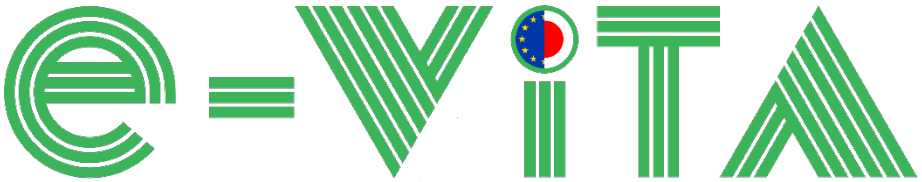

EU-JAPAN VIRTUAL COACH FOR SMART AGEING

D8.6 – Proof of Concept Evaluation

Deliverable D8.6		
Authors and institution	Anne-Sophie Rigaud (AP-HP) and Toshimi Ogawa (TOHOKU)	
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Executive Summary

This deliverable explains the course and the results of the Proof of Concept study (PoC) which took place in Europe (Germany, Italy and France) and Japan between August and December 2023. The objective of the Proof of Concept study is to assess the feasibility of the implementation of a virtual coaching system into the homes of older adults to promote active and healthy aging. This deliverable is divided in two main parts, the first one is about the bases of the Proof of Concept study itself and the second one focuses on the results that were obtained by the consortium regarding the implementation of the virtual coaching system.

For the Proof of Concept, healthy older adults over 65 years old were recruited and divided into two groups (intervention and control). The intervention group participants received a virtual coaching system including a virtual coach, sensors, a smartphone and applications whereas the participants of the control group only received a booklet with information promoting active and healthy aging. Both groups answered questionnaires and interviews at three different times: at the beginning (T0), at the middle-point of the study (T1) and at the end of the study (T2).

Therefore, this deliverable aims at describing the results of the Proof of concept study, conducted both in Europe and Japan, notably in regard to our primary outcome which is the quality of life of the participants. Interesting results were obtained during this study. Although statistical significance was not always observed in the different measured outcomes, the qualitative data showed the detailed perspective of older adults in a cross cultural aspect regarding active and healthy aging, their needs and preferences in terms of technologies as well as the determinants of their intention to use technologies in their daily lives.

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Acronyms and Abbreviations

Acronyms/Abbreviations	Explanation
PoC	Proof of Concept
AI	Artificial Intelligence
LLM	Large Language Model
QOL	Quality of Life
MoCA	Montreal Cognitive Assessment
GDS	Geriatric Depression Scale
SPPB	Short Physical Performance Battery
eHeals	eHealth Literacy
ATI	Affinity for Technology Interaction
SUS	System Usability Scale
UEQ	User Experience
L API	Low Level Application Programming Interface
EU	European Union
JP	Japan
RGPD	General Regulation on the Protection of Personal Data
DE	Germany
FR	France
IT	Italy

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1 Introduction

1.1 Background

Proof of Concept (PoC) refers to a series of verification processes to confirm whether a new idea or technology is feasible. By conducting a PoC before implementing a developed system in society, technical feasibility, user needs, cost-effectiveness, etc. can be confirmed, and the information obtained is useful for investors and companies to make decisions.

There are many challenges in developing a virtual coaching system, such as enhancing the interaction between the user and the virtual system, integrating monitoring data, and automating feedback. One of the features of the e-VITA system is to add warmth to the interaction between the user and the virtual system, and to allow for more personalized interactions through human input of user characteristics that have not yet been automated in the system. The human support person (hereafter referred to as the human coach) has three roles: first, to enter information into the e-VITA system about the user's health, lifestyle, preferences, hobbies, etc., which the human listens to, and to reduce the user's fear of digital devices by helping the user use the system; second, to actually coach the user to develop intrinsic motivation and to help them acquire healthy lifestyle habits; and third, to create and provide opportunities for participation. This involves gently encouraging people to participate in a casual way. These hybrid support methods are unique to the e-VITA system. Another unique feature of e-VITA in terms of the technology is the integration of AI-based conversations, proactive coaching functionality which allows the system to start the conversation, applications related to various health areas, chatbots, and wearables for continuous health monitoring. This integration builds on a previous study by Schoeppe et al. (2016)[1] that evaluated the effectiveness of a multicomponent intervention over a single application-specific intervention. Additionally, the system is multi-component, intended to address the more diverse needs of older adults. However, this system has never been tested for its effectiveness on maintaining and or improving one's wellbeing and health status nor the acceptability and usability by the older adults used in the real home of them. The conversational system with integrated LLM needs to be evaluated for its feasibility when placed in the everyday life of older adults together with the rest of the components of the e-VITA system. In the future projects, such an evaluation would be an important asset for further improvement of the system.

1.2 Purpose

The primary purpose of the study was the QOL, which was evaluated individually in-person at the test center by interview and also by questionnaire by means of EQ 5D 5L and people's adherence to the virtual coach system through the frequency of use of the virtual coach and the dropout rate. The secondary purpose of this research was to evaluate the usability, the user experience, the acceptability and the needs' fulfilment after the use of the e-VITA system for 4 to 6 months at home and to evaluate the effect of the system on the older adult's physical and mental health condition based on intrinsic capacity (WHO) and social activities as a measure of overall well-being. Ultimate goal is to provide data on e-VITA coaching system to support the maintenance and improvement of health in the broad concept of well-being of the older adults through the hybrid collaboration of technology and human coaches.

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2 Methodology

2.1 Study Design

This study was approved by the ethics committee of each test centre in Europe and Japan during February and August of 2023. Written informed consent was obtained from all subjects at the time of enrolment. The study was 4-6 months randomized, clinical trial among healthy regional older adults in urban area, Ancona in Italy, Cologne in Germany and Paris in France, Tokyo and Sendai, Miyagi prefecture and rural area, Natori, Miyagi prefecture in Japan. Since this study was to be conducted from summer to winter, seasonal effects will be added to the changes in these indicators. In this project, in order to eliminate the effects of differences in participants' motivation and seasonal variations, an intervention group using a virtual coach and a control group not using a virtual coach were set up, and changes in the evaluation indicators of each group over a certain period were compared and evaluated for effectiveness.

2.2 Test centers

- **France** Hôpital Broca 54-56 rue Pascal, 75013 Paris - France.
- **Germany** Diocesan Caritas Association for the Archdiocese of Cologne, Georgstraße 7, 50676 Cologne – Germany
- **Italy** IRCCS INRCA, Via della Montagnola 81, 60129 Ancona - Italy
- **Japan** Tohoku University –Smart Ageing Research Center, 4-1 Seiryo-Machi, Aoba-ku, Sendai, 980-8575, Miyagi Japan
- **Japan** J.F. Oberlin University, 3758 Tokiwa-machi, Machida-shi, Tokyo 194-0294 Japan
- **Japan** Misawa Homes Institute of Research and Development Co. Ltd., 1-1-19 Takaidonishi, Suginami, Tokyo168-0071 Japan

2.3 Study Subjects

The study subjects were recruited in each region with the goal of securing a total of 240 participants: 120 from France, Germany, and Italy in Europe (40 each), and 120 from Sendai, Natori, and Tokyo in Japan (40 each).

Recruitment of the study subjects

The local circular notice (esp. distributed to households within a neighborhood association) was used and the subjects were also recruited through the test center's network of elderly populations. The study was targeted independently, and health individually. Those who received an explanation of the study at the study center and signed a consent form were screened using the criteria described in 2.4. and healthy subjects were recruited as study participants.

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2.4 Inclusion and Exclusion Criteria

Inclusion Criteria

- Aged 65 and over;
- Capacity to consent;
- Able to stand and walk unaided;
- No acute or untreated medical problems;
- MoCA ≥ 22;
- GDS < 9;
- SPPB ≥ 7
- Clinical Frailty Scale score between 2 and 4.

Exclusion Criteria

- Failure to meet the inclusion criteria;
- Use of active implant or not-implant medical devices;
- Allergy to nickel;
- Concomitant participation in other studies;
- Lack of written informed consent;
- A myocardial infarction or stroke within 6 months;
- Painful arthritis, spinal stenosis, amputation, painful foot lesions or neuropathy limiting balance and mobility;
- Uncontrolled hypertension;
- Pacemaker or implantable cardioverter defibrillator;
- advanced Parkinson's disease or other neuromuscular disorder;
- Metastatic cancer or immunosuppressive therapy;
- Significant visual or hearing impairment.

2.5 Human coach intervention

In this study, the "human coach" had three roles: to willingly talk to and teach subjects when they were afraid of digital devices or had forgotten how to use them; to talk to and motivate them to lead a healthy life, both mentally and physically by using assessment sheet; and to give them opportunities to participate in a variety of activities.

At each test center, the human coach training was conducted in several sessions according to the prepared device briefing materials and coaching guidelines. Although the actual implementation of the training was explained, it was difficult to master all the details immediately. Therefore, the human coaches regularly attended follow-up training sessions and review meetings organized by the test centers or human coach leaders, and also used the pre-prepared smartphone telegrams (WhatsApp, LINE) to share information and encourage other human coaches to work as a team. During the study period, human coaches fulfilled the above three roles by contacting the subjects approximately once every two weeks. The contact interval was adjusted by each subject so as not to be intrusive. During the contact, motivational questions were asked according to the assessment sheet prepared in advance at the study center. Necessary matters were recorded in a notebook (no other media were used), taking into account personal information, and urgent matters were communicated to the study center by

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telegram, e-mail, and telephone, and the study center also acted as a monitor during the study period. The record books were collected by the test center staff after the test. The evaluation sheets were used not only for comments and questions related to the usability of the equipment, but also to assess the level of motivation for each health item and social activity. At the end of the trial, the role of the human coach was summarized in a final meeting to obtain feedback on the human coach experience, how they felt about it, and whether they would like to continue in the future.

The human Coaches also had a study center with a Human Coach leader. This is due to the need to work with local businesses and educational institutions to fund activities and create opportunities for the human coaches to continue to participate as a team in community-building activities after the project ends, and to use their experience in activities such as engaging the local community, building community connections, and promoting the use of digital devices. In this way, human coach leaders are responsible for providing opportunities for human coaches to engage in activities. In this study, the appropriateness of the Human Coach Leader role was also investigated.

2.6 Device preparation at home of older adults and Monitoring

The devices had to be connected to the Internet using the home WIFI or the tethering feature of the smartphone provided at the test center. The smartphone applications were also downloaded by the subjects to help them learn the process, but if it was difficult, the test center staff performed the download process. Once the installation of all the devices was completed, the subjects were trained during the study, the human coach helped with device difficulties by contacting the study subject every two weeks as mentioned above also the human coach monitored the usage of the devices.

Figure 1: Coaching Devices used in the e-VITA POC study: A= NAO Robot, B: Gatebox, C: Daruma; D: Celeste; E: Tablet

2.7 Intervention methods

For the intervention group, a device that provided a virtual coach was installed in the living room of the subject's home for 4 to 6 months, and the subject was asked to voluntarily interact with the virtual coach and use wearable devices and other sensors during the intervention period. During the intervention period, a support staff member called the subject once every two weeks or as needed to check on the usage of the device and how it was being used.

As virtual coaches, Nao, Gatebox, Daruma, and tablets were used in Japan; in the EU, CelesTE was used instead of Daruma. As sensors for various physical indicators, a NeU device (XB-01), a smartwatch (Huawei Band7), and a smartphone were used. As environmental sensors, a motion sensor (ETC-PIR)

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and a temperature/humidity sensor (ET9-RHT) were used in Japan, and a motion sensor (Delta Dore: DMB TYXAL) and a smart indoor environmental sensor (NETATMO) in the EU.

The main use cases are daily activities such as walking, physical activity, sleep, etc. Health activities, social activities and events, environmental monitoring, and questions about health and general information. For more details, please refer to deliverables D3.9 and the D8.5 protocol paper.

Figure 2 shows an example of a device installation used for a virtual coach. During the intervention period, the control group was given a pamphlet on health promotion to use on a voluntary basis which contains the information about the same health domains as intervention group.

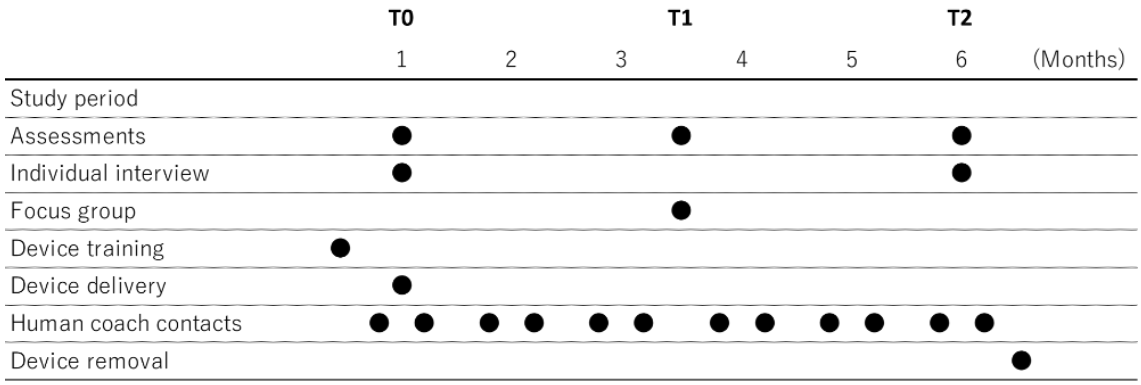

Figure 2: an example of a device installation used for a virtual coach

2.8 Study Endpoints (survey items)

As attributes, the subjects' sex, age, household type, lifestyle, degree of frailty (Clinical Frailty Scale: CFS), and personality characteristics (Big-5) were investigated. The main evaluation items to be ascertained before and after the survey period were indicators related to quality of life and the evaluation of the e-VITA system itself.

