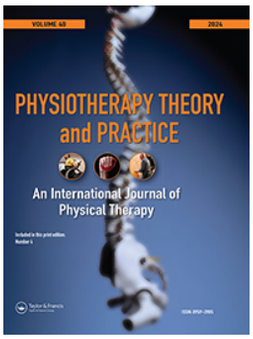


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QUALITATIVE RESEARCH REPORT

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# "Life has always been physical physical, now visual": an explorative study on the use of digital health technologies to promote physiotherapy home treatment programs among older people

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**ABSTRACT**

**Background:** There has been a recent rise in the use of technology for health promotional practices, which have begun to gain popularity among physiotherapists but not much research has been conducted to explore its many opportunities and challenges among older adults in developing countries.

**Objectives:** To explore Nigerian-based Physiotherapists' perspectives on how digital health technologies (DHT) can be utilized to promote physiotherapy home treatment programs among Nigerian older people.

**Methods:** This is a one-on-one semi-structured interview of 12 geriatric physiotherapists (7 Male, 5 female) virtually in the Teams Meeting platform. Data generated were analyzed thematically using the latest version of NVivo software.

**Results:** Three overarching themes were conceptualized including the usage of DHT in Nigeria, challenges to DHT application, and strategies to improve DHT usage. These described a low awareness and usage of DHT despite its recognized need and advantages for promoting home program. The forms of DHT commonly being used are mostly mobile-based through calls or texts, which could be due to barriers to the use of DHT including older people's declining cognition, poverty, and low interest in technology. Some external problems included the physiotherapists' attachment to hands-on practice and low commitment from the informal caregivers.

**Conclusions:** These findings suggested ways to utilize the DHT in promoting physiotherapy home treatment programs among older people by encouraging technological innovations and raising awareness among physiotherapists, while the physiotherapists need to patiently educate both the older people and involve their informal caregivers.

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Adherence; concordance; digital health technology; home treatment programmes; older people; physiotherapy

## Introduction

Home treatment programs enable physiotherapy patients to assume responsibility for managing their condition as this ensures the maintenance of functional gains and continuous progress (Lorenz and Morrison, 2015). This is a key component of the core principles of the physiotherapy practice, which is engaging the patients in their treatment and advising them to take charge of their health. This is because the benefits of many physical therapy interventions such as exercises depend on continued participation and the outcomes of most treatments are maintained and promoted by continual, repeated, and daily practices (Beebe and Lang, 2009; Withers et al, 2021), which is mostly achievable at the patients' home and throughout patient's activities of daily living. However, there are often challenges with older people's ability to optimally carry out their home programs (Chan and Chan, 2010; Miller, Hill, Kottke, and Ockene, 1997).

Adherence to a physiotherapy treatment program describes the extent to which an individual can implement the advised and agreed interval, treatment dose, and dosing regimen of their prescribed intervention (Conraads et al, 2012). Treatment adherence is an important factor, which can influence the outcome of a treatment as those who are able to adhere are shown to have better treatment outcomes (Hayden, Van Tulder, Malmivaara, and Koes, 2005). Within physiotherapy, the concept of adherence is multi-dimensional and very individualistic in that there are internal and

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external factors beyond patients' control that might make this difficult. It could relate to attendance at appointments, following advice, undertaking prescribed exercises, correct performance of exercises, or doing more, or less than advised (Kolt et al, 2007). Because of this multifactorial and problematic nature of adherence, the concept of concordance was introduced as an improved practice where the perspective of the patient and the clinician is well considered in treatment decisions with the clinician providing adequate information to the patient and supporting patients through the care process (Chakrabarti, 2014). While the move from adherence to concordance has not provided an ideal solution to understanding the complex process of patient's behavior in following treatment, the move from compliance to adherence and concordance represents genuine progress in this discourse, which puts the patient's perceptions at the center of the whole process (Chakrabarti, 2014). However, the word adherence has been used interchangeably with concordances in this paper.

Implementation of physiotherapy home programs is often unsatisfactory for achieving optimal health outcomes and it is a big obstacle faced by physiotherapists. Patients do not reach their rehabilitation goals and desired outcomes because they are not able to continue and follow their home programs. Studies from Turkey, Australia, and Saudi Arabia showed that less than 40% of patients fully implement health programs (Alasfour and Almarwani, 2022; Chan and Chan, 2010; Hill et al, 2011) especially, physiotherapy interventions in older people have been reported to have low levels of adherence (Alasfour and Almarwani, 2022; Hill et al, 2011). Data show that a large proportion of adults do not meet physical activity recommendations, and this is a significant public health problem. It has also been reported that about 50% of the adult population who start a physical activity program will drop out within a few months (Karvitz, 2011). Many factors related to the treatment regimen, the patient, the healthcare provider, and the healthcare organization are thought to influence the patient ability to follow their treatment (Miller, Hill, Kottke, and Ockene, 1997).

Strategies that have been reported in research for treatment programs among older people include the utilization of their informal caregivers as members of the treatment team (Azizan, Justine, and Kuan, 2013; Mudzi, Stewart, and Musenge, 2012) and physiotherapy home-based treatments. However, these approaches have not shown optimum success, especially among older people where treatment goals are usually varied and require a more holistic and individualized approach. There has also been a recent rise in the use of technology for health promotional practices (Ekoh, George, and Ezulike, 2021), which have begun to gain popularity among physiotherapists but not much research has been conducted to explore its many opportunities and challenges among older adults. Especially, studies are scarce among developing nations on this concept.

The growth in digital healthcare technology (DHT) has been boosted recently by advances in digital media and recent situations such as the COVID-19 pandemic, with healthcare systems substituting in-person appointments for virtual ones (Ekoh, George, and Ezulike, 2021). DHT is any form of healthcare administration that incorporates the administration of medical consultation and virtual intervention without physical contact and makes use of the internet, electronic mobile devices, communication, and information technology (Ali, Alam, Taylor, and Ashraf, 2021; Bhattarai and Phillips, 2017). It may be particularly helpful to promote concordance among older persons with chronic illnesses because it can help them improve self-efficacy (Sen, Prybutok, and Prybutok, 2022), access timely, effective, and acceptable health care (Wilson et al, 2021), and take an active daily role in their healthcare (Cristiano et al., 2022).

However, despite the potential advantages of DHT, there is a considerable digital divide among older people that has worsened because of the COVID-19 pandemic and its related shift toward virtual care (Ali, Alam, Taylor, and Ashraf, 2021; Barrie et al, 2021; Ekoh, George, and Ezulike, 2021). People who do not utilize the internet are more likely to become disenfranchised and disadvantaged as the Internet becomes increasingly incorporated into daily life. For instance, Physiotherapists could utilize DHT to promote home exercise programs in rehabilitation, which is currently very poor among older people as is reported in Ireland to have less than 50% implementation (Argent, Daly, and Caulfield, 2018).

