcher would like to thank all the patients who participated in the present study.

Abstract

Telemedicine expands access and has the potential to make healthcare services more convenient for patients, especially those in rural areas, with young children (childcare), and with mobility limitations. The aim of the present study is to explore the level of telemedicine acceptance among Greek patients with musculoskeletal disorders as well as the effect of sociodemographic and clinical characteristics on telemedicine acceptance. A cohort of 120 patients was recruited from two centers in Greece, a private physiotherapy clinic in the broader area of Athens and a public open social structure that hosts elderly people diagnosed with musculoskeletal disorders in the area of Patra. From this cohort, 117 patients provided full data on the variables studied. In order to evaluate telemedicine acceptance, we used an instrument consisted of 35 items across 12 dimensions. These dimensions were namely the following: perceived convenience PC perceived outcome PO perceived medical risk PMR perceived information risk PIR emotional preference EP perceived medical liability PML attitude toward the behavior ATTB subjective norm SN health consciousness HN perceived severity of disease PSD perceived behavioral control PBC behavioral intention BI. A positive and statistically significant correlation of age to perceived medical risk (r= 0.538, p= <0.001) was found. Also, a negative and statistically significant correlation of years of treatment to perceived behavioral control (r= -0.244, p= 0.008) and behavioral intention (r= -0.240, p= 0.009). The present study demonstrates the crucial role that sociodemographic and clinical characteristics play in telemedicine acceptance among Greek patients with musculoskeletal disorders.

Keywords: Telemedicine, acceptance, Greek patients, musculoskeletal disorders, sociodemographics, clinical characteristics

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Introduction

The rapid pace of development of Information and Communication Technologies (ICT) has led to significant developments in many sectors, improving the quality of life of citizens and contributing to the resolution of problems in all aspects of human activity. Health systems should be able to exploit developments in digital technology to improve their efficiency and reduce healthcare costs (Organization for Economic Cooperation and Development, 2019).

Electronic health (e-Health) is the application of medical informatics through the use of the Internet to provide care to patients and educate healthcare professionals (Sarafis, Bamidis, 2020). Specifically, the World Health Organization (WHO) in 2015 defined e-health as "the cost-effective and safe use of ICTs to support health and health-related domains, including health care, health monitoring and education, knowledge and research" (World Health Organization, 2016a).

The application of technology in healthcare has led to a significant change in the way healthcare services are able to provide care, making healthcare more easily accessible and more effective (Bernardo et al., 2022). This is particularly important for the increased health needs arising from an aging population, due to factors such as the greater prevalence of chronic diseases and increased life expectancy.

The COVID-19 pandemic is a prime example of how transformative healthcare can be through the use of ICT. Healthcare organizations have had to balance limited resources, the spread of the virus, and providing the best possible care to patients. Therefore, the need to adapt healthcare to the new data and the use of digital technology were essential in order to decongest healthcare organizations and reduce medical costs (Voutsidou et al., 2019).

In Greece, due to the pandemic, initiatives and actions in the field of transition to the era of digital transformation increased. These initiatives were aimed at developing new methods of delivering health services to the public, as well as serving the numerous health needs of the population in a period of increased hospital out- flows (Karakatsani, 2022, Karamani, 2021, Panagiotou, 2023).

eHealth has the potential to integrate aspects of health care into a coherent information system (Ahern et al., 2006). The importance of this issue is particularly notable in Greece, where the health system presents many functional and organizational weaknesses (Karakiozis, Papakitsos, 2020, Kosmidis, Kosmidis, 2020).

Numerous studies have focused on conducting literature, technical and economic evaluations of the impact of e-health implementation internationally (Penedo et al., 2020, Schreiweis et al., 2019, Reiners et al., 2019) and in Greece (Karakiozis, Papakitsos, 2020, Kosmidis, Kosmidis, 2020). Furthermore, a limited number of studies have investigated the views of health professionals on the subject (Duplaga, 2016, Kouris et al., 2020).

There is considerable international research interest in the applications of telemedicine, which are evolving. The aim of the present study is to explore the level of telemedicine acceptance among Greek patients with musculoskeletal disorders as well as the effect of sociodemographic and clinical characteristics on telemedicine acceptance.

Chapter 1. Telemedicine

1.1. Definition of telemedicine and conceptual clarification

According to the World Health Organization (WHO), telemedicine is defined as "the provision of health care services at a distance, using electronic means, for the diagnosis, treatment and prevention of disease and injury, for research and evaluation, and for the training of health care providers" (WHO, 2010). The WHO has also distinguished between clinical telemedicine and informational telemedicine. According to the respective definitions, clinical telemedicine is a professional activity that applies digital telecommunications facilities for physicians and other members of the medical profession to perform medical procedures on patients remotely. On the other hand, informative telemedicine is an interactive service based on audiovisual technological means, for organizing the dissemination of medical knowledge and protocols for patient care, in order to support and improve medical activity. In other words, clinical telemedicine refers to the practice of remote medicine using technological means, while informative telemedicine concerns the dissemination of knowledge and information for medical use based on the same means (Cerrato & Halamka, 2019).

Etymologically, the English term of the concept (telemedicine) comes from the combination of two words: "tele", which is a Greek term ("tele") and means "distance" and the Latin word "mederi" which means "treatment". Thus, literally, telemedicine could be translated as "tele-therapy" or as "remote treatment", although its purpose today does not only concern the treatment of patients, but also the dissemination of knowledge among interested parties of the medical profession (Gellman & Turner, 2013). It is important to clarify that telemedicine is not a practice in itself, but is a tool for improving the effectiveness and or efficiency of care. It is not a new type of healthcare, but simply a different way of providing care, which can often be of higher quality than traditional healthcare (Frehse, 2021).

This work focuses primarily on clinical telemedicine. According to Bhattacharyya (2017), telemedicine is the technology that enables the provision of care, regardless of the physical location of the parties involved and the time frame. Similarly, Raman et al., (2013) define telemedicine as the exchange of medical data using electronic telecommunications technology that enables the assessment, monitoring, and treatment of patients' medical problems when the patient and the doctor are in different locations (Raman et al., 2013, HRSA, 2013, David, 2020). The practice of telemedicine does not necessarily require the use of computers. In essence, any "technique" or "technology" that facilitates a clinician to provide care to a patient can be included in the context of "telemedicine".

It is also important to distinguish telemedicine from other related terms. Telemedicine as a practice falls under the field of telehealth, and the two concepts are different. Unlike telemedicine, which is defined, in its narrow sense, as the provision of medical services remotely by a physician,

telehealth is a broader term that covers the practice of telemedicine, as well as a set of non-medical services, including telenursing and telepharmacy (Weinstein et al., 2014). Similarly, according to Doarn et al., (2014), telehealth is a broader concept than telemedicine and is related to the use of information technologies, not only for the provision of medical care remotely, but also for the provision of preventive health services and other public health interventions. from a distance (Doarn et al., 2014, Cerrato & Halamka, 2019).

1.2. Telemedicine systems and system types

Telemedicine is more approached from the perspective of an information system that supports, organizes, monitors and evaluates the activity of health services. It is a means of organizing care delivery and planning in the health sector. Through telemedicine, traditional care processes are extended to health facilities and patients' homes or other locations (Fieschi, 2018).

1.2.1. Modern telemedicine systems

Although many automatically consider telemedicine as a live, two-way teleconference with a healthcare provider, there are actually several different ways in which a patient can receive healthcare services through telemedicine systems (Frehse, 2021). As there is a large variety of telemedicine systems, the literature classifies them in order to organize the ways in which this new technology is used to improve health. The first basic classification of these systems is based on the criterion of communication synchronization (Waller et al., 2018).

In the above context, telemedicine systems can operate either in real time (synchronous) or asynchronously. The first technologies used in telemedicine were synchronous, and operated through cameras and television technology. Synchronous communication refers to interactions in which the provider and patient are simultaneously connected to the telemedicine system. This usually takes the form of teleconferencing, requires time coordination of the visit, and responses to clinical questions must occur in real time (Waller et al., 2018).

Modern consultation typically involves the use of teleconferencing technology via mobile and desktop computing and telecommunications technologies and is still used regularly today. It may also involve the use of additional peripheral equipment to enhance medical care. Some examples of these peripheral devices include telestethoscopes, teleotoscopes, and other related devices, allowing the healthcare provider to perform an examination and diagnosis (Whitten, Holtz & Laplante, 2010). Such technologies are currently used in many areas, such as telepsychiatry, remote emergency consultation for pediatric patients, stroke diagnosis and treatment, and teledermatology (Voran, 2015).

Teleconsultation also falls under telemedicine systems with synchronous communication. Teleconsultation is defined as synchronous or asynchronous consultation using information and communication technology to bypass geographical and functional distances. Its goal is for diagnosis or treatment between two or more geographically separated healthcare providers (for example, doctors or nurses) or between healthcare providers and patients (Deldar et al., 2016). Teleconsultations are usually conducted by appointment only and require the use of high-quality audiovisual equipment in specially designed spaces (Deldar et al., 2016).

Before the modern COVID-19 pandemic, where telemedicine was widely adopted in many medical settings, modern telemedicine systems, according to Wilson & Maeder (2015), were mainly adopted in the context of urgent care and the provision of mental health services remotely (telepsychiatry). For example, smaller EDs and ICUs in health facilities in the USA have traditionally operated under staffing constraints and increased patient load, resulting in the transfer of the latter to larger EDs in other health facilities, which was inconvenient for patients and their families. Many telemedicine solutions that have been adopted and developed have solved such problems.

1.2.2. Asynchronous telemedicine systems

Asynchronous communication refers to the exchange of information that occurs when the provider and the patient are not simultaneously connected to the telemedicine system. This type of technology allows for the collection of information and data about the patient's health status, which are recorded at specific times and viewed by a specialist or other healthcare provider at another time and location (Voran, 2015, Frehse, 2021). The advantage of this type of system is that visits do not need to be coordinated to take place simultaneously. Furthermore, participants in the information exchange, such as mainly doctors, have time to think about the information they will give to patients, leading to more careful consultations (Waller & Stotler, 2018).

In the above category of technologies, home telecare applications known as “remote patient monitoring” (RPM) are growing in popularity. Remote patient monitoring involves a provider at a remote monitoring location and acts on data provided by the patient from the point of origin or presentation. Such applications enable patients to take vital signs or other measurements, such as blood pressure, weight, blood glucose levels, etc. These measurements are collected in a system and automatically sent to healthcare providers via a telephone line or the internet. Many of these systems have “alerts,” notifying healthcare providers if measurements are outside of normal ranges (Voran, 2015).

These systems have been shown to have an impact on reducing hospital and emergency department readmission rates for patients with cardiovascular disease (Whitten et al., 2009). As the prevalence of many chronic diseases increases, remote health monitoring of chronic patients can provide an important platform for disease management and encourage preventive behaviors (Whitten et al., 2010).

In general, the conceptual model underlying remote patient monitoring is that clinically significant changes in a patient's condition occur between regularly scheduled visits and that these changes can be detected by measuring physiological parameters (Chiang et al., 2021). This model of care assumes that if these changes are identified and treated earlier, the patient's overall condition will improve. An important distinction between remote patient monitoring and many conventional forms of telemedicine is that remote monitoring focuses on management rather than diagnosis.

1.2.3. mHealth

Mobile health (mHealth) is another category of telemedicine systems. Mobile health involves the use of portable devices, such as smartphones and tablets, and is the modality that has gained the most popularity in recent years. The rise of mobile health in recent years is fueled by the increase in access to the internet and mobile devices, and has now led to the development of innovations based primarily on mobile phone technology (Henson et al., 2019). The US Food and Drug Administration (FDA) estimated that in 2018, approximately 1.7 million people in the US downloaded mobile health apps (including patients and healthcare professionals), and that there are more than 325,000 apps available (FDA, 2018). In the US, too, in 2018, more than $9 billion in venture and private capital was spent on digital health application development companies, which was $2 billion more than in 2017 (Gordon et al., 2020).

