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RESEARCH

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Understanding wearable health technology use in older adults through social and psychological factors

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Abstract

As populations age globally, wearable health technologies offer promising solutions to support autonomy and well-being among older adults. This study explored the adoption of smart wearable systems, such as wristbands and chest sensors, for remote health monitoring among 352 older adults (aged 60–99) in Northern Portugal. Results showed that 74.4% of participants expressed interest in using wearable systems, with safety (93.9%) cited as the main benefit. Prevention (11.4%) and improved health monitoring (6.1%) were reported less frequently and should be considered secondary factors. However, barriers included discomfort (62.7%), heaviness (31.1%), and device size (32.7%), particularly in smartwatches. Chest bands were preferred when soft, lightweight, and discreet. Technology use frequency, especially smartphone usage, emerged as a key predictor of interest, as confirmed by a decision tree machine learning model with an accuracy of 71.88%. Despite low educational levels, participants demonstrated high motivation to use features such as medication reminders (83.5%), healthy habit prompts (74.2%), and appointment alerts (70.2%). Although many respondents felt reassured by the potential of continuous monitoring, some reported concerns related to anxiety (54.9%) and over-surveillance. These findings underscore the importance of balancing technological functionality with emotional comfort. The study highlights the need for user-centered design, digital literacy initiatives, and co-creation with older users to improve adherence and usability. Tailored interventions and accessible technologies can enhance health outcomes and promote independent living among aging populations.

1 Background

The aging population is increasing worldwide, leading to a growing demand for innovative healthcare solutions that support the well-being and autonomy of older adults [1, 2]. Advances in digital health technologies, particularly wearable health monitoring systems, offer new opportunities to enhance healthcare by enabling continuous and remote tracking of physiological parameters such as heart rate, oxygen saturation, and blood pressure [3, 4]. These technologies can provide early warnings of health deterioration,

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facilitate medical interventions, and promote a more proactive approach to disease prevention and management [5, 6]. Despite their potential benefits, the adoption of wearable health devices among older adults remains relatively low, raising concerns about the factors influencing their acceptance and long-term use [7, 8].

Multiple socio-demographic and psychological factors may impact the adoption of wearable technologies by older adults [9, 10]. Digital literacy, cognitive and sensory impairments, and overall comfort with technology play crucial roles in determining whether an individual is willing to integrate wearables into their daily routine [11, 12]. Additionally, privacy concerns, skepticism about data security, and the perceived complexity of these devices may act as barriers to adherence. Socioeconomic factors, including financial constraints and access to healthcare services, can also influence an individual's ability to obtain and effectively use such technology [13, 14]. Furthermore, support from caregivers, family members, and healthcare providers has been shown to significantly impact the willingness of older adults to engage with new digital health solutions [15, 16].

Device usability and design are also critical [17, 18]. Older adults may be reluctant to use health-monitoring wearables if they find them uncomfortable, difficult to operate, or intrusive in their daily lives. Factors such as device weight, size, battery life, and ease of data visualization must be carefully considered to ensure that these technologies are both functional and user-friendly. Additionally, the level of personalization and adaptability of these devices to individual needs may influence their acceptance [19–21].

Despite the growing interest in wearable health technologies, significant gaps remain in understanding the factors influencing their adoption among older adults. While prior research has identified barriers such as perceived complexity, cognitive decline, and technological anxiety, there is limited insight into how these factors interact with socio-demographic variables like income, education, and cultural background. Moreover, the role of subjective well-being and cognitive age in moderating technology adoption behaviors is not well understood. However, comprehensive studies examining these interactions across diverse populations are scarce. Additionally, concerns about data privacy and security continue to hinder adoption, yet few studies have explored effective strategies to alleviate these apprehensions among older adults. Understanding these nuanced factors is crucial for developing tailored interventions that promote the acceptance and sustained use of wearable health technologies in this demographic [10, 20, 22, 23].

This study aims to investigate the adherence and barriers to the use of smart wearable health monitoring systems among older adults. By analyzing socio-demographic, psychological, and behavioral factors, this research seeks to identify predictors of acceptance and potential obstacles that may hinder widespread adoption. The findings will contribute to the development of tailored interventions and technological improvements that enhance usability, accessibility, and compliance, ultimately promoting better health outcomes for the aging population.

Understanding these challenges is essential for ensuring that wearable technology can fulfill its potential in geriatric healthcare. By addressing the barriers to adoption and optimizing the design of these devices, it is possible to create more inclusive and effective health monitoring solutions that empower older adults to take control of their health and well-being.

2 Methodology

2.1 Study design

An observational cross-sectional, exploratory survey-type study was designed.

2.2 Sample

The study population comprised 1,521 older adults (aged 60–99 years) from the northern region of Portugal, both community-dwelling and institutionalized. A convenience sample of 352 volunteers was selected (Table 1). Inclusion criteria were: (a) living in the community or in an institution; (b) age between 60 and 99 years. Exclusion criteria were inability to communicate and/or cognitive disease. These criteria were assessed during the initial interview by trained researchers. Communication ability was verified through participants' capacity to understand and respond coherently to the informed consent explanation and to simple orientation questions. Cognitive status was screened informally using short memory and comprehension tasks (e.g., repeating three words, following simple instructions), included in the initial questionnaire, or medically diagnosed. Participants who were unable to complete these basic tasks were excluded.