Besides, there is a scarcity of qualitative research that has attempted a comprehensive exploration of DHT for older people receiving physiotherapy services as only a few related studies are available in the literature which has taken the initiative to do in-depth qualitative research on older people's use of DHT (Fernandes et al, 2022; Martínez de la Cal et al, 2021). For example, Martínez de la Cal et al. (2021) carried out a semi-structured interview study to understand physiotherapists' opinions on implementing a web-based telerehabilitation program for treating chronic low back pain (LBP). Although this work did not focus on older adults and was carried out in Spain, it showed that while exercise programs for LBP are not always adapted to

patient preferences, the use of DHT helps them to provide their patients with the follow-up and remote contact they demand, but long-term concordance to treatment stems from knowledge of the exercises and the correct techniques employed by the patients themselves. Fernandes et al. (2022) elicited their data from the physiotherapists, but they utilized the cross-sectional questionnaire survey approach which has limitations of poor generalizability and limiting the potential exploration of the participants' experience due to the fixed nature of the structured data collection tool. More qualitative study is therefore needed to further explore how DHT can be used to promote physiotherapy home treatment programs among older people. Most of these identified papers were conducted in developed countries, and it could be difficult to generalize their findings to older people in the less developed regions of Africa like Nigeria where there are often complex and intersectional challenges that pose many unmet health needs. More qualitative study is required to establish how DHT can be used to promote physiotherapy home treatment programs among older people. Since internet adoption rates among older persons vary depending on their age, ethnicity, level of education, and income (Atoyebi, Stewart, and Sampson, 2015), it becomes necessary to carry out this study in less developing nations such as Nigeria to fill the important research gap in this population. Thus, this study seeks to explore Nigerian-based Physiotherapists' perspectives on strategies for using the DHT to promote physiotherapy home treatment programs among older people.

## Study setting and methods

### Study setting

This study was conducted in Nigeria. After the Civil War, there was a strong demand for physiotherapy services, which led to the need for more persons to be trained in the field. A five-year Bachelor of Physiotherapy or Bachelor of Medical Rehabilitation programme is required to become a physiotherapist in Nigeria. This program includes two years of premedical training and three years of clinical training. There are about 2,450 registered Physiotherapists in Nigeria as of 2019, which equates to one physiotherapist per 86,800 people (Mbada et al, 2019), which is an indication of how physiotherapists are scarce and currently needed in the country. Moreover, most Nigerian older people live in villages, which are characterized by rural, sparse living conditions, and increasing demand for community-based physiotherapists (Okoye, 2013), which often necessitate patients' ability to become actively involved in their treatment (Slevin et al, 2019) for which DHT would be a suitable tool for its actualization (Cristiano et al, 2022). Although most of the physiotherapists in Nigeria reported good knowledge and attitude toward the practice of DHT (Awotidebe et al., 2023) not so much is known about whether they utilize it for older people's care.

### Research design

The qualitative exploratory research methodology (Bryman, 2016) was utilized with a one-on-one semi-structured virtual interview of 12 (7 males) Nigerian-based geriatric physiotherapists recruited using purposive sampling to enable recruitment of diverse characteristics of participants (Ormston, Spencer, Barnard, and Snape, 2014). The sample size was determined by data saturation (Bryman, 2016). The different categories (Table 1) that defined the identification and recruitment included participants from different durations of geriatric physiotherapy clinical experience among older people with the goal of including participants with extensive experience of DHT use and those with less experience. Also, participants' gender, level of education, community, or institutionalized practice settings, and urban or rural location of health practice were considered for the selection. The inclusion criteria were Nigerian-based geriatric physiotherapists who obtained their bachelor's degree from a Nigerian university,

**Table 1.** Participants characteristics.

| s/n | Pseudonyms | Sex | Age | Duration of clinical experience (years) | Levels of education | Practice settings | Type of institution | Location of health practice |
|---|---|---|---|---|---|---|---|---|
| 1 | Stefan | Male | 30 | 11 | PhD | Community | Private | Urban |
| 2 | Shesolm | Female | 25 | 8 | Masters | Mixed | Private | Sub-urban |
| 3 | Partrik | Male | 31 | 12 | BSc | Community | Private | Urban |
| 4 | Joesy | Male | 41 | 16 | Masters | Mixed | Public | Sub-urban |
| 5 | Emmy | Male | 43 | 17 | Masters | Community | Public | Surb-urban |
| 6 | Confiscus | Female | 29 | 33 | BSc | Tertiary | Public | Rural |
| 7 | Gold | Male | 26 | 4 | BSc | Community | Private | Urban |
| 8 | Ogens | Female | 27 | 3 | BSc | Community | Private | Rural |
| 9 | Ejele | Female | | 19 | Masters | Community | Private | Rural |
| 10 | Dafidsun | Male | 43 | 28 | PhD | Tertiary | Public | Urban |
| 11 | Aperi | Female | 45 | 23 | BSc | Tertiary | Public | Urban |
| 12 | Eremu | Male | 37 | 15 | BSc | Mixed | Private | Urban |

have been in practice and licensed for at least three years, and have actively engaged in the treatment of older adults. Those who had no access to the internet and who could not connect to the Teams Meeting platform were excluded. Physiotherapists were chosen for this study because the researchers have a background in physiotherapy and physiotherapy interventions are in the context of daily life, making them extremely beneficial for DHT optimization. Participants were recruited from the three main Nigerian physiotherapy associations that have all practicing Nigerian physiotherapists registered including the Nigeria Society of Physiotherapists (NSP), Association of Clinician and Academic Physiotherapists of Nigeria (ACAPN), and Medical Rehabilitation Therapist Board of Nigeria (MRTB). Firstly, the members of these groups known to the researcher were contacted personally, and the leaders of these groups who acted as the gatekeepers were also contacted in a written request attached with ERGO II approval mail. The gatekeepers were requested to help share the participant invite message to their various social media platforms. Participants who were willing to participate were asked to contact the researcher for further information. Those who reached out to the researcher were sent the participant's information sheet. After answering their questions those who agreed to give informed consent were recruited for the study and booked for the interview date.

The interviews were carried out in July and August 2023 virtually in the Teams Meeting platform in a one-off and one-to-one with the researcher using the English language and lasted between 45 to 60 minutes. The lead author (CFE) conducted the interview alone under the supervision and reviews of a supervisor (NF). The interview guide (provided in supplementary material I) focused on how DHT can be used to promote physiotherapy home treatment programs among older Nigerian people as well as strategies for narrowing the digital divide in health among older adults in Nigeria. Secondly, in the interview, information about their experience of digital healthcare during their practice with older people was discussed to know if and how it has helped in their practice and how it has affected treatment implementations and recovery among older people. All the interview was recorded and transcribed with the aid of the Teams Meeting platform.

The University of Southampton Ethics and Research Governance Online II provided ethical clearance for this research. Participants informed consent was sought with verbal and signed consent. The anonymity and privacy of the participants were assured (Gledhill, Abbey, and Schweitzer, 2006) by changing any leading and identifying words where they may be directly quoted in the paper and with the use of pseudonyms instead of the participant's actual names (Geest, 2003).

### Reflexivity

The researcher's position as a Nigerian-based physiotherapist was one of the possible sources of bias. There could be much bias due to the insider effect as some often presumed that the researcher should already know the details of what they were trying to explain (Gunaratnam et al., 2003). While being a Nigerian-based physiotherapist is beneficial for enabling participatory research (Clark, Foster, Sloan, and Bryman, 2021), it might have affected some responses given to the interview questions where more probing might have been inhibited because of the researcher's prior knowledge on the topic. For example, in some of the interview questions, the interviewees tend to be brief in describing the barriers to DHT application for older people and for promoting physiotherapy home program. The researcher found it difficult to probe this further without sounding redundant as the barriers all revolved around low resources.

Another possible source of bias could be the interviewer being female gender due to gender matching issues. This impacted the recruitment as more male (7) agreed to grant the interview and seemed to talk more about their experience and opinions on the topic. Also, the geriatric physiotherapists that were recruited were mostly from the southern part of Nigeria where the researcher is located. Nigerian northern versus southern differences in literacy and development indices (Adeleke, 2021) could impact differently on the digital divide among older people, and physiotherapists in these different regions.