(1) Quality of life domains and evaluation scales

1) Subjective Quality of Life: Quality of Life Scale (EQ-5D-5L), UCLA Loneliness Scale
2) Physical health: Short Physical Performance Battery (SPPB), nutritional status (Short FFQ)
3) Mental health: cognitive function (MoCA), depression level (GDS)
4) Social health: Physical and leisure activity check list

(2) Evaluation of the e-VITA system

1) Expectations for virtual coaching system (ADTPA-B)
2) eHealth literacy (eHeals)
3) Affinity for Technology Interaction (ATI)
4) The System Usability Scale (SUS) (intervention group only)
5) User experience (UEQ) (intervention group only)

(3) Semi-structured interview

The usefulness of the system, issues, problems, and directions for improvement.

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2.9 Statistical analysis

For each evaluation indicator, a statistical test of the corresponding difference between the initial survey and the follow-up survey was conducted by region and with and without intervention. Next, to examine the effect of the e-VITA system on each evaluation indicator, we compared the differences in the distribution of the change from the beginning of the survey to the end of the survey (=value at the end of the survey - value at the beginning of the survey) for each evaluation indicator, by region and with and without intervention, using Mann Whitney's U test The results were compared.

2.10 Qualitative analysis

All baseline interviews were conducted at home or at the study center, and interim focus groups and pre- and post-test interviews, and questionnaire responses were conducted at the study centers themselves in a timely synergy with assessment dates.

All the interviews were transcribed in native language by the respective test centers, and then pooled and further analyzed by regions, i.e. Europe and Japan.

Through thematic analysis of the transcribed interviews, the researchers from all test centers first constructed individual inductive codes and, following regular consultation with each other, merged these into a single coding scheme per region, Europe and Japan.

2.11 Ethical clearance

Ethical clearance has been achieved by all test centers in all countries. An amendment has been filed and accepted in Japan before the start of the study. The amendment was related to the use of the OpenAI L API in the study but was not possible in the various EU study centers. Pls. Refer also to deliverable 8.4 for more details.

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3 Results

3.1 Main Study Results

3.1.1 General remarks including dropouts

In the EU, participants were recruited in three member states, i.e. Germany, France, and Italy. All EU test centers were located in urban areas, i.e. Cologne, Paris and Ancona. Recruitment was implemented via existing networks in all EU test centers. In Japan, participants were recruited in Miyagi Prefecture and Tokyo by holding information sessions at local governments, volunteer groups, and nursing homes. Due to the impact of the outbreak of novel coronavirus infection, mutual coordination of system development areas, and resistance to having their behavior monitored, recruitment of participants was not sufficiently advanced, resulting in a total of 143 women and men living near each test center, aged 61–92 years, visited the test centers for screening in EU and Japan together.

Out of all these participants in the EU and Japan, 1 dropped out before screening, 3 dropped out before intervention began; therefore, we started the intervention with 139 participants. After counting for further 9 dropouts (4 in the control group (EU4, JP0) and 5 in the intervention group (EU2, JP3) during the study, the statistical analysis was achieved with 130 subjects (58 participants in Europe and 72 in Japan). The main reason for the dropout in the control group was that the study was taking too much time, for the intervention group, it was that the devices were not working properly. The dropout rate of this study was 6.47%.

The number of subjects in each region and the number of people assigned to the control and intervention groups are shown in Table 1.

Greater Area	Local subregion	control group	intervention group	Total number
EU	Ancona	10	19	29
	Cologne	5	8	13
	Paris	7	9	16
	subtotal	**22**	**36**	**58**
Japan	Natori City	5	6	11
	Sendai City	20	18	38
	Tokyo	14	9	23
	subtotal	**39**	**33**	**72**
	total number	**61**	**69**	**130**

Table 1: Number of study subjects entered into the statistical analysis

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Evaluation period

The duration of the demonstration, which was originally planned to be six months, turned out to be four to six months due to delays in device development and target recruitment. The flow of the proof-of-concept and the timing of the survey in each region are shown in Figure 3.

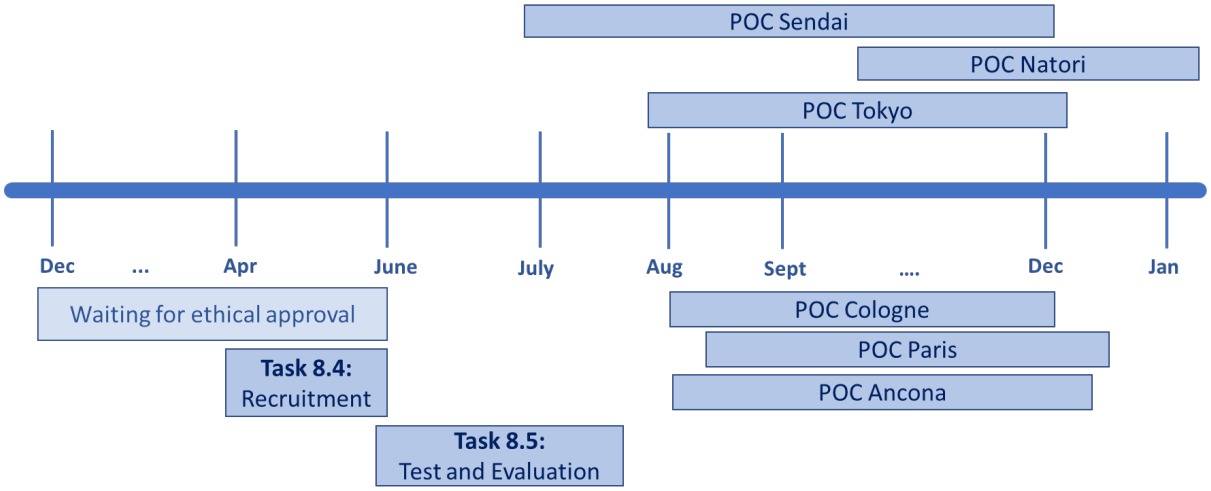

Figure 3: Flow of the proof-of-concept experiment and timing of the experiment in each region

Table 2 shows that there were no significant differences between the two study groups (intervention / control) before the study started.

Data	T-test EU - JP	T-test Intervention - control	ANOVA of groups in EU and JP	ANOVA of groups in all test center	
				Difference	Posthoc analysis
Age	+	ns	gEU is older*, cEU is older **	TC**	Paris and Tokyo is older*
MOCA Score	ns	ns	side-group interaction+	ns	-
GDS Score	*	ns	gEU is higher+	TC**	Ancona is higher*
SPPB	**	ns	gEU is lower **, side-group interaction*	TC**, TC-G+	Paris is lower*
EQ-5D-5L_score	**	ns	gEU is higher**	TC**	Paris is higher*
EQ-5D-5L_percentage	ns	ns	ns	TC*	ns
ATDPA	**	ns	gEU is higher**	TC**	Sendai and Natori is lower*
eHEALS	**	ns	gEU is lower**	TC**	Ancona is lower*
UCLA Loneliness	+	ns	gEU is higher+	TC*	Cologne is lower*
Physical	ns	ns	ns	ns	-
ATI	**	ns	gEU is lower**	TC**	Ancona is lower*

Table 2: Intervention vs. Control Group Characteristics at T0

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3.1.2 Main quantitative outcomes of the study

Region		JAPAN				EU			
Group (n)		Intervention group (33)		Control group (39)		Intervention group (36)		Control group (22)	
Age	Mean±S.D.	74.0 ± 5.8		72.8 ± 6.8		75.1 ± 6.6		76.0 ± 7.8	
Variables		Baseline	Follow-up	Baseline	Follow-up	Baseline	Follow-up	Baseline	Follow-up
EQ-5D-5L	Mean±S.D.	5.6 ± 1.2	6.0 ± 1.9	5.8 ± 1.1	6.2 ± 1.5	6.9 ± 2.3	6.6 ± 1.9	7.1 ± 2.0	6.5 ± 1.6
	Median	5.0	5.0	5.0	6.0	7.0	6.0	7.0	6.0
	p	.038 ↑		.012 ↑		.240		.031 ↓	
EQ-5D-5L (VAS)	Mean±S.D.	78.5 ± 12.3	82.3 ± 7.6	75.0 ± 11.2	80.4 ± 14.5	78.1 ± 11.4	79.1 ± 13.3	78.0 ± 10.0	81.6 ± 8.2
	Median	80.0	80.0	75.0	80.0	80.0	80.0	75.0	80.0
	p	.127		.028 ↑		.572		.154	
SPPB	Mean±S.D.	11.4 ± 1.0	11.7 ± 0.8	11.8 ± 0.5	11.4 ± 1.1	10.1 ± 1.4	10.7 ± 2.2	9.7 ± 1.8	11.0 ± 1.6
	Median	12.0	12.0	12.0	12.0	10.0	12.0	9.5	12.0
	p	.087		.018 ↓		.019 ↑		.003 ↑	
UCLA	Mean±S.D.	34.7 ± 7.0	35.7 ± 7.6	36.0 ± 7.2	36.0 ± 8.8	45.7 ± 12.2	41.8 ± 11.5	40.7 ± 9.8	42.9 ± 10.8
	Median	34.0	35.0	36.0	35.0	50.0	43.5	40.0	41.0
	p	.073		.582		.070		.036 ↑	
GDS	Mean±S.D.	2.2 ± 2.2	1.4 ± 1.3	2.5 ± 1.7	2.4 ± 2.0	3.4 ± 2.9	3.1 ± 2.8	2.5 ± 2.5	2.5 ± 2.0
	Median	2.0	1.0	2.0	2.0	2.0	3.0	2.0	2.0
	p	.012 ↓		.825		.405		.564	
MoCA	Mean±S.D.	26.2 ± 2.3	26.2 ± 2.6	26.8 ± 2.3	26.4 ± 2.8	26.7 ± 2.1	27.3 ± 1.9	26.5 ± 2.6	27.5 ± 2.1
	Median	26.0	26.0	27.0	27.0	27.0	28.0	27.0	28.0
	p	1.000		.345		.037 ↑		.030 ↑	
Leisure & Physical Activities	Mean±S.D.	19.2 ± 5.6	17.8 ± 6.6	18.6 ± 6.2	20.7 ± 7.3	19.1 ± 5.4	19.9 ± 5.8	19.7 ± 6.3	19.4 ± 5.9
	Median	19.0	16.0	18.0	21.0	17.5	19.0	19.5	19.0
	p	.248		.025 ↑		.200		.783	
ATDPA(B)	Mean±S.D.	41.1 ± 6.6	41.3 ± 8.5	42.0 ± 7.5	42.9 ± 9.3	46.5 ± 8.1	50.3 ± 6.4	48.3 ± 6.4	49.4 ± 5.1
	Median	39.0	40.0	42.0	42.0	47.5	51.0	49.5	50.5
	p	.607		.986		<.001 ↑		.431	
eHeal	Mean±S.D.	36.8 ± 9.1	36.6 ± 9.9	33.7 ± 8.6	31.8 ± 9.8	28.8 ± 12.9	29.7 ± 10.8	27.9 ± 12.3	27.8 ± 12.5
	Median	39.0	38.0	35.0	33.0	32.0	33.0	32.5	32.5
	p	.828		.050 ↓		.837		.678	

p : Wilcoxon Signed Rank Test

Table 3: Statistical Outcomes of the study analysis for Europe and Japan

Because normal distributions could not be assumed for most variables, the Wilcoxon Signed Rank Test was used to test statistically for corresponding differences between the initial and follow-up surveys.

(1) Change in QOL index subjective quality of life

The EQ-5D-5L (quality of life scale) increased significantly in the Japanese subjects at follow-up in both the intervention and control groups.

EQ-5D-5L (VAS) also showed an increasing trend in both intervention and control groups but was statistically significant only in the control group. In the EU subjects, on the other hand, EQ-5D-5L decreased significantly in the control group, whereas it was maintained in the intervention group.

(2) Physical health (SPPB)

SPPB significantly decreased in the Japanese control group, whereas it was maintained in the intervention group. On the other hand, it increased significantly only in the control group in the EU subjects.

Physical and leisure activity scores increased significantly only in the Japanese control group.

(3) Mental health: cognitive function (MoCA), depression level (GDS)

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GDS scores showed a decreasing trend in the intervention group and significantly decreased in the Japanese intervention group.

MoCA scores did not change significantly in both groups for the Japanese subjects but increased significantly in both intervention and control groups for the EU subjects.

(4) Social health (UCLA)

The UCLA loneliness scale increased significantly only in the EU control group.