2.3 Instruments

A questionnaire was developed including sociodemographic questions (such as age, sex, education level, job) and health status (such as previously diagnosed health conditions, medication, falls, and others), perception of the importance of health data based on biological signals, interest in telemonitoring wearable systems, and the frequency of

Table 1 Sample demographic characterization

	Frequency	%	Frequency	%
Sex (*n* = 352)				
Female	227	64.5		
Male	125	35.5		
Civil Status (*n* = 352)				
			(Female/male)	(Female/male)
Single	41	11.6	27/14	7.67/3.98
Married	206	58.6	129/77	36.65/21.88
Divorced	13	3.7	9/4	2.55/1.14
Widowed	92	26.1	62/30	17.61/8.52
Education level (*n* = 352)				
Don't know how to read or write	31	8.0	20/11	5.68/3.13
Know how to read and write	76	21.6	43/33	12.22/9.38
Primary Education	120	34.1	91/29	28.85/8.24
Basic Education	44	12.5	21/23	5.97/6.53
High School	60	17.0	37/23	10.51/6.53
Other	21	6.0	15/6	4.26/1.70
Work Situation (*n* = 352)				
Employed	41	11.6	31/10	8.80/2.84
Retired	311	88.4	196/115	55.68/32.67
Independent (*n* = 274)	274	77.8	170/104	62.04/37.96
Caregiver (*n* = 78)	78	22.2	57/21	73.08/26.92
Son	37	47.44	26/11	33.33/14.10
Hired Professional	30	38.46	21/9	26.92/11.54
Friend	6	7.70	6/0	7.70/0
Other Relative	3	3.85	3/0	3.85/0
Other	2	2.56	1/1	1.28/1.28

technology use. The questionnaire was evaluated by seven experts that contributed and approved the final questionnaire (Appendix 1). In order to minimize response bias, participants were asked to report positive factors for one device and negative factors for the other, rather than both aspects for the same device. This approach was adopted to avoid artificially balanced responses (i.e., participants feeling compelled to provide both strengths and weaknesses for each device), thereby encouraging more authentic and spontaneous perceptions.

2.4 Procedures

The study began with a training and instruction session for the researchers involved in data collection on how to apply the questionnaire. This training session included the explanation of the questions, the application format, and the possible examples and doubts that could be used to help older adults understand the question. The researchers responsible for data collection were physiotherapists, doctoral students, and laboratory researchers with prior experience in working with older adults. In addition, all team members received specific training on the standardized application of the questionnaire. This training ensured consistency across interviewers, including clarification of the questionnaire items, strategies to support participants' understanding, and procedures to address potential doubts in an ethical and appropriate manner.

Before the beginning of this study, a pilot study involving four older adults, was performed to understand if any modifications were necessary. Changes were made to the application of the questionnaires, such as examples.

The final version of the questionnaire was applied using Google Forms. The application was preceded by an explanation of the entire project, the objective of the questionnaire and the request for the verbal and written informed consent. The study was conducted from October 2021 to May 2023.

2.5 Statistical analysis

Statistical analysis was conducted using SPSS® 29 for Windows® (New York, USA). Exploratory data analysis and sample characterization were performed using descriptive statistics, including absolute and relative frequencies and central tendency measures such as mean, measures of dispersion, variability such as standard deviation, and their maximum and minimum values. The level of significance was set at 0.05, with a 95% confidence interval.

The RapidMiner Studio© Software version 10.1, was used to develop a prediction model based on a decision tree technique, through machine learning, to predict which variables are related to older adults' usage of technology and their level of interest to smart wearable systems for health remote monitoring.

3 Results

3.1 Sociodemographic characteristics

The sample consisted of 352 older adults, with a predominance of women (64.5%) (Table 1). The average age was 74.28 ± 9.68 years for women and 74.22 ± 10.21 years for men. Most participants were retired (88.4%) and lived in their own homes (96.6%). Educational attainment was low: 34.1% had completed primary education, 21.6% were literate without formal schooling, and only 4.3% held a bachelor's degree. Regarding independence, 77.8% were functionally autonomous.

Most participants were retired (88.4%, $n = 311$), with the majority having worked in the tertiary sector (67.3%, $n = 237$). Nearly all (96.6%, $n = 340$) lived in their own homes; 3.4% ($n = 12$) resided in care facilities. Most were independent (77.8%, $n = 274$), while 22.2% ($n = 78$) were dependent of caregiver.

3.2 Perception of remote monitoring

Among participants, 65.3% perceived remote smart wearable systems as useful (65.34%, $n = 230$). Safety was the most cited benefit 58.7% ($n = 135$), followed by prevention (24.8%) and control (7.4%). On the other hand, increased anxiety 54.9% ($n = 67$) and over-monitoring (13.1%) were the most frequent negative perceptions (Table 2).