However, to allow for empathy neutrality, credibility, and in-depth exploration of the phenomenon, matters on the research status and position were consistently checked throughout the interview process (Mays and Pope, 2000; Ritchie, Lewis, Nicholls, and Ormston, 2013). To achieve this, a detailed audit trail was kept as a memo in the NVivo software, and that was used for reflection during the final analysis to validate the authenticity and validity of the methods of data and the findings (Nowell, Norris, White, and Moules, 2017). Also, such key strategies as supervision and critical reflection were used to manage the position of the researcher throughout the process of the research by critically amending and implementing all supervisor's corrections and recommendations.

### Data analysis

The six steps of thematic analysis were used to guide the data analysis (Clarke and Braun, 2013). These included

importing the text transcript into the latest version of the Nvivo software that aided the coding and analytical process. The data generated was read repeatedly to get acquainted with the in-depth meanings and expressions generated. This is then followed by coding the data using the open coding with both the "in vivo" coding and new descriptions. All the coding from the 12 transcripts was cross-checked iteratively to ensure they were all relevant and applicable to the code (Strauss and Corbin, 1998) as well as examining the data to verify the categories and/or models connecting the research aim that each code represented (Lofland and Lofland, 1995). These allowed the application of new codes, deletion of less relevant ones, improvement on the coding labels, merging those that are of similar concepts, and grouping of those related to each other into a higher-order conceptual category. The researchers went further to interrogate the conceptualized theme to explore their relationship with the research questions by reviewing the chunks of text under each code and the context of their expressions. As well as assessing how each participant's characteristics are connected to their narrations, also search queries and matrix queries in the NVivo software were used to identify relevant chunks of text (Bazeley, 2009). These various queries helped to reflect on the codes and emerging themes to sort out the discrepancies in how they relate to the raw data and the research questions also conceptualized themes were removed or revised in cases where the disparities were true based on the raw data (Strauss and Corbin, 1998).

## Results

The data analysis supports the conceptualization of three overarching themes of the usage of DHT in Nigeria, challenges to DHT application, and strategies to improve DHT usage as presented in Table 2 with their subthemes. These themes addressed a socio-ecological model of the nature of DHT use in Nigeria, which captured older people-related factors, physiotherapists' related factors, care institutions, and factors related to the family and society.

### *Usage of DHT in Nigeria*

Nigerian-based geriatric physiotherapists described, identified, and defined DHT as audio calls, text messages, sharing pictures and videos, video calls, or websites, apps, and devices that signal their movements and conditions and communicate it to the therapist virtually. Albeit they indicated a low awareness and low application of DHT in their practices among older people, which did not differ across the different categories of the participants.

> The only thing I do is call them . . . to remind them of their home programme. (Partrik, M, 31 yrs, 12 Yrs of Clinical Experience-YCE)

Despite the indication of low awareness and uses of DHT, the need for DHT was recognized by many of the participants. They agreed that optimum implementations of home treatment programs are often lacking among older people, and most older adults find it difficult to comprehend the training instructions that are given, which warrants the DHT to enable the physiotherapists to monitor and possibly see what their patient is doing at home since the right technique and dosage is as important as the interventions itself.

> . . . , some older patients would not be conversant with the treatment. Even after teaching and instructions . . . , they might still forget . . . or do it wrongly. For instance, . . . , when they come to clinic in the next appointment, . . . they . . . often not be able to remember . . . . (Aperi, F, 45 yrs, 23YCE)

**Table 2.** Identified themes and subthemes for the use of DHT to improve older people's adherence to physiotherapy home treatment programs.

| Themes | Subthemes |
|---|---|
| Usage of DHT in Nigeria | Available forms of DHT(audio calls, text messages, sharing pictures and videos, video calls, or websites, apps, and signal devices). |
| | Needs for DHT (Easy access to care, reduces financial burden) |
| | Benefits and uses of DHT (follow up, patient education, placebo effect, reminder, Virtual guide). |
| Challenges to DHT application | Low use of digital devices among older people |
| | Physiotherapists related factors (Low DHT awareness, Lack of individualized DHT programme, |
| | Lack of institutional support |
| | Poverty/Resource limited nation |
| | Time factor |
| | Poor internet network |
| Strategies to improve DHT usage | Institutional support (allocation of DHT time, allocation of funds, More research for individualized design, More staffing) |
| | Educate patient and their caregivers |
| | Improvising for DHT |
| | Creating DHT awareness |
| | Mixing DHT with physical appointments |
| | Older adults' welfare policies |

Key: DHT-Digital health technologies.

The use of DHT was also reported to be easier and user-friendly when compared with analogue training tools as the DHT could often have automated virtual instructions. An example of this advantage is seen in the reported experience of one of the participants involved in both community and tertiary practices.

> . . . they get some electronic devices like . . . sphygmomanometer. . . . unlike the manual one, they . . . were taught . . . on how to use and interpret it . . . from the voice in the machine. (Joesy, M, 41 Yrs, 16YCE)

Another recognized need for DHT is to reduce the workloads on physiotherapists and be able to reach more patients in more time-efficient ways, as well as reduce the transportation and medical cost for patients.

> We don't see those in rural areas too often. . . . now devices allow means to reach out to them. . . . when they now come back, the result is always better . . .. (Dafidsun, M, 43 Yrs, 28YCE)

This need for DHT was particularly pronounced where the informal caregivers are not available and among the community physiotherapists who are often involved with reaching many rural dwelling patients where there are significant shortages of social amenities and resources needed for easy access to healthcare.

> . . . , life has often been physical, physical,. . . . . now visual. . . One can achieve more visually . . . Yeah, it can increase treatment time and access to care. (Stefan, M, 30 Yrs, 11YCE)

In addition to the recognized needs for DHT, many cited that DHT can be used to provide a virtual guide to older people while they train at their homes.

*" . . . with technology, you are even able to monitor what the patient is doing virtually including the technique and dosage"*(Aperi, F, 45 yrs, 23YCE).

Another well-noted use for DHT was for reminder, in terms of prompting and motivating older people. This was acknowledged by all the participants.

> . . . , I remind them, . . . Did you do the programme? Remember to do the programme? Just a kind of alarm to alert them . . . . (Dafidsun, M, 43 Yrs, 28YCE)

When asked to assess the effectiveness of using DHT to promote a home treatment program, Ejele (F, 38 Yrs, 19YCE) who works in an urban area stated that it was effective in making real-time reminders.

> . . ., my patients after having five sessions without these images still forget to do their exercises the right way but when I send them images . . ., . . . it improves their performances.

Closely related to the use of DHT for reminders is its usage for follow-up. This was reported to help in reducing patient hospital visits thereby reducing their financial burden, as well as allowing the therapists to easily get feedback about the recovery of their patients.

> . . . you could visually assess the progress of your treatment. . . Ask them if they have done what you asked them to do and if they can let you see how they did it . . . To follow up on them. . . ., like make them see the need to do it. . . . (Stefan, M, 30 Yrs, 11YCE)

This use of the DHT for follow-up was indicated to create a positive behavioral change in older people as they are reported to perceive the therapeutic empathy demonstrated through DHT as concerned attention to their recovery, and sometimes it leaves a placebo effect of good feeling on them.

> They will be very happy. . .that their healthcare provider is willing to monitor their home treatment, and this will encourage them even more. Once some patient notices that you are concerned, they can be motivated. . .. (Aperi, F, 45 yrs, 23YCE)

Lastly, the participants highlighted that DHT is a useful tool for patient education and reassurance even when the patient is with them in the clinic as it could help promote easy understanding while reducing information overloads coming from many therapeutic advice and instructions.