Similar growth is being recorded in Europe, and a recent study estimated the size of the e-health market to be $38.1 billion in 2019. Increasing importance also seems to be given by national governments to the development of relevant applications and systems, as a WHO report found that 70% of EU member states had national e-health policies or strategies by 2015 (WHO, 2016b). At a global level, according to Bol, Helberger & Weert (2018), in 2018 there were almost 3.2 million active health apps for mobile phones available on iTunes and 3.6 million active apps on the Google Play store, among which 95.8 thousand were health-related and 105.9 thousand were fitness-related.

Today, a wide range of health applications have been developed for many different uses. The first category of health applications is those that have been developed exclusively for management by health professionals, such as doctors, nurses, etc. These applications are generally more sophisticated,

with medical terminology and related functions. In a study published in 2012, a group of healthcare workers surveyed reported that the most popular categories of electronic application functions include medication reference tools, clinical decision support tools, communication tools, electronic health record access applications, and medical education applications (Boulos, 2014).

According to Ventola (2014), healthcare professionals use medical devices and applications for many purposes, which can be grouped into five broad categories: information and time management applications, applications and systems for maintaining and accessing patient health records, communication and consultation systems, information collection systems and applications, and systems that support medical education. Most such applications today fall into one of the above categories (Ventola, 2014, Kalra & Ingram, 2006).

There is also a wide range of applications that support the management of patients with chronic diseases. The use of digital health applications for remote monitoring of the health status of patients with chronic diseases is today a viable option for these patients. These applications offer the possibility of public health monitoring, collect data for the community and help people with disabilities living independently in the community. Special sensors embedded in clothing or other objects on patients automatically collect medical data (e.g., blood sugar), which can be accessed remotely by healthcare professionals. They also have alarms when vital signs or other signs exceed normal limits (Gardner, 2014).

1.3. Brief historical background of telemedicine

The great interest in telemedicine in recent years can be attributed to the advancement of telecommunications. Telemedicine, as we know it today, was first developed during the 1960s, when NASA concluded that the best way to continuously monitor the health of its astronauts from the ground was to properly utilize telecommunications technology and various health monitoring instruments. In fact, NASA incorporated telemedicine technology into the first spacecraft and astronauts' spacesuits to monitor their physiological health parameters. However, there are other medical milestones that mark the historical development of telemedicine (Bhattacharyya, 2017).

One of the first ventures was that of W. Einthoven, who, in 1905, used the telephone network to transmit electrocardiograms (ECGs) between his hospital and laboratory, which were 1.5 km apart (Fieschi, 2018). Some of the first telemedicine systems were also developed in the 1960s by the Nebraska Psychiatric Institute and Massachusetts General Hospital. In particular, in 1964, the Nebraska Psychiatric Institute began using a two-way closed-circuit television link between itself and Norfolk Hospital, which was approximately 112 miles away. This system was used for training and consultations between specialists and general practitioners (Fieschi, 2018).

In 1964, through the North-West Telemedicine project, a pilot satellite communications network, the Q-Network, was established in Australia by government authorities to provide health care to patients in five remote towns south of the Gulf of Carpathia. In 1965, with the invention of color television and the development of satellites, Dr. Michael DeBakey, a cardiovascular surgeon at Baylor College of Medicine, incorporated video tools into the medical education curriculum and that same year successfully transmitted the first live cardiac surgery lesson, from the operating rooms at Methodist Hospital at Texas Medical Center to Europe, using satellite transmission. In 1967, a medical station was also established at Logan International Airport in Boston, which provided a link to Massachusetts General Hospital, which was several miles away. Doctors at the Massachusetts hospital provided medical care to patients at the airport 24 hours a day, using a two-way microwave audio/video link (David, 2020).

Later, in the 1980s and 1990s, Western governments invested in integrating better telemedicine tools, emphasizing rural communities and the need to extend care to internationally deployed military forces. These actions were the first efforts to spur the development of modern telemedicine programs. Undoubtedly, the development of the Internet at that time gave new impetus to the development of telemedicine systems. The Internet was used in 1983 at the Texas Medical Center to disseminate medical information between doctors and patients in order to address “bottlenecks” in the in-hospital flow (David, 2020).

Since the 1990s, the cost of electronic equipment has decreased, along with its improved reliability, while digital compression technologies have been developed and network bandwidth has increased. These factors have led to the globalization of telemedicine and its uses have become more specialized. For example, telemedicine was used to remotely perform gallbladder surgery in 2001 by French doctor Jacques Marescaux and his medical team from a New York hospital to a patient in Strasbourg. Another famous example of the use of telemedicine, as we know it today, was in 1999, when Jerri Nielsen, a doctor working in Antarctica, received breast cancer diagnosis and treatment services remotely via a satellite connection. The video equipment and therapy were delivered by US Air Force pilots (Waller & Stotler 2018).

While the need to provide medical care to patients remotely has existed for a long time, the use of telemedicine to meet this need has only grown rapidly in recent decades. This is largely due to improvements in digital technology (Waller & Stotler 2018). The evolution of the Internet has helped to develop countless telemedicine projects since then (Fieschi, 2018), while more recently the development of laptops and mobile phones has given new impetus to the development of telemedicine systems and applications (Teoli & Aeddula, 2020). A recent study suggested that telehealth applications grew tenfold between 2012 and 2018, as assessed by the number of patients and by revenue from services and technology sales. This increase is mainly attributed to the rapid

proliferation of mobile and home devices, as well as the reduction in the cost of technology (Wilson & Maeder, 2015).

The interest in telemedicine today stems from the benefits that these systems have in improving access and more efficient use of resources in the healthcare sector. First, distance medical education provides an opportunity to reduce the knowledge gap between larger academic medical centers, when new medical knowledge is emerging, and health professionals in remote locations, who are increasingly under pressure to provide quality care and meet the needs of patients. In addition, telemedicine offers the possibility of creating a more efficient and accessible healthcare delivery system. The expansion of health services to rural communities facilitates improved quality and access to health programs and services that would otherwise not be available to these communities (David, 2020, Wootton, Craig & Patterson, 2017).

Chapter 2. The usefulness of telemedicine in chronic diseases

Telemedicine expands access and has the potential to make healthcare services more convenient for patients, especially those in rural areas, with young children (childcare), and with mobility limitations (Finkelstein et al., 2006; Rojas et al., 2008). Patient satisfaction is an important factor in all aspects of healthcare, and as the voice of the customer, it is a measure of quality through the collection of data and information on healthcare effectiveness. As with traditional healthcare delivery methods, telemedicine relies heavily on patient satisfaction reports, because they are the only source of information that can report how they were treated and whether the treatment they received met their expectations for care (Cleary, 2003).

According to the research by Gokalp, Folter, Verma, Fursse, Jones and Clarke (2018), carried out in the United Kingdom, for the monitoring of frail elderly people with chronic diseases, telemedicine services for the provision of improved care appear to have a positive impact on the well-being of patients.

Diseases such as chronic respiratory disease (COPD), hypertension, diabetes mellitus, congestive heart failure, stroke are making progress in their treatment with the implementation of telemedicine services, such as telemonitoring (Gokalp et al., 2018).

The research aimed to explore the possibilities of an integrated care system, a platform for telemonitoring of vital data and patient habits. The telemonitoring system used included sensors to record data such as activity level, restlessness in bed, body movements and bathroom visits (Gokalp et al., 2018).

The data collected recorded important information about the patient's well-being. Any change in activity levels is associated with changes in well-being. For example, hypoactivity due to depression and hyperactivity due to discomfort or the onset of dementia were observed. Also, frequent bathroom visits due to a urinary tract infection were recorded in one patient. Notifications were collected for events such as a patient falling and an increase in the nighttime activity level in a patient with a cold (Gokalp et al., 2018).

The data collected would not have been detected without the use of the telemonitoring platform. Patients were quite satisfied with the system and seemed to comply with the recommendations (Gokalp et al., 2018).

Finally, the research demonstrated the feasibility of integrating telemedicine services in the treatment of chronic diseases. Remote monitoring can reduce the time and cost of hospitalization and improve the patient's quality of life and well-being. Also, recording habits can provide important information about the progression of the disease, acting complementary to increasing the accuracy of the prediction and recommendations of doctors (Gokalp et al., 2018).

Several studies have addressed the use of e-health applications by citizens of various countries. In a 2021 survey of patients with obstructive pulmonary disease in Saudi Arabia on telemedicine applications, participants perceived their access to these technologies as adequate and recognized the time-saving benefits and fulfillment of healthcare requirements offered by e-health (Alsharif, 2021). In a study conducted in the United States of America (USA) that examined satisfaction with telemedicine services, respondents felt that in-person visits would likely yield better outcomes before and after the pandemic (Holtz, 2021). According to a 2021 study in Greece, e-prescribing emerged as the most widely recognized e-health application. However, the use of other applications was found to be generally inconsistent, with extremely low adoption rates (Kortsimelidou, 2021).

Diabetes mellitus is also one of the most prevalent diseases in the world, reaching epidemic proportions. It is considered one of the most difficult health problems of the 21st century, with a global prevalence of 2.8%, a figure that is expected to double by 2030, to 4.4% (Russel-Minda et al, 2009). The challenges in the care and treatment of diabetes mellitus are many and the deficits of the health system are even greater. The lack of trained medical and nursing staff as well as the patient's inability to cope with instructions, require innovative management strategies (Marcolino et al, 2013).

In addition, diabetes mellitus requires continuous self-care, self-management and support. Telemedicine services are capable of providing a rapid development in patient education and support. The application of technology in diabetes education, in addition to the integration of online programs, includes the analysis of data such as glucose measurements and patient lifestyle. In addition, a specially trained team of healthcare providers, doctors, nurses, dietitians, coaches, who aim for a better future for patients with diabetes, by creating patients who are prepared, informed and activated (Greenwood et al, 2017).

Technological developments in the health sector and telemedicine services can be a suitable strategy for closer and optimal management of diabetes mellitus. Given the wide variety of technologies and interventions, significant developments can be observed and progress can be made in the management of diabetes mellitus in terms of (Hanlon et al, 2017):

- Remote monitoring with continuous feedback and creation of action plans.
- Clinical review.
- Patient compliance (for example, in taking medication correctly) and lifestyle intervention (exercise, weight loss, smoking cessation).
- Psychological support.

The application of telehealth in the field of physical therapy (tele physiotherapy) can take many forms, based on intervention objectives and can be mainly distinguished into telemonitoring, teleguidance and telerehabilitation, which may include the other two categories (Holland, 2017; Hwang and Elkins, 2020). Regarding telemonitoring, it can be included in rehabilitation programs for

cardiorespiratory (e.g. oxygen saturation) and musculoskeletal diseases (e.g. joint range of motion), either by using special equipment or by using widely available devices and software. The use of mobile phones is noteworthy, which also contributes to the conduct of teleguidance, by exchanging audiovisual messages, interactive and/or automated programs (Holland, 2017). Although telemonitoring has been shown to be generally useful for self-management and reducing the risk of hospitalization, its implementation has not consistently yielded benefits in chronic conditions (heart failure and COPD) compared to usual care, perhaps due to the difficulty of maintaining long-term compliance with monitoring and the difficulty of detecting significant changes in variables. However, these trials were based on the observation of physiology and symptoms, rather than the provision of treatment (Holland, 2017; Hwang and Elkins, 2020).