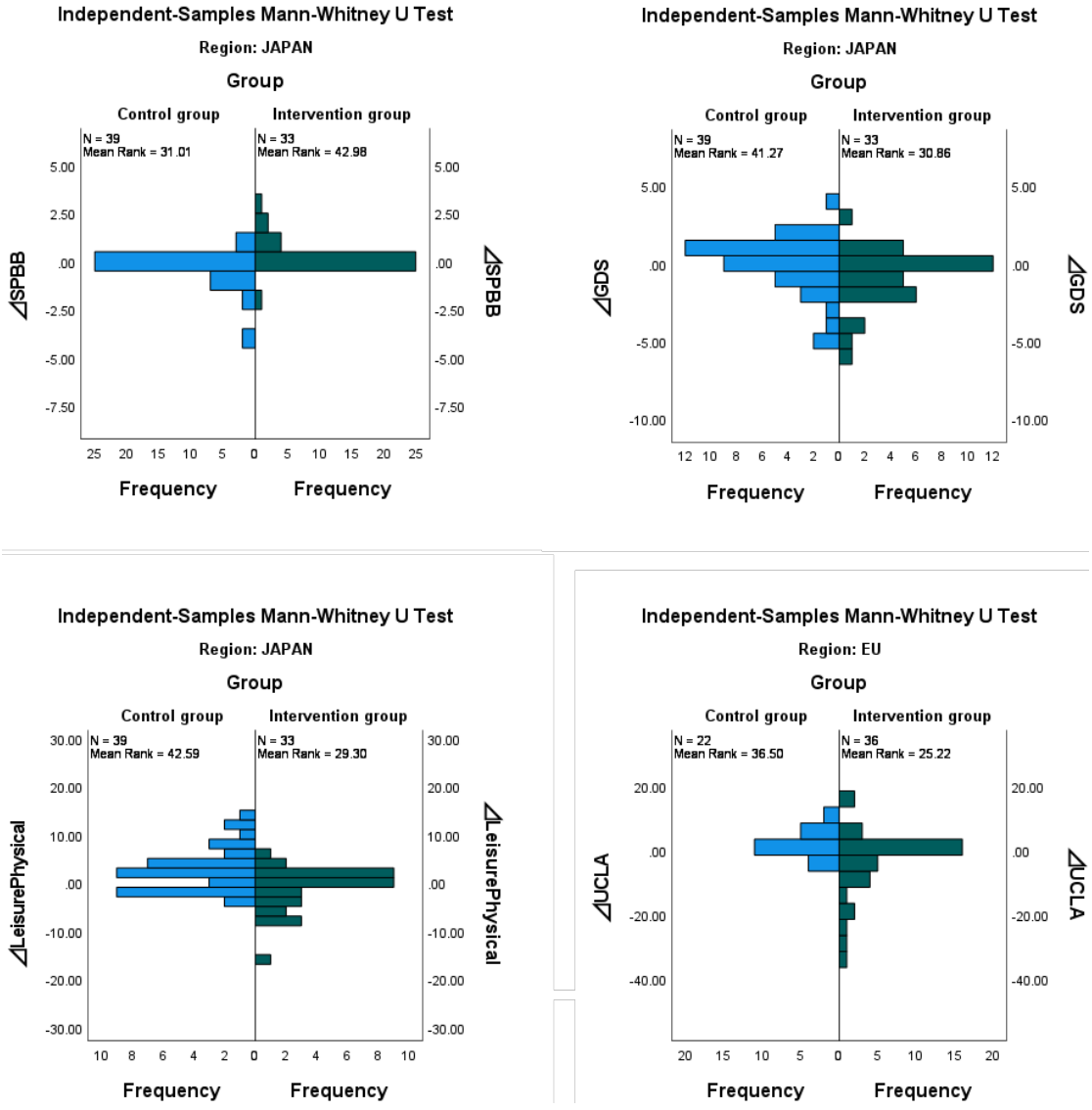

Figure 4: Independent Samples Mann-Whithney U Test results.

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(4) Evaluation of the e-VITA System Scores

1) Expectations for Virtual Coaching System (ADTPA-B)
ADTPA-B was significantly increased only in the EU intervention group.

(2) eHealth literacy (eHeals)
eHeals scores were significantly lower only in the Japanese control group.

(5) Effect of the e-VITA system on QOL indicators (Figure 4)

As a result of comparing the differences in the distribution of the change in each QOL index from the beginning to the end of the study (⊿ = value at the end of the study - value at the beginning of the study) by region and with and without intervention, significant differences were found in ⊿SPPB, ⊿GDS, and ⊿ Physical and leisure activity scores for the Japanese subjects, and the degree of improvement in SPPB was significantly greater in the intervention group, and physical ability improved more in the intervention group. The intervention group showed significantly greater improvement in SPPB and more improvement in physical ability, while the intervention group showed significantly greater reduction in GDS and more improvement in depression. In the EU subjects, only the change in the UCLA Loneliness Scale was significantly different between the intervention and control groups, with increased loneliness in the control group. of intervention. Because normal distributions could not be assumed for most variables, the Wilcoxon Signed Rank Test was used to statistically test corresponding differences between the initial and follow-up surveys.

3.2 Interactions with the Coaching Devices

During the entire study period, all conversation (each question and answer counted as one conversation) records were stored as text with anonymized individual names.
The comparison between Europe and Japan for the total number of conversations, the number of users and the number of conversations per users is shown in the figure below. The number of conversations totaled 1064 and 15542 conversations in Europe and Japan respectively during the survey. These data revealed regional differences in the number of conversations per person: 331 in Japan and 28 in the EU.

Country	Europe	Japan
Total number of conversations	1 064	15 542
Number of Users	*38*	*47*
Number of Interactions per users	28	331

Table 4: Number of Interactions with Coaching Devices between EU and JP

The number of coaching device interactions per user is shown in the figure below. It shows high variations of use between users (see following chapters, separated for the EU and JP).

3.2.1 EU Usage Data

3.2.1.1 Overview of Conversation Data (EU)

In general, the total number of interactions with coaching devices during the POC study was rather low in Europe: 1.064 Interactions of 38 Users gains a mean interaction of about 28 Interactions per User.

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Figure 5. Shows the total number of interactions with the coaching devices of European Users during the POC.

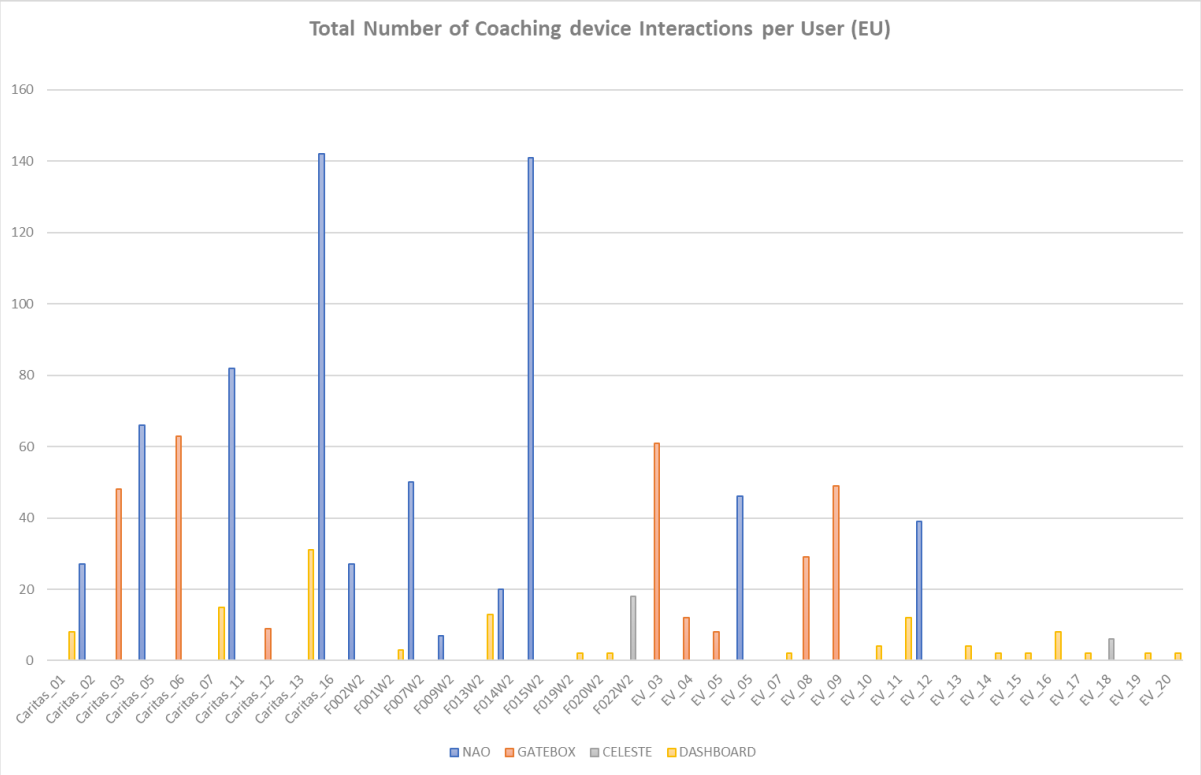

Figure 5: Total Number of Interactions with Coaching Devices (EU)

Table 5 Shows the number of interactions separated for the different coaching devices (NAO, GATEBOX, CELESTE, TABLET) of European Users during the POC.

EU	NAO	GATEBOX	CELESTE	Tablet
#Interactions	647	279	24	114
#Users	*11*	*8*	*2*	*17*
#Interactions per P.	59	35	12	7

Table 5: Number of Interactions with different Coaching Devices (EU)

Table 6 Shows the total number of interactions with the coaching devices of European Users from different countries during the POC.

	DE	FR	IT
#Interactions	491	283	290
#Users	*10*	*10*	*18*
#Interactions per P.	49	28	16

Table 6: Number of Interactions with different Coaching Devices (EU)

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3.2.1.2 Conversation Categories (EU)

Throughout the study period, users had several conversations with the robots and chatbots. As for the conversations users had with the chatbots available to them, Tigro for physical activity and Fridolin for nutrition. The Tigro chatbot was definitely the one most used by users, which users turned to in order to get information about exercises to do, to follow suggested videos, and to keep track of their progress. In contrast, the Fridolin chabot was not particularly consulted by users: in fact, they stated that they did not feel the need to receive advice on nutrition and recipes or in any case that they preferred other media (books, paper media, the Internet), for these kinds of topics.

As for conversations with robots, the first robot in order of the number of conversations was Nao. The topics of the conversations with Nao were very varied and ranged from “general culture,” to “hobbies,” to “entertainment,” to “health,” suggesting that Nao is among the three, the device with the most potential from the perspective of interaction and companionship to the older person. One user in particular report that he approached Nao for information of a general nature, enjoyed ranging with questions, and found Nao to be a conversation partner. Nao has anthropomorphic features and an appealing appearance, which facilitates empathy and trust. In addition, his large gestures give the impression of being involved and drawing the interlocutor into the conversation; finally, his size allows the user to position him where they see fit. These characteristics have probably led users to perceive Nao as a conversation partner.

The content of the conversations with Celeste differed significantly from the conversations users had with the other two robots. These conversations could be described as “religious,” since Celeste's appearance induces the user to think about religious issues rather than other topics, which were instead more addressed with Gatebox and Nao. In addition, Celeste's voice, which is much deeper than that of the other two robots, could also be associated with an angelic being, stimulating such conversations. Besides that, Celeste was asked a few questions about the topic “health,” and no questions about “hobbies,” “entertainment,” and “general culture.” The user who interacted most with Celeste reported that he conversed with the robot essentially on religious issues, ranging from asking about the saint of the day to reading some Bible verses. In addition, the same user reported that he also asked Celeste health-related questions (e.g., about fall prevention), but that she did not often find appropriate answers.

Finally, the last robot is Gatebox. As for Gatebox, one can label the requests made to the robot as “concerning health” or “prevention.” In any case, conversations with this type of robot have been very small. Probably its appearance and size did not positively affect the acceptability of the product itself, which was not used by users to its full potential.

3.2.1.3 Conversation Contents (EU)

The content of the conversations included questions on cooking and nutrition, health and medicine, cooking and recipes, physical training, weather forecast, news, history and politics, leisure, horticulture and painting. The users also made some comments with the robots. Those comments were more frequent with the Nao robot than with the Gatebox robot. The topics which were discussed are shown in the table below.

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Topics	Examples of conversations
Cooking and nutrition	How many calories does an apple have? Which foods have unsaturated fatty acids? what's healthy for dinner? what is healthier butter or margarine ? Tell me a regional recipe? what substitutes are there for sugar? I want information about obesity I weigh 72 kg and I am 173 tall. How many calories should I eat per day?
Health and Medicine	what helps against back pain? Can you recommend me some medication for headaches? What are the symptoms of Alzheimer? How can I prevent dementia? What are the causes of diabetes? tell me about Parkinson's disease What is the cause of frequent fainting spells? What are the most frequent causes of falls? How to prevent falls? What are the symptoms of diabetes? What do you recommend for sleeping well? I would like to know my health status. I would like to know how I slept last night What is fibrinogen which are the correct cholesterol values
Cooking/recipes	Give me the recipe for quiche Lorraine. How do I make tea?
Physical training	Please tell me how much I trained last week. How many steps did I take today? I would like to train indoors. Which exercises do you recommend? Could you please show me some exercise videos? How many minutes of gymnastics should I do per day How many kilometers of walking is best for me to do per day
Weather forecast	What will the weather be like in Bonn? In Paris? In Ancona?
News	What is the latest news?
History/politics	When did Hitler die? Who is Helmut Kohl? Who is the President in France? Who is the Italian Prime Minister?
Tourism	What touristic sites are there in Japan? In France? In Italy? What do you know about Sardinia? What is the capital of Italy? Of France?
Leisure	How many Christmas markets will there be in Bonn? When does the Christmas market start? Can you recommend me a good book? Can you sing me a song?
Horticulture	Which flowers are currently blooming?
Painting	Tell me about the Mona Lisa
Comments especially to the NAO robot	Nao you are a big lazy person Nao Can I take a picture of you?