3.3 Interest in a monitoring wearable system

Interest in using a smart wearable system was high, with 74.4% ($n = 263$) expressing willingness. The main features that negatively influenced smartwatch adherence were discomfort (62.74%, $n = 165$) and heaviness (31.15, $n = 86$%). In contrast, chest band devices were preferred if they were comfortable (76.05%, $n = 200$) and soft (34.6%, $n = 91$), and small (28.9%) (Table 3).

Feelings associated with wearable use were predominantly positive, with 93.91% ($n = 247$) reporting an increased sense of safety. The mean intention to use was 8.02 ± 2.73 (on a 0–10 scale), and perceived usefulness scored 7.76 ± 3.08.

Features most desired in smart monitoring systems included medication reminders (83.5%), promotion of healthy habits (74.2%), and doctor visit reminders (70.2%) (Table 4).

Table 2 Utility perception of remote monitoring smart wearable

Utility perception of remote monitoring smart wearable (*n* = 352)	**Frequency**	**%**
No	122	34,66
Yes	230	65.34
Positive utility perception of remote monitoring smart wearable (*n* = 230)		
Safety	135	58.70
Safety and prevention	57	24.78
Control and safety	17	7.39
Prevention	10	4.35
Don't know how to answer	5	2.17
Anxiety control	2	0.87
Medication control	4	1.74
Negative utility perception of remote monitoring smart wearable (*n* = 122)		
Increased Anxiety	67	54.91
Not necessary	23	18.85
Over measuring	16	13.11
Don't know how to answer	10	8.20
Just in case of disease	5	4.10
Development of obsession	1	0.82

Table 3 Perception of the importance of biological signals related to health

Interest in wearable system (*n* = 352)	Frequency	%	Frequency female/male	% female/male
Yes (female/male)	263	74.4	168/95	47.73/26.99
No (female/male)	89	25.3	59/30	16.76/8.52
Smartwatch features that may reduce the adherence (*n* = 263)			Frequency	%
Uncomfortable			165	62.74
Heavy			86	31.15
Big size			84	32.70
Modern			58	22.05
Flashy			54	20.53
Noisy			44	16.73
Chest band features that may increase the adherence (*n* = 263)				
Comfortable			200	76.05
Soft			91	34.60
Small			76	28.90
Light			72	27.38
Discreet			64	24.33
Simple			62	23.57
Other			50	19.01
Silent			49	18.63
Thigh			49	18.63
Feelings regarding smart wearable use (*n* = 263)				
Safety			247	93.91
Prevention			30	11.41
Monitorization			16	6.08

Other: don't know how to answer and only applicable in case of having a disease

Table 4 System features needs reported by the older adults

Warning in case of disturbance (*n* = 352)	Frequency	%
Warning to medication intake	294	83.53
Warning to do some healthy habits	261	74.15
Warning to go to the doctor	247	70.17

3.4 Technology use

Regarding technology access, 63.9% had smartphones and 36.1% owned a computer. Frequent usage was reported for smartphones (84.4%) and computers (85.0%). Preference was strong for portable systems (81.5%) and for consulting health data on smartphones (84.7%) (Table 5).

3.5 Artificial intelligence model

3.5.1 Technology use decision tree

The decision tree model developed using RapidMiner identified technology use frequency as a key predictor for interest in wearable systems. A decision tree can be found at Appendix 2. The attributes weight can be found **at** Table 6, being computer frequency the attribute with more weight.

4 Discussion

The findings reveal significant insights into the adoption of wearable health technologies among older adults. The high representation of women is consistent with demographic trends, as women generally have longer life expectancies and tend to participate more

Table 5 Use of technology equipment's

	Frequency	%
Have Computer	127	36.08
Frequency of use of computer ($n = 127$)		
Several days per week	108	85.04
Don't use	13	10.24
1 day per week	4	3.15
1 day at 2 weeks	1	0.79
1 day per month	1	0.79
Have Smartphone	225	63.92
Frequency of use of smartphone ($n = 225$)		
Several days per week	190	84.44
Every day	24	10.67
1 day per week	9	4.00
Have Tablet	76	21.59
Frequency of use of tablet ($n = 76$)		
Don't use	47	61.84
Several days per week	22	28.94
1 day at 2 weeks	4	5.26
Every day	2	2.63
Monitorization system ($n = 352$)		
Portable System	287	81.53
Unportable System	65	18.47
Data consulting ($n = 352$)		
Smartphone	298	84.66
Computer	54	15.34

Table 6 AI tree psychometric properties

Attribute	Weight
Computer_frequency	1
Tablet_frequency	0.498
Phone_frequency	0.409
Phone	0.215
Tablet	0.035
Computer	0

Accuracy was 71.88%, with high precision (76.80%) and recall (89.35%), especially when smartphone, computer, and tablet use were considered. Psicometric values can be found at Table 7

Table 7 AI tree psychometric properties

Question		Trees Psychometric Properties
Frequency of use	Accuracy	71.85% +/- 7.83% (micro average: 71.88%)
	Precision	76.65% +/- 3.29% (micro average: 76.80%) (positive class: yes)
	Recall	89.32% +/- 9.840% (micro average: 89.35%) (positive class: yes)
Device	Accuracy	71.85% +/- 7.83% (micro average: 71.88%)
	Precision	76.65% +/- 3.29% (micro average: 76.80%) (positive class: yes)
	Recall	89.32% +/- 9.840% (micro average: 89.35%) (positive class: yes)

actively in health-related studies. The low educational level observed reflects the historical education context of older generations in Portugal [24, 25].

