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Exploring the Experiences of Wearable Health Monitoring Devices among the Aging Population: A Qualitative Systematic Review

Atisi Lawson Hayford, Jomin George

Faculty of Medicine and Health Life Sciences, Swansea University, Swansea, UK
Email: catisihayford@yahoo.com, jomin.george@swansea.ac.uk

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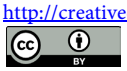

Abstract

The integration of the Internet of Things (IoT) in healthcare, particularly through wearable health monitoring devices (WHMDs), has the potential to significantly enhance elderly care by promoting active aging and remote health management. This study aims to explore the experiences, motivations, and challenges faced by older adults using WHMDs through a qualitative systematic review. We conducted a systematic search across six electronic databases and selected 18 studies conducted in 10 countries. The review adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and employed the SPIDER tool for organising keywords and phrases. The findings underscore the significant positive impact of WHMDs on elderly health. These devices enhance physical activity, detect falls, and improve posture and sleep, thereby promoting a healthier lifestyle for older adults. They also provide safety features and connectivity with family and healthcare providers, which are highly valued by the elderly. However, challenges, such as short battery life, complex interfaces, and concerns about privacy and data security, hinder widespread adoption. Additionally, older adults often find these devices expensive and face issues with interoperability and connectivity. The review highlights the urgent need for user-centred approaches in WHMD development. These approaches are crucial for addressing technological and socio-psychological barriers and enhancing device functionality to better meet the unique needs of older adults. By overcoming these hurdles, WHMDs can significantly improve the quality of life and independence of older adults, making them a valuable tool in elderly care. These findings offer valuable insights for researchers, developers, policymakers, and service providers in enhancing the adoption and effectiveness of wearable technology among the aging population.

Subject Areas

Health Informatics

Keywords

Health, Elderly, Monitoring Device, Wearable Devices, Technology, Review

1. Introduction

Integrating the Internet of Things (IoT) in healthcare aims to lower costs, improve quality of life, and enhance user experience through various applications, including remote health monitoring, exercise regimens, elderly care, and chronic illness management [1]. Among IoT technologies, wearable health devices are anticipated to transform healthcare and lifestyles significantly, particularly in the fitness and healthcare sectors [2] [3]. These devices, defined as smart equipment, gather data about users and their environments to enhance self-awareness and benefit the user [4] [5]. They also remotely provide real-time, accurate health data [6] [7]. Wearable Health Monitoring Devices (WHMD) can be categorised into head-mounted devices, wrist-worn gadgets, e-textiles, e-patches, and smart ornaments, with primary functions including fall prevention, body movement monitoring, vital sign tracking, and position tracking [8]-[10].

The global aging population, a result of increased life expectancy, presents significant challenges to healthcare systems [11] [12]. Individuals aged 60 and older are projected to rise from 1 billion in 2019 to 2.1 billion by 2050, indicating substantial financial impacts on the public and private sectors [13]. Supporting elderly individuals to monitor and manage their health at home is a major challenge, prompting governments to seek technological solutions [14]. Wearable technology, integral to the concept of "active aging" [15], is particularly beneficial in aiding older adults in managing their health and supporting remote health monitoring [16] [17].

Studies highlight that older adults (O.A) are motivated to use wearable technology for its helpful features and efficiency [18]-[20]. However, despite the perceived benefits, elderly individuals express concerns about potential risks and usability issues [20]. Although they are well-suited to benefit from technological advancements, older adults are often stereotyped as resistant to technology [21] and use wearables less frequently than other age groups [22]. Nonetheless, the benefits of wearable technology for older adults are substantial, as it enables caregivers and healthcare professionals to monitor their independence and anticipate health changes.

