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REVIEW

# Older Adults Perception with respect to M-Health applications: a systematic review

# Percepción de las aplicaciones M-Salud en adultos mayores: revisión sistemática

# Percepção de Aplicações M-Saúde em idosos: uma revisão sistemática

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## Abstract

**Introduction**: M-Health refers to the use of mobile devices for health care. There are several apps dedicated to health, especially for older adults; however, it is essential to identify their perception when considering the skills of the elderly for the management and use of apps and mobile devices. **Objective**: To know the perception of the elderly regarding M-Health apps. **Methodology**: A systematic review in the following databases: PubMed, Journal of Medical Internet Research, Web of Science and Wiley Online Library. Articles in the English language, published between 2013 and 2021 were included. Inclusion criteria: Elderly people using mobile devices were included in the sample. Perception about m-health apps was reported. The guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses were followed. A total of 569 articles were found, of which a sample of 20 articles was obtained after the review. **Results**: The use of various mobile devices, apps and websites was found. The perception referred by the older adults was positive because they were useful, comfortable, easy to use; although they also expressed negative perception due to fear of using them, not knowing how to use them, lack of security of personal data and costs. **Conclusion**: The perception about m-health is that these apps have more positive than negative aspects; the negative perceptions were generated by the difficulty and fear felt by elderly adults to make use of M-Health applications.


**Key words:** Mobile devices; Older adults; Perception; M-Health; Nursing (DeCS).


## Resumen

**Introducción:** Las m-salud se refieren al uso de dispositivos móviles para el cuidado de la salud, existen diversas aplicaciones relacionadas a la salud, especialmente para adultos mayores. Sin embargo, es indispensable identificar la percepción al considerar las habilidades del adulto mayor para el manejo y uso de las aplicaciones y dispositivos móviles. **Objetivo:** Conocer la percepción que tiene el adulto mayor hacia las aplicaciones m-salud. **Metodología:** Revisión sistemática, bases de datos consultadas: Pubmed, Journal of Medical Internet Research, Web of Science y Wiley Online Librery. Se incluyeron artículos en idioma inglés, publicados entre 2013 y 2021. Criterios de inclusión: contemplar en su muestra a adultos mayores, que utilizaran dispositivo móvil y reportar la percepción sobre las aplicaciones m-salud. Se siguieron los estándares de la declaración de Preferred Reporting Items for Systematic Reviews and Meta-Analyses. Se encontraron 569 artículos, de los cuales se realizó una revisión obteniendo la muestra de 20 artículos. **Resultados:** Se observó la utilización de diversos dispositivos móviles, aplicaciones y páginas de internet. La percepción referida por adultos mayores fue positiva por ser útil, cómoda y fácil de utilizar y en la percepción negativa manifestaron miedo a utilizarlo, no saber utilizarlo, inseguridad en datos personales y costos. **Conclusión:** La percepción sobre las m-salud fueron más aspectos positivos que negativos, las percepciones negativas se generaron por la inhabilidad y miedo que sintieron los adultos mayores para hacer uso de las aplicaciones m-salud.


**Palabras clave:** Dispositivos móviles; Anciano; Percepción; M-Salud; Enfermería (DeCS).


## Abstrato

**Introdução:** M-saúde refere-se à utilização do dispositivos móveis para cuidados de saúde, tendo sido desenvolvidas várias aplicações que são úteis, especialmente para idosos. Contudo, ao considerar as competências do idosos para gerir as aplicações e o dispositivo móvel, é essencial conhecer a percepção das aplicações m-saúde para adultos. **Objetivo:** Descobrir como os idosos percebem as aplicações de m-saúde. **Metodologia:** Revisão sistemática em diferentes bases de dados: Pubmed, Journal of Medical Internet Research, Web of Science e Wiley Online Library. A pesquisa incluiu artigos em língua inglesa de 2013 a 2021, que preenchiam os critérios do inclusão tais como: contemplar os adultos na sua amostra,

utilizar um dispositivo móvel e relatar a percepção da utilização de aplicações m-saúde; seguir as normas dos Artigos Preferidos para Relatórios Sistemáticos e a declaração de Meta-Analyses. Encontrámos 569 artigos, dos quais foi feita uma revisão, obtendo uma amostra de 20 artigos. **Resultados:** Foram utilizados diversos dispositivos de tecnologia móvel, tais como smartphones, tablets e ferramentas como aplicativos e websites. A percepção relatada pelos idosos era tanto positiva (útil, conveniente e fácil de usar) quanto negativa (medo de usá-la, não saber como usá-la, segurança e custos). **Conclusão:** As percepções da m-saúde são tanto positivas quanto negativas, geralmente as percepções negativas são geradas pela incapacidade ou medo dos idosos velhos de fazer uso da m-saúde.