Despite potential barriers, the interest in wearable systems was considerable (74.4%). Usability factors such as comfort, size, and weight significantly influenced acceptance, which highlights the necessity of user-centered design in health technologies targeted at older populations. Specifically, wearables must accommodate age-related sensory, physical, and cognitive changes to ensure adoption [12, 18].

The perception of safety as the primary benefit of wearable use reinforces prior literature emphasizing the role of psychological comfort in technology adoption. Although prevention (11.4%) and improved health monitoring (6.1%) were also reported, these values are considerably lower compared to safety (93.9%). Therefore, they should be considered secondary benefits rather than primary determinants of wearable adoption. This finding highlights that older adults' motivation to use these devices is predominantly driven by the reassurance provided by safety, while prevention and monitoring functions play a complementary but less decisive role. However, concerns such as increased anxiety and feelings of constant surveillance underline the ambivalence some older adults feel, revealing a delicate balance between reassurance and stress due to continuous monitoring [8, 9, 19].

The strong preference for portable and smartphone-compatible systems, alongside frequent use of smartphones and computers, challenges stereotypes about older adults being resistant to technology. These findings suggest that, with proper design and support, this demographic is not only capable but also willing to engage with digital health innovations [3, 4, 20].

The machine learning model further validated that frequency of technology use, especially smartphones, serves as a reliable predictor for wearable system interest. This insight supports the implementation of stratified adoption strategies based on digital literacy levels and prior experience with technology [10, 15].

The high demand for functionalities such as medication alerts and preventive health prompts indicates that older adults see wearable technologies not only as passive monitors but as active tools for managing their health. This aligns with contemporary models of aging in place and healthy aging, advocating for proactive, personalized, and technology-supported care [7, 15].

Although wearables are primarily designed for continuous health monitoring and the promotion of healthy habits, in our study older adults consistently highlighted reminder functions (e.g., medication intake, doctor's appointments) as one of the most valuable features. This finding suggests that participants perceive wearables not only as monitoring devices but also as supportive tools for daily routine management. Smartphones already provide widespread and effective reminder functions; however, not all older adults are comfortable using them consistently. In this context, incorporating reminders into wearables could facilitate adherence by making them more relevant to the user's perceived needs and reducing reliance on more complex devices. Thus, reminders should not be seen as the primary function of wearables but as a complementary feature that may improve acceptance and long-term use [20, 26–28].

Despite the promising findings, this study has some limitations. One major concern relates to the use of convenience sampling, which, although effective in securing participation, may have introduced selection bias. Participants were recruited based on availability and willingness to participate, which likely favored individuals who are more open to technology and research engagement. As a result, the generalizability of the findings to the broader older adult population is limited and should be interpreted with caution. Other limitation of this approach is that it does not allow for a direct comparison of both positive and negative factors across the two devices. While this methodological choice reduced potential bias in participants' responses, it restricted the possibility of systematically contrasting strengths and weaknesses within the same device.

Another important limitation is the exclusive reliance on self-reported data, which is subject to social desirability bias—particularly in responses related to interest in and perceived benefits of wearable technology. Furthermore, psychological constructs such as digital self-efficacy and technology-related anxiety were not assessed using validated instruments, which may have restricted the depth of analysis regarding user readiness and psychological barriers. In addition, the cross-sectional nature of the study prevents any inference of causality between the variables studied. Future research should address these gaps through longitudinal designs and probabilistic sampling methods to enhance the robustness and external validity of the results.

Additionally, the assessment of eligibility and exclusion criteria was not based on standardized clinical instruments, relying instead on informal tasks. This arbitrariness represents a methodological limitation that may have influenced sample selection and should be addressed in future studies by adopting validated tools.

Given these considerations, we recommend the implementation of targeted digital literacy programs tailored to the needs of older adults to enhance their familiarity and comfort with wearable health technologies. Additionally, randomized controlled trials could be valuable in evaluating the real-world impact of these systems on clinical outcomes such as medication adherence, physical activity, and chronic disease management. Collaborative efforts with technology developers should also be encouraged to promote a co-design approach that aligns device ergonomics and features with the physical and cognitive profiles of older users, thereby fostering greater adoption and sustained use [29, 30].

Appendix

Appendix 1

- Questionnaire to older adults:

This questionnaire is an instrument used in the research project SAFHE - SAFe Health Elderly Monitoring with the objective of characterizing the needs for the use of a vitalBAN, cardioBAN and new technologies in the monitoring of the health status of older adults and their caregivers. We therefore ask that you answer as honestly as possible. Your data will only be used for research purposes and will only be shared with the team that analyzes them. Thank you in advance for your participation, it will be extremely important!