Despite the varying user experiences and dispositions of older adults to wearables, there remains a significant gap in research examining this behaviour among this demographic [23]. Among the few researches that have been made, its conclusions are limited by the exploratory nature of the study design, the number of

participants [24] or by insufficient data collection practices, such as collecting only quantitative ratings of users experience [25] [26]. These are insufficient to understand the underlying reasons affecting the adoption of wearable devices among the elderly population. The adoption and acceptance of wearables, according to Hart and Sutcliffe [27], is a dynamic process in which users' attitudes, perceptions, and usage behaviours can be changed by many factors at different stages. Hence, there is a clear need for further studies to comprehend these variations during the adoption process [28] [29]. Gaining more insight into these events can help guide future investigations and provide design inspiration for devices that optimise user experience for this demographic.

2. Materials and Methods

The Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines were followed for this qualitative systematic review. The SPIDER tool (Sample, Phenomenon of Interest, Design, Evaluation, Research type) was utilised to organise keywords and phrases for the systematic search. A technical roadmap is provided in Figure 1 to visually demonstrate the research development process, which included the following steps:

1) **Systematic Search:** Conducted across six electronic databases: Embase, PubMed, ScienceDirect, Scopus, Springer, and Cochrane. Additional papers were identified by screening the reference lists of included studies, as well as searching Google Scholar and open grey literature.

2) **Inclusion Criteria:** Studies that recruited older adults (≥60 years), utilised qualitative research methods, were published between 2013 and 2023, and focused on wearable health monitoring devices were eligible for inclusion.

3) **Study Selection:** Covidence tool was employed to ensure accuracy and efficiency in the selection process, resulting in 18 studies being included.

4) **Data Extraction and Analysis:** Data were extracted and analysed, with the methodological quality of the studies assessed using the Critical Appraisal Skills Programme (CASP).

Technical Roadmap:

- Step 1: Define research questions and objectives.
- Step 2: Develop search strategy using SPIDER tool to identify keywords and phrases.
- Step 3: Conduct systematic search across specified databases.
- Step 4: Screen and select studies using inclusion criteria.
- Step 5: Extract data and assess methodological quality.
- Step 6: Analyze data and synthesize findings.

This comprehensive approach ensured a thorough examination of the experiences of older adults using wearable health monitoring devices.

3. Results

The results from the various tools used are presented in Tables 1-3 and Figure 1, Figure 2.

Table 1. Spider tool for keywords and phrases.

SPIDER TOOL	SEARCH TERMS
S	"elder" OR "senior" OR "aging" OR "older adults" OR "geriatrics"
P and I	"wearable device" OR "wearables" OR "wearable sensor" OR "wearable monitoring systems"
D	"interview" OR "focus group" OR "observe" OR "case study"
E	"experience" OR "attitude" OR "perception"
R	"qualitative" OR "mixed methods"

Table 2. Themes, definitions and supporting comments.

THEME	DEFINITION	SUB-THEME	SUPPORTING COMMENTS
Health Behaviour Impact	The effect of WHMD on health-related behaviours	Physical Activity	- "I've changed my behaviour somehow. I am now more likely to walk to shops. Previously, I took the car" Scholman *et al.* (2016) - "You could see how far you have walked; I have not registered that previously. It was fun" Ehn *et al.* (2018) - "I think it's helpful for us older people because we've never been able to have something like this to help get us motivated and move" Chung *et al.* (2022)
		Enhanced well-being	- "I found it was novel, and good in the sense that one can have it on all day to mark pain intensity and the time it happened." Rodriguez *et al.* (2017)
User experience and satisfaction	How OA perceive and interact with WHMD	Usability	- "I liked the colors from these two little things, it's like calling on the phone" Abouzahraa *et al.* (2019) - "It protrudes too much, it should be smaller, more adaptable to the body." Abouzahraa *et al.* (2019)
		Perception	- "Based on the results that the app has shown me, my daily activity level is consistently above average, according to the WHO. This is interesting and important for my confidence and encouragement to continue to be active." Hvalič-Touzery *et al.* (2022)
		Comfort	- "The neck position was comfortable and loose for the participants "because let's see, it did not bother me at all, really at all. It's like wearing a necklace: more comfortable, friendlier" Rodriguez *et al.* (2017)
Motivation	Factors influencing the adoption and continuous use of WHMD	Support systems	- "I am no longer afraid of moving around my bed because I know help is readily available in cases of an emergency, thanks to my monitor" Fotoyi *et al.* (2022) - "At my age, I cannot be bothered with learning how to use a mobile device. That is why I have a permanent caregiver who helps me with such things" Fotoyi *et al.* (2022)
		Long-term engagements	- "It's something that clicks in your mind. You have to make that commitment, and once you do, the technology is very motivating. But, until you take the step of getting it and tuning into it, it isn't going to work" Kononova *et al.* (2019)
		Social and emotional support	- "Many of my friends use Fitbit or similar wearables. They said Fitbit was very good in tracking their steps and calories." Abouzahraa *et al.* (2019)