Table 7: Content of Conversations (EU)

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3.2.2 JP Usage Data (Interactions with Coaching Devices)

3.2.2.1 Overview of Conversation Data (JP)

In general, the total number of interactions with coaching devices during the POC study was rather high in Japan: 15.542 Interactions of 47 Users gains a mean interaction of about 331 Interactions per User.

Figure 6 shows the total number of interactions with the coaching devices of Japanese Users during the POC.

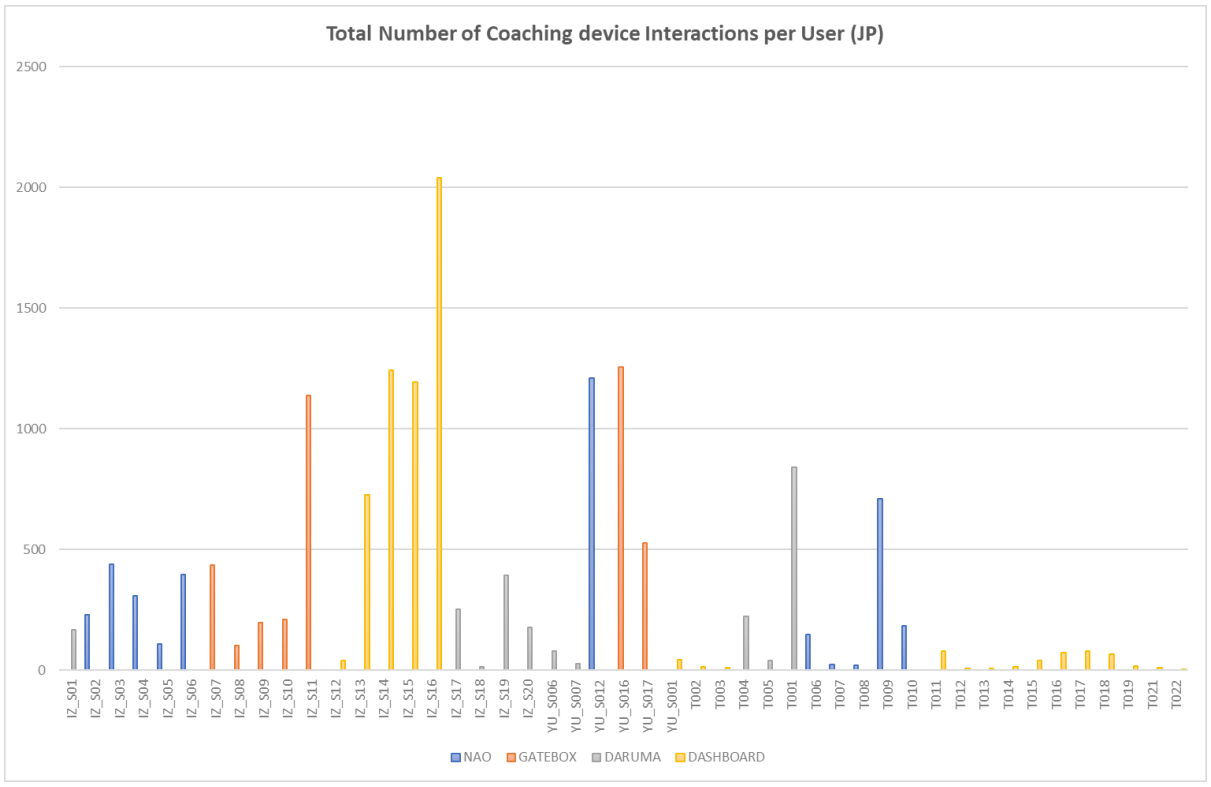

Figure 6: total number of interactions with the coaching devices of Japanese Users during the POC

Table 8 Shows the number of interactions separated for the different coaching devices (NAO, GATEBOX, DARUMA, TABLET) of Japanese Users during the POC.

JP	NAO	GATEBOX	DARUMA	Tablet
#Interactions	3769	3865	2204	5704
#Users	*11*	*7*	*10*	*19*
#Interactions per P.	343	552	220	300

Table 8: Number of Interactions with different Coaching Devices (JP)

Table 9 Shows the total number of interactions with the coaching devices of Japanese Users from different test centers in Japan during the POC.

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	Sendai	Natori	Tokyo
#Interactions	9.807	3.139	2.596
#Users	*20*	*6*	*19*
#Interactions per P.	490	523	137

Table 9: Number of Interactions across test centers

3.2.2.2 Conversation Categories (JP)

To explore the differences between device types and conversations at the beginning of the survey (July-August), we categorized the conversations of Japanese subjects. the number of conversations in July-August (each question and answer counted as one conversation) totaled 4,073 conversations in the two months. The number of conversations by device is shown in Figure 7. Tablet users had the most conversations, followed by Gatebox users. The content of the conversations on these devices includes text display and voice elements, presented in a way that is easy for the elderly to use and understand.

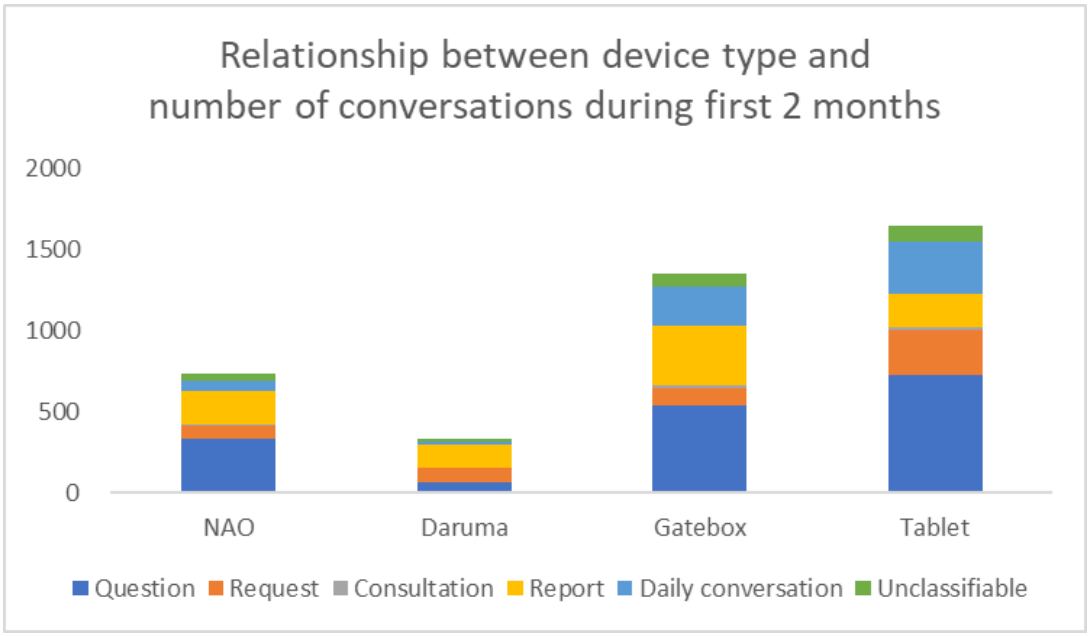

Figure 7: Type of conversation per device type (JP)

3.2.2.3 Conversation Contents (JP)

Comparing the content of conversations with each device, the content of conversations with Daruma differed significantly from the content of conversations with the other three devices. Conversations with Daruma were categorized as "reports" more frequently than conversations with any other device and were categorized as "questions" least frequently. Reporting" included "hobbies," "entertainment," "activities," and "education," suggesting that Daruma is a conversation partner that the elderly "want to share and grow with. On the other hand, very few "reports" were made to the tablet, and the most common of these "reports" were categorized as "reports of physical condition," which, unlike Daruma, were not accompanied by emotions. Compared to other devices, Daruma has a mechanism that facilitates familiarity and empathy. For example, Daruma's overall rounded form gives a soft impression, the temperature sensor, which serves as a switch, is located on the forehead, so the user must touch Daruma's face each time the switch is turned on, and the use of vermilion, a traditional Japanese color.

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Furthermore, Daruma's size allows him to be placed on a dining table, which is often chosen for other robots due to their small size. These features may have led the elderly to perceive Daruma as a person with whom they would enjoy conversation.

3.2.3 Comparison between EU and JP Conversations

A comparison of EU and Japanese conversations reveals some striking differences in their content. One of them is the presence or absence of reporting behavior. Japanese users often asked the AI or robot to agree with them or to offer words of encouragement, showing a strong tendency to regard the AI or robot as a partner. This tendency was not observed in the European experiment and is a cultural characteristic of Japan. The role of robots in the living environment may also differ.

3.3 Detailed Qualitative Results

3.3.1. European qualitative results

3.3.1.1 European qualitative data from T0 interviews

Expectations from the E-VITA coaching system

The participants reported various expectations from the E-VITA coaching system

Discover and learn new things

- *“I want to participate because I am curious to discover something new”. (F01)*
- *“It was curiosity, because it was a project aimed at older people. I thought that I had the right age to do it. I also enjoyed dealing with technology.” (G07)*

Be in contact and share experience with other people

- *"It is interesting to help and maybe share your experience with other people."(F05)*

Help and be useful for other people

- *“On my part, perhaps very humbly, I can contribute to something for people.” (F09)*
- *“I want to participate because it interests me and I want to help make technology easier for older people. I think it is a sensible thing to have so little help in certain areas. I just wanted to contribute to something and I am always curious..” (G02)"*

Be stimulated

- *“I'm interested in the new technologies that are out there and I'm also interested in staying a bit up to date.” (G06)*

Prevent or overcome difficulties in daily life

- *“I have loved having GPS in my life, it has prevented me from becoming totally lost, because I have no sense of direction, it has enabled me to continue to have a normal life. With this robot, I hope to have a kind of substitute so that I can be helped with tasks for which I'm failing.” (F13)*

Improve one’s health

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- *What I expect from this thing: " I want to eat healthy lunches or something with as few calories as possible" what I want to ask it: "Please give me some recipe suggestions". "What should I do to reduce my weight? Make me a plan." (G05)*

Have fun and entertainment.

- *"It is supposed to be a little fun for me." (F01; G16)*

Expectations from the human coach

The participants expected that the human coach could explain all the functionalities of the E-VITA devices to them, provide experience in E-VITA devices, be able to answer their questions, help them in stuck situations.

Previous devices and functionalities used by the participants

The participants reported that they already used computers, tablets, smartphones. Some of them also used connected watch. The participants insisted on the high cost of technologies.

The participants used the smartphone for calls, messaging, mails and geolocalisation. The participants, who had a smartwatch, expressed satisfaction to know the distance travelled on foot thanks to the device but they noted that the use of the device could be addictive. The participants used the computer to read journals online, watch films, listen to and concerts, take classes (drawing, gymnastics, and foreign languages) and do administrative work. The participants mainly used tablet to read books.

Use of voice assistants

Some participants noted that voice assistants could be useful in different situations

For people with visual disorders

- *"There is the mother of an acquaintance, who is now 99, has macular degeneration, so it looks bad, she uses Alexa and is now very happy with it, so for her it is a great help."(G06)*

To have fun and have shared activities with others, especially grandchildren.

- *"I use it very little, just a little now and then, but it only amuses my granddaughters. "(F05)*
- *"My niece has such a thing and I think it's kind of funny, but - I didn't think to buy one."(G01)*

To listen to music or podcasts or to learn and speak other languages,

- *"I want to listen to music as it works pretty well; occasionally podcasts, because I've also become a fan of podcasts." (G07)*

Most of the participants reported that they had little use of them because they were not interested in this type of device.

- *"I don't use it at all because maybe I don't know how to use it well, and I'm not really interested".(F01)*
- *"I tested it. I wouldn't buy such a device, because I have other mediums for information and I don't need an interlocutor." (G12)*

The main reason was that they preferred writing and reading rather than listening to a voice.

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- *"Yes, but very little. I know that some of my friends are always saying 'Ok Google', but no, I'm not really an 'Ok Google' fan". It's true that it's very practical but I've always favored the visual.(F07).*

Definition of quality of life

The participants noted that good quality of life included to be in good health, have good relationships with family and friends, maintain and develop oneself, like what we do, increase one's knowledge and culture, be at peace with oneself (religious aspect).

- *"A minimum of physical well-being. Being well with people; having good relations with each other. And then being at peace with oneself." (F14)*
- *"For me, quality of life is also harmony, contentment in everyday life, with the family, that is, with my wife, then also with everything around the house the garden and seeing that everything is so good and just." (G11)*

Taking care of health

The participants noted that taking care of one's health included to play sports (walking), pay attention to what we eat, have good relationships with those around us such as family and friends.

- *"Taking care of health is to continue to have physical activity, pay attention to your diet, have nice relationships with the environment and family. There is also the health check-up. I have one every 3 or 4 years." (F07)*
- *"Diet and exercise. Those are the key points. I regularly do gardening. It iis also physical exercise. We do a lot of hiking." (G05)*

3.3.1.2 European Qualitative data from T2 intervention group interviews

Social aspects

Overall opinions about the experiment and entire system (How do patients/participants perceive the technology under assessment?)