Declaration of informed consent

By accepting the option "Yes, I accept and I am aware of what will be asked of me and what it is for" I was informed that the aforementioned Research Study is intended to characterize the needs for the use of a vitalBAN, cardioBAN and new technologies in monitoring health status in older adults. I know that in this study, questionnaires are planned, having been explained to me what they consist of and what their possible effects are. I was assured that all data relating to the identification of participants in this study are confidential and that anonymity will be maintained. I know that I can refuse to participate or stop participating in the study at any time, without any penalty for this fact. I understood the information given to me, I had the opportunity to ask questions and my doubts were clarified. I agree to participate voluntarily in the aforementioned study. I also authorize the dissemination of the results obtained in the scientific environment, guaranteeing anonymity. Researcher Name and Contact: Andreia Sofia Pinheiro de Sousa, asp@ess.ipp.pt.

1. Let's start the questionnaire with a very simple task. I will repeat three words and later I will ask you what they were. Repeat after me: Lemon, **key and plane.**
2. Which sex do you most identify with?

- Femine.
- Masculine.
- I rather not tell.
- Other______________________.

3. How old are you in years? (Indicate a number): ____.
4. What is your education level (Select the most appropriate option with an O):

Can't read or write	Can read and write	Incomplete Primary Education	Primary education	Primary education Incomplete	Primary education	Secondary education **Incomplete**	Secondary education	Bachelor's or Bachelor's degree	Postgraduate studies	Masters	Doctorate

5. You are retired from what profession: _________.
6. What is your Marital Status (Select the most appropriate option with an x):

- Single.
- Married.
- Widowed.
- Union.
- Divorced/Separated.
- Other: ______.

7. What is your usual address? (select with an X the most suitable option)

- Own house.
- House of a family member.
- House of a caregiver.
- Residence.

    i. How many years have you been at this address? Years: ______________.

    8. Do you have a caregiver to accompany you to medical appointments?

- Yes.
- No.
- Other__________________.

9. Do you have a caregiver to accompany you in some of the most important tasks (meals, banking, shopping)?

- Yes.
- No.
- Other__________________.

10. How many hours a day is the caregiver with you? ______________________.
11. What is your relationship with your caregiver?

- Child.
- Husband.
- Wife.
- Nephew.
- Friend.
- Hired Professional.
- Other__________________.

12. In the last month, have you been feeling well?

- Sad.
- Unmotivated.
- None of the options.
- Well.
- Happy.
- Motivated.
- Other____________________.

13. In the last month, have you been feeling discouraged or unwilling to carry out your activities?

- Yes, but I also do the activities.
- Yes, but I end up not doing the activities.
- No, but I also do the activities.
- No, but I end up not doing the activities.

14. Do you have any of these health problems? If yes, indicate which. You can tick several.

- Arterial hypertension;
- Diabetes mellitus;
- High cholesterol;
- Other, which: _____________.

15. Do you take any medication daily?

- Yes (go to the next question – 15.a).
- No (go to question 16).
- The medication you take is for:

  i. Hypertension.
  ii. Cholesterol.
  iii. Diabetes mellitus.

iv. Cardiorespiratory diseases.
v. Musculoskeletal diseases.
vi. Rheumatic diseases.
vii. Neurological diseases.
viii. Others: __________.

- Yes (move on to question i.)
- No (move on to question 17).

i. What was the reason for the fall?

  i. Slip.
  ii. Trip.
  iii. Losing consciousness.
  iv. Dizziness.
  v. Weakness of the lower limbs.
  vi. No apparent reason.
  vii. Don't remember.
  viii. Other: _______.

ii. If so, in or out of the house?

i. Inside the house.
ii. Away from home.
iii. Both locations.

iii. If so, did you need medical attention?

i. Yes (move on to question 16iv.)
ii. No (move on to question 16vi.)

iv. If you needed medical attention, tell me where you had access to that care?

i. Hospital.
ii. Health center.
iii. Health professional in home context (dressings).
iv. Other: ________.

v. If you had a hospital intervention, how many days did you need care (hospitalized and/or curated)? (Enter a number)
vi. Have you had restrictions on your daily activities? (walking, talking, eating, personal hygiene)

i. Yes (move on to question 16.vii).
ii. No (move on to question 16.viiI).

vii. If so, how many days?

i. viii. Did you have a fracture?

ii. Yes (move on to question 16.ix).

iii. No (move on to question 17).

ix. If you've had a fracture, do you indicate the region?

i. Skull.
ii. Spine.
iii. Ribs.
iv. Clavicle.
v. Arm.
vi. Forearm.
vii. wrist.
viii. Pelvis.
ix. Thenca (femur neck).
x. Thigh.
xi. Knee.
xii. Pafter.
xiii. Ankle.
xiv. Foot.
xv. Other: _________.