Continued

Socio-psychological barriers	Internal hurdles and external factors limiting adoption	Personal barriers	"I used to check the heart rate, but I did not understand its meaning. Therefore, I did not use it this week."1 Well mum's not really using it It's kind of on-off, on-off, on-off Yeah. And even now it's never on now I think actually it was too tight. I think mum's wrist might have got a bit bigger It swelled with the infection So once it was off But she kept on it for a fair bit too" O'Sullivan *et al.* (2022)—"During my time at school there were no computers, only type-writers". Fotoyi *et al.* (2022)
		Stigma	"And the stigma too, probably of having something, 'oh you're wearing one of those' I don't think I'd be affected by stigma." Chaudhuri *et al.* (2015). t should be used under your clothes because nobody would notice, nobody would criticise me, nobody would be pointing out that I use it or not" Cajamarca *et al.* (2018)
Economic Constraints	Financial limitations experienced with the use of WHMD	Affordability	"As an elderly woman living alone, it is important that I surround myself with all these gadgets even though they may sometimes be expensive. However, the cost is outweighed by the peace of mind in knowing I am taken care of even in my sleep" Fotoyi *et al.* (2022) "It is so disheartening not being able to find information because my pension money does not stretch far into the month and data is too expensive" Fotoyi *et al.* (2022)
Data Reliability and accuracy	The precision, dependability and trustworthiness of Health data collected by WHMD	Data Accuracy	"No. Because one night, it said I woke up 19 times, and there is no way I could even go the next day if I had woken up 19 times. So, I don't think it is very accurate." Fausset *et al.* (2022) - "At many times, Fitbit would not wake up, and I couldn't see my data. At other times, it did not show any heart rate. This made me so frustrated." Abouzahraa *et al.* (2019)
Privacy and security	Perceptions about the safety of health data collected by WHMDs	Data security concerns	How can providers make sure our personal health profiles will not be accessed by unauthorised people? Will they track any additional data using the device without informing us or analyse our data in any unintended ways? Will they even sell our data to any third parties to gain commercial benefits?" (Streitz & Konomi, 2018)
Technological Barriers	Obstacles that hinder the use and implementation of technology	Connectivity issues	"I can hardly hear and plus you have instructions to what? Hold for 7 seconds, if you're destroyed, you're scared, you are panicking, your arm… I don't like it, sorry." Chaudhuri *et al.* (2015) "At many times, Fitbit would not wake up, and I couldn't see my data. At other times, it did not show any heart rate. This made me so frustrated." Abouzahraa *et al.* (2019)
		Interoperability	- "The scenario will become even more complicated when considering the very strict regulations and rules of hospitals, which may not allow doctors to accept and use data supplied by different wearable devices used by elderly people" Xing *et al.* (2021)
		Limited functionality	- "It would be nice to have a range of devices that fit your situation. Then it would [be] what I need, and not put on a lot of extra stuff that's gonna cost me more, because you know I think it's essential to keep it within reasonable price range where you can afford it if you need. But if you don't need it you don't have to take it" Fausset *et al.* (2013)

Table 3. Study characteristics.