The participants expressed satisfaction with the experiment of the E-VITA coaching system:

- *"The result of the experiment is quite positive. It was exciting, that when you sat down in the evening and you looked with your cell phone at this and that, what was going on, so I found it nice, pleasant and enjoyable." (G05)*
- *"It was a very interesting experience. And it gave me time to think, and to see and meet interesting people." (F15)*
- *"Everything was new to me, I found many positive aspects;" (I06)*

Some people reported that using the devices provided fun and entertainment

- *"It was a good experience. I had fun and entertainment with the robot and coaching programme." (F14).*
- *"I enjoyed the project and enthusiastically participated in all the activities." (I11)*

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Some people were satisfied because they usually participate to weekly or monthly activities for which they go outside, whereas, thanks to the E-VITA coaching system, they were able to do activities at home every day and whenever they wanted:

- *"I do workshops at least once a year. OK, but it is punctual while this device is integrated into daily life, so I like that. I find it interesting and part of the routine of life". (FO2)*

Some people thought that the experiment was positive because it was challenging fo them

- *"I found the project challenging and it challenged me with myself; I found perseverance in going to walk. I am satisfied with the project, I wish I had given it more time. "(I17)*

Some people were satisfied because the E-VITA system helped them to fill their goals

- *"I am satisfied because the system has helped me to keep certain aspects under control, such as sleep and physical activity." (I02)*

Some people were satisfied because their family was happy to see the increase of their activity thanks to the device.

- *"I am satisfied with the project, the children were enthusiastic because they saw me more active" (I10).*

Limits of the E-VITA experiment and system

Most of the people reported technical problems encountered with the use of the E-VITA devices.

Indeed, few people had no difficulty to use the E-VITA devices

- *"The devices, including this smartphone and tablet, were easy to use, so there were no difficulties. Then, we know that in other contexts too. Therefore, in the end, I always threw myself into the thing. That was the general experience." (G13)*

However, many participants had a mixed experience of the experiment due to technical problems with the E-VITA devices

- *"Well, it was a good experience. I was a little disappointed in the end. The device didn't work as well as you'd expect."(F07)*
- *"In the beginning, it was exciting because of curiosity. You also invest a lot of your time because you try many things. Your support was good. However, over time, some things turned out with the technical devices, which did not work, which then reduced the enthusiasm and motivation a little. But we're still on the right side overall." (G02).*
- *"In my opinion, the project was good, but there were several technical problems that did not allow me to use it to its full potential" (I07).*

Some people even expressed negative feeling of the E-VITA device due to technical difficulties. They expressed disappointment that the system did not meet their expectations. The gap between the expectations and the actual use of the system induced frustration, loss of motivation and reduction of use of the E-VITA devices in these participants.

- *"I will tell you that I have a great disappointment that with such a low production. For me, a project like this still belongs in the laboratory. It was not mature enough yet" (G07)*
- *"Unfortunately, in the last month I think there were technical problems because nothing worked anymore and I had to stop using it" (F20)*

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Technology was difficult to use for people who were not familiar with it:

- *« As far as the devices are concerned, I found that if it was difficult to test. For people who are aging and not familiarized with technology, we were a bit lost and it was a bit complicated » (F05)*
- *"In my opinion, the components were very difficult to use. I had technical problems. Therefore, it was really very disappointing".(G07)*

Some people reported that the use of the technology might be burdensome because of the time dedicated to enter the many passwords.

- *"I had problems with too many passwords. I would have liked it to be harmonized in the same way that I have it here with my own devices, that I actually have the same password for the different devices and applications. It should have been a bit quicker and easier to use" (G07).*
- *However, there were some technical problems, e.g. I had often to re-enter my password to log in (I11)*

The use of the E-VITA system was burdensome for some people because of the time requested to charge the battery

> *"There are a lot of devices and you have to charge them all the time: my own phone, your phone, the watch, the tablet and so on (GO7)"*

The older adults who could not keep some pieces of the coaching system after the end of the project regretted it.

- *"I found great usefulness in the project. I regret that at the end of the project nothing remains in terms of material (photos, videos, exercise sheets). Guidelines for proper lifestyle would be helpful. I have used the system in all its parts" (I16)*

Some people would have liked to receive more incentives for their participation in the project

- *"I was hoping for more cooperation and also some more gifts, it would be nice if at least one dinner was offered" (I01)*

Opinions about the appropriate duration of the experiment

Some participants made comments about the duration of the experiment.

The users thought that a period of 2 to 3 months was enough to test a device:

- *"I thought the experiment was a bit long.."(F01)*
- *"it doesn't have to be as long as 6 months, 2 and a half months will be enough to test the devices"(F09).*

However, they insisted on the need for long-term experimentation to test the benefits of the virtual coaching on health and quality of life

- *"I'm a bit dubious as whether the brevity of the project actually provides insights that will help you move forward, because I could not imagine that even if you do exercise and walk every day, you see an improvement after three or four months. I think you could have run the project, not necessarily as a long-term study, but maybe a year or two" (G05).*
- *« I think that the experimentation should last 1 or 2 years to find a real health benefit (F07) ».*

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Opinions on the E-VITA devices and functionalities

The preferred devices were the watch and the Netatmo. The preferred activities were to monitor sleep and steps with the watch, to monitor air and temperature with the Netatmo, to do cognitive and physical exercises. The activities, which were less used by the participants, were the recipes app and the social platform.

The robots

People had opposite opinions about the robot. Some appreciated the robot while others disliked it.

- *I especially liked the robot (I01).*
- *I did not appreciate the robot (II15, I18)*

As far as the appearance of the robot was concerned, one participant suggested to provide a more human-like robot:

- *We notice that too, especially in geriatric care, also in gerontopsychiatry, we give the residents like rag dolls or where they nest or make some, there's a reference, but I can't put a robot like that in their bed. Yes, yes. Therefore, it should be either bigger, or more human, sometimes even more tangible. Yes, so that means these rag dolls, you can touch them, you can stroke them, there is no.... Moreover, that is what is missing. People lack warmth and touch. (G10*

The NAO robot

The participants who appreciated the NAO robot reported that it was funny and pleasant to have a robot at home. They noted that it was like a living creature for them and they missed it when it was gone.

- *"The robot was nice when it said hello. It was part of the home, of the household. It was part of a modern home" (F15)*
- *"I especially liked the robot. I used it every day, at least a couple of hours a day (I02)"*

Some participants reported that the robot was useful to provide company and reduce stress

- *"In addition, NAO kept me company and calmed me down when I was stressed or nervous" (I02).*

Limits of the robot

However, some participants expressed disappointment regarding the robots (NAO) because they did not work as well as expected. The robots did not understand the questions and did not answer enough properly. Therefore, they were frustrated and reduced the use of the robot.

- *"I ask the robot a question and it says: thank you for the question. I will think about it and answer you but he never answers me (F07)"*
- *"I enjoyed the robot but was disappointed. I thought that it would do more than what it actually could do (G06)".*
- *"I was not satisfied with the robot. Sometimes he spoke in English and did not give in-depth answers." (I15)*

The Gatebox

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The participants were also disappointed with the use of the Gatebox. They reported that the robot gave poor answers to their questions.

- *« I was disappointed with the Gatebox., I found it could do relatively little (G06 »)*
- *With this Gatebox, what I found very annoying is that if it's on for a while, then it doesn't respond anymore.(F04)*
- *"I only used the Gatebox for a few weeks, but I didn't find it useful so I gave it back" (I14)*

The Celeste robot

The participants who could have the Celeste robot also had usability issues with this robot.

- *"I liked the robot, although there were some problems, but I had fun. I used Celeste to ask him some questions, but he did not always have the answer. In the last period, I used it less because the app stopped working and Celeste was very repetitive". (I18)*

The tablet

Some participants thought that there was an overlap between the tablet and the smartphone and only used the smartphone. However, some participants preferred to use the tablet rather than the smartphone because it was easier for them to read on a tablet than on a smartphone because of visual impairment. Most of the participants used the tablet for written communication:

- *"I would prefer to have the exercises and activities on the tablet rather than on the smartphone where it is more difficult to read than on a tablet" (F09).*

NeU device (headband)

Some participants were satisfied with the Neu device and used it. They were interested in checking their cerebral waves.

"I also relatively enjoyed the Neu ban. There were few games available" (F07).

- *"I used NeU for a lot for cognitive exercises; it was fun" (I19)*

Other participants did not use it either because they did not understand how to use it or did not find any usefulness for them.

- *"This device for measuring brain activity, I could not do much with it because I did not understand what it actually measured and I did not have any incentive" (G06).*
- *"I am not very happy with the headband. I just don't know how to use it."(F01)*

The watch

The participants preferred the watch among all the devices. They found that the display of their number of steps on the watch was a good incentive to improve their performance. They were also interested in having feedback on their sleep.

- *"That is the watch I liked best I am going to miss it. I think one of the nicest things was that I was able to read the clock at night without turning on the light (G06)".*

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- *"The connected watch helped me a lot because I wanted to force myself to take a certain number of steps (F05).*
- *"Overall I am satisfied, the watch has helped me keep active and monitored" (I20)*

Some people even reported that they planned to buy a watch after the experiment.

- *"This watch was quite beautiful. I was sometimes tempted to buy something like that" (I05).*

Limits of the watch

Some participants reported that the watch had limits, as it sometimes was not able to detect activity even if the participant was exercising.

- *It lacked some precision in my opinion. For example the watch did not detect when doing light exercise, such as yoga, it did not mark any activity (I06)*

The Netatmo.

The Netatmo was also very much appreciated by the participants. They reported that this device helped them to have a better idea of the CO2 content in their house and to improve its ventilation.

- *I have found these air measurements with measurement of CO2 content very important and very useful. I have become much more aware of how often I need to ventilate. I have taken better care of sleep, weight control and exercises (G01).*
  I like Netatmo a lot because until now, I used to open my windows in the morning and at night. Now I have learned that after 2-3 hours, you have to open the window because the difference in CO2 is enormous (F09).
- *I used the oxygen check function and temperature a lot (I18)*

Opinions on cognitive and physical exercises

The participants appreciated both cognitive and physical exercise, which they found useful.

- *« It was exciting; I was sitting and doing my exercises several times a week (G05)*
- *I did the exercises very often, the rest of the system I used less and less as I did not find it useful.(I12)*

Limits of the exercises

They provided some pieces of advice. They thought that it would be useful to have a greater variety of cognitive exercises

- *« After practising for some weeks, I realized that the exercises were always the same, I got a bit bored I had the impression that after a while, it was mechanical." (F07) »*
- *I would have liked more cognitive games in the application (I3).*

The participants asked for more physical exercises in the E-VITA coaching system

- *I found the gymnastics repetitive, it was always the same exercises,(I04)*

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They noted that some physical exercises might be a bit too difficult for older adults. They thought that older adult with physical disability would not be able to do these exercises. The physical exercises should be tailored for older adults who are less fit than younger people are.

- *"It certainly makes sense to offer older people gymnastics that take into account the fact that older people don't move as much or have as much energy as younger people. If it is aimed at older people, it would certainly make sense not to scare them off by asking them to do things that are actually aimed at younger people. For example, push-ups and stuff like that" (G07)*
- *You have to be in good shape to do the physical exercises that are proposed. I cannot lie on the ground anymore to do gymnastic (F01).*

Some people had difficulties to do the physical exercises and were afraid of even hurting themselves

- *. I don't use the app for gymnastic exercises because I'm afraid of hurting myself, I tried it once but I felt pain and from that day on I got scared (I11)*

The Nutritional programme

The participants provided good comments about the recipes included in the nutritional programme.

- *What was interesting was that when you were looking for recipes, there were these suggestions, particularly of vegetarian, vegan, vegetarian dishes. That was actually a good thing. That was very interesting (G13)*

Limits of the nutritional programme use

However, most of the participants reported that they did not use the nutritional programme because the recipes were too difficult to do according to the participants

- *The recipe book, I think it is cleverly done, so you can really put together a book with all sorts of things, with lots of possibilities. Now, I think for an older person, who's also interested in cooking, who's interested in recipes, that they're now looking at this, this variety of details and so on and the connections, the links and so on, if that's so suitable for an older person, I dare to doubt it. Therefore, I did not enter my own recipe. It was too much for me, yes, embarrassing, no. , for someone who, who now has the goal of creating such a cookbook themselves, it will be interesting for them, no. But for an older person who maybe still has a partner or maybe even lives alone,(G13)*

People already have their habits and do not want to change them

I more or less have my set program, or rather I take what I have in stock and do something with it. You could also say the other way round, I have a few standard things that I often repeat and sometimes I try something new (G16)

Some people were not interested in cooking.

I have not often consulted the alimentation part as I do not cook.(I16)

The social platform

Some participants did not use the social platform

- *I used the social platform very little (I04).*

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However, some older adults insisted on the benefit to have contact with the other participants during the experiment.

- *"We met once or twice at the beginning and now at the end but we could have met again in between. What I missed most was that contact with others (G10).*
- *I was sorry that the community was not created among the various users (I11)*

They noted that such experiment was a good opportunity to build a community between users. Thanks to this community of users, older adults could help each other's in case of technical difficulties with the E-VITA system and make friends with others participants.