17. Are you afraid of falling?

- Yes (move on to the next question – 17.a).
- No (move on to question 18).

i. 17.a - If you're afraid of falling, tell me what the reasons were?
i. Fear of getting hurt.
ii. Fear of reprisals from caregivers.
iii. Fear of not being helped.
iv. Other: _______.

18. How many hours a day you sit on:

- 1 to 2 h.
- 3 to 4 h.
- 5 to 6 h.
- 7 to 8 h.
- All day long.

Questions related to health variables:

19. How often do you go to the doctor? (Select with an x the most appropriate option):

Every month	Every 2 months	Every 3 months	Every 4 months	Every 5 months	Every 6 months	Once a year	Only when I'm sick	Only when they make me

20. When you go to the doctor, do you like to?

- Know if I'm okay or have a problem.
- Know in detail the values of my exams.
- Both options.

21. When you go to the doctor, what subjects would you like the doctor to explain to you: (you can select more than one option)

- I would like the doctor to hear more, to give more attention to the information That I share and have more time with me.
- I would like the doctor to explain my condition/illness further.
- I would like the doctor to explain to me more about my treatment, what medicines (treatment reason, consequences of medicines, what I cannot ingest).
- I would like the doctor to explain more the other therapies I should do (physiotherapy), healthy habits,
- The doctor chooses how to say the information.

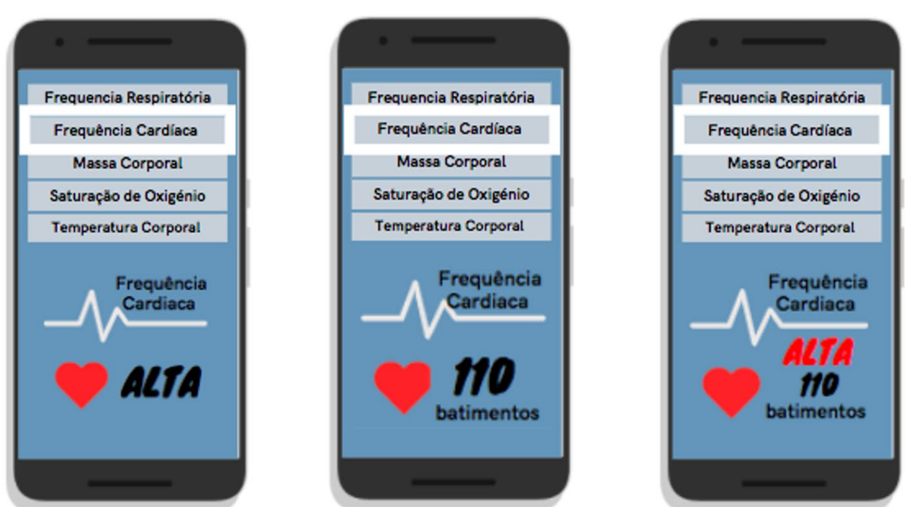
With COVID-19 infection, it is necessary to monitor the patient's health in order to understand how he is, as well as develop and the disease. Thus, health professionals, caregivers and patients should be aware of values of arterial pression, cardiac frequence, and eletrocardiography, oxygen saturation of the blood, galvanic response of the skin, respiratory rate, glucose, body temperature and physical activity, since this information indicates the patient's health status. Thus, some questions are presented regarding the way in which this information is presented, as well as how relevant it may be to you.

22. Do you find it useful to monitor your health every day?

- Yes (if yes, justify it)____.
- No (if not, justify)____.

23. For you, what is more important, knowing the value of your vital signs, or knowing the level (low, moderate, high) of them? For example: A Heart Rate of 110 beats per minute (value) at rest is also a high heart rate (qualitative rating) (Choose the option that makes the most sense to you).

   a. (the image indicate the Heart rate – high (a), number (110 bpm) (b), and both information b. c.



24. For you, in order of relevance, which of the information is most important s (use only those that knows its meaning):

- Blood pressure, Heart rate, Electrocardiography, Oxygen saturation in the blood, gallenic response of the skin, respiratory rate, glucose, body temperature, physical activity;

25. Would you be interested in using a vitalBAN and a cardioBAN (a system consisting of a wristband and a band that puts on your chest and that monitors your vital signs such as heart rate and frequency of respiratory cycles, among others) todos the days?

- Yes (if yes, move on to question 26).
- No (if not, move on to question 27).

26. What can't have a watch so you could wear it every day?

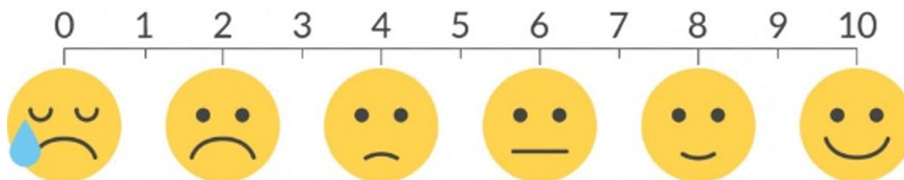
27. What should a vitalBAN (bracelet) watch have in terms of comfort so you could wear it every day?
28. Would you use a vitalBAN (wristband) that would monitor your health?