> . . . when you explain and show them what to do at home using examples or illustrations, it gives them better understanding. (Stefan, M, 30 Yrs, 11YCE)

> . . .I do . . . digitally signpost them . . . about their condition and . . . to know what evidence says about their condition . . . . like using NICE guidelines. (Joesy, M, 41 Yrs, 16YCE)

### Challenges in DHT application

Despite the many benefits and the need for DHT, many challenges were highlighted as hindering the speedy adoption of DHT for promoting physiotherapy home treatment programs. These challenges cut across older people, Nigerian-based physiotherapists, care institutions, and factors related to the family and society.

There were older peoples' characteristics noted to be possible causes of barriers including reported low affinity to technological advancement, declining cognitions, low socioeconomic status (SES), and poor recovery goals.

> . . . , more difficult for them to learn it. . . . , they might not have the phone, they might not have the internet. Most . . . just want to make and receive calls, . . . . (Eremu, M, 37 Yrs, 15YCE)

The implication of this inability to own a device and understand the technology is that older people would

require only targeted digital content to get involved and benefit from the opportunities it offers. For instance, one of the participants [Stefan] reported that he has a website where physiotherapy health promotional information is advertised to the public, but he only gets clicks and only attracts younger adults, some of whom were seeking advice regarding their older relatives.

Albeit, these peculiar problems are compounded by the more general low SES barriers common in developing countries. For instance, considering the poor economy in Nigeria, many older people would have difficulty getting a smartphone that has modern apps. Also, the cost of data, even when some have a phone, they cannot access the internet because of data.

> . . . , some of them don't have the right level of education to operate these devices [android phone]. . . . interpret the content or understand the intervention being illustrated without further guidance. . . . , inability to afford . . .these devices. . . . because . . . there is high rate of poverty. (Ejele, F, 38 Yrs, 19YCE)

> . . . with some developed country,. . . it's easy to say send exercise guidelines to these patients. But here, there are patients that can't read. (Shesolm, F, 25 Yrs, 8YCE)

Some of the participants agreed that older people with higher SES such as a higher level of education, as well as those who have younger family members have better chances of accepting and using DHT. This is portrayed in the response of a male participant with 4 years clinical of experience in geriatric settings, and practices in a private clinic located in an urban area; describing one of their patients who had good usage of DHT.

Interviewer: Do you think her level of education contributed to her learning of this digital skill?

Gold: Yes of course. . . She is a graduate and has worked as an accountant, so she was literate enough and I think it helped her . . . ."

The physiotherapist reported a lack of appropriate devices that are suitable to individual older persons as well as finding it difficult most times to identify suitable training or exercise videos with individualized contents for instance, that meets their patients' needs without risking providing them with demonstrations that are not evidence-based.

> . . ., I think finding the right content online. Like getting the proper videos and images that are tailored to patient's needs. Some exercises were done by people that are not Physiotherapist. . .(Ejele, F, 38 Yrs, 19YCE).

Also, many older people often have multi-morbidities, whereas digital contents are mostly designed with and by younger people.

> The patients might have clinical issues, . . . that demands your close monitoring. (Stefan, M, 30 Yrs, 11YCE)

Besides, the practice of physiotherapy in Nigeria appeared to uphold the principles of "hands-on" in high regard as some of the participants hinted that DHT would be a disadvantage to the need for physical touch in their treatment.

> Physiotherapy is appreciated when there is a physical meeting and hands-on which is proven to give more impact because of the nervous transmission and interaction. (Ogens, F, 27 Yrs, 3YCE)

However, this limitation could be overcome by combining virtual care with the same level of physical appointments following the advice of Joesy (M, 41 Yrs, 16YCE) who works among sub-urban dwelling older people.

The participants reported an absence of extended follow-up plans in the care models and processes of many physiotherapy centers, especially the public-owned facilities where it is hard to obtain funding for extra costs of running a DHT such as subscribing to the internet since many physiotherapists in Nigeria-only depends on their private internet subscription.

> . . . you would not be able to call a patient with your money when the funding is not there from the employer (Confiscus, F, 29 Yrs, 33YCE).

Again, there were issues of lack of time for virtual treatment meetings with home patients within work hours as home treatments rather happen during the physiotherapist's private times and for those patients that are willing to contract them for extra treatment hours and pay.

> . . . , our work schedules . . . can also be a barrier, we work all day and . . . not have time to check on those at home. . . The workload is more than the workforce. (Aperi, F, 45 yrs, 23YCE)

While this lack of time may be due to the overreliance on physical visits to patients' homes, the participants also noted that they are not provided with advanced DHT devices and there are lack of research or funding targeted at innovatively improving the approaches to care.

> We don't have the most recent technologies in terms of physiotherapy in Nigeria. (Emmy, M, 43 Yrs, 17YCE)

### *Strategies to improve DHT usage*

The participants noted the need for an effective welfare system for the health insurance of the older population, as well as funding or subsidizing the cost of DHT by both government and non-governmental agencies. They explained that it is more difficult to convince older to learn new devices when they are bearing the costs.

> . . . to motivate DHT . . . , a welfare system that makes health care accessible including providing . . . devices . . . that can survive the fluctuating nature of light . . . The non-governmental agencies can help in providing subsidies . . . . (Ejele, F, 38 Yrs, 19YCE)

The need for raising awareness about available advances in DHT and training of therapists as well as investing and sponsoring research for adapted designs of DHT were also pointed out.

> Government can joint with companies that produce such things, . . . and supply it at affordable prices . . . . (Joesy, M, 41 Yrs, 16YCE)

Creating awareness requires that evidence about the effectiveness of each DHT should be established and popularized. Ejele (F, 38 Yrs, 19YCE) pointed out that in their previous experience, organizations that provide funding are always driven and convinced to help when they see the effectiveness of the intervention.

Where these devices remain unavailable, the participants believed that they could improvise by giving the older person pamphlets that have pictorial illustrations. As well, the physiotherapist noted the need for older adults and their informal caregivers to be patiently educated on specific DHT indicated for their treatment.

> I take things bit by bit slowly and integrate them [older people] into technology . . . sometimes it's not just about teaching them, . . . also . . . teach the people around them. (Emmy, M, 43 Yrs, 17YCE)

Finally, when asked about how the informal caregivers could help, they identified the need to involve the informal carers to bridge the knowledge and functional gaps that might be limiting older people from making optimum use of DHT.

> . . . they might not be able to interpret the content . . . They will rely on caregivers who . . . play a very big role in reminding them or being the direct contact for the usage of the DHT . . . acting as a bridge. (Ejele, F, 38 Yrs, 19YCE)

> . . . my WhatsApp intervention with the patients . . . is always via the relative. . . Because of some unique situation like hemiplegia on the dominant side . . . making it difficult to use a phone. (Joesy, M, 41 Yrs, 16YCE)

## Discussion

This qualitative study was aimed at exploring Nigerian-based Physiotherapists' perspectives on how digital health technologies (DHT) can be utilized to promote physiotherapy home treatment programs among Nigerian older people. The results indicated that DHT is warranted to promote home treatment among older adults despite notable challenges.

The use of DHT was notable in this study for its relevance in monitoring their patient's treatment sessions at home to ensure they are doing the right thing. This agrees with previous findings that have shown that such devices as text-messaging devices (Harada et al., 2010), and voice-controlled intelligent personal assistants (Jansons et al., 2022) can be used to remotely deliver and monitor an individually tailored, home-based treatment to older adults. The effect of such continuous monitoring helps to promote their performance as the service users are drawn to understand the benefit of the program based on the concentrated attention and empathy the therapists portray by going the extra to use DHT to check up on them after their physical appointments (Geraedts et al., 2013). This extended checkup potentially leaves a positive behavioral change in attitude toward their home treatments (Harada et al, 2010; van Het Reve et al, 2014) that agrees with the principle of concordance in contemporary behavior change literature (Johnston et al, 2021). Also, such behavioral intention could be likened to the social influence component of the unified theory of acceptance and use of technology (Carrera et al., 2023), in terms of perceiving the DHT as important based on the importance their therapists attached to it. In turn, the increased use of the DHT might mean more opportunities to optimize the easier and cost-effective usage of the DHT toward increasing the implementation of the recommended home treatment program among this population.