Lead author/ Year	Country	Aim of Study	Study design	Data collection	Population description	Total number of participants	Device	Trial duration
Yolan de Fotoyi (2022)	South Africa	To investigate the factors that will improve the adoption of MMC systems for healthcare monitoring by the elderly living at home in South Africa.	Qualitative	Interview	Elderly people residing in Eastern Cape with an average age of 72.7 years	15	Mobile monitoring and care devices	N/A
Anna Schlomann	Germany	To evaluate the experiences, opportunities, and obstacles of self-monitoring when applied by older adults. To investigate the usability of a wear	Qualitative	Focus groups	Elderly female retirees (67 - 78 years)	6	Fitness tracker (steps per day, distance walked, burned calories, movement during sleep)	4 weeks
Friederike J. S. Thilo (2018)	Switzerland	able, waterproof, automatically alerting, fall detection prototype, through the involvement of community-dwelling older people in a qualitative study using a real field-testing approach.	Qualitative	Focus groups	Community - dwelling older people (75 - 92 years)	15	Wearable fall detector	9 Days
Theresa A. Floegel (2018)	USA	To examine feasibility and acceptability of continuous objective activity monitor use in an aging clinical population during and after hospitalization	Qualitative	Interview; Observation	Older adults with Heart failure	27	Inclinometric accelerometers (record posture) Ankle accelerometer (record ambulatory activity)	5 months
Cara Bailey Fauss e (2013)	USA	To investigate how older adults integrated activity monitoring products into their lives over two weeks in their own homes	Qualitative	Interview	Elderly individuals without prior experience with Activity monitoring devices (61 - 69 years)	8	Activity monitoring technologies (Striiv, Fitbit®, Nike + FuelBand, and MyFitnessPal)	2 weeks
Maria Ehn (2018)	Sweden	To investigate how seniors experience using activity monitors (AMs) as support for PA in daily life.	Qualitative	Interview	community-dwelling older adults (>75 years)	8	Activity monitor (Withings, Jawbone)	9 days
Gabriela Cajarnarca (2018)	Chile	This study proposes the use of wearable devices to identify the bodily postures of older persons, while also looking into the perceptions of the users	Qualitative	Interview	Older adults living in a residential home (60 - 83 years)	30	StraightenUp + (posture monitor)	50 - 65 minutes/participants
Shomir Chaudhuri (2015)	USA	To evaluate older adults' perceptions of FDDs and specifically examine what factors affect their willingness to use these devices and suggestions for improvement.	Qualitative	Focus groups	Older adults from independent and assisted living communities around the Puget Sound region.	27	Fall detection device	4 months

Continued

Fei Xing (2018)	China	To address this knowledge gap by reporting on an exploratory study that investigated older people's user requirements towards wearable medical devices and explored potential challenges and difficulties for large-scale deployment of such devices.	Qualitative	Focus groups	Family containing 1 - 2 older adults (>60 years) plus 2-4 younger family members.	7 older adults, 12 family members	N/A	N/A
Fei Xing (2021)	China	To obtain an in-depth understanding and holistic exploration of potential barriers and issues influencing large-scale deployment of AI-enabled WMDs in the Chinese context.	Qualitative	Focus groups	Chinese elderly users and their families, 2 WMD providers, and 2 public health organizations.	8 elderly individuals, 12 family members	N/A	N/A
Anastasia Kononova (2019)	USA	To investigate older adults' perceptions and uses of activity trackers at different points of use: from nonuse and short-term use to long-term use and abandoned use to determine the factors to maintain tracker use and prevent users from discontinuing tracker usage.	Qualitative	Focus groups	Adults aged 65 years and older (66 - 94 years)	48	Wearable activity trackers (Garmin Vivofit 2)	6 weeks
Mohamed Abouzah-raa (2019)	Canada	To examine the factors that influence seniors' use of wearable devices and the effect of these devices on seniors' behavior.	Qualitative	Interviews	Elders who have never used wearables before (65 - 75 years)	26	Activity tracker (Fitbit)	2 months
Iyubanit Rodríguez (2017)	Chile	To study whether mobile or wearable devices are appropriate to self-report pain levels and to find which body position is more appropriate for elderly people to wear a device to self-report pain	Mixed methods	Interviews	Older adults (60 - 93 years)	18	RepWear (A Wearable Io)	24 minutes
Wei Peng (2021)	USA	To uncover the mechanism underlying the long-term continued use of wearable devices among older adults through the theoretic lens of habit formation	Qualitative interview		Older adults (aged 65+ years) who had used wearable activity trackers for more than 6 months. 55% Female	20	Garmin Miband	6 months
Zhaoyi Ma (2022)	China	To investigate the changes in the usage behaviours, perceptions, and attitudes of older people towards wearables over four weeks	Mixed method		Retired employees from Inter Higher Institution (62 - 74 years) Female-5 Male-15	20	Smart bracelets and smart watches (Xiaomi Band 4 & 5, Honor Band 6, Amazfit GTS 2, Huawei Honor Watch Magic 3)	4 weeks
Grace O' Sullivan (2022)	Ireland	To explore the acceptability and feasibility of using a FitBit Charge 3 among people with dementia, living in the community, who took part in the physical exercise component of the Comprehensive Resilience-building psychosocial intervention pilot study	Mixed method		Older people with dementia (>60 years) and their caregivers	9 older adults, 9 caregivers	Wrist-worn tracker (Fitbit)	9weeks