- Yes, (if yes, justify)____.
- No, (if not, justify)____.
- Other: ____________.

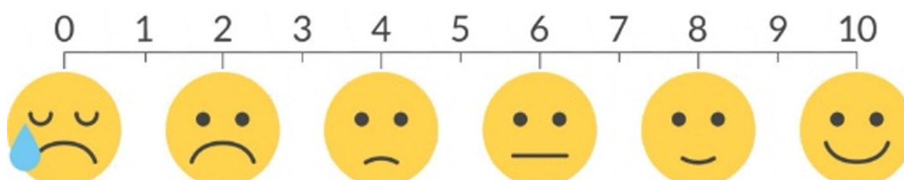
29. Would it feel safer if a technology system monitored your health permanently?

- Yes, (if yes, justify)____.
- No, (if not, justify)____.
- Other: ____________.

30. Would you have a vitalBAN (wristband) and a cardioBAN (chest band) that would monitor your health from a distance for you, a caregiver or a health care professional? On a scale of 1 to 10, where 1 corresponds to "wouldn't use" and 10 "would use permanently," your willingness to use the system would be:



31. In case of COVID-19 isolation, how useful would it be to use a vitalBAN (wristband) and a cardioBAN (chest band) that would monitor your health? Indicate for you the usefulness on a scale of 1 to 10, where 1 corresponds to "not very useful" and 10 "very useful":



32. For a vitalBAN (wristband) and a cardioBAN (chest band) that monitor your health, check which of the following features is most important to you (you can check several options):

- Warn to take the medication;
- Warn of disease situations;
- Notify the doctor of your health status;
- Warn for healthy habits;

33. If you had a vitalBAN (wristband) and a cardioBAN (chest band) thatmonitored your health, what would you like the system to tell you, or go beyond the variables presented to you?

Other technology issues:

34. Do you know how to use a computer?

- Yes (if yes move on to question 35).
- No (if not, move on to question 36).

35.How much do you use the computer?

1 day per week	Sev-eral days a week	1 time every 2 weeks	1 time per month	1 time every 2 months	1 time every 4 month	1 time every 6 month	1 time per year	Irregular, but less then 1 time per year

36.Do you know how to use a mobile phone in other tasks besides making calls?

- Yes (if yes move on to question 37).
- No (if not, move on to question 38).

37.How much do you use the mobile phone:

1 day per week	Sev-eral days a week	1 time every 2 weeks	1 time per month	1 time every 2 months	1 time every 4 month	1 time every 6 month	1 time per year	Irregular, but less then 1 time per year

38.Do you know how to use a tablet?

- Yes (if yes move on to question 39).
- No (if not, move on to question 40).

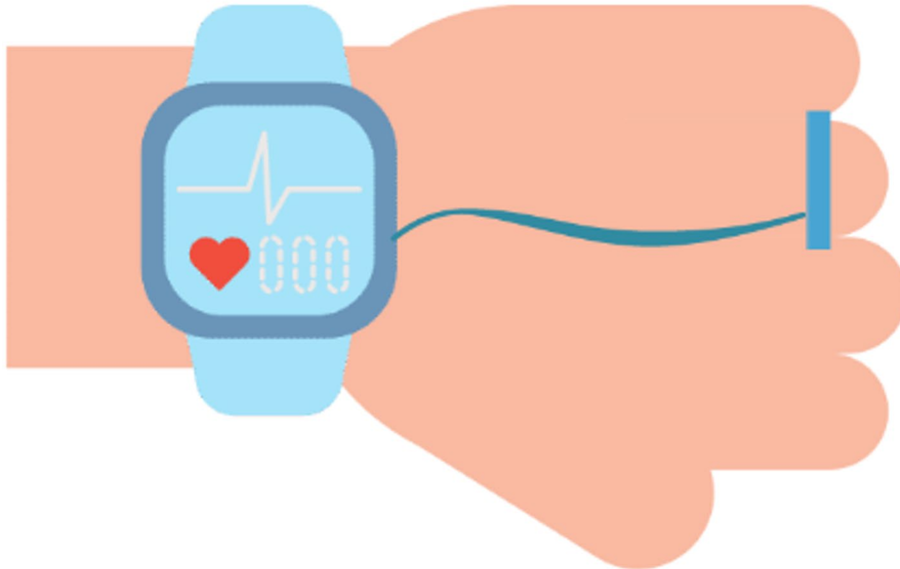
39.Usually use tablet:

1 day per week	Sev-eral days a week	1 time every 2 weeks	1 time per month	1 time every 2 months	1 time every 4 month	1 time every 6 month	1 time per year	Irregular, but less then 1 time per year

40.In the caseof C OVID-19, regularly monitoring your health status is very important. In this sense, would you prefer a system in which you could monitor yourself at your will when you want, or a system that monitors you constantly and autonomously?

- I'd prefer a system that I can decide when and where to monitor myself.

- I'd rather have a system that could monitor me without any command on my part.