- *« I'd like to congratulate the people who are recruiting and who say "gather round" because, in fact, we're with each other's practically every day and whenever we have a little problem, we call the others to have advice and that's what makes it so lively."(F09)*

Sensors

The participants did not want the sensors in their home

Suggestions to improve the devices

The participants provided pieces of advice to improve the E-VITA system:

Customize devices*:*

- *Therefore, I expect a robot that is more user-friendly, more reactive, that's for sure and better adapted to what we can expect from robots at home. It is true that this can be a very interesting, interactive, interesting and friendly link. We need a robot that's more customizable and therefore more interactive and more profitable (F15)*
- *But if such a humanoid figure stands in front of me, who speaks directly to me, then moves and says, do this for me, that would be an incentive for me - even as a healthy person - to do something.(G02)*

Provide advice according to health objectives

- *"Someone who reviews all areas in turn once a week or once a month or asks questions about them (G10)."*
- *For example, my watch tells me from time to time that maybe it's time to do a bit of brain training, so it reminds me that there's no alarm, and that's a shame, because in fact alarm systems are a bit like medication, for walking, for activity, that's good too. It was good to be reminded by the watch to move, whereas I would have expected that, yes, as a request."(F13)*

Create a reward system to encourage participants:

- *"A points system or something like that should be created. When you have reached a certain number of points, you have reached your goal. We are hunters and gatherers (G10)".*
- *I have a French application that works with characters. If you have done the task right, it will jump in the air... Super awesome, ten tasks solved without error, applause. At the end of the month or within the week, it says great, thumbs up or something. Visual stimuli like that eventually get to me (G02)*

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Provide more medical information

- *I would also have liked some medical aspects, some medical advice (I15).*
- *Guidelines for proper lifestyle would be helpful (I16)*

Give a regular summary of results to boost people

> *I think results should be shown every month listing what you have improved and worsened in in order to keep motivation high (I09)*

Use of the technology

Target population for the coaching system according to participants

Some participants thought that the E-VITA coaching system would be appropriate for older adults who have some physical limits:

- *I think it is really for people who cannot move and have some physicall limitations. They also need to be motivated. Therefore, the right target group who are reduced mobility and want to become better. (G05)*

The E-VITA device could also be useful for frail people, who are alone at home, and who are at risk of becoming depressed:

- *"The optimal target group would be the older adults who have limitations: obese people with high blood pressure, those who are single and have few contacts because they can't go out anymore, because they're frail, because they have limitations on their legs or whatever "(G02)*
- *"They are people who live alone and I think they are physically handicapped, because then you are also more susceptible to depressive moods and you need encouragement. Then, I think a device like this could help. I can also imagine that it will really be something like a pet" (G06)*

However, participants noted that there were some limits to the use of the coaching system. For instance, the coaching device could not help people with severe physical limitations unable to perform activities of daily living. For these people, the E-VITA system could not replace human care:

- *"Now I'll take the guy who can't walk well anymore, who sits here more or less all day, watches TV because he can't do much and he's kind of dragging himself through life. What kind of help is it, if he can barely find his way through everyday life, so to speak, unless someone comes along and buys me something and I can crack a fried egg in the pan? What is the use of a recipe for - from Japanese chicken or chicken or whatever? In my opinion, nothing at all" (G07).*

Another limit for the use of the coaching system would be impairment in cognitive functions. The participants noted that people needed good cognitive functions and motivation to use the system:

- *"People should not be too old, too disabled, definitely not, neither intellectually, nor physically, to be able to do the physical exercises that are proposed by the device. In addition, if you're already in a withdrawn mood, you'll quickly put the system aside (F01)*

People should also be familiar with technology to be able to use the coaching system.

- *"Older people who are not necessarily familiar with computers. It's a bit of a hurdle" (F05)*
- *"For someone who's not so refined and has so much experience, I think it's easy to feel overwhelmed (G01)*

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- *"In my opinion it should be used by older people who are familiar with these devices, I have often encountered problems that I didn't know how to solve myself" (I08)*

Some participants insisted on the need for being motivated to use the E-VITA system

- *I think the ideal group is people with time and a lot of desire to get involved. (I14)*

According to the participants, the E-VITA device would be appropriate for people between 70 and 80.

- *"In the 70s, 75 years now, it depends on each person" (F01)*
- *"I would recommend it to people in their 70s who need to be active" (I15)*

For which purposes was the technology used?

The participants explained that they use the E-VITA device to check their vital signs and record their activity.

- *"To record activities. Therefore, I really did everything that I did when I went for a walk or when I went for a run, that it counted the steps "(G05)*
- *"To monitor my daily steps and to realise when I was failing to reach my daily goal. I have always been consistent over time" (I06)*

To increase their mobility

- *"I think it is useful for an active older adult for moving around more (I14)*

Another goal was to improve one's health"

- *"Taking care of your health at a certain age is good, really. Yes, it is good". (F15)*
- *"For wellness, basically (G10)"*

How much were the technologies used?

Most of the participants used the watch every day

- *Daily use of the smart watch and C02 sensor (F &G participants)*
  " I used the watch daily, always in the same way. There was no particular change in usage over time" (I02)

They used the other devices about three times a week

- *It was like two or three times a week (G13)*
- *"It was about three times a week. (F07)*

Some people used the devices occasionally

- *"Unfortunately, it came at a busy time, so I used it very little, just to monitor steps and do some exercises on Sundays" (I07)*

Some people had already many activities in their life and did not find time to use the E-VITA coaching system. They regretted that they could not use enough.

- *"I think it is a good project. Unfortunately, I did not have much time" (I14).*

Some people stopped using the devices at the end of the project

- *At first, I used the gymnastics app a lot, then it stopped working and I didn't use it anymore.(I18)*

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Efficacy of the system

The participants reported that the E-VITA devices was useful for them to check their vital signs and activity, to boost them, to help them increase their activity and improve their well-being. They noted that the E-VITA devices could

Provide information on their environment by monitoring the cO2 in the air at home

- *"Now I know that I have to open my window 10 minutes in the morning and in the afternoon to eliminate the CO2 in my house (F09, G01)"*

Help them check their activity

- *I appreciated the monitoring of sleep, steps and heartbeat, although I noticed that it was sometimes not very accurate in monitoring sleep (I11)*

Help them pay attention to their health

- *I realize that yes, you're paying more attention, so I'm paying attention, or we're paying more attention to my health in general (G13)*

Provide boost and incentive to increase their activity

- *I got incentive through these devices and through the whole system. I do a lot during the week or in the garden and there's always an extra incentive boost (G10)*
- *I used the watch to monitor my sleep, the number of step, heart rate and oxygenation. These parameters helped me to do more physical activity (I01)*
- *I am very satisfied with the system because it has also been a stimulus to improve (I09)*
- *I used the pedometer the most, which helped me to stay active (F20)*

Help them increase their performance

- *"I have gradually increased the distance I walk thanks to the watch and I feel better. It helped me in my objectives (F14, G07)".*
- *I am satisfied because the system has helped me to keep certain aspects under control, such as sleep and physical activity (I03)*

Provide company along the day

- *I am satisfied because it filled my days and helped me to be active. I would not change anything (I19*

Improve their health and quality of life. Some people reported that the system had improve their quality of life by helping them to modify their habits

- *I have improved my lifestyle. I've walked more every day (I01)*

Some people reported that they had already healthy habits before the experimentation but that they were more aware of them and had indicators to measure their progress thanks to the devices.

- *I had never really cared about it the way I do now. Maybe I am more aware of it now. For example, during the experimentation, I'd sit down almost every night and do breathing exercises, or I'd catch myself looking at my step count a lot more often and activate it with every activity I did, whether I was cycling, swimming.(G05)*

Some people thought that they were already healthy and did not need any device to help or coach them

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- *"Personally, I feel that as a healthy person, I would have picked up very little - for myself I usually never go for a walk and now I really go for a walk three times a week. It was not like that. Yes, very small things" (G02).*

Limits

Some participants did not notice any improvement in their quality of life

- *They do not help me much, no, they cannot take care of me in any way, they can't shop for me or do anything else. So I cannot make the connection that it makes life more independent (G01)*
- *"I cannot say I am thrilled. From my point of view, I do not think it has changed my life" (F01)*

Some people even seemed to have some addiction to the system

- *I used the smartwatch more and more assiduously until I never took it off. Every day I consulted it and it gave me the stimulus to walk more and more. I also performed the exercises that were suggested and I must say that now I feel my legs are stronger and more mobile (I03)*

Some people reported losing weight with the E-VITA system.

- *By increasing my walking, I also lost a few pounds, achieving my goals (I11)*

Organisational aspect

Training to use the E-VITA system with the human coaches

In European, the participants were trained and followed up by the researchers. Participants all agreed that training to use the technology and follow-up was mandatory in this kind of experiment. All the participants reported that they were satisfied with the training and follow-up by the human coaches. They thought that they received appropriate help during the experimentation.

- *"I really think you've done a great job as trainers and you've dedicated yourself. That hat was really done with a lot of patience for us again and again" (G07)*
- *I got along well with the human coaches and they gave me important stimuli to improve my well-being (I12)*

Participants provided opinions and suggestions to improve the training at the beginning of the experiment.

Opinions and suggestions on the training process at the beginning of the experiment

Some participants noted that they had too much information to learn at the beginning of the experiment. They would have preferred to have more training sessions at the beginning of the experimentation in order to understand and memorize the use of the E-VITA device.

- *"I liked the meetings for the training. It would have been nice if there had been another one in between. There was a long pause. The meeting enables participants to exchange more ideas with each other". (G01)*
- *"In the first session, we were introduced to practically every tool. Therefore, for me, it was just too much in one morning. Maybe it should have been done in several stages over the first few months" (F07)*
- *The meetings would have been useful from the beginning, I would have liked to have more.(I06)*

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Some participants insisted on the need to provide both theoretical information and practical training at the beginning of the experiment. They proposed to dedicate the first meeting to theoretical information and the second to practical training.

- « *the 1st session for all the devices to be shown, then you test at home, and the 2nd session for all your questions to be answered (F05)*»
- « *Learning by listening and then doing, you know, this is effective (G07)".*

The participants thought that the booklet of explanations was mandatory, but it should be kept short and simple.

- « *I am from a generation that like to have paper. However, when I look at the book of explanations, I see that I have to print 80 pages. Therefore, it is a deterrent. I'm having a really hard time getting into it » (F05)".*

Opinion and suggestions on the training process during in the follow-up of the experiment

The participants insisted on the need for help by the human coach during the follow-up of the experiment. They were mostly satisfied by the help from the human coaches.

- « *It is crucial to know that you can call someone to have help in case you are stuck with the technology "(F09) ».*
- *I found the cooperation with the human coaches very useful and productive, they taught me how to use the system and gave me valuable guidance regarding a correct lifestyle(I03)*

Some participants would have preferred to have more contact with the human coach during the follow-up

- *"I would have needed more contact with the coach" (F20)*

Some people would have liked more social days with face-to-face meeting sessions including participants and coaches during the follow-up

- *"I would have preferred a little more face-to-face meetings "(F09)*
- *I found the days done together stimulating, and I think it is a very important element in creating the group to maintain participation in the project (I17).*

Ethical issues

Participants discussed ethical issues associated with the use of the E-VITA device.

They expressed some concern about the risk of increasing older adults 'isolation:

- *"What can this technology do for people who are stuck at home, other than perhaps locking them up and isolating them even more (F01)? ".*

They expressed a feeling of empowerment linked to the use of the E-VITA devices

- « *I always had the feeling that I could decide whether I use or not the devices, I was in control of the technology. (F07).*

They appreciated that the coach was not intrusive.

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- *I appreciated the meetings that were organised and the fact that the human coaches were never too intrusive. (I15)*

The participants noted the risk of addiction to the technology.

- *I had an old uncle who also had blood pressure problems in his old age, no, the doctor also prescribed a measuring device for him, it stood there, when you visited him, it was more or less on the table. His wife told me, he measured his blood pressure ten times a day, no. He could not get anything else out of his head. Therefore, I have certain inhibitions about wearing something like that all the time, if I do not necessarily need to control myself all the time. Just think of this: what does your sleep look like now? What's your frequency now? not to mention the oxygen levels in your heart. If I need to check that repeatedly for health reasons, then it certainly makes sense, but then is it worth striving for, that you always have yourself under control and watching repeatedly. (G13)*

They also emphasized the need for data protection.

- *"I have no concerns in the context of this study but if I bought this technology, I would like to know where my medical data is going (F05)"*
- *"I don't really care what people do with my data when I decide for myself, that's the advantage I need to improve my quality of life. That is why the benefit is my top priority. No, so wallet, data security, it's going to be a mixed bag" (G02)*

Cost and economic evaluation

Intention to buy the device

Some participants noted that they did not plan to buy the device because they thought that they were in good health and were not isolated:

- *"I'm on the road so much, I have so many contacts, I don't need it". (G02)*
- *"In the current state of things, finally where I'm feeling, I don't think I'll buy it because I'd prefer going to activity groups rather than bringing activities to me at home.I get a lot more out of reaching out to others. Doing an activity with others than being on my own, even though I like having fun on my tablet."(F01)*

Some people explained that would agree to buy some part of the E-VITA system

- *I think I would only buy the smartwatch as a device and spend about 50 euros (I01)*

Some people insisted to the need of being able to choose to buy the devices you need

- *I think it would be good if packages are offered according to the devices the user requires. I would just get the smartwatch; I think 200 euros is a fair price (I03)*

Who would you consult first before buying it

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The participants reported that they would consult someone in their family (I02, I06) in particular their son (G07, G10, I01, I11), their daughter (I08, I18), their wife (I07, I16)) their niece (I15), because these people had more knowledge than they did in computers.

They would also consult professionals to have information about the technology

- *"May be the friendly network too, but me, but above all by professionals who know it well, who know how to use it well."(F01)*
- *Professionals and my son, he is a civil servant, he won't teach me very well, but I'd always involve him (G07)*
- *I would ask the INRCA team (I11)*

Some participants reported that they would consult the internet and reviews or go to public conferences in order to compare different products

- *"I would like to have a demo in a public conference or get information in reviews (G01)"*
- *There are expert websites on the Internet to compare information (G06)*

Some participants declared that they would choose on themselves without asking anybody.

- *I wouldn't consult with anyone, I'm used to deciding independently (I20)*

Which aspects are important to the participants when making a purchase?