Continued

Jane Chung (2022)	USA	To examine older adults' perceptions of GPS-enabled smart watches and to identify potential barriers and facilitators of smart-watch and sensor data use	Mixed method	Elderly individuals (>60 years)	30	Wearable activity tracker (Fitbit Surge 3) and smart watch	30 days
Simon Hvalica Touzery (2022)	Slovenia	To explore the benefits of combining wearable activity monitors and telecare for older adults	Mixed method: Quasi-ex-perimental	Dyads of older primary users (>60 years)	13	Wearable activity tracker (GoLiveClip device)	4 months

Authors/year	Was there a clear statement of the aims of the research?	Is a qualitative methodology appropriate?	Was the research design appropriate to address the aims of the research?	Was the recruitment strategy appropriate to the aims of the research?	Was the data collected in a way that addressed the research issue	Has the relationship between researcher and participants been adequately considered?	Have ethical issues been taken into consideration?	Was the data analysis sufficiently rigorous?	Is there a clear statement of findings?	How valuable is the research?
Fotoyi et al. (2022)	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Valuable
Schlomann et al. (2016)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Valuable
Thilo et al. (2018)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Valuable
Floegel et al. (2018)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Valuable
Fausset et al. (2013)	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	No	Yes	Valuable
Ehn et al. (2018)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Valuable
Chaudhuri et al. (2015)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Valuable
Streitz&Konomi (2018)	Yes	Yes	Yes	No	Yes	No	No	Yes	Yes	Valuable
Xing et al. (2021)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Valuable
Kononova et al. (2019)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Valuable
Abouzahra etal.(2019)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Valuable
Rodríguez et al. (2017)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Valuable
Peng et al. (2021)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Valuable
Ma et al.(2022)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Valuable
O'Sullivan et al(2022)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Valuable
Chung et al. (2022)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Valuable
Hvali˘cTouzery et al. (2022)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Valuable
Cajamarca et al(2018)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Valuable

Figure 1. The critical appraisal skills programme (CASP) checklist.