At the same time, telemonitoring is proposed for exercise prescription, in order to control the quality, quantity of exercise and patient compliance, and to adapt the program appropriately to the needs and abilities of each patient. Of course, self-reported diaries and unsupervised exercise did not bring the expected compliance, which, combined with the above, leads to the conclusion that telemonitoring must be accompanied by other forms of tele physical therapy to be effective (Hwang and Elkins, 2020). It is a fact that the possibility of providing remote physical therapy has increased not only due to innovative technological achievements but also due to the emergence of therapeutic exercise as a means of treating a multitude of conditions, with the simultaneous reduction in the use of “hands-on” techniques. Many of these interventions, which typically include goal setting, exercise prescription, and self-management education, do not require in-person visits and are appropriately delivered via telerehabilitation (Holland, 2017). However, it should be noted that exercise prescription is a complex process and requires advanced therapeutic skills for patient education and communication (Suso-Martí et al, 2021). A key characteristic of successful tele physiotherapy interventions is that they have taken proven treatments in traditional practice and adapted them to the digital environment. At the same time, individualization of treatment is an integral part of these. The therapist should carefully choose the means of service delivery (e.g., video), synchronous or asynchronous session, the presence or absence of other people (caregivers, family members), the frequency of sessions, and the necessity of some in-person visits (e.g., for initial assessment) (Holland, 2017). According to Suso-Martí et al. (2021), telerehabilitation offers positive clinical outcomes or even comparable ones, regarding functionality, compared to conventional in-person rehabilitation techniques. Telerehabilitation allows the individual to continue rehabilitation in their personal social/professional environment and has a potential role in public health emergencies, such as the real pandemic era due to the inability to seek in-person sessions (Seelman and Hartman, 2009).

Chapter 3. Acceptance of telemedicine by chronic patients - technology acceptance models

Technology acceptance, according to Teo (2011), can be defined as the willingness of a user to use technology for the tasks it is designed to support. For several years, researchers in the field have been eager to understand the factors that influence the adoption of technologies in various settings and sectors. In most studies of technology acceptance, researchers have attempted to identify and understand the forces that shape user acceptance in order to influence the design and implementation process, with the ultimate aim of limiting avoidance and rejection of its use or minimizing resistance when users interact with the technology. This body of research has led to the identification of a set of technological and psychological variables on which technology acceptance is based (Teo, 2011).

In recent years, several theoretical models have been developed to assess and explain individuals' acceptance and behaviors towards the use of digital technologies. Many of these have been based on extensions of existing theories from the field of psychology. Perhaps the most popular theoretical model to date is the Technology Acceptance Model (TAM), which was developed in 1998. TAM originated from the social and psychological theories of the Theory of Reasoned Action (TRA) and the Theory of Planned Behavior (TPB) (Taherdoost, 2018).

The two models above, namely TRA and its extension, TPB theory, are cognitive theories that formulate conceptual frameworks for understanding human behavior in specific contexts. They study individuals' intention to perform a behavior, but their structure is different. According to TRA, the intention to engage in a specific behavior is considered the best predictor of whether or not an individual will engage in that behavior. Intentions, in turn, are predicted by attitudes and subjective norms, which means that the more positively an individual perceives a specific behavior or action (attitudes), and the more he or she perceives that his or her behavior is important to his or her friends, family, or social context (subjective norms), the more likely he or she is to form an intention to engage in that behavior (Ajzen & Fishbein, 1977; Ramírez-Correa et al., 2020).

TPB added to the above theoretical framework, another dimension, that of Perceived Behavioral Control (PBC), thus proposing that attitudes, subjective norms and perceived behavioral control are the three main determinants of behavior towards the adoption or use of a technology, which refers to behavioral intention and constitutes the fourth variable of TPB. TPB includes a total of five variables and the fifth variable is Actual Behavior (Actual Behavior) (Ramírez-Correa et al., 2020). TPB theory has been widely used to predict and explain many behaviors that individuals undertake in relation to their health, such as participation in exercise, weight loss, dietary behavior, smoking, oral hygiene, etc. Intentions are typically more powerful than perceived behavioral control in predicting health

behaviors, suggesting that such behaviors are largely driven by personal motivations (LaCaille et al., 2011).

Moving on to the TAM model, it was developed by Davis et al. (1989) by adapting the TRA and TPB theories, who proposed that it has the ability to predict the actual use of any information system. Davis introduced two key changes to both models. First, the influence of subjective norms in understanding actual behavior was not examined, while the individual's attitude towards the use of the system was examined in an alternative way. Second, two separate variables were examined, namely perceived usefulness (PU) and perceived ease of use (PEOU), which were considered sufficient to understand an individual's attitudes towards the use of any technology. Perceived usefulness, perceived ease of use and attitudes are the main cognitive determinants of the use and intention to use information technology in the TAM model. Perceived usefulness refers to the extent to which users of a technology believe that using a particular system will enhance their task performance, while perceived ease of use is the extent to which users believe that using a particular system will be easy (Rahimi et al., 2018; Al-Emran & Granić, 2021). Sometimes, other factors known as external variables (user training, system characteristics, user involvement in the design, and the nature of the implementation process) are taken into account in the TAM model (Taherdoost, 2018).

Several studies have used TAM to examine the use of various technologies, such as e-government, mobile learning and education, wireless technology, online and mobile banking, social networks, etc. (Al-Emran & Granić, 2021). The healthcare sector is also rich in applications, where TAM has been utilized to study the acceptance of technologies, both by healthcare providers (e.g. health information systems, electronic health records, pharmaceutical prescription systems, telemedicine, mobile health applications, automated data processing systems, clinical decision systems and many others), and by patients (e.g. telemedicine, mobile health applications, etc.) (Rahimi et al., 2018).

Later, some researchers suggested that there is a need to incorporate more variables into the TAM model, which would be related to the human and social processes of change. Thus, the TAM-2 model was developed, with the addition of three additional variables, social influence (subjective norms), cognitive processes (task relevance, quality of output, and demonstrated outcome), and previous experience (Venkatesh & Davis, 2000).

Later, Venkatesh and Bala (2008) presented the TAM-3 model, adding two groups of variables to perceived ease of use: anchors and adjustments. Anchors are considered to be individuals' general beliefs about computers and their use, and include a set of variables, including self-efficacy in using computers, perceptions of external control, anxiety in using computers, and enjoyment of using computers. Adjustments are understood as beliefs based on practical experiences, and include variables such as perceived enjoyment and usability goals, thus providing more information regarding the degree of ease or difficulty of an individual to use the system.

Another model proposed by Sharp (2006) is the Unified Theory of Acceptance and Use of Technology (UTAUT). It proposes four main determinants of information system use, which are performance expectations, effort expectations, social influence and facilitating conditions, also introducing four important mediating variables, which are gender, age, experience and voluntary use (Hoque & Sorwar, 2017). Performance expectations refer to whether the individual believes that using the system will have benefits on his or her own performance in the work domain, while effort expectations refer to whether the individual believes that using the system will require effort and effort from him or her. Social influence is defined similarly to previous technology acceptance models in the subjective norms variable. Finally, facilitation is a variable that reflects the extent to which the individual believes that the necessary infrastructure (technical, human, organizational) exists to support the use of the system.

A few years later, Venkatesh et al. (2012), published the UTAUT2 model, introducing three new variables: hedonic motivation, monetary value, and habits. Hedonic motivation is defined as the enjoyment or level of fun that the use of a technology can provide, and is considered to play an important role in the acceptance and use of mobile technology. Habits are defined as the extent to which people tend to undertake behaviors automatically due to learning, while the variable of monetary value (of technology) was added to the model because it is considered that costs and prices can have a significant impact on consumers' use of technology.

In summary, it has been suggested that the TAM model is the most popular among those concerned with technology acceptance and use, although the other models also have broad applications. Importantly, however, many of these models have also been adapted by introducing additional variables depending on the context of the study and the type of technology, or have been combined with each other (Rahimi et al., 2018).

Chapter 4. Method

4.1. Aim and rational of the study

In spite of the fact that several studies regarding the role of telemedicine in chronic disease patients have been conducted, there is a very limited number concerning investigation of telemedicine acceptance among patients suffering from musculoskeletal disorders in Greece. The aim of the present study is to explore the level of telemedicine acceptance among Greek patients with musculoskeletal disorders as well as the effect of sociodemographic and clinical characteristics on telemedicine acceptance.

4.2. Research design

The present study is quantitative and cross sectional including the dependent variable of telemedicine acceptance and the independent variables of sociodemographic (e.g. gender, age, education, marital status etc.) and clinical factors (perceived health status, years of diagnosis, years of treatment).

4.3. Sample

A cohort of 120 patients was recruited from two centers in Greece, a private physiotherapy clinic in the broader area of Athens and a public open social structure that hosts elderly people in the area of Patra, diagnosed with musculoskeletal disorders (neck pain, back pain and arthritis). From this cohort, 117 patients provided full data on the variables studied. The inclusion criteria were to be diagnosed with a musculoskeletal disorder, being above 18 years old, and having the ability to communicate in the Greek language. The exclusion criteria were: a) not diagnosed with musculoskeletal disorders, b) below 18 years old, c) not able to communicate in Greek. Some of these patients reported that they had experience in the use of technology, e.g. physiotherapy sessions via skype or zoom, online ordering of items from pharmacies or orthopedic stores.

4.4. Questionnaires

The questionnaire which was used in this study was derived from the relevant scale developed by Dehe Li et al. (2020). The original instrument aimed to capture patients' intention to use online health services based on the theory of planned behavior (TPB) (Ajzen, 1991), which is comprised of five domains: attitude toward the behavior, subjective norm, perceived behavioral control, behavioral intention, and actual behavior. According to TPB, people engage in certain activities according to their behavioral intention. To complement the subjective and social factors that may affect a patient's behavior in the healthcare settings (i.e., use of online services by a hospital), Dehe Li et al. (2020) added

sub-scales that were relevant to patient's perceived severity of sickness, and perceived medical risk from using an online service by a hospital. The final instrument consisted of 35 items across 12 dimensions or sub-scales. These sub-scales were namely the following: perceived convenience PC perceived outcome PO perceived medical risk PMR perceived information risk PIR emotional preference EP perceived medical liability PML attitude toward the behavior ATTB subjective norm SN health consciousness HN perceived severity of disease PSD perceived behavioral control PBC behavioral intention BI. This questionnaire has been translated, culturally adapted and tested within Greek population (Papachristou et al., 2023) consisting the only tool in Greece that can be used to investigate telemedicine acceptance. After communication with the researchers, permission was obtained to use the specific questionnaire. They also provided me with the form of the questionnaire as well as the scoring of it.

4.5. Procedure

The research protocol was approved by the Master Program Committee. Ethical permission to gather data was also obtained by the directors of the two centers. This study was conducted according to the guidelines of the Declaration of Helsinki. After communication with the private physiotherapy clinic and the public open social structure that hosts elderly people diagnosed with musculoskeletal disorders, questionnaires were distributed. The whole process took place within the centers. Patients were informed about the aim of the present study, the anonymity and confidentiality of the research data, as well as their right to discontinue their participation at any time during the survey. Completing the questionnaires by each patient took approximately 10 minutes. The collection of research data lasted from September to November 2025.

4.6. Statistical analysis

Means, standard deviations, and frequencies were calculated for the demographic and clinical characteristics of the patients, in order to capture their profile. In order to investigate the effect of sociodemographic and clinical characteristics on telemedicine acceptance and based on the fact that the sample is considered large (central limit theorem >30 observations), parametric tests were performed (Pearson correlation, independent samples t test, One - Way Anova). A p value of 0.05 or less was considered to indicate statistical significance. All statistical analyses were performed using the Jamovi Statistical Program.

Chapter 5. Results

The results of the present study are described below.