**Palavras-chave:** Dispositivos móveis; Idosos; Percepção; M-Saúd; Enfermagem. (DeCS).

## Introduction

Technological development has produced changes in health care and services, now mobile devices are used as service tools known as mobile health or m-health (use of mobile devices in healthcare), these applications in mobile devices offer the facility to provide health promotion, care, information, teaching and training. They are different from other practices and technologies because of the interaction that allows an immediate contact [1, 2]. Although mobile devices are considered exclusive for the young and active population of society, older adults are interested in integrating and reducing the digital divide between generations; the elderly have been engaging in continuous use by searching for information such as news, activities of interest and healthcare; in addition, they make use of apps for the control and care of their health [2, 3]. In general, older adults who manage to master the use of mobile devices and internet can enjoy a psychological well-being and achieve an improvement in their family role and even before society.

Previous literature reviews have analyzed the perception of older adults regarding various devices and m-health apps [4, 5], however, new apps for mobile devices with various functions are being developed every day, so it is important to know and analyze the use and perception of older adults regarding mobile devices and m-health apps. The knowledge achieved with this review will be useful to recognize the factors that influence older adults regarding the use of m-health apps, so that these factors can be considered when making interventions and programs focused on the prevention and promotion of people's health, to provide digital care that allows direct contact and follow-up of treatment and rehabilitation at any time and place.

International reviews have been found on the perception of older adults regarding mobile devices, such as health care apps for diabetes control, tobacco or alcohol consumption, physical activity, walking, meal plans, among others, their results suggest that there is resistance to the use of mobile devices, because of the challenge that can represent the use of apps; evidence found so far focuses on the use of computers. Because technology is changing and improving day by day, we must update and synthesize information regarding m-health apps; in this sense, older adults with intention of using m-health apps to improve their lives can be influenced by the updates and changes in this type of technology [1, 6, 7]. This systematic review was conducted to determine the perception of older adults towards m-health apps; for which the following research question was posed: What is the perception of older adults regarding the use of m-health apps?