The DHT is also noted for its benefits in aiding the easy education of patients and informal caregivers regarding home treatment programs. Using the DHT as an illustration, for instance, makes for easy understanding, better reassurance, and reduced information overloads. Notwithstanding, literacy issues among older people in developing nations could be the barrier to the optimum use of DHT for teaching as they could need to start learning technological skills (Ambrens et al, 2021; Chatto, York, Slade, and Hasson, 2018) and ability to understand the device interfaces (Gamecho et al, 2015). Participants in the present study explained that the benefit of DHT in this regard warrants that they would take the older people patiently and teach them the DHT little by little. The study by Schirmer et al. (2022) has

noted the importance of such adapted and individualized teaching approaches in their programs to promote digital inclusion among older people. This is echoed in such care models as person-centered care and user-centered approaches to digital health interventions (Gulliford and Alageel, 2019).

The application of DHT was reported to have the opportunity to reduce the workloads on physiotherapists and afford them the ability to reach more patients in more time-efficient ways, as well as reduce the transportation and medical costs for patients. This is consistent with previous findings in the literature about the use of DHT for accessing cheaper physiotherapy services (Hawley-Hague et al., 2022; Lawford, Delany, Bennell, and Hinman, 2018). Aside from reports on the cost issues of obtaining a DHT among older people (Mbunge, Batani, Gaobotse, and Muchemwa, 2022), others have reported that DHT itself promotes convenience to all involved (Arkkukangas, Cederbom, Tonkonogi, and Carlsson, 2021), reduces cost (Hawley-Hague et al., 2022), and promotes self-efficacy and engagement (Pettersson et al, 2021). However, Fernandes et al. (2022) in Brazil reported contrarily that accessing care through DHT in low- and middle-income countries would have the same cost as they pay the same for in-person consultations. This difference in the finding of Fernandes et al. might be due to their focus on medical care services compared to physiotherapy treatments where the interventions are often transferable skills that the patient can do at the convenience of their home with no extra costs. Findings from other contexts have acknowledged that training numerous participants at the same time as possible, and DHT allows for an individualized treatment approach while saving therapist time (Thumm, Giladi, Hausdorff, and Mirelman, 2021).

Furthermore, DHT was identified as a useful tool for providing reminders and keeping older people encouraged to do their home programs. This is consistent with previous findings by Lilje et al. (2017) who reported positively about older adults' experience of receiving text messages as reminders of home exercises after manual treatment for recurrent LBP in a hospital in Sweden. They showed that such reminders can empower older adults toward personalizing the treatment goal. Harada et al. (2010) also showed similarly that text-messaging reminders can prompt home treatment especially one that keeps the patients engaged. Meanwhile, while the evidence on using DHT for reminders has utilized automated messaging, the geriatric physiotherapists in this study only reported manual messaging, which has the barrier of being forgotten when the therapist is not disposed. This shows a gap in practice in developing countries and requires more policy intervention for advanced and technological innovations.

Lastly, DHT was reported in this work to be beneficial for follow-ups and checkups on older adults, which helps in reducing physical appointments and saving transportation costs for both parties. This was one of the simple uses of DHT, which often is in the form of follow-up consultations to receive feedback about the older person's response to previous treatment, as well as about the implementation of their home treatment. Mehra et al. (2020) explained that DHT increases the accessibility of physiotherapy services due to such functions as follow-up calls, remote contact, and their ability to produce long-term support for treatment goals.

This study finding reported a low awareness and usage of DHT that is like those reported in the systematic review study of Aboye, Vande Walle, Simegn, and Aerts (2023) where the only SMS and calls-based DHT methods were utilized in Sub-Saharan Africa compared with Europe countries that utilized more of apps, sensors, and wearables even among the older population. Unlike previous studies on the available forms of DHT in Africa that were carried out on public health promotional services, this study adds novel evidence to the literature for the use of DHT in physiotherapy. The explanations for the reported pattern of low technological advancement found in this study are consistent with the report of Mbunge, Batani, Gaobotse, and Muchemwa (2022) in South Africa that developing nations are hindered by infrastructural and technological barriers as well as a lack of adequate welfare coverage for the public health. For this study, numerous and dynamic interplay of factors cutting across the older person's ecological framework were highlighted to be hindrances to the optimum utilization of DHT. These are further discussed in detail in the subsequent sections.

Some of the hindrances to the optimum utilization of DHT were those emanating from older people's biopsychosocial attributes. For instance, the present study highlighted situations where older people lack interest in technology relatable to how much personal effort, they are willing to put toward their recovery and treatment plans. Previous studies have confirmed this finding that older people's psychological disposition such as the feeling that DHT is not appropriate for them presents challenges in their rehabilitation and suggested that both healthcare professionals and family caregivers can improve their responses by encouraging them (Dennison, Morrison, Conway, and Yardley, 2013). The perceived importance of DHT as a tool for their

recovery is important to how much effort they can put into using them (Isernia et al, 2019) in turn for letting DHT be an avenue for the therapist to prompt their home treatments.

Secondly, this study highlighted declining cognition in later life as an example of many biomedical changes that are common in later life that presents challenges to optimally access and utilize DHT for their healthcare. These challenges are similarly reported in previous studies in the form of low computer literacy among older people (Ambrens et al, 2021; Chatto, York, Slade, and Hasson, 2018) and the ability to understand the device interfaces (Gamecho et al, 2015). The participants in this study believed that such barriers can be overcome by involving older people's informal carers. Informal carers are important in promoting home treatment programs (Bogardus, Martin, Richman, and Kulas, 2019). They could be engaged to bridge the knowledge and functional gaps that might be limiting older people from making optimum use of DHT (Jokisch, Schmidt, and Doh, 2022). These important roles of the informer caregivers or the family members echo the need for adequate social support in the recovery pathway of older people (Ebersöhn, Omidire, and Mampane, 2021) especially in developing countries like Nigeria where most care packages or supports are provided by families and there is the poor presence of institutional care packages (Ojembe and Ebe Kalu, 2018; Oluwagbemiga and Tiwalade, 2017).

Again, the SES of older people also presents limitations as they are often retired or unemployed and dependent on their children who might as well be unemployed given the high unemployment rate across all age groups in Nigeria (Yarima, 2014). Older people are therefore faced with the dynamic of challenges that require cautious policy and practical efforts to improve their access and use of DHT. The participants in this study suggested that for health services among older people to be glitch-free, older people welfare that covers their health insurance in Nigeria should be established. Researchers have shown that older people who have a functioning welfare system respond well to their care plans and their clinicians' prescriptions (Age UK, 2019; National Institute for Health and Care Excellence NICE, 2015), which supports the finding in this work that paying out of pocket makes older people lose motivation from adjusting and adapting to innovative approaches to their care.

The participants also highlighted the need for training the geriatric physiotherapy to gain more skills in approaches to providing sustainable care to the peculiar population of older people. For instance, the World Economic Forum (2021) in their work believed that geriatric healthcare professionals should possess such skills as inclusive designs and positive aging attitudes to ensure the digital inclusion of older adults. Putting these strategic solutions in place will help in narrowing the already existing digital dive across different demographics of Nigerian older people.