Table 5. 1. Descriptives regarding age, years of treatment and years since diagnosis

	Age	Years of treatment (musculoskeletal disorder)	Years since diagnosis (musculoskeletal disorder)
N	117	117	117
Missing	0	0	0
Mean	62.7	7.12	11.1
Median	66	5	8
Standard deviation	16.0	8.10	11.1
Minimum	24	1	1
Maximum	92	72	72

Regarding age, years of treatment and years since diagnosis, the results indicated that the age of the sample was 62.7±16.0 years, years of treatment were 7.12±8.10 while years since diagnosis were 11.1±11.1 (Table 5.1).

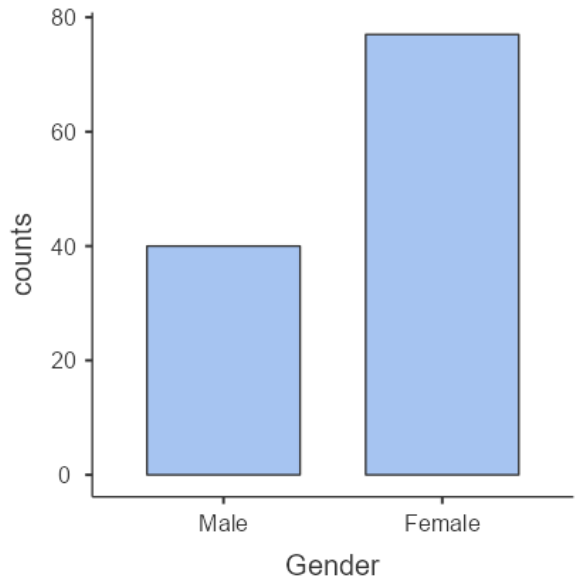

Figure 5. 1. Frequencies of Gender

As far as gender is concerned, the results showed that 77 females (65.8%) participated in the study while 40 males (34.2%) participated (Figure 5.1, Table 5.2).

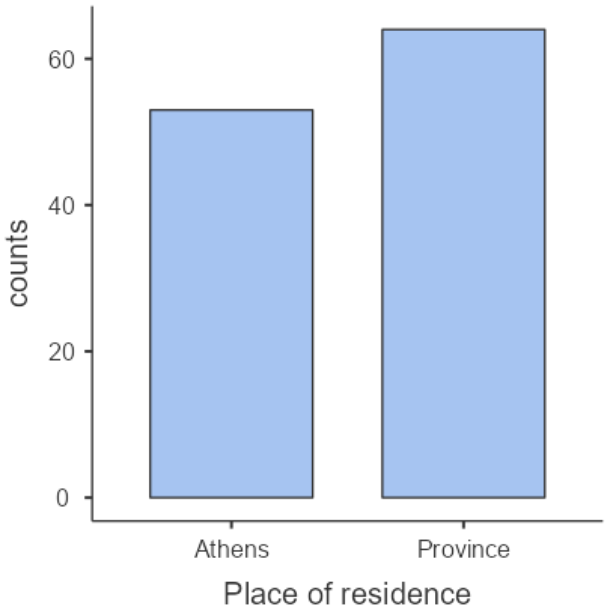

Figure 5. 2. Frequencies of place of residence

As far as place of residence is concerned, the results showed that 64 patients (54.7%) were living in province while 53 patients (45.3%) were living in Athens (Figure 5.2, Table 5.3).

Table 5. 2. Frequencies of education

Education	n	% of total	Cumulative %
Primary	27	23.1	23.1
High School	20	17.1	40.2
Lyceum	37	31.6	71.8
University	22	18.8	90.6
Master/PhD	11	9.4	100.0

Regarding the level of education, 37 patients (31.6%) were lyceum graduates, 27 patients (23.1%) had primary education, 22 patients (18.8%) were university graduates, 20 patients (17.1%) were high school graduates and 11 patients (9.4%) had Master/PhD (Table 5.4).

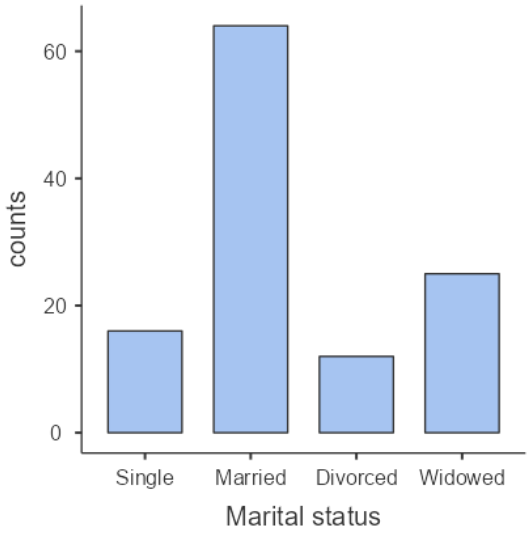

Figure 5. 3. Frequencies of marital status

Regarding marital status, 64 patients (54.7%) were married, 25 patients (21.4%) were widowed, 16 patients (13.7%) were single and 12 patients (10.3%) were divorced (Figure 5.3, Table 5.5).

Table 5. 3. Frequencies of work status

Work status	n	% of total	Cumulative %
Unemployed	1	0.9	0.9
Private Employee	21	17.9	18.8
Public Servant	18	15.4	34.2
Freelancer	16	13.7	47.9
Household	16	13.7	61.5
Pensioner	45	38.5	100.0

Regarding work status, 45 patients (38.5%) were pensioners, 21 patients (17.9%) were private employees, 18 patients (15.4%) were public servants, 16 patients (13.7%) were freelancers, 16 patients (13.7%) were households while only 1 patient (0.9%) was unemployed (Table 5.6).

Table 5. 4. Frequencies of annual income

Annual income	n	% of total	Cumulative %
<10,000 euros	39	33.3	33.3
10,000–15,000 euros	54	46.2	79.5
>15,000 euros	24	20.5	100.0

Regarding annual income, 54 patients (46.2%) had 10.000 - 15.000 euros, 39 patients (33.3%) had <10.000 euros while 24 patients (20.5%) had >15.000 euros (Table 5.7).

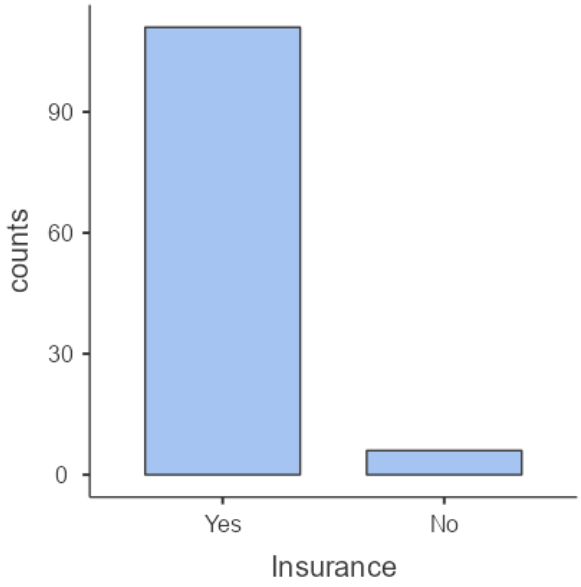

Figure 5. 4 Frequencies of insurance

Regarding insurance, 111 patients (94.9%) had insurance while 6 patients (5.1%) did not have insurance (Figure 5.4, Table 5.8).

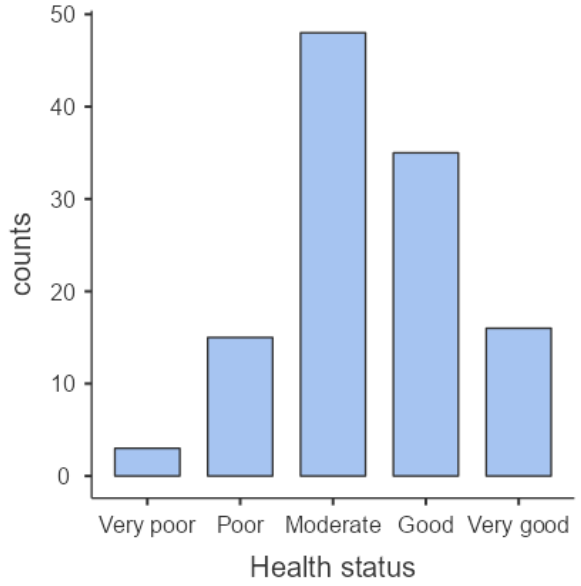

Figure 5. 5 Frequencies of health status

As far as health status is concerned, 48 patients (41.0%) had moderate health, 35 patients (29.9%) had good health status, 16 patients (13.7%) had very good health status, 15 patients (12.8%) had poor

health while only 3 patients (2.6%) answered that their health status was very poor (Figure 5.5, Table 5.9).

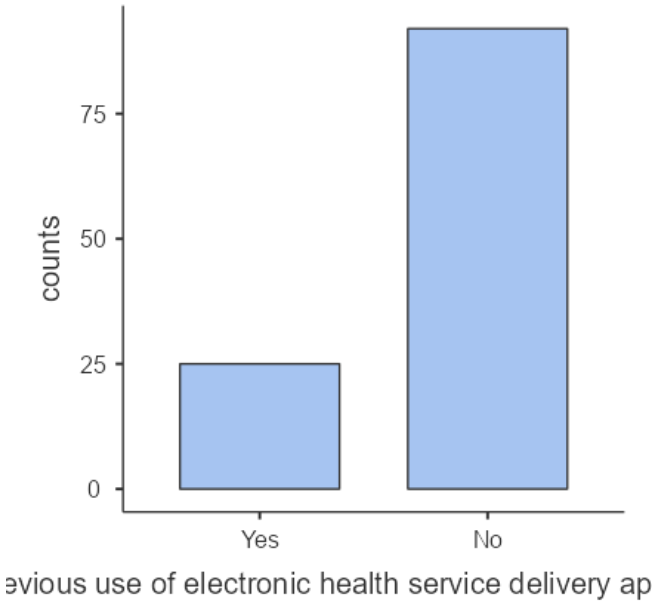

Figure 5. 6. Frequencies of previous use of electronic health services

Regarding previous use of electronic health service delivery applications, 92 patients (78.6%) had previous use while 25 patients (21.4%) did not have previous use (Figure 5.6, Table 5.10).

Regarding the descriptives of the 12 dimensions of the questionnaire used, the mean of the perceived convenience was 19.6±4.28 (min 7 max 25), the mean of the perceived outcome was 9.61±3.05 (min 3 max 15), the mean of the perceived medical risk was 14.7±5.48 (min 5 max 25), the mean of the perceived information risk was 6.81±2.13 (min 2 max 10), the mean of the emotional preference was 5.69±1.79 (min 2 max 10), the mean of the perceived medical liability was 11.8±2.16 (min 6 max 15), the mean of the attitude toward the behavior was 9.71±3.01 (min 3 max 15), the mean of the subjective norm was 11.6±2.95 (min 4 max 19), the mean of the health consciousness was 8.22±1.07 (min 6 max 10), the mean of the perceived severity of disease was 3.35±1.23 (min 1 max 5), the mean of the perceived behavioral control was 9.81±3.69 (min 3 max 15) and the mean of the behavioral intention was 5.86±2.34 (min 2 max 10).

In order to evaluate the correlation of age, years of treatment and years since diagnosis to all the dimensions of the questionnaire, Pearson correlation was performed. The results indicated a negative and statistically significant correlation of age to

- Perceived convenience (r= -0.578, p= <0.001)
- Perceived outcome (r= -0.380, p= <0.001)
- Emotional preference (r= -0.451, p= <0.001)

- Medical liability (r= -0.188, p= 0.042)
- Attitude toward the behavior (r= -0.393, p= <0.001)
- Health consciousness (r= -0.289, p= 0.002)
- Perceived behavioral control (r= -0.680, p= <0.001)
- Behavioral intention (r= -0.491, p= <0.001)
- Perceived severity of disease (r= -0.347, p= <0.001)

as well as a positive and statistically significant correlation of age to perceived medical risk (r= 0.538, p= <0.001).