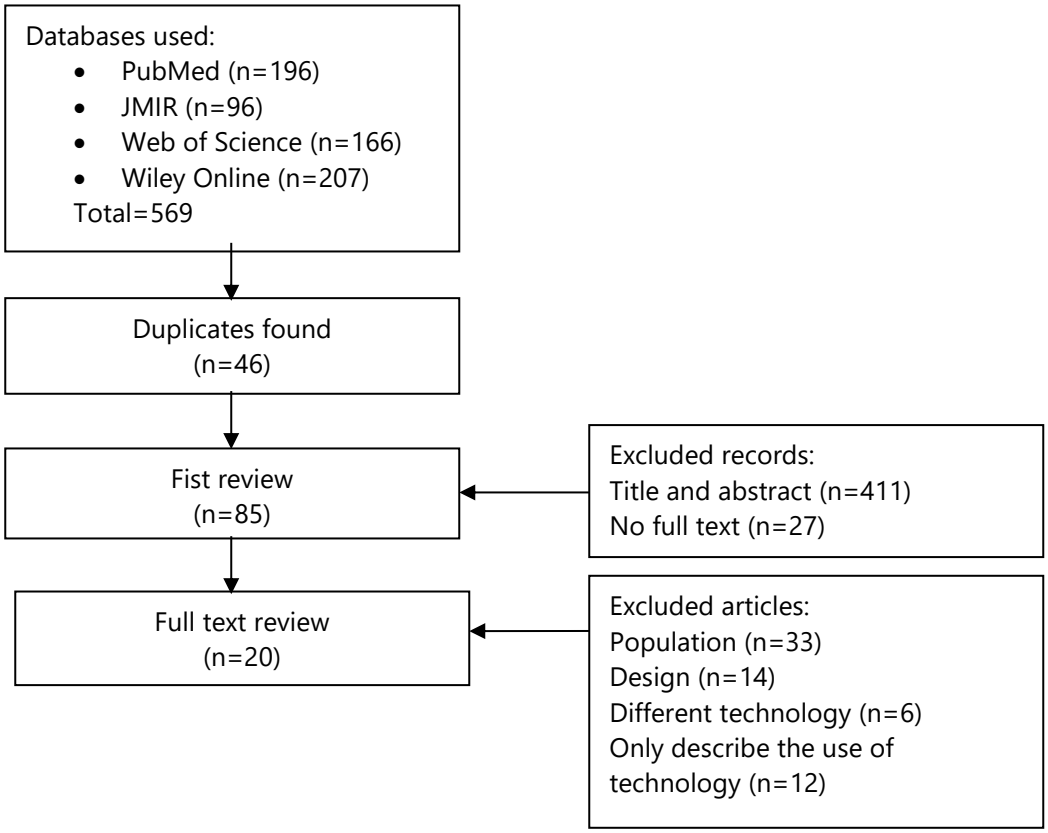
## Methodology

For the systematic review, a literature search was performed using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines for literature review [8] using PubMed, Journal of Medical Internet Research (JMIR), Web of Science and Wiley Online databases. The following Medical Subject Headings (MeSH) keywords were used: m-health, mobile health, m-health applications, perception, older people, older person, aged. The Boolean operators used were AND and OR. Variables were delimited to title and abstract or the entire article. To expand the search and broaden the information, truncation operators were used and primary articles and Randomized Clinical Trials (RCTs) were included [9]. We considered articles in the English language that included in their analysis the population of older adults (60 years and older), that used mobile devices and reported the perception regarding the use of such devices and m-health apps. As an exclusion criterion, articles using other types of technology were not included.

A total of 569 articles were peer-reviewed by the authors using the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist, which evaluates the elements that studies must comply with; duplicates were eliminated, then the selected articles were reviewed by title and abstract, and finally the full text was reviewed. Articles that did not include the population of older adults or the analysis

of the perception of m-health apps, or articles that referred to other types of technologies, were eliminated. The final sample included for review 20 articles that met the inclusion criteria, (Figure 1).

Figure 1. Inclusion process, PRISMA.




Source: Own-development.

## Results

To identify the perceptions and use of mobile devices by older adults, it is important to know and explore the context of the articles that studied these variables. The analyzed articles came from different continents, mostly from Europe [1, 6, 17-22] and North America [10, 15], the rest from Asia [23, 24], South Africa [3, 25] and Australia [16]; these articles were published between 2013 and 2021. The designs of the studies found were systematic review [1, 6], mixed method [10, 12, 13, 15, 19, 25], qualitative studies [2, 6, 15, 20, 22, 24], pilot [13], proof-of-concept trial [17], prospective [18], and cross-sectional [11, 16, 21, 23]. Articles that analyzed the perception of people over 60

years of age were included [1, 3, 10, 15, 22-24], although some articles that included people under 60 years of age were considered since they described the perception of the target age group [11, 13, 15, 17, 19, 20, 23]. Several studies aimed to identify or explore the use or perception of m-health apps by people with health conditions such as type 2 diabetes mellitus [17], cardiac pathologies [15], chronic obstructive pulmonary disease (COPD) [10, 22], peritoneal dialysis [14] or mild cognitive impairment [20]. Regarding the use of mobile apps, 50-70% made use of them [8, 10, 11, 15], the percentage was lower when referring to health-related apps [10]. An intervention study on the implementation of the use of m-health apps resulted in 77% using m-health apps [15]. The perception found was that m-health apps were easy to use [8, 12, 15, 17, 22], convenient [10], and useful [23], (Table 1).

Table 1. Characteristics of selected articles, 2020-2021 (n=20).

| Authors, Year and Country | Study Objective/Design | Sample | Perception regarding m-health apps. |
|---|---|---|---|
| Kampmeijer, Pavlova, Tambor, Golinowska, Groot. 2016, Netherlands [1] | Provide information on the scope of e-health and m-health tools for health promotion and disease prevention in older adults. Systematic review | 45 articles selected. Participants > 50 years old. | Using the technology motivated older adults, they felt supported, helped them to self-regulate, and to obtain information in real time. Usability and accessibility. As barriers: lack of adherence to treatment, confusing information, difficult to use device and costs of devices or apps. |
| Jarvis, Chipps, Padmanabhanunni 2019, South Africa [2] | Explore the perception and experience of older adults using an app to socialize. Qualitative | 32 adults over 60 years of age | Using the app gave them self-confidence, they maintained contact with their family and friends, and contributed to their empowerment. Negatively, using the app caused anxiety and fear. It generated a negative self-evaluation of their abilities. |
| Padial, Pinzón, Espinosa, Kalache, Garrido. 2018, Spain [6] | Know the contribution of information and communication technologies to the active and healthy aging of people. Qualitative/systematic review | 22 miscellaneous items. Population > 50 years old | Participants' perception of using such technologies was based on ease of use and familiarity, which gave them confidence. It helped them to adhere to treatments, remember appointments, and the taking of their medications, among other things. It also increased their perception of independence and empowered them to perform self-care. Negative aspects: some studies reported that adults needed help with the application; they ask that the |