This study's findings showed that there is poor readiness of Nigerian physiotherapists toward applying DHT for their home treatment programs. This agrees with the ethnographic study of Keel, Schmid, Keller, and Schoeb (2023) in Switzerland who reported that physiotherapists and their patients scarcely utilize DHT, much less completely utilize its specific capabilities in everyday physiotherapy practice. Although Keel et al.'s study only explored the usage of a specific mobile app they designed in their research, participants in this study explained that the necessary information is not often available on the internet in a form that they can easily prescribe to their patients. This also aligns with previous findings about challenges in designing appropriate DHT treatment program for older people as it is often limited by the dynamic interplay of factors of older adults presenting situations like those having multimorbidity (Wilson et al., 2021). Wilson et al. (2021) recommended the training and education of physiotherapists on how best to use the DHT to the advantage of people of all age groups, which is similar to the opinion of participants in this study for raising awareness about available advances in DHT and training of therapists as well as investing and sponsoring research for adapted designs of DHT as a strategy to motivate innovative approach to care and increase access to care services for older people. There is also a need for more physiotherapy-designated content on the internet, created and posted by physiotherapists.

Meanwhile, some of the therapists also explained that treating people through physical contact affords them to have "hands-on, which they believe is vital to their patients" recovery. However, they reported on lack of time and booking the patients for longer durations due to the demanding nature of physical treatment. While the DHT in this study was not intended to replace the importance of hands-on but to emphasize approaches to supporting older people to implement their home programs, which is already established in literature among physiotherapists to be important for the sustained progress in their patient's prognosis (Lorenz and Morrison, 2015). DHT instead presents as a potent tool to implement the original intent of home programs among a challenging population group by being a pathway to behavioral changes (Arkkukangas, Cederbom, Tonkonogi, and Carlsson, 2021; Hawley-Hague et al, 2020) and boosting confidence and motivating independent living for a longer period by reminding patients when and how to

train (Hawley-Hague et al, 2022; Silveira et al, 2013). Therefore, the need to blend DHT with physical appointments was highlighted in this study like those reported in the literature (Mehra et al., 2020; Thumm, Giladi, Hausdorff, and Mirelman, 2021). Balancing DHT with physical sessions can help boost the confidence of older people as some might be concerned about not being kept at the long arm of technology without the normal physical touch of meeting their therapists.

These study findings are of immense practical implication for Nigerian physiotherapists in meeting the demand of the sustainable development goals that recommended the mobilization of all resources to promote more accessible health (United Nations, 2015), which the DHT is increasingly found suitable given its many innovative opportunities (World Health Organisation, 2020). The aging population, population growth, increasing prevalence of chronic disease, and higher survival rates following accidents or illnesses are all factors that contribute to the increasing need for physiotherapy services in this population. Therefore, to sufficiently serve the growing and aging African population, physiotherapists would need to maximize digital opportunities for increased healthcare access. An interesting highlight of this paper is its focus on DHT as an important tool for optimizing older people's concordance with home treatment programs. Concordance as a concept is a progress from those of compliance and adherence. It explained how DHT is a good fit for meeting the requirements of the concept of concordance. Unlike compliance and adherence where the patient is solely responsible for the successful implementation of the recommendations made by their clinicians, concordance involves both patient and clinician in choosing their treatment options, taking consideration of patient's preference and psychosocial factors, as well as continuing to provide them with information, support, and reviewing to ensure they are able and willing to continue in the agreed treatment plan. Thus, concordance sees both patient and clinician as co-responsible for the successful implementation of agreed treatment plans. This would encourage clinicians to move away from blaming patients for their inability to implement their home programs to taking equal responsibility for the success or failure of the same. As well as to move away from spelling out home program and expecting all patients to do them, rather than individualized plans that consider each person's ability, sociocultural factors, and one that is co-created.

### *Study limitations*

This study's findings are not without some limitations that would necessitate reviewers' caution. For instance, excluding potential participants who did not have internet access might have influenced the result of this research as access to the internet is cardinal to the effective use of DHT, and exploring the experience of this group of people may have generated different perspectives about the use of DHT. However, the implication of this exclusion criteria was minimal as many practicing physiotherapists have Android phones and the meeting was scheduled on days when they are in a good network location, as well as the researcher offered to provide an internet subscription to help them afford the cost. Moreover, since only the geriatric physiotherapists were interviewed, the data represents only their perspective about older people and not the opinion of the older adults themselves, which may include more nuance around their experiences, opportunities, and challenges. However, the principles of qualitative research protocol and analysis were followed to ensure high-quality research findings including using ethically directed methods, memos records, and continuous reflexivity through every stage of the study.

## Conclusion

These findings suggest a low awareness and usage of DHT despite its recognized need and advantages for promoting home program. The forms of DHT commonly being used are mostly mobile-based through calls or texts. This could be due to notable challenges in the use of DHT including older people's declining cognition, poverty, and low affinity to technological advancement. However, the findings suggested that major ways to utilize the DHT in promoting home treatment among older people are by encouraging technological innovations and raising awareness for available technological advances to the physiotherapists, while the physiotherapists need to patiently educate both the older people and involve their informal carers where necessary.

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## Data availability statement

All relevant data from this study have been provided with the submission.

## References


Aboye GT, Vande Walle M, Simegn GL, Aerts JM 2023 Mhealth in sub-saharan Africa and Europe: A systematic review comparing the use and availability of mhealth approaches in sub-saharan Africa and Europe. Digital Health 9: 1–25.

Adeleke R 2021 Digital divide in Nigeria: The role of regional differentials. African Journal of Science, Technology, Innovation and Development 13: 333–346.

Age UK 2019 State of health and care of older people FINAL. Crosswall, London. https://www.age-uk-briefing-state-of-health-and-care-july-2023-abridged-version.pdf.

Alasfour M, Almarwani M 2022 The effect of an innovative smartphone application on adherence to a home-based exercise program for female older adults with knee osteoarthritis in Saudi Arabia: A randomized controlled trial. Disability and Rehabilitation 44: 2420–2427.

Ali MA, Alam K, Taylor B, Ashraf M 2021 Examining the determinants of eHealth usage among elderly people with a disability: The moderating role of behavioral aspects. International Journal of Medical Informatics 149: 1–8.

Ambrens M, Stanners M, Valenzuela T, Razee H, Chow J, Van Schooten KS, Close JC, Clemson L, Zijlstra GA, Lord SR, et al. 2021 'Exploring older adults' experiences of a home-based, technology-driven balance training exercise program designed to reduce fall risk: A qualitative research study within a randomized controlled trial. Journal of Geriatric Physical Therapy 46: 139–148.

Argent R, Daly A, Caulfield B 2018 Patient involvement with home-based exercise programs: Can connected health interventions influence adherence? JMIR MHealth and UHealth 6: e47.

Arkkukangas M, Cederbom S, Tonkonogi M, Carlsson ÕU 2021 Older adults' experiences with mhealth for fall prevention exercise: Usability and promotion of behaviour change strategies. Physiotherapy Theory and Practice 37: 1346–1352.

Atoyebi OA, Stewart A, Sampson J 2015 Use of information technology for falls detection and prevention in the elderly. Ageing International 40: 277–299.

Awotidebe TO, Fasakin OM, Oyewole OO, Bello U, Ademoyegun AB, Onigbinde AT, Mbada CE, Odunlade AJ, Adedoyin RA 2023 'Nigerian physiotherapists' knowledge, attitude, and practice of digital physical therapy: A cross-sectional study. Bulletin of Faculty of Physical Therapy 28: 1–8.