Moreover, the results indicated a negative and statistically significant correlation of years of treatment to

- Perceived behavioral control (r= -0.244, p= 0.008)
- Behavioral intention (r= -0.240, p= 0.009)

as well as a positive and statistically significant correlation to perceived information risk (r= 0.241, p= 0.009).

Finally, the results indicated a negative and statistically significant correlation of years since diagnosis to

- Perceived outcome (r= -0.328, p= <0.001)
- Attitude toward the behavior (r= -0.311, p= <0.001)
- Subjective norm (r= -0.353, p= <0.001)
- Perceived behavioral control (r= -0.345, p= <0.001)
- Behavioral intention (r= -0.398, p= <0.001)

as well as a positive and statistically significant correlation to

- perceived medical risk (r= 0.224, p= 0.015)
- perceived information risk (r= 0.376, p= <0.001)

Table 5. 5. Differences between males and females regarding the level of telemedicine acceptance

	Group	N	Mean	Median	SD	SE	p
Perceived convenience	Male	40	19.35	19.00	3.93	0.622	0,698
	Female	77	19.68	20.00	4.46	0.509	
Perceived outcome	Male	40	8.78	8.50	3.30	0.522	**0,033**
	Female	77	10.04	11.00	2.83	0.323	
Perceived medical risk	Male	40	16.00	17.00	5.12	0.809	0,074
	Female	77	14.09	13.00	5.58	0.636	
Perceived information risk	Male	40	7.22	8.00	2.12	0.335	0,130
	Female	77	6.60	6.00	2.11	0.241	
Emotional preference	Male	40	5.05	6.00	1.71	0.270	**0,005**

	Female	77	6.03	6.00	1.75	0.199	
Perceived medical liability	Male	40	12.32	12.00	1.69	0.266	**0,041**
	Female	77	11.47	12.00	2.33	0.265	
Attitude toward the behavior	Male	40	9.15	9.50	3.36	0.531	0,148
	Female	77	10.00	10.00	2.79	0.318	
Subjective norm	Male	40	10.57	11.00	2.85	0.450	**0,009**
	Female	77	12.06	12.00	2.89	0.329	
Health consciousness	Male	40	7.88	8.00	1.09	0.172	**0,011**
	Female	77	8.40	8.00	1.02	0.116	
Perceived severity of disease	Male	40	3.23	4.00	1.29	0.204	0,428
	Female	77	3.42	4.00	1.20	0.136	
Perceived behavioral control	Male	40	9.70	10.00	3.11	0.493	0,814
	Female	77	9.87	11.00	3.98	0.453	
Behavioral intention	Male	40	5.30	5.00	2.23	0.353	0,061
	Female	77	6.16	7.00	2.36	0.269	

Regarding differences between males and females on the level of telemedicine acceptance, the results showed statistically significant differences in the dimensions of perceived outcome, emotional preference, perceived medical liability, subjective norm and health consciousness ($p<0.05$). In particular, as presented in table 5.11, females indicated higher scores compared to males in the dimensions of perceived outcome, emotional preference, subjective norm and health consciousness. On the contrary, males evaluated more favorably than females the dimension of perceived medical liability.

Table 5. 6. Differences between residents in Athens and province regarding the level of telemedicine acceptance

	Group	**N**	**Mean**	**Median**	**SD**	**SE**	**p**
Perceived convenience	Athens	53	21.89	23.00	3.24	0.446	**< .001**
	Province	64	17.64	18.00	4.084	0.510	
Perceived outcome	Athens	53	9.92	12.00	3.27	0.449	0.307
	Province	64	9.34	9.00	2.846	0.356	
Perceived medical risk	Athens	53	12.85	10.00	5.80	0.797	**< .001**
	Province	64	16.31	17.00	4.693	0.587	
Perceived information risk	Athens	53	7.15	7.00	2.27	0.311	0.117
	Province	64	6.53	6.00	1.976	0.247	
Emotional preference	Athens	53	6.36	6.00	1.53	0.211	**< .001**
	Province	64	5.14	5.00	1.807	0.226	
Perceived medical liability	Athens	53	12.36	13.00	1.94	0.267	**0.006**
	Province	64	11.27	12.00	2.220	0.277	

Attitude toward the behavior	Athens	53	10.11	10.00	3.34	0.458	0.187
	Province	64	9.38	10.00	2.682	0.335	
Subjective norm	Athens	53	10.92	11.00	3.22	0.442	**0.034**
	Province	64	12.08	12.00	2.614	0.327	
Health consciousness	Athens	53	8.45	8.00	1.12	0.154	**0.033**
	Province	64	8.03	8.00	0.992	0.124	
Perceived severity of disease	Athens	53	3.72	4.00	1.17	0.160	**0.003**
	Province	64	3.05	4.00	1.201	0.150	
Perceived behavioral control	Athens	53	11.45	13.00	3.64	0.500	**< .001**
	Province	64	8.45	8.00	3.167	0.396	
Behavioral intention	Athens	53	6.23	7.00	2.46	0.338	0.128
	Province	64	5.56	5.00	2.217	0.277	

Regarding differences between residents in Athens and province on the level of telemedicine acceptance, the results showed statistically significant differences in the dimensions of perceived convenience, perceived medical risk, emotional preference, perceived medical liability, subjective norm, health consciousness, perceived severity of disease and perceived behavioral control ($p<0.05$). In particular, as presented in table 5.12, residents in Athens indicated higher scores compared to residents in province in the dimensions of perceived convenience, emotional preference, perceived medical liability, health consciousness, perceived severity of disease and perceived behavioral control. On the contrary, residents in province evaluated more favorably than residents in Athens the dimensions of perceived medical risk and subjective norm.

Table 5. 7. Differences between patients with insurance and those with no insurance regarding the level of telemedicine acceptance

	Group	**N**	**Mean**	**Median**	**SD**	**SE**	**p**
Perceived convenience	Yes	111	19.72	20.00	4.26	0.405	0.088
	No	6	16.67	17.00	3.724	1.520	
Perceived outcome	Yes	111	9.70	10.00	3.07	0.291	0.144
	No	6	7.83	7.50	1.941	0.792	
Perceived medical risk	Yes	111	14.45	13.00	5.46	0.518	**0.012**
	No	6	20.17	20.00	2.041	0.833	
Perceived information risk	Yes	111	6.69	6.00	2.11	0.200	**0.009**
	No	6	9.00	9.00	1.095	0.447	
Emotional preference	Yes	111	5.69	6.00	1.79	0.170	0.971
	No	6	5.67	5.00	1.966	0.803	
Perceived medical liability	Yes	111	11.76	12.00	2.18	0.206	0.933
	No	6	11.83	11.50	2.041	0.833	
Attitude toward the behavior	Yes	111	9.83	10.00	2.98	0.283	0.064

	No	6	7.50	6.50	2.739	1.118	
Subjective norm	Yes	111	11.62	12.00	2.91	0.276	0.299
	No	6	10.33	9.50	3.615	1.476	
Health consciousness	Yes	111	8.19	8.00	1.07	0.101	0.151
	No	6	8.83	8.50	0.983	0.401	
Perceived severity of disease	Yes	111	3.42	4.00	1.20	0.113	**0.005**
	No	6	2.00	2.00	1.095	0.447	
Perceived behavioral control	Yes	111	10.04	10.00	3.63	0.344	**0.004**
	No	6	5.67	6.00	2.251	0.919	
Behavioral intention	Yes	111	5.97	6.00	2.30	0.218	**0.029**
	No	6	3.83	3.00	2.401	0.980	

Regarding differences between patients with insurance and those with no insurance on the level of telemedicine acceptance, the results showed statistically significant differences in the dimensions of perceived medical risk, perceived information risk, perceived severity of disease, perceived behavioral control and behavioral intention ($p<0.05$). In particular, as presented in table 5.13, those with no insurance indicated higher scores compared to patients with insurance in the dimensions of perceived medical risk as well as perceived information risk. On the contrary, patients with insurance evaluated more favorably than those with no insurance the dimensions of perceived severity of disease, perceived behavioral control and behavioral intention.

Table 5. 8. Differences between patients with previous use of electronic health applications and not regarding the level of telemedicine acceptance

	Group	N	Mean	Median	SD	SE	p
Perceived convenience	Yes	25	23.12	24.00	2.682	0.536	**< .001**
	No	92	18.60	19.00	4.12	0.430	
Perceived outcome	Yes	25	11.80	12.00	1.443	0.289	**< .001**
	No	92	9.01	9.00	3.10	0.323	
Perceived medical risk	Yes	25	9.60	9.00	3.697	0.739	**< .001**
	No	92	16.14	17.00	5.05	0.526	
Perceived information risk	Yes	25	5.68	6.00	1.547	0.309	**0.002**
	No	92	7.12	8.00	2.16	0.225	
Emotional preference	Yes	25	6.96	7.00	1.428	0.286	**< .001**
	No	92	5.35	6.00	1.73	0.180	
Perceived medical liability	Yes	25	12.12	12.00	2.223	0.445	0.351
	No	92	11.66	12.00	2.14	0.224	
Attitude toward the behavior	Yes	25	11.96	12.00	2.031	0.406	**< .001**
	No	92	9.10	9.00	2.94	0.307	
Subjective norm	Yes	25	12.96	13.00	1.457	0.291	**0.007**

	No	92	11.17	11.00	3.13	0.327	
Health consciousness	Yes	25	8.76	9.00	1.052	0.210	**0.004**
	No	92	8.08	8.00	1.03	0.107	
Perceived severity of disease	Yes	25	4.28	4.00	0.843	0.169	**< .001**
	No	92	3.10	3.50	1.20	0.125	
Perceived behavioral control	Yes	25	13.04	14.00	2.669	0.534	**< .001**
	No	92	8.93	9.00	3.44	0.359	
Behavioral intention	Yes	25	7.56	8.00	1.325	0.265	**< .001**
	No	92	5.40	5.00	2.35	0.245	

Regarding differences between patients with previous use of electronic health applications and those with no previous use on the level of telemedicine acceptance, the results showed statistically significant differences in all the dimensions ($p<0.05$) apart from perceived medical liability. In particular, as presented in table 5.14, those with no previous use indicated higher scores compared to patients with previous use in the dimensions of perceived medical risk as well as perceived information risk. On the contrary, patients with previous use of electronic health applications evaluated more favorably than those with no previous use the dimensions of perceived convenience, perceived outcome, emotional preference, attitude toward the behavior, subjective norm, health consciousness, perceived severity of disease, perceived behavioral control and behavioral intention.