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| | | | design of the apps be designed with the characteristics of older adults in mind. |
| Alwashmi, Fitzpatrick, Farrell, et al. 2020, Canada [10] | Describe the demographic characteristics, use and availability of Smartphones in patients with COPD. Mixed study | 77 people, of whom 72 were > 55 years old with COPD. | 29% of participants understood the app concept; 50% used an app, but only 3 used an m-health app. 7 participants felt comfortable that their family members and physician could access their personal information and because of the health reports generated through the app. The barriers were: concern about the security of their information and mobile data usage, difficulty of use, and cost. |
| Jaana, Paré 2020, Canada [11] | Compare the use of m-health technologies in older adults for self-monitoring and associated factors. Cross-sectional study | 4109 general population, 682 adults over 65 years of age | 383 older adults were familiar with the use of mobile devices for health care; only 78 used an m-health app in the last few months; 6 out of 10 participants used m-health apps to maintain and improve their health status. This helped them to know their health status and to feel self-confident about taking care of their health through the use of these devices; they reported having intentions to continue using the apps. |
| Ware, Dorai, Ross, Cafazzo, Laporte. Boodoo, et al. 2019, Canada [12] | Describe the perception of older adults regarding the m-health app "Medly" for self-monitoring. Mixed method, exploratory. UTAUT2 model | Interviews to 24 adults | Using the app gave them benefits such as managing their disease, obtaining self-care information, peace of mind regarding the information provided by the healthcare provider, thus improving the relationship between them. They perceived that the app was ease to use, anywhere and in real time. |
| Eisenhauer, Hageman, Rowland, Rowland, Becker, Barnason, Pullen, et al. 2016, USA [13] | Feasibility and acceptability study of the use of the Fit Bit One step counter, text messages and activity monitoring. Pilot/Mixed Study | 12 men from a rural area, between 40 and 69 years of age. | The monitoring app provided participants with self-awareness of their physical activity, water consumption, and daily food intake. Participants using the app were able to record their activities in real time, which they perceived as convenient and easy to use. Text messages helped them to self-evaluate the food intake and physical activity. Perceived barriers were related to the mobile device, such as internet connection, lack of Wi-Fi and outdated systems. |

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| Hussein, Bennett, Pace, Chen, Legg, Atwal, et al.<br>2021, USA [14] | Examine people's readiness for m-health apps.<br>Cross-sectional study | 949 people, 495 were > 61 years old | 57% of the participants reported having the ability to use m-health apps to communicate with healthcare personnel; 60% showed interest in using them to learn how to improve their health.<br>Some of their concerns were the lack of security of personal information, lack of privacy when sharing information with the healthcare provider. |
| Park, Ng, Shim, Elnaggar, Villero.<br>2020, USA [15] | Perception, attitude and beliefs of people to use apps for treatment adherence.<br>Mixed study | 28 adults with history of coronary heart disease,<br>> 50 years of age. | Text messages as a reminder helped the adults to have a new routine for their medications, to take them properly, and to check that they were the correct ones. The apps they used helped create new habits to their medication-taking regimen; adults were interested in using apps to validate and track their health.<br>One concern was the security of their personal information. |
| Nguyen, Irizarry, Garret, Downing<br>2015, Australia [16] | Learn how older adults choose and learn to use mobile technologies.<br>Cross-sectional study | 153 adults over 65 years of age | Of the participants, 88% used the devices for emergencies and security; 64.9% used them to maintain communication with family members; 33% found them easy to use.<br>Participants reported that they would like to know how to use them better to monitor their blood pressure (32.7%), count their steps (11.1%), locate places in their community, as GPS (18.3%), to monitor their heart (19.3%) and to remember activities (20%). |
| Ding, Fatehi, Russell, Karunanithi, Menon, Bird, et al.<br>2018, Austria [17] | Evaluate adherence and experience of using the software (IDA), using the smartphone app.<br>Proof-of-concept trial | 9 participants > 58 years old | The app helped the adults with self-management and self-awareness of their health condition, also, gave them confidence to manage their condition; they were satisfied with the software. As a barrier, they reported technical problems such as internet signal slow-down. |
| De Battle, Massip, Vargiu, Nadal, Fuentes, Ortega, et al.<br>2020, Spain [18] | Evaluate the acceptability and satisfaction by the adult for the implementation of the "conecare" apps.<br>Prospective study | 194 participants > 55 years of age | High acceptability of the software was reported; 77% of the adults used the apps. The m-health apps enabled communication and health advice messages and provided participants with daily feedback on their health status, goals achieved, and personalized advice. |