Azizan A, Justine M, Kuan CS 2013 Effects of a behavioral program on exercise adherence and exercise self-efficacy in community-dwelling older persons. Current Gerontology and Geriatrics Research 2013: 1–9.

Barrie H, La Rose T, Detlor B, Julien H, Serenko A 2021 "Because I'm old": The role of ageism in older adults' experiences of Digital Literacy Training in public libraries. Journal of Technology in Human Services 39: 379–404.

Bazeley P 2009 Analysing qualitative data: More than "identifying themes". Malaysian Journal of Qualitative Research 2: 6–22.

Beebe JA, Lang CE 2009 Relationships and responsiveness of six upper extremity function tests during the first 6 months of recovery after stroke. Journal of Neurologic Physical Therapy: JNPT 33: 96–103.

Bhattarai P, Phillips JL 2017 The role of digital health technologies in management of pain in older people: An integrative review. Archives of Gerontology and Geriatrics 68: 14–24.

Bogardus RL, Martin RJ, Richman AR, Kulas AS 2019 Applying the Socio-Ecological Model to barriers to implementation of ACL injury prevention programs: A systematic review. Journal of Sport and Health Science 8: 8–16.

Bryman A 2016 Social research methodspp. 1108–1130 Oxford: Oxford University Press

Carrera A, Zoccarato F, Mazzeo M, Lettieri E, Toletti G, Bertoli S, Castelnuovo G, Fresa E 2023 What drives patients' acceptance of digital therapeutics? Establishing a new framework to measure the interplay between rational and institutional factors. BMC Health Services Research 23: 145–155.

Chakrabarti S 2014 What's in a name? Compliance, adherence, and concordance in chronic psychiatric disorders. World Journal of Psychiatry 4: 30–36.

Chan D, Chan F 2010 Patients' adherence/compliance to physical therapy home exercises. Fizyoterapi Rehabilitasyon 21: 132–139.

Chatto CA, York PT, Slade CP, Hasson SM 2018 Use of a telehealth system to enhance a home exercise program for a person with Parkinson disease: A case report. Journal of Neurologic Physical Therapy 42: 22–29.

Clarke V, Braun V 2013 Teaching thematic analysis: Overcoming challenges and developing strategies for effective learning. The Psychologist 26: 120–123.

Clark T, Foster L, Sloan L, Bryman A 2021 Bryman's social research methods. Oxford: Oxford University Press.

Conraads VM, Deaton C, Piotrowicz E, Santaularia N, Tierney S, Piepoli MF, Pieske B, Schmid JP, Dickstein K, Ponikowski PP et al. 2012 Adherence of heart failure patients to exercise: Barriers and possible solutions: A position statement of the Study Group on exercise Training in heart failure of the heart failure Association of the European Society of Cardiology. European Journal of Heart Failure 14: 451–458.

Cristiano A, Musteata S, De Silvestri S, Bellandi V, Ceravolo P, Cesari M, Azzolino D, Sanna A, Trojaniello D 2022 'Older adults' and clinicians' perspectives on a smart health platform for the aging population: Design and evaluation study. JMIR Aging 5: 1–16.

Dennison L, Morrison L, Conway G, Yardley L 2013 'Opportunities and challenges for smartphone applications in supporting health behavior change': Qualitative study. Journal of Medical Internet Research 15: e2583.

Ebersöhn L, Omidire MF, Mampane MR 2021 Collective distress calls for collective wellbeing measures: The case of social support as a resilience-enabling afrocentric indigenous pathway. In: Weaver Hilary N Eds The Routledge international handbook of indigenous resilience, pp. 195–207. Oxfordshire, United Kingdom: Routledge.

Ekoh PC, George EO, Ezulike CD 2021 Digital and physical social exclusion of older people in rural Nigeria in the time of COVID-19. Journal of Gerontological Social Work 64: 629–642.

Fernandes LG, Oliveira RFF, Barros PM, Fagundes FRC, Soares RJ, Saragiotto BT 2022 Physical therapists and public perceptions of telerehabilitation: An online open survey on acceptability, preferences, and needs. Brazilian Journal of Physical Therapy 26: 1–10.

Gamecho B, Silva H, Guerreiro J, Gardeazabal L, Abascal J 2015 A context-aware application to increase elderly users' compliance with physical rehabilitation exercises at home via animatronic biofeedback. Journal of Medical Systems 39: 135–146.

Geest SVD 2003 Confidentiality and pseudonyms: A fieldwork dilemma from Ghana. Anthropology Today 19: 14–18.

Geraedts H, Zijlstra A, Bulstra SK, Stevens M, Zijlstra W 2013 Effects of remote feedback in home-based physical activity interventions for older adults: A systematic review. Patient Education & Counseling 91: 14–24.

Gledhill S, Abbey J, Schweitzer R 2006 Sampling methods: Methodological issues involved in the recruitment of older people into a study of sexuality. Australian Journal of Advanced Nursing 26: 84–94.

Gulliford M, Alageel S 2019 Digital health intervention at older ages. Lancet Digital Health 1: 382–383.

Gunaratnam L, Morley M, Franovic A, De Paulsen N, Mekhail K, Parolin DA, Nakamura E, Lorimer IA, Lee S 2003 Hypoxia inducible factor activates the transforming growth factor-α/epidermal growth factor receptor growth stimulatory pathway in VHL-/-renal cell carcinoma cells'. Journal of Biological Chemistry 278: 44966–44974.

Harada ND, Dhanani S, Elrod M, Hahn T, Kleinman L, Fang M 2010 Feasibility study of home telerehabilitation for physically inactive veterans. The Journal of Rehabilitation Research and Development 47: 465–475.

Hawley-Hague H, Lasrado R, Martinez E, Stanmore E, Tyson S 2022 A scoping review of the feasibility, acceptability, and effects of physiotherapy delivered remotely. Disability and Rehabilitation 45: 3961–3977.

Hawley-Hague H, Tacconi C, Mellone S, Martinez E, Ford C, Chiari L, Helbostad J, Todd C 2020 Smartphone apps to support falls rehabilitation exercise: App development and usability and acceptability study. JMIR MHealth and UHealth 8: e15460.

Hayden JA, Van Tulder MW, Malmivaara A, Koes BW 2005 Exercise therapy for treatment of non-specific low back pain. Cochrane Database of Systematic Reviews 2005: 1–82.

Hill AM, Hoffmann T, McPhail S, Beer C, Hill KD, Brauer SG, Haines TP 2011 Factors associated with older patients' engagement in exercise after hospital discharge. Archives of Physical Medicine and Rehabilitation 92: 1395–1403.

Isernia S, Pagliari C, Jonsdottir J, Castiglioni C, Gindri P, Gramigna C, Palumbo G, Salza M, Molteni F, Baglio F et al. 2019 Efficiency and patient-reported outcome measures from clinic to home: The human empowerment aging and disability program for digital-health rehabilitation. Frontiers in Neurology 10: 1206–1213.

Jansons P, Dalla via J, Daly RM, Fyfe JJ, Gvozdenko E, Scott D 2022 Delivery of home-based exercise interventions in older adults facilitated by Amazon Alexa: A 12-week feasibility trial. The Journal of Nutrition, Health and Aging 26: 96–102.

Johnston M, Carey RN, Connell Bohlen LE, Johnston DW, Rothman AJ, De Bruin M, Kelly MP, Groarke H, Michie S. 2021. Development of an online tool for linking behavior change techniques and mechanisms of action based on triangulation of findings from literature synthesis and expert consensus. Translational Behavioral Medicine 11: 1049–1065.

Jokisch MR, Schmidt LI, Doh M 2022 Acceptance of digital health services among older adults: Findings on perceived usefulness, self-efficacy, privacy concerns, ICT knowledge, and support seeking. Frontiers in Public Health 10: 1073756.