Table 5. 9. Differences among patients with different education regarding the level of telemedicine acceptance

	Education	**N**	**Mean**	**SD**	**SE**	**p**
Perceived convenience	Primary	27	16.63	4.244	0.817	
	High School	20	18.45	3.395	0.759	
	Lyceum	37	20.00	3.951	0.650	**< .001**
	University	22	20.91	3.624	0.773	
	Master/PhD	11	24.64	0.924	0.279	
Perceived outcome	Primary	27	8.11	3.630	0.699	
	High School	20	7.85	2.601	0.582	
	Lyceum	37	10.22	2.647	0.435	**< .001**
	University	22	10.59	2.016	0.430	
	Master/PhD	11	12.45	1.440	0.434	
Perceived medical risk	Primary	27	18.81	4.796	0.923	
	High School	20	17.40	4.198	0.939	
	Lyceum	37	14.08	5.117	0.841	**< .001**
	University	22	11.41	3.899	0.831	
	Master/PhD	11	8.82	2.359	0.711	
Perceived information risk	Primary	27	7.59	2.206	0.425	**0.002**

	High School	20	7.55	2.282	0.510	
	Lyceum	37	6.92	1.862	0.306	
	University	22	5.77	1.660	0.354	
	Master/PhD	11	5.27	1.954	0.589	
Emotional preference	Primary	27	4.67	1.441	0.277	
	High School	20	5.20	1.765	0.395	
	Lyceum	37	6.14	1.512	0.249	**0.001**
	University	22	6.14	1.983	0.423	
	Master/PhD	11	6.73	1.902	0.574	
Perceived medical liability	Primary	27	10.96	2.278	0.438	
	High School	20	12.10	1.252	0.280	
	Lyceum	37	11.97	2.279	0.375	0.305
	University	22	11.86	2.315	0.494	
	Master/PhD	11	12.18	2.316	0.698	
Attitude toward the behavior	Primary	27	7.89	3.178	0.612	
	High School	20	8.45	2.837	0.634	
	Lyceum	37	10.14	2.750	0.452	**< .001**
	University	22	11.14	2.100	0.448	
	Master/PhD	11	12.18	1.662	0.501	
Subjective norm	Primary	27	10.44	3.130	0.602	
	High School	20	9.85	3.117	0.697	
	Lyceum	37	11.89	2.736	0.450	**< .001**
	University	22	12.95	2.058	0.439	
	Master/PhD	11	13.45	1.753	0.529	
Health consciousness	Primary	27	8.04	0.898	0.173	
	High School	20	7.70	1.174	0.263	
	Lyceum	37	8.35	1.006	0.165	0.099
	University	22	8.45	1.057	0.225	
	Master/PhD	11	8.73	1.191	0.359	
Perceived severity of disease	Primary	27	2.96	1.224	0.236	
	High School	20	2.95	1.146	0.256	
	Lyceum	37	3.41	1.257	0.207	**0.005**
	University	22	3.64	1.136	0.242	
	Master/PhD	11	4.27	0.905	0.273	
Perceived behavioral control	Primary	27	6.04	2.766	0.532	
	High School	20	9.10	2.222	0.497	
	Lyceum	37	10.38	3.269	0.537	**< .001**
	University	22	12.27	2.472	0.527	
	Master/PhD	11	13.55	2.876	0.867	
Behavioral intention	Primary	27	4.11	2.207	0.425	**< .001**
	High School	20	4.70	2.029	0.454	

	Lyceum	37	6.08	1.963	0.323	
	University	22	7.64	1.497	0.319	
	Master/PhD	11	8.00	1.265	0.381	

Regarding differences among patients with different education on the level of telemedicine acceptance, the results showed statistically significant differences in the dimensions of perceived convenience, perceived outcome, perceived medical risk, perceived information risk, emotional preference, attitude toward the behavior, subjective norm, perceived severity of disease, perceived behavioral control and behavioral intention ($p<0.05$). In particular, as presented in table 5.15, patients with Master/PhD showed higher scores in the dimensions of perceived convenience, perceived outcome, emotional preference, attitude toward the behavior, subjective norm, perceived severity of disease, perceived behavioral control and behavioral intention. On the contrary, patients with primary education indicated higher scores in the dimensions of perceived medical risk and perceived information risk.

Table 5. 10. Differences among patients with different marital status regarding the level of telemedicine acceptance

	Marital status	**N**	**Mean**	**SD**	**SE**	**p**
Perceived convenience	Single	16	20.81	5.102	1.275	**0.036**
	Married	64	19.61	4.058	0.507	
	Divorced	12	21.58	3.848	1.111	
	Widowed	25	17.68	3.913	0.783	
Perceived outcome	Single	16	10.56	2.732	0.683	0.277
	Married	64	9.36	2.989	0.374	
	Divorced	12	10.67	3.339	0.964	
	Widowed	25	9.12	3.166	0.633	
Perceived medical risk	Single	16	12.13	4.992	1.248	**0.007**
	Married	64	14.97	5.185	0.648	
	Divorced	12	11.50	5.713	1.649	
	Widowed	25	17.40	5.180	1.036	
Perceived information risk	Single	16	6.69	2.272	0.568	0.948
	Married	64	6.86	2.084	0.261	
	Divorced	12	6.50	2.236	0.645	
	Widowed	25	6.92	2.197	0.439	
Emotional preference	Single	16	6.44	1.504	0.376	**0.035**
	Married	64	5.61	1.848	0.231	
	Divorced	12	6.42	2.109	0.609	
	Widowed	25	5.08	1.412	0.282	

Perceived medical liability	Single	16	12.25	1.653	0.413	0.416
	Married	64	11.73	2.318	0.290	
	Divorced	12	12.17	2.329	0.672	
	Widowed	25	11.32	1.952	0.390	
Attitude toward the behavior	Single	16	10.31	3.049	0.762	0.380
	Married	64	9.77	3.038	0.380	
	Divorced	12	10.33	3.229	0.932	
	Widowed	25	8.88	2.774	0.555	
Subjective norm	Single	16	12.88	2.247	0.562	0.053
	Married	64	11.27	3.061	0.383	
	Divorced	12	12.58	2.353	0.679	
	Widowed	25	10.96	3.062	0.612	
Health consciousness	Single	16	8.44	1.094	0.273	0.315
	Married	64	8.11	1.100	0.138	
	Divorced	12	8.67	0.985	0.284	
	Widowed	25	8.16	0.987	0.197	
Perceived severity of disease	Single	16	3.63	1.310	0.328	0.161
	Married	64	3.38	1.228	0.153	
	Divorced	12	3.75	1.215	0.351	
	Widowed	25	2.92	1.115	0.223	
Perceived behavioral control	Single	16	11.50	4.290	1.072	**< .001**
	Married	64	9.83	3.278	0.410	
	Divorced	12	12.83	2.368	0.683	
	Widowed	25	7.24	3.205	0.641	
Behavioral intention	Single	16	6.69	2.414	0.604	**0.014**
	Married	64	6.02	2.271	0.284	
	Divorced	12	6.67	2.060	0.595	
	Widowed	25	4.56	2.200	0.440	

Regarding differences among patients with different marital status on the level of telemedicine acceptance, the results showed statistically significant differences in the dimensions of perceived convenience, perceived medical risk, emotional preference, perceived behavioral control and behavioral intention ($p<0.05$). In particular, as presented in table 5.16, in the dimensions of perceived convenience and perceived behavioral control, divorced patients presented the higher scores compared to the other groups. Moreover, in the dimension of perceived medical risk widowed patients presented the higher score while in the dimensions of emotional preference and behavioral intention single patients had the higher scores.

Table 5. 11. Differences among patients with different annual income regarding the level of telemedicine acceptance

	Annual income	N	Mean	SD	SE	p
Perceived convenience	<10.000 euros	39	18.90	3.844	0.616	0.198
	10.000 - 15.000 euros	54	20.33	4.243	0.577	
	>15.000 euros	24	18.92	4.872	0.994	
Perceived outcome	<10.000 euros	39	9.03	3.313	0.530	0.090
	10.000 - 15.000 euros	54	9.61	3.111	0.423	
	>15.000 euros	24	10.54	2.206	0.450	
Perceived medical risk	<10.000 euros	39	16.28	5.601	0.897	0.109
	10.000 - 15.000 euros	54	14.06	5.455	0.742	
	>15.000 euros	24	13.79	5.013	1.023	
Perceived information risk	<10.000 euros	39	7.64	2.206	0.353	**< .001**
	10.000 - 15.000 euros	54	6.78	1.920	0.261	
	>15.000 euros	24	5.54	1.841	0.376	
Emotional preference	<10.000 euros	39	5.67	1.782	0.285	0.912
	10.000 - 15.000 euros	54	5.65	1.814	0.247	
	>15.000 euros	24	5.83	1.810	0.369	
Perceived medical liability	<10.000 euros	39	11.72	1.932	0.309	0.756
	10.000 - 15.000 euros	54	11.91	2.317	0.315	
	>15.000 euros	24	11.50	2.207	0.450	
Attitude toward the behavior	<10.000 euros	39	9.10	3.362	0.538	0.206
	10.000 - 15.000 euros	54	9.85	3.006	0.409	
	>15.000 euros	24	10.38	2.223	0.454	
Subjective norm	<10.000 euros	39	10.95	3.324	0.532	0.318
	10.000 - 15.000 euros	54	11.81	2.908	0.396	
	>15.000 euros	24	11.96	2.255	0.460	
Health consciousness	<10.000 euros	39	8.38	0.990	0.158	0.319
	10.000 - 15.000 euros	54	8.22	1.093	0.149	
	>15.000 euros	24	7.96	1.122	0.229	
Perceived severity of disease	<10.000 euros	39	3.13	1.239	0.198	0.292
	10.000 - 15.000 euros	54	3.54	1.239	0.169	
	>15.000 euros	24	3.29	1.160	0.237	
Perceived behavioral control	<10.000 euros	39	8.54	3.560	0.570	**0.028**
	10.000 - 15.000 euros	54	10.33	3.686	0.502	
	>15.000 euros	24	10.71	3.507	0.716	
Behavioral intention	<10.000 euros	39	5.31	2.597	0.416	0.125
	10.000 - 15.000 euros	54	5.98	2.269	0.309	
	>15.000 euros	24	6.50	1.934	0.395	

Regarding differences among patients with different annual income on the level of telemedicine acceptance, the results showed statistically significant differences in two dimensions ($p<0.05$), that is perceived information risk and perceived behavioral control. In particular, as presented in table 5.17, patients with annual income <10.000 euros presented higher score in the dimension of perceived information risk compared to other two groups. On the contrary, patients with annual income >15.000 euros presented higher score in the dimension of perceived behavioral control.

Table 5. 12. Differences among patients with different health status regarding the level of telemedicine acceptance

	Health status	N	Mean	SD	SE	p
Perceived convenience	Very poor	3	13.00	1.732	1.000	**< .001**
	Poor	15	16.20	4.144	1.070	
	Moderate	48	19.04	3.994	0.577	
	Good	35	21.40	3.397	0.574	
	Very good	16	21.50	4.017	1.004	
Perceived outcome	Very poor	3	6.67	3.786	2.186	**0.017**
	Poor	15	7.40	2.530	0.653	
	Moderate	48	9.42	3.072	0.443	
	Good	35	10.60	2.546	0.430	
	Very good	16	10.63	3.074	0.769	
Perceived medical risk	Very poor	3	21.67	2.082	1.202	**< .001**
	Poor	15	18.60	4.421	1.141	
	Moderate	48	15.35	5.059	0.730	
	Good	35	12.57	5.129	0.867	
	Very good	16	12.75	5.733	1.433	
Perceived information risk	Very poor	3	6.00	3.464	2.000	0.399
	Poor	15	7.40	2.324	0.600	
	Moderate	48	7.17	1.950	0.281	
	Good	35	6.40	1.988	0.336	
	Very good	16	6.25	2.408	0.602	
Emotional preference	Very poor	3	4.00	3.464	2.000	0.055
	Poor	15	4.93	2.086	0.539	
	Moderate	48	5.44	1.712	0.247	
	Good	35	6.00	1.475	0.249	
	Very good	16	6.81	1.424	0.356	
Perceived medical liability	Very poor	3	11.33	2.082	1.202	0.796
	Poor	15	12.07	1.870	0.483	
	Moderate	48	11.52	2.370	0.342	
	Good	35	12.06	1.765	0.298	