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| | | | They reported that the apps were easy to use. |
| Fox, Connolly 2016, Ireland [19] | Evaluate the factors that make the person reluctant to use m-health apps. Mixed study | 17 people, > 50 years old | To use m-health apps, adults should feel comfortable, otherwise it was difficult for them to use such apps. They reported being afraid of sharing personal information with the healthcare provider. |
| Christiansen, Lindberg, Sanmartin, Anderberg, Skär, et al. 2020, Sweden [20] | Describe the perceptions of m-health apps and its impact among older adults with cognitive impairment. Qualitative research with a phenomenological approach | 18 adults over 70 years of age | Older adults reported ease of communication, feeling safe and staying informed at all times. It helped them in monitoring their health and as a support to remember information. They felt they lacked the skills to use them and lacked teaching. Negative aspects: fear of using the apps, cost of the device or app and difficulty of use. |
| Göransson, Wengström Ziegert, Langius-Eklöf, Blomberg, et al. 2020. Sweden [21] | Assess self-care using an interactive app to report health status. Descriptive study | 17 people > 70 years old | The app was useful for people living alone, it gave them a sense of protection knowing that they had contact with a person who was their healthcare provider. They found the self-care prompts very useful, it helped them to know their health status and to monitor their health. |
| Korpershoe, Vervoort, Trappenbur, Schuumans 2018, Holland [22] | Explore the perceptions and use of m-health apps for self-management. Qualitative | 13 patients with COPD > 40 years and 6 health care workers | Using the app helped the participant become aware of their symptoms and empowered them to communicate with their health care provider. It provided them with information about the symptoms and causes of their health condition; it decreased their fear of using it. As negative aspects, they reported lack of interest in using the app and lack of digital skills. |
| Jiang, Zhu, Zheng, Zhu, Li, Huo, et al. 2019, China [23] | Explore the use and perception of m-health by patients with Cerebrovascular Disease. Transversal | 231 adults over 50 years of age, n=178 | 68% of adults over the age of 65 were interested in using m-health apps for disease management; of these, 63% felt that m-health apps could benefit them and 26.5% reported that they tried to use them. |
| Son, Oh, Kim 2020, South Korea [24] | Explore the perception and need for the use | 20 adults over 65 years of age with | Positive perception of the participants for receiving reliable information on their device. Helped to improve communication between the older adult and healthcare |

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| | of m-health technology. Qualitative | coronary heart disease. | personnel. On the negative side, older adults perceived difficulty and stress when using the device, not so much the m-health apps, and also reported feeling a lack of security for sharing personal information through these apps. |
| Nichols, Stephen, Singh, Qanungo, Treiber, Ovbiagele et al. 2017, South Africa [25] | Explore barriers, facilitators and recommendations for m-health intervention. Socio-ecological model. Mixed study | 200 heart attack survivors. Between 52 and 72 years of age | Participants were willing to be part of apps m-health related studies. 30% reported that they monitored their blood pressure. They were interested in learning how cell phones or computers can help control their blood pressure. |

Source: Own-development.

The purpose of using m-health apps was to have reports or health monitoring [9, 10, 15, 17, 22, 23], self-management and reporting of their physical activity and blood pressure monitoring, counseling and communication with healthcare personnel [8, 10, 12, 17, 23]. Although the use of m-health apps was low, older adults mentioned that continued use was desirable [17], the results of 30% of the studies showed interest in using m-health related apps [1, 10, 15, 20, 21, 24, 25]. The barriers identified for the use of mobile devices and their apps were concern about the security of personal information [12, 16, 20, 21, 23], difficulty of use [1, 3, 12, 18, 22], cost [1, 12, 25], fear of using them [3, 16, 23], technical problems with the Internet [9], Internet connection [17], dependence on such devices [20] and stress [14] (Table 2).

Table 2. Perception of older adults regarding m-health apps, 2021. (n=20)

| Positive Perceptions | Reference |
|---|---|
| Self-management/Self-care | 1, 11, 14, 15, 18 |
| Self-monitoring | 1, 10, 17, 19, 21, 22, 23, 25 |
| Communication with the healthcare provider | 1, 12, 14, 17, 19, 20, 23 |
| Awareness of their health status | 11, 19, 25 |
| Helps adherence to treatment | 1, 18, 21 |
| Contribute to personal empowerment | 3, 18, 23 |
| Easy to use, useful | 1, 3, 13, 14, 17, 18, 19, |
| They are interested in using them | 1, 10, 15, 20, 21, 24, 25 |
| Negative Perceptions | Reference |

| | |
|---|---|
| Fear of using them | 3, 16, 23 |
| Not knowing how to use it, lack of computer skills | 1, 3, 12, 18, 22 |
| Lack of data privacy or security | 12, 16, 20, 21, 23 |
| Costs (devices and apps) | 1, 12, 25 |

Source: Own-development.