Karvitz L 2011 Exercise motivation: What starts and keeps people exercising. Doctoral dissertation, University of New Mexico.

Keel S, Schmid A, Keller F, Schoeb V 2023 Investigating the use of digital health tools in physiotherapy: Facilitators and barriers. Physiotherapy Theory and Practice 39: 1449–1468.

Kolt GS, Brewer BW, Pizzari T, Schoo AMM, Garrett N 2007 The sport injury rehabilitation adherence scale: A reliable scale for use in clinical physiotherapy. Physiotherapy 93: 17–22.

Lawford BJ, Delany C, Bennell KL, Hinman RS 2018 'I was really sceptical . . . but it worked well': A qualitative study of patient perceptions of telephone-delivered exercise therapy by physiotherapists for people with knee osteoarthritis. Osteoarthritis and Cartilage 26: 741–750.

Lilje SC, Olander E, Berglund J, Skillgate E, Anderberg P 2017 Experiences of older adults with mobile phone text messaging as reminders of home exercises after specialized manual therapy for recurrent low back pain: A qualitative study. JMIR MHealth and UHealth 5: 39–51.

Lofland J, Lofland LH 1995 Developing analysis. Analyzing social setting: A Guide to qualitative observation and analysispp. 183–203 California, USA: Wadsworth Publishing Company

Lorenz D, Morrison S 2015 Current concepts in periodization of strength and conditioning for the sports physical therapist. International Journal of Sports Physical Therapy 10: 734–747.

Martínez de la Cal J, Fernández-Sánchez M, Matarán-Peñarrocha GA, Hurley DA, Castro-Sánchez AM, Lara-Palomo IC 2021 Physical therapists' opinion of e-health treatment of chronic low back pain. International Journal of Environmental Research and Public Health 18: 1889.

Mays N, Pope C 2000 Assessing quality in qualitative research. British Medical Journal 320: 50–52.

Mbada C, Olawuyi A, Oyewole OO, Odole AC, Ogundele AO, Fatoye F 2019 Characteristics and determinants of community physiotherapy utilization and supply. BMC Health Services Research 19: 168–178.

Mbunge E, Batani J, Gaobotse G, Muchemwa B 2022 Virtual healthcare services and digital health technologies deployed during coronavirus disease 2019 (COVID-19) pandemic in South Africa: A systematic review. Global Health Journal 6: 102–113.

Mehra S, van den Helder J, Kröse BJ, Engelbert RH, Weijs PJ, Visser B 2020 Aging and physical activity: A qualitative study of basic psychological needs and motivation in a blended home-based exercise program for older adults.

In: Betsy N Gloria H Eds Self-determination theory and healthy aging: Comparative contexts on physical and mental well-being, pp. 127–144 Singapore: Springer Singapore.
Miller NH, Hill M, Kottke T, Ockene IS 1997 The multilevel compliance challenge: Recommendations for a call to action: A statement for healthcare professionals. Circulation 95: 1085–1090.
Mudzi W, Stewart A, Musenge E 2012 Effect of carer education on functional abilities of patients with stroke. International Journal of Therapy and Rehabilitation 19: 380–385.
National Institute for Health and Care Excellence (NICE) 2015 'Older People with Social Care Needs and multiple long-term conditions'. Manchester, United Kingdom. https://www.nice.org.uk/guidance/ng22.
Nowell LS, Norris JM, White DE, Moules NJ 2017 Thematic analysis: Striving to meet the trustworthiness criteria. International Journal of Qualitative Methods 16: 1609406917733847.
Ojembe BU, Ebe Kalu M 2018 Describing reasons for loneliness among older people in Nigeria. Journal of Gerontological Social Work 61: 640–658.
Okoye UO 2013 Community-based care for home bound elderly persons in Nigeria: A policy option. International Journal of Innovative Research in Science, Engineering & Technology 2: 7086–7091.
Oluwagbemiga O, Tiwalade OO 2017 Concept, conception, and misconception of old people's homes in Nigeria. MOJ Gerontology & Geriatrics 2: 317–320.
Ormston R, Spencer L, Barnard M, Snape L 2014 The foundations of qualitative research. In: Ritchie L, Lewis J, McNaughton C Ormston R Eds Qualitative research practice, 2nd pp. 1–25. London, United Kingdom: SAGE Publications Ltd.
Pettersson B, Janols R, Wiklund M, Lundin-Olsson L, Sandlund M 2021 'Older adults' experiences of behaviour change support in a digital fall prevention exercise program: Qualitative study framed by the self-determination theory. Journal of Medical Internet Research 23: e26235.
Ritchie J, Lewis J, Nicholls CM, Ormston R 2013 Qualitative research practice: A Guide for social science students and researchers, 2nd pp. 180–200. London: Sage.
Schirmer W, Geerts N, Vercruyssen A, Glorieux I, Digital Ageing Consortium 2022 Digital skills training for older people: The importance of the "lifeworld". Archives of Gerontology and Geriatrics 101: 104695.
Sen K, Prybutok G, Prybutok V 2022 The use of digital technology for social wellbeing reduces social isolation in older adults: A systematic review. SSM – Population Health 17: 101020.
Silveira P, Van De Langenberg R, van Het Reve E, Daniel F, Casati F, De Bruin ED 2013 Tablet-based strength-balance training to motivate and improve adherence to exercise in independently living older people: A phase II preclinical exploratory trial. Journal of Medical Internet Research 15: e159.
Slevin P, Kessie T, Cullen J, Butler MW, Donnelly SC, Caulfield B 2019 Caulfield B 2020 exploring the barriers and facilitators for the use of digital health technologies for the management of COPD: A qualitative study of clinician perceptions. QJM: An International Journal of Medicine 113: 163–172.
Strauss A, Corbin J 1998 Basics of qualitative research techniquespp. 105–127 London, United Kingdom: Sage Publications, Inc
Thumm PC, Giladi N, Hausdorff JM, Mirelman A 2021 Telerehabilitation with virtual reality: A case report on the simultaneous, remote training of two patients with Parkinson disease. American Journal of Physical Medicine and Rehabilitation 100: 435–438.
United Nations 2015 What are the sustainable development goals? New York, USA. https://www.undp.org/sustainable-development-goals.
van Het Reve E, Silveira P, Daniel F, Casati F, De Bruin ED 2014 Tablet-based strength-balance training to motivate and improve adherence to exercise in independently living older people: Part 2 of a phase II preclinical exploratory trial. Journal of Medical Internet Research 16: e159.
Wilson J, Heinsch M, Betts D, Booth D, Kay-Lambkin F 2021 Barriers and facilitators to the use of e-health by older adults: A scoping review. BMC Public Health 21: 1556.
Withers HG, Glinsky JV, Chu J, Jennings MD, Hayes AJ, Starkey IJ, Palmer BA, Szymanek L, Cruwys JJ, Wong D, et al. 2021 Face-to-face physiotherapy compared with a supported home exercise programme for the management of musculoskeletal conditions: Protocol of a multicentre, randomised controlled trial—the REFORM trial. BMJ Open 11: e041242.
World Economic Forum 2021 How can we ensure digital inclusion for older adults? Geneva, Switzerland. https://www.weforum.org/agenda/2021/10/how-can-we-ensure-digital-inclusion-for-older-adults/.
World Health Organisation 2020 Digital health. Geneva, Switzerland. https://www.who.int/health-topics/digital-health/#tab=tab_1.
Yarima YA 2014 Socio-economic effects of unemployment among the youth in Nigeria. Journal of Contemporary Issues in Business Research 3: 240–249.