	Very good	16	11.63	2.655	0.664	
Attitude toward the behavior	Very poor	3	5.00	1.732	1.000	**0.005**
	Poor	15	8.53	3.335	0.861	
	Moderate	48	9.50	2.721	0.393	
	Good	35	10.51	2.934	0.496	
	Very good	16	10.56	2.851	0.713	
Subjective norm	Very poor	3	15.00	0.000	0.000	NaN
	Poor	15	9.07	1.981	0.511	
	Moderate	48	11.46	3.142	0.453	
	Good	35	11.89	2.621	0.443	
	Very good	16	12.81	2.536	0.634	
Health consciousness	Very poor	3	8.67	1.155	0.667	0.195
	Poor	15	8.13	0.834	0.215	
	Moderate	48	7.94	1.099	0.159	
	Good	35	8.37	1.003	0.169	
	Very good	16	8.75	1.125	0.281	
Perceived severity of disease	Very poor	3	1.00	0.000	0.000	NaN
	Poor	15	2.40	0.986	0.254	
	Moderate	48	3.06	1.080	0.156	
	Good	35	3.83	1.043	0.176	
	Very good	16	4.50	0.632	0.158	
Perceived behavioral control	Very poor	3	7.33	3.786	2.186	**0.006**
	Poor	15	6.93	3.262	0.842	
	Moderate	48	9.06	3.218	0.465	
	Good	35	11.46	3.320	0.561	
	Very good	16	11.63	3.879	0.970	
Behavioral intention	Very poor	3	2.67	1.155	0.667	**< .001**
	Poor	15	4.20	2.455	0.634	
	Moderate	48	5.63	2.312	0.334	
	Good	35	6.66	1.955	0.330	
	Very good	16	7.00	1.862	0.465	

Regarding differences among patients with different health status on the level of telemedicine acceptance, the results showed statistically significant differences in the dimensions of perceived convenience, perceived outcome, perceived medical risk, attitude toward the behavior, perceived behavioral control and behavioral intention ($p<0.05$). In particular, as presented in table 5.18, patients with very good health status indicated higher scores compared to the other groups in the dimensions of perceived convenience, perceived outcome, attitude toward the behavior, perceived behavioral

control and behavioral intention. On the contrary, in the dimension of perceived medical risk, those patients with very poor health status presented the higher score.

Chapter 6. Discussion

The aim of the present study was to explore the level of telemedicine acceptance among Greek patients with musculoskeletal disorders as well as the effect of sociodemographic and clinical characteristics on telemedicine acceptance.

In the context of our central research hypothesis, the findings confirm it. In particular, it seems that age is closely related to telemedicine acceptance among Greek patients with musculoskeletal disorders. This finding is in line with the findings of other similar studies (Li et al., 2023, Kabir et al., 2024). In the study of Shao et al. (2023) regarding the factors influencing the behavioral intentions and use behaviors of telemedicine in patients with diabetes, telemedicine use was higher in the 40 to 59 years and 18 to 39 years age groups than in the ≥60 years age group. In another study, Islam et al. (2021) revealed that the proportion of people who could read SMS was significantly higher among younger people.

Further, in our study, females seem to evaluate more favorably compared to males the dimensions of perceived outcome, emotional preference, subjective norm and health consciousness. On the contrary, males evaluate more favorably than females the dimension of perceived medical liability. The crucial role that gender plays is confirmed by other studies as well (Islam et al., 2021).

Concerning the variable of residence, the present study shows that residents in Athens indicate higher scores compared to residents in province in most dimensions of telemedicine acceptance, that is perceived convenience, emotional preference, perceived medical liability, health consciousness, perceived severity of disease and perceived behavioral control. On the contrary, residents in province evaluate more favorably the dimensions of perceived medical risk and subjective norm. In the study of Kabir et al. (2024) urban people were more intent on utilizing this service compared to rural individuals.

Regarding differences between patients with insurance and those with no insurance on the level of telemedicine acceptance, the results show that those with no insurance indicate higher scores compared to patients with insurance in the dimensions of perceived medical risk as well as perceived information risk. On the contrary, patients with insurance evaluate more favorably than those with no insurance the dimensions of perceived severity of disease, perceived behavioral control and behavioral intention.

Regarding differences between patients with previous use of electronic health applications and those with no previous use on the level of telemedicine acceptance, the findings demonstrate that those with no previous use indicate higher scores compared to patients with previous use in the dimensions of perceived medical risk as well as perceived information risk. On the contrary, patients with previous use of electronic health applications seem to be more familiar and more willing to adapt to the use of the new technologies. For this reason, they evaluate more favorably than those with no

previous use many dimensions of the questionnaire, that is perceived convenience, perceived outcome, emotional preference, attitude toward the behavior, subjective norm, health consciousness, perceived severity of disease, perceived behavioral control and behavioral intention. This finding corresponds to other similar research findings (Li et al., 2023, Kyroudi & Katsaliaki, 2024, Memenga, & Link, 2024).

Regarding differences among patients with different education on the level of telemedicine acceptance, the results show statistically significant differences in the dimensions of perceived convenience, perceived outcome, perceived medical risk, perceived information risk, emotional preference, attitude toward the behavior, subjective norm, perceived severity of disease, perceived behavioral control and behavioral intention. In particular, patients with Master/PhD show higher scores in the dimensions of perceived convenience, perceived outcome, emotional preference, attitude toward the behavior, subjective norm, perceived severity of disease, perceived behavioral control and behavioral intention. On the contrary, patients with primary education indicate higher scores only in the dimensions of perceived medical risk and perceived information risk. This finding also corresponds to other similar research findings (Li et al., 2023, Kabir et al., 2024, Islam et al., 2021). In the study of Shao et al. (2023) regarding the factors influencing the behavioral intentions and use behaviors of telemedicine in patients with diabetes, telemedicine use was higher in the senior high school and the university.

Regarding differences among patients with different marital status on the level of telemedicine acceptance, the results show statistically significant differences in the dimensions of perceived convenience, perceived medical risk, emotional preference, perceived behavioral control and behavioral intention. In particular, in the dimensions of perceived convenience and perceived behavioral control, divorced patients present higher scores compared to the other groups. Moreover, in the dimension of perceived medical risk widowed patients present the higher score while in the dimensions of emotional preference and behavioral intention single patients have the higher scores. The crucial role that marital status plays is confirmed by other studies as well (Kabir et al., 2024).

Regarding differences among patients with different annual income on the level of telemedicine acceptance, the results show statistically significant differences in two dimensions, that is perceived information risk and perceived behavioral control. In particular, patients with annual income <10.000 euros present higher score in the dimension of perceived information risk compared to other two groups. On the contrary, patients with annual income >15.000 euros present higher score in the dimension of perceived behavioral control. The crucial role that the factor of income plays is confirmed by other studies as well (Islam et al., 2021, Shao et al., 2023).

The present study also demonstrates the importance of health status on the level of telemedicine acceptance. In particular, patients with very good health status indicate higher scores compared to the

other groups in the dimensions of perceived convenience, perceived outcome, attitude toward the behavior, perceived behavioral control and behavioral intention. On the contrary, in the dimension of perceived medical risk, those patients with very poor health status present the higher score. In the study of Kabir et al. (2024) regarding the factors associated with the intention of telehealth service utilization among Bangladeshi people, perceived health status is significantly associated with the participants' intention to utilize the telehealth service.

Finally, this study determines years of treatment as well as years since diagnosis as two important variables which are closely related to the telemedicine acceptance. It seems that patients with more years of treatment and more years since diagnosis are burdened and not very willing to adapt to the use of the new technologies. The duration of treatment has been explored in the past in many studies indicating that it is an independent factor which may affect negatively the patients' life (Ginieri - Coccossis et al., 2008).

This study has some limitations, under which it is useful to examine its findings. First, the survey of patients with musculoskeletal disorders focused on health and social welfare units in specific regions of the country. Therefore, the findings reflect the level of acceptance of these patients in a specific part of Greece and cannot be generalized to the general population of patients. Moreover, the present study examined the topic of telemedicine acceptance in a group of specific patients as well as the effect of specific variables. Future studies may be conducted in different groups of chronic disease patients measuring the impact of other independent factors as well (e.g. type of musculoskeletal problems, type of telemedicine applications used etc.).

Conclusion

The use of technology and its services, such as telemedicine, is an important step towards the health and medicine sector of the future. It can significantly contribute to increasing the efficiency of the health system, reducing inequalities in the health sector, improving costs and offering personalized health with the main focus on the patient. Specifically, the benefits of telemedicine are the following (Hjelm, 2005):

- It allows individuals to take more control over their condition and life while maintaining their autonomy at home
- It allows services that were previously only available in hospitals to be delivered at home
- It reduces the need for visits to hospitals or clinics, saving time and travel costs
- It supports long-term management of diseases at home
- Technologies can be adapted to the individual needs of each individual
- Improving access to services in remote areas
- It reduces the cost of healthcare
- Some forms of telemedicine provide immediate access to medical and nursing staff, thus eliminating waiting times for appointments
- Some forms of telemedicine provide continuous monitoring, 24 hours a day, 7 days a week
- It solves the problem of a shortage of medical and nursing staff

To create a technologically advanced health system, specific actions are needed:

 Replacing the equipment of health structures with new and technologically advanced equipment.

 Mandatory training of health professionals in new methods.

 Strengthening and increasing telemedicine networks.

Informing citizens about the possibilities and prospects of technology with the aim of universal acceptance.

 Coverage and support of immigrant reception centers, prisons, mobile units, ships.

Understanding the complexity of factors influencing the acceptance of telemedicine is crucial for the creation of policy and legislation in Greece that will encourage the adoption of such systems by health units, but also for the creation of a positive climate that will favor the development and use of these systems, leading to improvements in the quality of care.

Moreover, telemedicine has now become established as a key tool in modern medical practice, constituting an integral part of the effort for a more equitable, efficient and people-centered health system. Its contribution is becoming evident on multiple levels. On the one hand, it ensures better access to health services for social groups that until recently were lagging behind, such as residents of remote areas, the elderly or people with mobility difficulties. On the other hand, it upgrades the overall

quality of the services provided, as it enables regular monitoring and early diagnosis of diseases, reducing the risk of complications and serious hospitalizations.

Based on the above research findings, relevant interventions and educational programs must be implemented in order to improve telemedicine acceptance among chronic disease patients, particularly those who are males, with lower education level, no previous familiarity with the use of technology and residents in province.

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Annexes

Annex A. Tables

Table 5. 13. Frequencies of Gender

Gender	n	% of total	Cumulative %
Male	40	34.2	34.2
Female	77	65.8	100.0

Table 5. 14. Frequencies of place of residence

Place of residence	n	% of total	Cumulative %
Athens	53	45.3	45.3
Province	64	54.7	100.0

Table 5. 15. Frequencies of marital status

Marital status	n	% of total	Cumulative %
Single	16	13.7	13.7
Married	64	54.7	68.4
Divorced	12	10.3	78.6
Widowed	25	21.4	100.0

Table 5. 16. Frequencies of insurance

Insurance	n	% of total	Cumulative %
Yes	111	94.9	94.9
No	6	5.1	100.0

Table 5. 17. Frequencies of health status

Health status	n	% of total	Cumulative %
Very poor	3	2.6	2.6
Poor	15	12.8	15.4
Moderate	48	41.0	56.4
Good	35	29.9	86.3
Very good	16	13.7	100.0

Table 5. 18. Frequencies of previous use of electronic health service delivery applications

Previous use of electronic health service delivery applications	n	% of total	Cumulative %
Yes	25	21.4	21.4
No	92	78.6	100.0

Annex B. Consent form and questionnaires

PARTICIPANT INFORMATION SHEET

Version 2.71, May 22, 2024

I. INTERESTED PARTY INFORMATION

Study Name: Investigation of the acceptance of telemedicine among Greek patients with musculoskeletal disorders: The influence of sociodemographic and clinical characteristics

Scientific Responsible: Paraskevi Theofilou, Savvas Anastasiadis

The study is carried out in the context of a Diploma Thesis

Processing Manager: Aristotle University of Thessaloniki (AUTH)

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Data Protection Officer (DPO): data.protection@auth.gr

Important Information:

We are providing you with some information about the study we are conducting regarding the level of acceptance of telemedicine among Greek patients with musculoskeletal disorders, as well as the impact of sociodemographic and clinical characteristics on the acceptance of telemedicine and we will invite you to participate. Your participation is voluntary.