## Discussion

This review focused on exploring the perception of older adults regarding the use of m-health apps. Positive perceptions could be identified as ease of use related to communication with health personnel and health monitoring, in addition to the convenience of sharing or consulting information [1, 3, 8-13, 15-21, 23]. The use of m-health apps for self-management and self-monitoring of their illness allows them to keep a daily record of activities and adhere to treatment, which provides confidence, empowering older adults to take control and play an active role in the management of their health [1-3].

Also, negative perceptions focused on insecurities related to the use of mobile devices or m-health apps were found. The low digital skills they report, generate fear, anxiety, stress in older adults [1, 3, 10, 14, 16, 18-21, 23], even so, they show interest in learning how to use them. Another aspect that could be related to poor digital skills is insecurity regarding the mishandling of personal information that could occur, as they are afraid to provide personal information to strangers or people they do not yet trust, including their health care providers or family members [16, 20, 21, 23]. Negative perceptions may decrease if they are educated about the use of data protection, how to identify free or low-cost apps, and especially if they are trained to increase their skills in the use of devices and download and use of m-health apps [3, 10, 14, 16].

Older adults make little use of mobile devices, and their use of m-health apps is even lower. The literature is divided into positive aspects and negative aspects, regarding the positive aspects, older adults mention interest in learning to use m-health apps with the purpose of being able to have a management and control of their condition, which helps them to have self-awareness about their health status [1, 8, 9, 12, 13, 16, 18, 19, 21-23]. This point is important for the healthcare area, especially for nursing, since with the objective of promoting and maintaining health, it is necessary to inform and instruct people in the use of tools that facilitate the

achievement of the objectives, in addition to achieving independence, participation, organization of older adults [26]. The use of apps is very useful when older adults have mobility difficulties, as they make it easier to carry out banking procedures and formalities, pay bills, make purchases, among other things, that they would not have been able to do before due to their disability [26, 27].

A study with educational intervention on the use and management of mobile devices and apps achieved that slightly more than three quarters of the included sample used such devices and apps effectively [15]; therefore, interventions with education may reduce barriers and increase positive perceptions in this age group about m-health apps, which could help to monitor, maintain and even improve health in this population.

The interest in learning to use mobile devices is related to the features and facilities offered by such devices such as maintaining contact with family members through messages and calls; in addition, by using m-health apps the older adult can have contact with his or her health care provider and stay informed at all times [8, 15, 16, 23, 28]. On the contrary, if the person perceives difficulties in their use, they may lose interest and thus underestimate their potential use [16, 29, 30].

## Conclusions

We were able to identify as a positive perception the ease of use and convenience to share and receive health-related information, as well as satisfaction with the use of mobile devices and m-health apps. As negative aspects, we found the concern of older adults regarding the security of the information shared, the costs, and also that they consider themselves with little skills to use apps.

The positive perception regarding the use of m-health is one of many factors that are required and can help to carry out an effective health intervention using technological devices, since the older adult feels confidence and support in the health personnel to be able to effectively exercise self-care and achieve awareness in their state of health. Thus, taking into account personalized and simple manuals for the design

of m-health protocols could avoid negative perceptions such as fear and stress due to the use, as it would help older adults to develop digital skills and thus safety.

As a future line of research, we suggest continuing to explore perceptions on the use of technology, especially the use of mobile devices such as cell phones and m-health apps. We should analyze whether the perception is different according to gender, age and educational level. The results of this study invite us to explore the perceptions of older adults regarding the use of mobile devices and m-health apps for nursing, as a fundamental source for health promotion and primary healthcare. It is important to develop health monitoring, prevention and control interventions using the benefits that technology offers, adapted to each perception or factor that facilitates or limits the use of such tools. Therefore, educational programs on cell phone management are considered relevant, so that older adults can acquire skills for the use of cell phones and therefore decrease their fear, anxiety, stress, and increase their independence in the management of their own health care.

## Conflicts of interest

The authors stated there were no conflicts of interest.

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## Bibliographic References

1. Kampmeijer R, Pavlova M, Tambor M, Golinowska S, Groot W. The use of e-health and m-health tools in health promotion and primary prevention among older adults: a systematic literature review. BMC Health Serv Res [Internet]. 2016 [cited 06 dec 2020];16(S5). Available at: http://dx.doi.org/10.1186/s12913-016-1522-3
2. La eSalud en la región de las Américas: derribando las barreras a la implementación PAHO, OPS. [Internet]. 2016. [cited 09 dec 2020]. Available at: https://iris.paho.org/bitstream/handle/10665.2/31287/9789275319253-spa.pdf?sequence=3&isAllowed=y
3. Jarvis MA, Chipps J, Padmanabhanunni A. This phone saved my life: older persons' experiences and appraisals of an mHealth intervention aimed at addressing loneliness. J Psychol Afr [Internet]. 2019 [cited 05 jan 2021];29(2):159-166. Available at: http://dx.doi.org/10.1080/14330237.2019.1594650