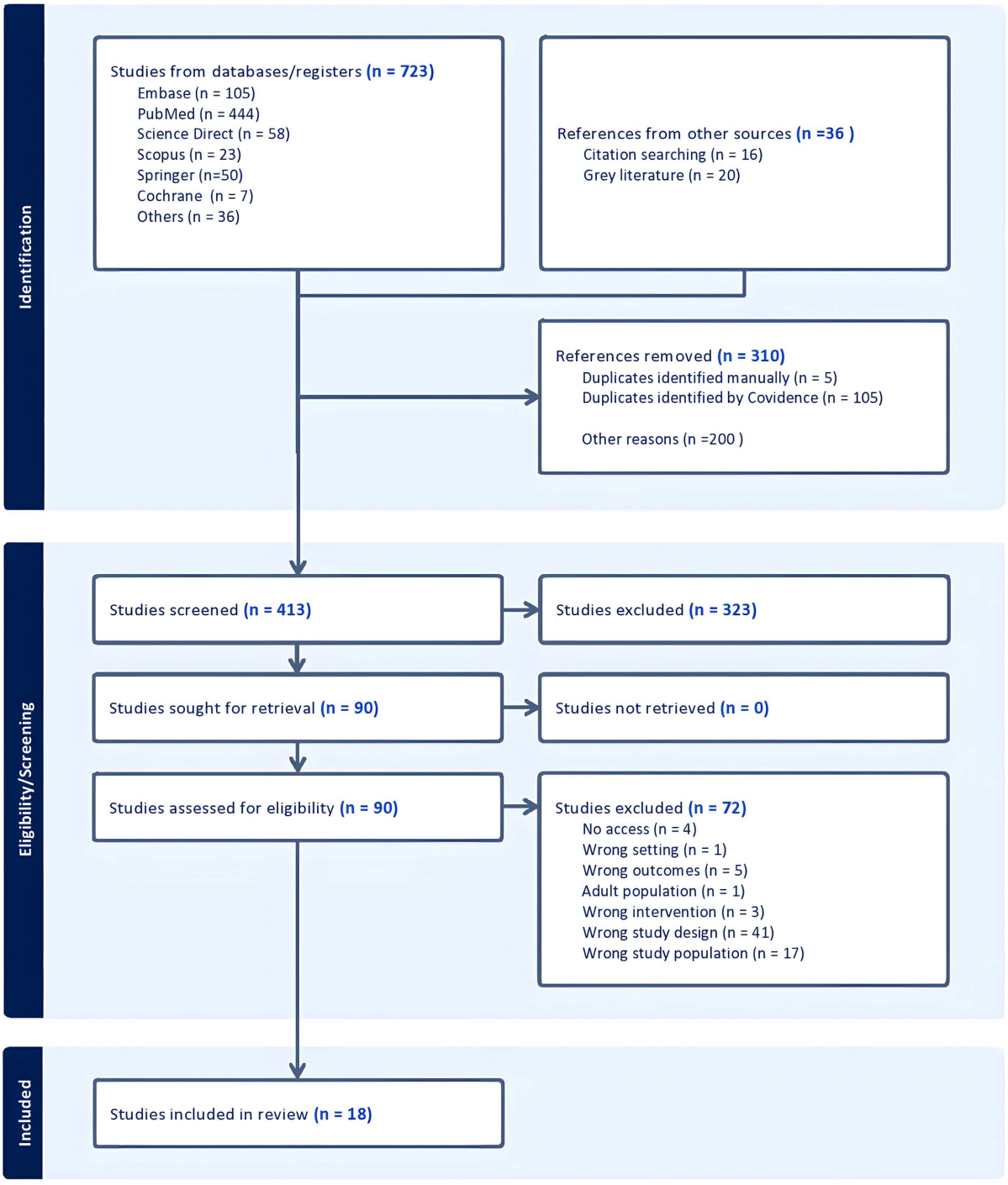

Figure 2. Prisma flow chat.

4. Discussion

This systematic review highlights the experiences of 335 older adults and 33 family members and caregivers across 10 countries, revealing varying degrees of the older adults' interactions with WHMD. Within this study, eight themes emerged, providing insights into the varied dimensions of the benefits, motivations, and challenges encountered by older adults while using these WHMDs.

The study illustrated the positive impact of WHMDs on the health status of older adults. From enhancing physical activity and detecting falls to improving posture and sleep, these devices enabled the promotion of a healthier lifestyle among older adults. This is in tandem with the study by Majumder *et al.* [30], which states the potential for WDs to achieve such results among elders. In addition, part of the gratification revealed by older adults in this study was the sense of safety they felt through connectivity with their family, healthcare providers and caregivers by sharing health data with them on these devices, which was also discovered to be the most significant feature of WD's for older adults in a study by Wu *et al.* (2019) [31]. Contrary to the concerns of elders revealed by [32] about frequent hospital visits and the financial burden it imposed on elders, the findings of this study, however, discovered unexpected benefits such as cost reduction in transportation and reduced hospital visits, emphasizing the multifaceted advantages associated with WHMD use. Overall, these benefits improved the self-awareness and independence of older adults, mirroring the studies by [33].