41. In the case of COVID-19, when using a system capable of regularly monitoring your health status, would you prefer a vitalBAN (wristband) and cardioBAN (chest band) system in which you could consult your data on it, or would you prefer a system in which you could check your data on a mobile phone or tablet?

- I preferred a system that I could query the data on the computer.
- I preferred a system that I could query the data on the phone.

Thank you for your time. Your opinion was very helpful and will be extremely valuable for the development of the project.

Appendix 2

See Fig. 1

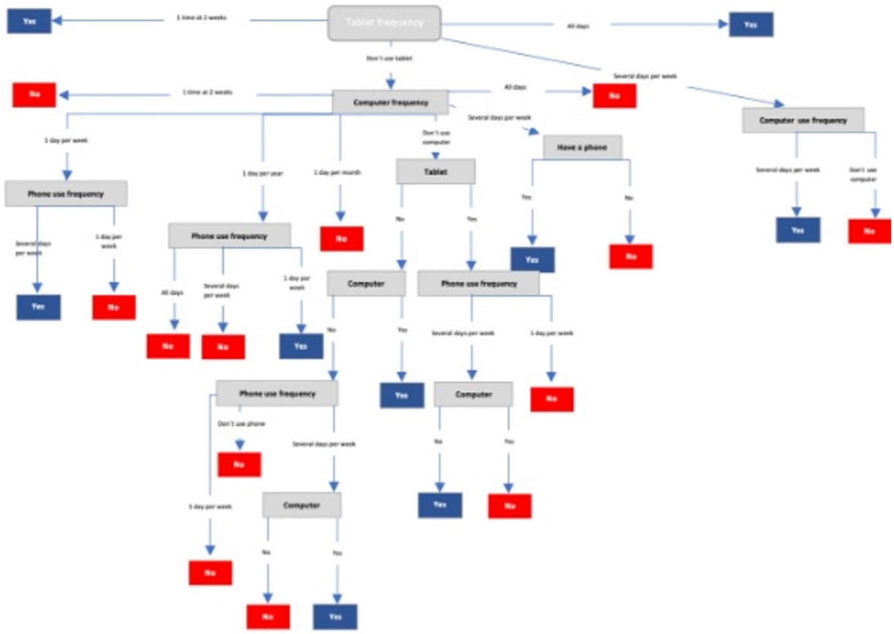


Fig. 1 Decision tree

Author contributions
1. José Félixo Conceptualization: Contributed to defining the research scope and main objectives.o Data Curation: Managed the organization and quality control of the collected data.o Writing - Original Draft: Drafted sections of the manuscript, including results and discussion.o Supervision: Provided guidance on methodology and ethical considerations.o Writing - Review & Editing: Assisted in revising the manuscript.2. Juliana Moreirao Data Curation: Managed the organization and quality control of the collected data.o Investigation: Conducted fieldwork and administered surveys.3. Soraia Pereirao Investigation: Assisted with participant recruitment and data collection.o Writing - Original Draft: Drafted major portions of the manuscript and ensured coherence.4. Diana Guedeso Investigation: Assisted with participant recruitment and data collection.o Writing - Original Draft: Drafted major portions of the manuscript and ensured coherence.5. Catarina Sáo Software: Developed and implemented analytical models using SPSS and RapidMiner.o Formal Analysis: Applied machine learning techniques for predictive modeling.o Writing - Review & Editing: Reviewed the manuscript for technical precision.6. Rubim Santoso Supervision: Oversaw the analytical and technical aspects of the research.o Conceptualization: Contributed to defining the theoretical framework.o Writing - Review & Editing: Reviewed and refined the manuscript.o Funding Acquisition: Secured financial support for the study.7. Brígida Fariao Validation: Ensured compliance with ethical standards and study protocols.o Writing - Review & Editing: Assisted in revising the manuscript.8. Elina Kontioo Resources: Provided access to software and analytical infrastructure.o Investigation: Supported the fieldwork and participant engagement.o Writing - Review & Editing: Reviewed the manuscript and provided critical insights.9. Ana Rita Pinheiroo Formal Analysis: Participated in interpreting the statistical results.o Writing - Original Draft: Authored sections related to methodology and results.10. Andreia S. P. Sousao Conceptualization: Led the development of the research idea and objectives.o Supervision: Oversaw the analytical and technical aspects of the research.o Project Administration: Coordinated the entire research process and team.o Writing - Original Draft: Drafted major portions of the manuscript and ensured coherence.o Writing - Review & Editing: Assisted in revising the manuscript.

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Data availability
Data is provided within the manuscript files. For more information the authors should be contacted.

Declarations

Ethics approval and accordance.

The protocol was submitted and approved by the Ethics Committee of the Health School of Polytechnic of Porto receiving the code CE0075C, in accordance with the recommendations of the American Psychological Association's Code of Ethics and the Declaration of Helsinki.

Consent to participate
Informed consent was obtained from all individual participants included in the study.

Consent for publication
Not Applicable.

Competing interests
The authors declare no competing interests.

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