4. Anthony V, Murugiah MK, Soh YC, Chuan Sheng Y, Wong TW, Ming LC. Mobile health applications for caring of older people: Review and comparison. Ther Innov Regul Sci [Internet]. 2018 [cited 05 jan 2021];52(3):374-382. Available at: http://dx.doi.org/10.1177/2168479017725556
5. Bin F, Dhillon JS. A systematic review of factors influencing the effective use of mHealth apps for self-care. 3rd International Conference on Computer and Information Sciences (ICCOINS). Kuala Lumpur, Malaysia [Internet]. IEEE; 2016 [cited 06 jan 2021]. Available at: http://doi.org/10.1109/ICCOINS.2016.7783213
6. Padial M, Pinzón S, Espinosa J, Kalache A, Garrido F. Longevidad y revolución digital. Contribución de las tecnologías de la información y de la comunicación al envejecimiento saludable. Gerokomos [Internet]. 2020 [cited 23 dec 2021];31(1):6-14. Available at: https://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S1134-928X2020000100003
7. Joe J, Demiris G. Older adults and mobile phones for health: A review. J Biomed Inform [Internet]. 2013 [cited 05 mar 2021];46(5):947-954. Available at: https://doi.org/10.1016/j.jbi.2013.06.008
8. Moher D, Liberati A, Tetzlaff J, Altman DG, PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. PLoS Med [Internet]. 2009 [cited 23 dec 2020];6(7):e1000097. Available at: http://dx.doi.org/10.1371/journal.pmed.1000097
9. Cooper C, Booth A, Varley-Campbell J, Britten N, Garside R. Defining the process to literature searching in systematic reviews: a literature review of guidance and supporting studies. BMC Med Res Methodol [Internet]. 2018 [cited 06 jan 2021];18(85): 1-14. Available at: http://dx.doi.org/10.1186/s12874-018-0545-3
10. Alwashmi MF, Fitzpatrick B, Farrell J, Gamble JM, Davis E, Van Nguyen H, et al. Perceptions of patients regarding mobile health interventions for the management of chronic obstructive pulmonary disease: Mixed methods study. JMIR MHealth UHealth [Internet]. 2020 [cited 08 jan 2021];8(7):e17409. Available at: http://dx.doi.org/10.2196/17409
11. Jaana M, Paré G. Comparison of mobile health technology use for self-tracking between older adults and the general adult population in Canada: Cross-sectional survey. JMIR MHealth UHealth [Internet]. 2020 [cited 05 feb 2021];8(11):e24718. Available at: http://dx.doi.org/10.2196/24718
12. Ware P, Dorai M, Ross HJ, Cafazzo JA, Laporte A, Boodoo C, et al. Patient adherence to a mobile phone-based heart failure telemonitoring program: A longitudinal mixed-methods study. JMIR MHealth UHealth [Internet]. 2019 [cited 06 feb 2021];7(2):e13259. Available at: http://dx.doi.org/10.2196/13259
13. Eisenhauer CM, Hageman PA, Rowland S, Becker BJ, Barnason SA, Pullen CH. Acceptability of mHealth technology for self-monitoring eating and activity among Rural Men. Public Health Nurs [Internet]. 2017 [cited 04 mar 2021];34(2):138-146. Available at: http://doi.org/10.1111/phn.12297.
14. Hussein WF, Bennett PN, Pace S, Chen S, Legg V, Atwal J, et al. The mobile health readiness of people receiving in-center hemodialysis and home dialysis. CJASN. [Internet]. 2020 [cited 04 mar 2021];16(1):98-106. Available at: https://doi.org/10.2215/CJN.11690720
15. Park LG, Ng FK, Shim J, Elnaggar A, Villero O. Perceptions and experiences of using mobile technology for medication adherence among older adults with coronary heart disease: A qualitative study. Digit Health. [Internet]. 2020 [cited 04 mar 2021];6:2055207620926844. Available at: https://doi.org/10.1177/2055207620926844