You can discuss the information in this form with someone from your family, with friends or with anyone you feel comfortable with. You do not have to decide immediately. You can decide whether you wish to participate after thinking about it/discussing it.

Please study it carefully and do not hesitate to contact the above study leaders for more information or clarification if you wish. You can also ask us any time we meet in person for any reason.

Your decision will not in any way affect the care or services you receive from the public or private institution you are served by.

The study protocol has been submitted to the Research Ethics Committee (REC) of the Aristotle University of Thessaloniki (AUTH). Furthermore, the information in this form will be submitted to competent bodies in the private and public sectors, where the data collection will take place, for approval.

Purpose: Why are we conducting this study?

In order to see if our research hypothesis is correct, no matter how obvious it may seem, we must test it by following the scientific methodology.

The purpose of this work is to study the level of acceptance of telemedicine among Greek patients with musculoskeletal disorders, as well as the effect of sociodemographic and clinical characteristics on the acceptance of telemedicine.

Participant selection: Why are we asking you to participate?

The criteria for participation in the study are a diagnosis of a musculoskeletal disorder, age over 18 years, and the ability to communicate in the Greek language.

Participation is voluntary: Do I have to do it?

You do not have to participate in the study if you do not want to. Even if you say “yes” now, you can change your mind later.

Cost of participation: What will it cost me?

There will be no charge for your participation in the study. You will only need to spend a little time answering the questions that will be asked of you.

Procedure: What will happen if you participate?

You are asked to answer questions about your profile, e.g., gender, age, etc. as well as questions regarding the level of acceptance of telemedicine. The procedure will be carried out once and only once without repetitions.

Data: What data will be collected?

Data will be collected using questionnaires regarding your socio-demographic profile and your views on telemedicine. The collection of information is anonymous. Their analysis will be carried out using a specialized statistical program.

Who will receive or to whom will the personal data that will be collected be distributed?

The data (about your sociodemographic profile and your views on telemedicine) will only be accessible to those responsible for the study.

Risks: Is my participation dangerous for me?

No. Your participation in the study is not dangerous for you as you are only asked for your opinion on telemedicine.

Risks: Will I suffer any pain?

No. You will not suffer any pain (physical or otherwise).

Benefits: Will something beneficial happen to me?

There is no direct benefit. However, you will contribute by participating to the dissemination of scientific knowledge.

Sharing the results: Will you tell me what you learned from me?

Unfortunately, we will not be able to inform you about the results because the collection is anonymous. However, you can learn about the research activities and their results on the website of the Laboratory of Medical Physics and Digital Innovation https://medphys.med.auth.gr/. When we finish the study, we will inform other people about the study we did and what we found. We will achieve this by writing articles but also by meeting people who are interested in the work we do.

Consent: Can I choose not to participate in the study? Can I change my mind?

Your participation is not mandatory. You can stop the study at any time.

How do we manage your personal data and what are your rights?

Although we do not retain your personal data, if you have questions about your personal data or rights and believe that they are being violated, you can contact the Data Protection Officer at the email: data.protection@auth.gr and we will respond as soon as possible or file a complaint with the Personal Data Protection Authority through the website www.dpa.gr. We encourage you to read more about the privacy and data protection policy of the Aristotle University of Thessaloniki on the website: https://www.auth.gr/gdpr

Socio-demographic & other data

A.1. What is your age?…….

A.2. Gender: **Male** ☐ 1 **Female** ☐ 2

A.3. In which area do you live? **Athens** ☐ 1 **Province** ☐ 2

A.4. What level of education have you completed?

Primary School	Junior High School	High School	University	Master's/PhD
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

A.5. What is your marital status?

Unmarried	Married	Divorced	Widower(s)
1	☐ 2	☐ 3	☐ 4

A.6. What is your professional occupation?

Unemployed	Private Employee	Public Servant	Freelancer	Housewife	Pensioner	Student	Other
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8

A.7. What is your annual (net) income?

<10.000 euros ☐ 1 10.000 - 15.000 euros ☐ 2 >15.000 euros ☐ 3

A.8. Insurance

Insured person ☐ 1 Uninsured…….2 ☐

A.9. How would you assess your health condition?

Very bad ☐ 1 Bad ☐ 2 Medium ☐ 3 Good ☐ 4 Very good ☐ 5

A.10. Have you used electronic applications for the provision of health services by health units in the past?

Yes ☐ 1 No ☐ 2

Years of treatment (for the musculoskeletal problem): ……

Years since diagnosis (musculoskeletal problem):.....

Questionnaire

Intention of patients with chronic conditions to use an electronic health service provider application from a hospital

Please indicate whether you agree or disagree with each of the following proposals, which relate to your intention to use a supposed electronic health service provider application from a hospital.

Perceived comfort	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
1. I believe that it would be convenient to use an online health service provider application of a hospital, from anywhere, without having to go to it, in person.					
2. I believe that an online health service provider application of a hospital could provide me with the medical information I need and help me find "widely known" hospitals or doctors across the country.					
3. I believe that using an online health service provider application of a hospital would help me save time.					
4. I believe that using an electronic application for the provision of health services of a hospital would help me save costs (e.g. hospital transport costs, accommodation costs)					
5. I believe that using an electronic application for the provision of health services of a hospital would help me to avoid possible losses, such as e.g. loss of income due to illness.					

Perceived outcomes	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
6. I believe that a hospital's online health service provider application could accurately understand my health status.					
7. I believe that an electronic application for the provision of health services of a hospital could provide me with effective therapeutic recommendations.					
8. I believe that an electronic application for the					

Perceived outcomes	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
provision of health services of a hospital could provide me with effective instructions for medication.					

Perceived medical risk	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
9. I am concerned because I believe that if I received services from a hospital's online health service application, doctors would pay less attention to my health condition.					
10. I would have doubts about the professionalism of a hospital or its doctors, who provide services through an electronic application for the provision of health services of a hospital.					
11. I would have doubts about the accreditation of doctors and the hospital if I received services from an online application for the provision of health services of a hospital.					
12. I am concerned that I may not be able to clearly explain my condition to doctors if I use a hospital's online health service application.					
13. If I were to receive services from a hospital's online health service provider application, I would be concerned about a possible misdiagnosis or incomplete diagnosis, as the online services do not offer the possibility of conducting medical examinations.					

Perceived Information Risk	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
14. I am concerned that I may be a victim of fraud if I use a hospital's online health service application.					
15. I am concerned that personal information could be leaked if I use a hospital's online health service application.					

Emotional preference	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
16. I believe that through the use of an electronic application for the provision of health services in a hospital, I could avoid the tension that exists in interpersonal communication with doctors.					
17. I believe that the use of an electronic application for the provision of health services of a hospital could be useful in protecting my personal data and avoiding the embarrassment associated with interpersonal communication with doctors.					

Perceived medical responsibility	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
18. I believe that the relevant laws and regulations concerning the provision of electronic health services by hospitals are at an incomplete stage.					
19. I believe that it is difficult to separate the responsibility for medical errors that are likely to occur when using a hospital's online health service provider, between patients, doctors, hospitals and online platforms.					
20. I believe that it would be difficult to protect my legal rights if a medical error occurred when using a hospital's online health service application.					

Attitude - Behavior	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
21. In general, I believe that the experience of using a hospital's online health service provider application will be better than that of the services provided by traditional hospitals.					
22. In general, I believe that an electronic application for the provision of health services of a hospital is useful for the treatment of diseases.					
23. In general, I believe that it makes sense to use an electronic application for the provision of health services by a hospital.					

Subjective rules	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
24. My family and friends believe that I should use a hospital's online health services.					
25. Other patients from my social circle believe that I should use the electronic health services of a hospital.					
26. My online "friends" think I should use a hospital's online health services.					
27. The government supports the use of a hospital's electronic health services.					

Health Awareness	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
28. I am aware of my health problems and I am very worried about them.					
29. I will try to manage and improve my level of well-being.					

Perceived disease severity	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
30. I do not believe that my health problems are serious.					

Perceptual Behavior Control	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
31. I have the appropriate logistical equipment (e.g. smartphone, computer, internet connection) to use a hospital's online health service application.					
32. I could manage an online application for the provision of health services of a hospital on my own.					
33. I could clearly distinguish between valid and invalid information in a hospital's electronic health					

Perceptual Behavior Control	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
service application.					

Behavioral Intention	Strongly Disagree	Agree	Neutral	Agree	Strongly Agree
34. If I feel sick, I will choose to receive health services from a hospital's online health service application.					
35. If someone close to me needs health services, I would suggest using the electronic application for the provision of health services of a hospital.					

Annex C. Approval of questionnaires distribution

PHYSIOTHERAPY CLINIC - ZOROU EIRINI
ou 2, Ilion, Athens Contact Tel.: 213.0345.059 – 6973.66.19.42
sikotherapeia.com

Ilion, 22/09/2025 Protocol No.: **148**

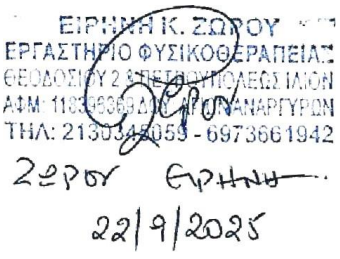
APPROVAL FOR THE DISTRIBUTION AND COLLECTION OF QUESTIONNAIRES

I, the undersigned, Zorou Eirini, owner and head physiotherapist of the Physiotherapy Clinic located at Theodosiou 2, Ilion, Athens Greece, hereby approve the request submitted by Mrs Theofilou Paraskevi for the distribution and collection of paper-based questionnaires to the patients of the aforementioned clinic, within the framework of the Master's Thesis entitled *"Exploration of telemedicine acceptance among Greek patients with musculoskeletal disorders: The effect of sociodemographic and clinical characteristics"*, under the scientific supervision of Mrs Theofilou Paraskevi and Mr Savvas Anastasiadis.

The distribution process shall commence as of the present date and shall continue for as long as necessary to ensure the completion of the data collection procedure.

Owner & Head Physiotherapist

Zorou Eirini



HELLENIC REPUBLIC
Ref. No.:12164

PREFECTURE OF ILIAS
Lechaina, 26/09/2025

SOCIAL PROTECTION, SOLIDARITY

AND CULTURE ORGANIZATION

MUNICIPALITY OF ANDRAVIDA – KYLLINI

TO: PARASKEVI THEOFILOU

Subject: Confirmation of completion questionnaires

Following your request for completion- accomplishment questionnaires to members of the Open Care Center for the Elderly of our Prefecture with musculoskeletal disorders, for your Master's degree "Exploration of telemedicine acceptance among Greek patients with musculoskeletal disorders: The effect of sociodemographic and clinical characteristics" of Aristotle University of Thessaloniki, we inform you that you have our acquiescence. Essential requirements are the keeping of the register and the Code of Conduct that are accordingly provided, as well as the use of data-research findings for the specific purpose. The qualified department staff are at your disposal for the necessary technical details.

At your disposal for further clarifications.

The Social Worker Responsible

GIALYPSOY PETROULA