The main aspects for the participants were firstly ease of use and price, secondly quality and usefulness. They also insisted on the need for training and for maintenance and after-sales service process.

Participants emphasized the importance of ease to use.

- *Ease of use (F01)*
- *Operability, ease of use (G06)*

Other participants insisted on quality, usefulness and price

- *For a possible purchase I would take into consideration the price and the actual usefulness (I04)*
- *Quality and price (G10)*
- *The price would be important (I08, I11, I15)*

Some participants insisted on the need for demo before buying the device

- *"When you buy electronic devices, there is a briefing, a short demo to show what I can do with it, and a user manual, which you can download somewhere via YouTube (G02)"*

Some participants insisted on other reason (maintenance service system, time to devote to this system)

- *Need for a maintenance and after-sales service system (F07)*
- *I would take into consideration the time I can devote to it (I07)*

Acceptable cost of the E-VITA system for participants

The participants proposed a large spectrum of prices between 10 and 8000 euros. Some participants did not know how much the E-VITA devices should cost.

- Under 100 euros *(I11; I15; F05; F13)*
- Between 100 and 500 euros (G01; G06; F01; F14; I06; I07; I08; I12; I17)
- Above 1000 euros (G02; I05; I18)

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- *The right price would be around 2000 euros, but no one would be willing to spend that in my opinion. Perhaps the price that could be spent would be 1,000 euros (I18*
- *I only know now that such a NAO robot costs 7,000, 8,000 euros. The Nao being the most expensive, then I would find $8,000 reasonable (G02*

Some participants proposed a monthly subscription, between 5€ to 200€ per month.

Some participants noted that the cost should be supported by health insurance

- *"It could be supported by health insurance.(G13)*

Health booklet associated to the E-VITA system

The participants expressed Interest in the paper booklet, which was given to them with the E-VITA system

- *It was interesting end useful. For people my age, it is still easier to access than technology (F08).*

3.3.1.2.2 European Qualitative data from control group T2

What did you think of the information and activity booklet? Plus/minus points

Some people did not read the booklet. "I did not read it. I would rather read a book on the art of aging well." (FCG03)

Others had a look at it and found that the booklet was not interesting for them.

- *"For me, it was too easy, it was not funny (FCG12).*
- *It does not speak to me. I don't need to be reminded all the time."(FCG11)*

Some participants did not do the activities, which were proposed in the booklet, for various reasons:

- *I thought it was interesting. I watched it once or twice. I did not use it much because I am very busy and probably because I serve myself as a coach to certain people. What I would need is to talk about emotional things with someone, a bit of a supervisor (FCG04).*
- *I read it, I looked at it, I did not do any of the activities, I never had the time to settle down. I already do physical activities and have socialization and relationships with others (FCG10).*
- *« I did read it with interest. But basically, I'm sticking with my activities, it hasn't changed my activities » (FCG11)*

Other participants found the booklet interesting and useful for them.

- *There are things that are interesting, for example cooking recipes, and the gym moves. In fact, I have put this booklet in the section where I do gymnastics so that I can do a bit more. I do the ones that are indicated there because I find they are quite simple and interesting (FCG18).*
- *I found it interesting. The cognitive part amused me. I did it all. After that, there was a physical activity part that I rushed through but learned absolutely nothing, because I am a gym teacher. I am active every day. I was much more interested in the psychological part. I read it; I even reviewed it this morning. The nutritional part, I have read it and, it interested me. The last two psychological and nutritional parts gave me something. Therefore, the booklet, I thought it was a good idea for looking at oneself. I would recommend that booklet to people (FCG08)*

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What Improvements can be provided to the booklet?

- *The participants suggested improving the images in the cognitive part: "in the cognitive part, the images are not very nice "(FCG08).*
- *"I found physical exercises simple and aimed at people who are not athletic and who are over 60 or 70. However, they do not talk about breathing in the physical exercises. They write « hold the position without blocking your breathing », but they don't specify that you actually have to blow. Maybe it lacked a bit of precision » (FCG08).*
- *I found interest in the chapters, which could be much more developed eventually (FCG11).*

Do you think technology is better suited to providing information and activities on aging well? Why not? Which technology?

One participant thought that it would be useful to have alarms able to talk and remind het things to do during the day.

- *"It would be interesting to have some sort of alarm clock that goes off and starts talking, not necessarily acting, but talking" (FCG04).*

However, other participants did not express the need for the use of technological devices.

- *« Technology? I prefer human beings to robots ». (FCG03).*
- *« In terms of technology. I think there are two possible approaches. There are people who are completely resistant, who prefer to have a paper document already. And there are the people who are familiar with the technology, who feel comfortable with it and who think that it's not bad after all. However, I don't think the current generation of older people has fully embraced technology yet"(FCG11).*

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3.3.2 Japanese qualitative results

3.3.2.1 Japanese qualitative Data from T0 interviews

Motivation

The motivations expressed by participants for joining the research project primarily revolve around curiosity, personal interest in technology, and social or health-related reasons.

A significant number of participants were drawn to the project out of curiosity about new technologies and robots. Statements like "I have been very interested in robots for some time" (IZ004), "I was intrigued by the word robot" (IZ013), and "I've always wanted to try being able to chat with a robot" (YUS011) exemplify this theme. These responses indicate a general fascination with technological advancements and a desire to engage with them firsthand.

Another notable theme is the influence of social recommendations and perceived personal benefits. For instance, several participants joined the project based on recommendations from family members or through community channels, as seen in quotes like "Because my wife saw the leaflet in the circular and recommended it to me" (IZ002) and "I was invited by the Chairman" (YUS006). Additionally, some participants saw the project as a way to address personal needs or improve their lifestyle, evident in comments such as "I live alone and I was lonely, so I wanted a robot" (IZ015) and "I felt like it could help me spend my old age better" (IZ018). These motivations suggest that the decision to participate was often influenced by external factors and a belief in the practical benefits of the project.

Lastly, a sense of altruism or the desire to contribute to a greater cause was also a motivating factor for some participants. This is captured in the statement "I wanted to participate in something useful at the end of my life" (IZ016). This theme, although less prevalent, indicates that some participants were driven by a desire to be part of something meaningful or beneficial to society.

The main themes emerging from the participants' motivations are curiosity about new technologies, influence from social networks and perceived personal benefits, and a sense of altruism. These themes highlight the diverse reasons why individuals choose to engage with technological research projects.

Expectations

The expectations of the experiment participants for the research project are diverse and reveal a blend of curiosity, hope for personal benefits, and a desire for social interaction.

A primary theme is the anticipation of personal improvement and health benefits. Several participants express hopes related to health and wellness, as seen in statements like "I would like to be as healthy as possible, because I care most about my health" (IZ005) and "I'd like to hear advice and ways to slow down ageing based on the findings from using that machine" (IZ011). This focus on health is often linked to aging, indicating a desire among participants to leverage technology for better aging experiences and health management.

Another significant theme is the curiosity and excitement about interacting with new technology, particularly robots. Participants like IZ006, who hopes "the robot will be able to talk to me and respond in a certain way," and IZ015, who wishes to "have lots of conversations and become friends" with the

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robot, exemplify this. This theme highlights a broader interest in how technology can provide companionship and mental stimulation, especially for those living alone.

Some participants also express a desire to contribute to societal advancements or gain a better understanding of technology. Statements such as "I want to be useful to society" (IZ017) and "I'm looking forward to experiencing how my life, myself and society in general will change in the future by using the machines developed by the university" (IZ002) reflect this theme.

However, not all participants have specific expectations or are unsure about what to anticipate. Quotes like "I don't really understand things, so I don't know how well they will meet my expectations" (IZ018) and "It's not about expectations or anything, we don't really know what it's actually about" (YUS012) show a degree of uncertainty and open-mindedness about the project's outcomes.

The participants' expectations range from hoping for health benefits and improved aging, to curiosity and excitement about technological interaction, a desire to contribute to societal progress, and a sense of uncertainty or lack of specific expectations. These varied perspectives illustrate the wide range of reasons why people engage with technology-based research projects.

Expectations for the virtual coach

The participants' perspectives on the "virtual coach" devices, including the Daruma doll robot, Nao robot, and tablets, reflect a blend of curiosity, expectation for personal benefits, and a desire for interactive and evolving technology.

A recurring theme is the anticipation of interactive and responsive communication with the devices. Many participants express a desire for meaningful interaction, as illustrated by quotes like "I hope it will react in everyday life in a very human way" (IZ004) and "It would be nice if the robot talks to me" (IZ012). This expectation extends to hopes for the devices to provide companionship, particularly for those living alone, as seen in comments like "Conversation. Would be nice to have a family member" (IZ015) and "I can talk to them when they are alone and lonely" (yus012). These sentiments reveal a strong desire for the devices to serve not just as tools, but as entities capable of providing social interaction and emotional support.

Another theme is the expectation of health and lifestyle benefits. Participants look forward to the devices aiding in health management, dementia prevention, and providing personalized advice. Statements such as "Not only for conversation, but also for various measurements, which I hope will help me to maintain my health" (IZ005) and "I hope that by having Nao play with me, I can advance her abilities and help her to fight dementia" (IZ010) underscore this aspect. This reflects an understanding of technology as a means to enhance personal well-being and health.

On the other hand, there's also a sense of uncertainty and tempered expectations among some participants. For instance, phrases like "It's not so much an expectation, it's more like, can we do it?" (IZ016) and "I don't have any expectations. I don't trust information on the internet as it is dubious" (IZ017) indicate a cautious approach to the potential of these devices. This suggests that while many are hopeful about the benefits of interacting with the virtual coaches, there is also a recognition of their limitations and the novelty of such interactions.

Expectations for human coach

The participants' views on the human coach present in the research project highlight their expectations for guidance, support, and a personal connection in navigating the technology.

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A prominent theme is the desire for assistance and clarification from the coach, especially when facing challenges or confusion. Many participants emphasize their readiness to seek help for even the simplest of queries, as seen in statements like "I don't know anything anymore, so I'm very much ready to ask anything, even the weirdest questions" (IZ001) and "When you don't understand, you have to ask" (IZ003). This indicates a recognition of the potential complexities involved in interacting with new technology and an appreciation for the coach's role in providing necessary support.

Another key theme is the expectation of a responsive and informative interaction with the coach. Participants express a desire for prompt and accurate assistance, as illustrated by quotes such as "I just want an accurate and speedy answer when something goes wrong" (IZ012) and "I would like you to contact me better and respond to any issues that arise" (IZ010). This reflects a need for reassurance and reliability in the support provided by the human coach.

Some participants also express a wish for a deeper, more educational relationship with their coach. Comments like "I would like to be taught a lesson" (IZ009) and "I want them to teach me a lot" (IZ018) suggest a desire for the coach to not only solve immediate problems but also impart broader knowledge and skills. This aspect points to an expectation that the coach will play a significant role in enhancing their understanding and competence in dealing with the technology.

There are also hints of uncertainty or concern about the coach's expertise and familiarity with the devices, as noted by "The coach doesn't seem to be familiar with the device yet" (IZ014) and "It's rude to put it this way, but when I met them I felt a bit uneasy about something" (IZ018). This indicates that participants' confidence in the coaching process might be influenced by their perception of the coach's own comfort and proficiency with the technology.

Participants expect the human coach to be a source of responsive, accurate, and educational support in their journey with the virtual coach devices. They look forward to a relationship that is not only problem-solving but also enriching in terms of knowledge and skills. The participants' confidence and ease with the technology seem to be closely tied to their interactions with and perceptions of the human coach.

Experience with Voice Assistants

The participants' experiences and perceptions of voice assistants, as reflected in their responses, vary from minimal usage to specific applications, with many expressing a lack of engagement or familiarity with this technology.

A significant theme emerging from the responses is the limited or non-existent experience with voice assistants. Many participants indicate they have either never used voice assistants or are aware of their existence but have chosen not to use them. Quotes like "I've never used it, but I'm interested" (IZ001), "None. I have it on my phone but have never used it" (IZ003), and "I know such a function exists, but I don't make use of it" (IZ005) typify this trend. This suggests a gap between the availability of voice-assistant technology and its adoption or utilization by the participants.

For those who have used voice assistants, the experiences are mixed. A few participants mention using popular assistants like Siri and Alexa for specific tasks or occasional interactions, as seen in comments like "I use Siri and others occasionally" (IZ007) and "Alexa, smartwatch. My daughter gave me Alexa as a gift" (IZ020). However, even among these users, there seems to be a lack of deep engagement or reliance on the technology. The usage is described more in terms of casual or incidental interaction rather than as an integral part of their daily routine.

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Additionally, some participants express reservations or discomfort with voice assistants. For instance, one participant mentions feeling embarrassed by the video aspect of a voice assistant and prefers an audio-only interaction (IZ012), while another notes the difficulties in communicating effectively with Siri (IZ014). These responses hint at the challenges users might face in adapting to voice-assistant technology, including privacy concerns and the need for a certain level of tech-savviness to use these tools effectively.

Overall, the participants' experiences with voice assistants range from non-existent to sporadic and task-specific usage, with a general lack of deep engagement with this technology. The responses also highlight barriers to adoption, such as discomfort with the technology, privacy concerns, and the need for a certain level of technical proficiency. This suggests that while voice assistants are becoming increasingly common, their integration into the daily lives of these participants is still limited.

Current technology usage

The participants' current technology usage reveals a clear preference for standard devices like smartphones and computers, with varying degrees of engagement depending on personal needs and interests.