16. Nguyen T, Irizarry C, Garrett R, Downing A. Access to mobile communications by older people: Mobile phone use by older people. Australas J Ageing [Internet]. 2015 [cited 06 jan 2021];34(2): E7-12. Available at: http://dx.doi.org/10.1111/ajag.12149
17. Ding H, Fatehi F, Russell AW, Karunanithi M, Menon A, Bird D, et al. User experience of an innovative mobile health program to assist in insulin dose adjustment: Outcomes of a proof-of-concept trial. Telemed J E Health [Internet]. 2018 [cited 07 jan 2021];24(7):536-543. Available at: http://dx.doi.org/10.1089/tmj.2017.0190
18. De Batlle J, Massip M, Vargiu E, Nadal N, Fuentes A, Ortega B M, et al. Implementing mobile health-enabled integrated care for complex chronic patients: Patients and professionals' acceptability study. JMIR MHealth UHealth [Internet]. 2020 [cited 26 feb 2021];8(11): e22136. Available at: http://dx.doi.org/10.2196/22136
19. Fox G, Connolly R. Mobile health technology adoption across generations: Narrowing the digital divide. ISJ [Internet]. 2018 [cited 05 mar 2021];28(6):995-1019. Available at: https://doi.org/10.1111/isj.12179
20. Christiansen L, Lindberg C, Sanmartin B J, Anderberg P, Skär L. Using mobile health and the impact on health-related quality of life: perceptions of older adults with cognitive impairment. Int J Environ Res Public Health [Internet]. 2020 [cited 06 mar 2021];17(8):2650-2662. Available at: https://doi.org/10.3390/ijerph17082650
21. Göransson C, Wengström Y, Ziegert K, Langius-Eklöf A, Blomberg K. Self-care ability and sense of security among older persons when using an app as a tool for support. Scand. J. Caring Sci [Internet]. 2020 [cited 05 mar 2021];34(3):772-781. Available at: https://doi.org/10.1111/scs.1282
22. Korpershoek YJ, Vervoor SC, Trappenburg JC, Schuurmans MJ. Perceptions of patients with chronic obstructive pulmonary disease and their health care providers towards using mHealth for self-management of exacerbations: a qualitative study. BMC Health Serv Res [Internet]. 2018 [cited 07 feb 2021];18(1):757-770. Available at: https://doi.org/10.1186/s12913-018-3545-4
23. Jiang J, Zhu Q, Zheng Y, Zhu Y, Li Y, Huo Y. Perceptions and acceptance of mHealth in patients with cardiovascular diseases: A cross-sectional study. JMIR MHealth UHealth [Internet]. 2019 [cited 07 feb 2021];7(2):e10117. Available at: http://dx.doi.org/10.2196/10117
24. Son YJ, Oh S, Kim EY. Patients' needs and perspectives for using mobile phone interventions to improve heart failure self-care: A qualitative study. J Adv Nurs [Internet]. 2020 [cited 08 feb 2021];76(9):2380-2390. Available at: http://doi.org/10.1111/jan.14455.
25. Nichols M, Sarfo FS, Singh A, Qanungo S, Treiber F, Ovbiagele B, et al. Assessing mobile health capacity and task shifting strategies to improve hypertension among ghanaian stroke survivors. Am J Med Sci [Internet]. 2017 [cited 06 mar 2021];354(6):573-580. Available at: https://doi.org/10.1016/j.amjms.2017.08.005
26. Cabrera R, Salum S, Fuster N. Personas mayores y uso de tecnologías de la información: develando brechas, sentidos y afectos en Valparaiso. Trab Soc [Internet]. 2021 [cited Jan 28, 2022];23(1):197-224. Available at: https://doi.org/10.15446/ts.v23n1.87702
27. Abad L, Llorente C, Sánchez M, Viñaras M, Pretel M. Administración electrónica y trámites online: hacia la autonomía y empoderamiento de las personas mayores. El profesional de la información [Internet]. 2017 [cited 28 jan 2022];26(1):34-42. Available at: http://hdl.handle.net/10637/8303

28. Moreno T, Fuentes M. Comunicación móvil y adulto mayor: exclusión y uso desigual de dispositivos móviles. Persectiva Comu [Internet]. 2016 [cited 28 jan 2022];9(2):7-29. Available at: http://ojs.ufro.cl/index.php/perspectivas/article/view/553
29. Galkute M, Rojas L, Folch E. Life Clock: desarrollando una plataforma tecnológica para promover el envejecimiento activo. En: Meiselwitz G. (eds) Informática social y redes sociales: aplicaciones en marketing, aprendizaje y salud. HCII 2021. Lecture Notes in Computer Science [Inernet]. 2021 [cited 09 jan 2022];12775. Available at: https://doi.org/10.1007/978-3-030-77685-5_26
30. Guevara G, Jordan F, Huilcapi M, Sánchez P. Importancia de la usabilidad y accesibilidad en los juegos digitales y su contribución en la mejora de la calidad de vida en los adultos mayores. JCR. CICACI [Internet]. 2020 [cited 29 jan 2022]; 5:176-193. Available at: https://doi.org/10.5281/zenodo.4728044

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