Motivation for adopting WHMDs varied and was driven by positive user experiences, aesthetic appeal, comfort, usefulness, and social influence. The intertwining of these factors played a significant role in motivating elders to embrace and utilize wearable devices. The study by [31] highlighted similar motivators for elders to use wearable sensors. Despite the affirmation by elders of these motivators, some older adults expressed dissatisfaction with the location of the device, stating the abdomen and neck were the preferred locations. However, the non-dominant wrist and the waist were chosen in previous studies [34]. Furthermore, support from family and society played a pivotal role in the widespread acceptance of WD's by elders in this study, thus echoing the research of some renowned writers [35] [36] whose discovery revealed that support from family aids the adoption of WHMD's among elders. Wu *et al.* (2019) believed that social integration is a strong motivation for elders to adopt WD's, which was evident in this research.

Amidst the positive encounters and motivations, elders still encountered challenges with the devices, which hindered their adoption and use of wearables. The papers in this study showed that elders were discouraged by the short battery life, high volume, difficult buttons, false alarms and complexity of the device, which aligns with the factors outlined by other scholars [37] [38]. A researcher [39] reckons that the WD industry still faces many challenges that can limit its use, especially in the healthcare sector. One of which is the interoperability and connectivity issues discovered in this study, which limits the process of health data sharing between elders and their healthcare providers.

While a researcher believes that using wearable devices will provide a cost-effective solution, findings from this study revealed a contrary situation as elders found the WD's to be expensive, similar to the findings of another [40].

Additionally, stress monitoring was discovered to be an essential feature for older adults [41], whereas, this study disclosed that older adults did not consider

it necessary due to their lack of understanding of its benefits. Thus, this highlights the impact of poor health literacy and poor knowledge of device usefulness among elders, as presented in similar work [42]. Hence, scientists [43] beckons for user education and support in promoting adoption among elders. Similar to this study, a researcher disclosed that the reliability and trustworthiness of health data collected by WHMDs raised a lot of concerns. Thus, to build the trust of users, accuracy concerns need to be addressed, otherwise it will continue to pose a huge challenge to adoption. Data security remains a major concern with the use of wearables; this was displayed in that study. Therefore, there is a need to address these challenges comprehensively in the design and implementation of WHMDs that cater to the unique needs of older individuals in diverse contexts.

In summary, 18 studies were included in this study, spanning 10 different countries, including three developing countries. The common barriers to adoption were technological barriers, socio-psychological barriers, limited functionality of the device, privacy, and security concerns. The benefits derived by older adults were mainly associated with improvements in their physical activities, sleep, posture, and overall well-being, thereby promoting independence and self-awareness. Additionally, older adults were motivated mainly by social influence and support from friends and family. This study highlighted the need for user-centred approaches in the development of wearable health monitoring devices.

5. Conclusion

This study highlights the experiences of older adults using wearable health monitoring devices. The findings reveal that while these devices offer significant benefits in managing health and promoting independence, they also present challenges related to usability, data privacy, and the need for ongoing support. The benefits of wearable health monitoring devices include enhanced self-monitoring, early detection of health issues, and improved communication with healthcare providers. However, the study also identifies significant challenges, such as difficulty using the devices, concerns about data privacy, and the necessity for technical support.

6. Suggestions for Future Research

Future research should focus on designing more user-friendly interfaces tailored to the cognitive and physical abilities. Additionally, investigating and developing robust measures to address data privacy concerns is crucial. Exploring the creation of comprehensive support systems, including technical assistance and user training programs, will also be beneficial. Conducting long-term studies to assess the sustained impact of wearable health monitoring devices on the well-being and health outcomes of older adults is essential. By addressing these areas, future research can contribute to the development of more effective and acceptable wearable health technologies for older adults, ultimately enhancing their quality

of life and health management.

Conflicts of Interest

The authors declare no conflicts of interest.

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