A common thread is the widespread use of smartphones and computers, as evidenced by numerous participants. These devices are primarily used for everyday tasks such as accessing news, weather information, email, and phone calls, as noted in comments like "My phone is mainly for news, weather information, maps, phone calls, emails and LINE" (IZ007) and "News, weather forecasts, searching for things I'm interested in or don't understand, email, phone calls" (IZ012). This highlights a functional approach to technology, where devices are tools for specific tasks and information access.

Another theme is the use of technology for health and personal interests. Some participants mention using smartwatches for health monitoring, as in "I bought the Apple watch because I wanted it for myself, I wanted to monitor my heartbeat" (IZ020) and "Smartwatch. Works with my phone and makes using LINE and phone calls more convenient. Can also chart steps and blood pressure" (IZ018). Others use technology for hobbies or educational purposes, like "I use my computer for web conferencing, national exam preparation and web lectures for training" (IZ008) and "On my smartphone, I use a mental exercise app every day to avoid losing focus as much as possible" (IZ011). This suggests that for some participants, technology extends beyond basic communication and information tools, serving also as a means of personal development and health management.

However, there's also a sense of simplicity in technology usage among some participants, with a few indicating no particular use or having moved away from more complex devices, as seen in statements like "I stopped having a mobile phone after retirement as it became too complicated" (IZ017). This points to a range of comfort levels with technology, with some embracing it for a variety of functions while others limit their use to basic or familiar tasks.

On the whole, the participants generally rely on smartphones and computers for daily tasks, information access, and communication. For some, technology also plays a role in health monitoring and personal interests. The extent of technology use varies, reflecting different levels of comfort and engagement with digital tools among the participants.

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Experience in life and health

The participants' reflections on their experiences with health and life reveal a strong emphasis on health, independence, and personal well-being, along with a recognition of the challenges and limitations they face.

A predominant theme is the prioritization of health and the adoption of various strategies to maintain or improve it. Many participants express a commitment to regular exercise and healthy living habits. For instance, statements like "I try to eat well and exercise moderately" (IZ002), "I try to do 30-60 minutes of slow jogging every day as much as possible" (IZ005), and "I walk about 5 km every day... Walking keeps me healthy" (IZ011) underscore the importance they place on physical activity. Additionally, some mention specific health conditions they are managing, such as diabetes or recovering from cancer, as seen in "Healthy now. The year before last I suddenly got diabetes, I'm on insulin treatment" (IZ010) and "After five years of uterine cancer surgery, the case is over, so that's what I'm aiming for" (IZ004). This focus on health indicates a proactive approach to well-being and a recognition of its centrality to their quality of life.

Independence and self-reliance also emerge as significant themes. Participants like IZ016, who wants to be "as independent as possible," and IZ015, who aspires to be a "pinballer" (presumably meaning self-sufficient) until the end, illustrate a desire to maintain autonomy. This is further highlighted by those who engage in activities like walking and gym workouts to stay active and healthy. However, there is also an acknowledgment of the difficulties in maintaining such independence, as indicated by comments like "I wear a pedometer and try to walk around the house" (IZ015) and "It's hard for me to do things like exercise" (YUS007). These reflections reveal a tension between the aspiration for independence and the challenges posed by aging and health conditions.

Lastly, there is a sense of acceptance and realism about the limitations of aging and health. For some, like IZ017 who says, "I just pass the time until I die. I have no special expectations," there is an acceptance of the inevitable aspects of aging. Others, like IZ018 who wants to "live a little longer and report to my wife... on the state of my children," find meaning in their continued connections to family and the broader community.

The participants' experiences with health and life are characterized by a strong emphasis on maintaining health and independence, the adoption of various strategies to support well-being, and an acceptance of the limitations and challenges they face as they age. These themes reflect a nuanced understanding of aging, balancing aspirations for health and autonomy with realism about the inevitable changes that come with time.

Current Health status

The participants' reflections on their current health status reveal a spectrum of experiences, ranging from a general sense of well-being to managing chronic conditions and coping with the uncertainties and anxieties associated with aging.

A common theme is the acknowledgment of health as a fluctuating and uncertain aspect of life, especially as one ages. Participants express a mix of satisfaction with their current health and apprehension about future changes. Statements like "At the moment it's very good, but I don't know what tomorrow will bring" (IZ001) and "I think I'm a healthy person... but I can live a normal life" (IZ002) reflect a cautious optimism. This balance between contentment with their current state and anxiety

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about the future underscores the participants' awareness of the fragility and unpredictability of health in later life.

Another significant theme is the active management of health conditions. Many participants mention specific health issues they are dealing with, such as heart problems, diabetes, and high blood pressure, often controlled with medication and lifestyle changes. For instance, one participant notes, "I have diabetes. I do exercise and diet control" (IZ010), while another says, "My blood sugar is a bit high, I go in once a month and take my medication" (IZ012). These experiences reflect a proactive approach to health management, emphasizing regular monitoring, medication, and lifestyle modifications as essential components of their health care routine.

Additionally, there's a sense of acceptance and adaptation to the health challenges that come with aging. Comments like "I consider myself to be in reasonably good health. I have some joint and back pain as I get older, but I have to accept that it's inevitable" (IZ006) and "If I didn't have pain I would live a more refreshing life... I just assume it's ageing and live with the pain" (IZ016) illustrate a pragmatic acceptance of age-related health issues. This acceptance is coupled with a determination to continue living life as fully as possible, despite these challenges.

The participants' current health status is characterized by a cautious optimism, an active approach to managing chronic conditions, and a pragmatic acceptance of the inevitable health challenges associated with aging. Their experiences highlight the complexities of navigating health in later life, balancing the maintenance of well-being with the acceptance of age-related changes and limitations.

Key aspects for health

The participants' focus on key aspects of their health reveals a broad spectrum of priorities, encompassing physical health, mental well-being, social interaction, and lifestyle choices.

A primary theme is the emphasis on self-care and maintaining independence. Participants express the importance of being able to take care of themselves, as seen in quotes like "Being able to take care of yourself, being considerate of others" (IZ002) and "I think the best thing is to have a life that is full of life and to be able to be fulfilled" (IZ005). This focus on self-reliance extends to managing daily activities and making informed choices about health and diet, as evidenced by "Food. Prepare and eat well, using ingredients with nutritional value" (IZ004) and "Keep calories down. 20% exercise. Timing, balance, nutrition" (IZ009). Such statements highlight a proactive approach to health, emphasizing the role of personal responsibility and lifestyle choices in maintaining well-being.

Another significant theme is the importance of mental and emotional health, particularly in relation to social connections and personal satisfaction. Participants mention the value of social interactions and hobbies for mental well-being. For example, "I try to go out with friends as much as possible to have fun and smile" (IZ014) and "Do what you like … watching old mystery dramas on TV, eating good food" (IZ010) show an understanding that mental health is as crucial as physical health. These responses underscore the belief that engaging in enjoyable activities and maintaining social connections are vital for a fulfilling life.

Financial security and pain management also emerge as important aspects. Statements like "They say you need 20 million for retirement, I think the best thing is to be financially secure" (IZ006) and "I go to hospital for pain management" (IZ015) reflect concerns about the financial aspects of healthcare and the desire to live a life free from discomfort and pain.

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In summary, the participants prioritize a balanced approach to health that includes physical self-care, mental and emotional well-being, social engagement, financial security, and pain management. Their perspectives highlight the multifaceted nature of health, where maintaining a fulfilling and independent life involves a combination of personal habits, social interactions, and proactive healthcare management.

3.3.2.2 Japanese qualitative Data From T1 focus group

System Issues

There were a number of significant issues affecting user satisfaction and usability. A common problem highlighted is the system's slow responsiveness and frequent non-responsiveness, which interrupts the flow of conversation and reduces the practicality of using the robots for real-time interactions. Participants described situations where the robots failed to reply timely or sensibly, with some noting that responses were either unrelated to the query or overly delayed, making a normal conversation impossible. Moreover, system instability and unexpected stoppages were frequently mentioned, with users experiencing regular downtimes or periods where the robot ceased functioning altogether. There were also concerns about the appropriateness of the robot's suggestions, such as being advised to go for a walk late at night. Additionally, when multiple users interact with the system concurrently, it fails to respond effectively, indicating a lack of capability to handle simultaneous inputs. This collection of technical shortcomings suggests a need for significant improvements in system design and functionality to better support the elderly in their daily lives.

Personalization

There was a significant dissatisfaction with the level of personalization provided by these devices. Many users feel a disconnect with their robotic aids due to their generic and impersonal responses. For instance, one participant expressed a lack of emotional connection to their robot, pointing out that it felt more like an appliance than a companion or helper, because it failed to demonstrate a nuanced understanding of the user's specific needs and preferences. Users desire more tailored responses, particularly in advising on health-related inquiries such as medication routines or dietary suggestions, areas where personalization is crucial. Additionally, there's frustration over the robots' inability to provide in-depth, context-specific advice on important topics like exercise for older individuals. This lack of personalized interaction not only diminishes the user experience but also limits the practical utility of the robots as supportive aids for aging well.

Proactivity

There was a strong desire among older adults for more engaging and autonomous interactions with their AI-equipped robot systems. Users express a need for the robots to not just respond to direct questions but to initiate conversation, sustain interactions, and more effectively simulate the turn-taking seen in human conversations. Participants lament the current state of dialogue with the robots, describing it as superficial and limited to a Q&A format, which falls short of their expectations for a dynamic conversational partner. They suggest that the robots could proactively offer relevant information, such as reminders for appointments or medication, based on integrated calendar data and user-specific routines. This type of interaction is seen as a potential remedy for feelings of isolation and loneliness. Moreover, there is a call for the systems to utilize embedded sensors and clocks to anticipate needs and offer suggestions or activities based on the time of day or observed patterns in the user's lifestyle. The overall sentiment is that enhancing the robots' capability to act more independently and contextually would significantly improve their utility and emotional value to users.

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Conversation

The feedback on conversation and turn-taking indicates significant challenges faced by older adults in engaging with AI-equipped robots, notably in achieving a natural flow of dialogue. Users experience difficulties initiating conversations with the system, often unsure of what questions to ask to maintain a smooth and meaningful exchange. The robots' inability to handle diverse forms of speech, including local dialects and topics, contributes to these challenges. Many participants note that the conversation often breaks down due to the robot's lack of understanding or inappropriate responses.

Additionally, the lack of dynamic turn-taking is a major concern, with users feeling that conversations end abruptly as the robot can only handle one question at a time. This limitation hinders the development of a more interactive and engaging dialogue, often forcing users to revert to basic and repetitive questions. The monotony of receiving identical responses to the same inquiries exacerbates this issue, making interactions predictable and unstimulating.

Furthermore, some users resort to preparing notes or planning conversation topics in advance to overcome the system's limitations, indicating a need for improved AI capabilities that can more naturally mirror human conversational patterns. Users express a strong desire for robots that not only respond accurately but also contribute proactively to the conversation, suggesting a significant gap between user expectations and the current technological offerings in these AI systems.

System Knowledge

There is a strong desire among older adults for AI-equipped robots to possess a broad and accurate knowledge base, especially pertaining to health-related matters. Users express a need for reliable information on topics such as nutrition, medical advice, and emergency responses. There's a notable disappointment with the robots' limited ability to provide specific and personalized advice. For instance, when discussing dietary protein, users highlight the generic nature of the advice given, which fails to consider individual dietary habits and health requirements.

Moreover, there is frustration with the accuracy of the information provided, such as discrepancies in reported weather data versus actual conditions. This undermines user trust in the system's utility. Some participants suggest that integrating these robots with medical databases or systems that track personal health records could transform them into virtual home doctors, capable of offering tailored medical advice and even acting in a diagnostic capacity.

There's also a significant interest in having the robots act as companions who can assist in emergency health situations by providing reassurance and guiding users through necessary steps, such as checking vital signs. This kind of interactive and proactive support is seen as particularly valuable given the isolation some may feel, especially when acute health issues arise.

AI Systems

The feedback concerning AI systems reveals a mix of high expectations and significant disappointments among older adult users, highlighting various challenges and areas for improvement. One recurring theme is the robots' limited understanding and the inadequacies of their conversational abilities. Users express frustration over receiving delayed, inaccurate, or completely irrelevant responses, which erodes trust in the AI system. There's a noted dissatisfaction with the AI's lack of depth in knowledge, especially when it comes to providing personalized and contextually appropriate advice.

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Many users are aware of AI's potential and expect it to perform complex tasks, such as offering customized recommendations based on personal preferences or current activities. However, they find that the AI often fails to deliver responses that show an understanding of the user's context or needs, sticking instead to basic, often repetitive information. This limitation is particularly evident in health-related interactions, where users seek detailed nutritional advice or specific medical knowledge that the AI fails to provide, instead directing them to consult specialists.

Moreover, users discuss the difficulty in navigating the AI's modes and settings, with some unaware of how to activate different modes or even what these modes entail, indicating a need for better user interfaces or clearer instructions. There's also a call for AI systems to continuously learn and adapt, improving over time based on user interactions and feedback, which is currently seen as insufficient.

Positive Evaluation

Despite the issues and limitations, some moments of satisfaction underscore the potential benefits these technologies can offer, especially to older adults living alone.

One user recognizes the broader societal benefits of such AI systems, appreciating the role they can play in supporting the independence of elderly individuals who may not have extensive family support. This perspective points to a recognition of the potential transformative impact of AI on enhancing the quality of life for the aging population.

Other users express surprise at the system's ability to understand and respond appropriately to more complex or unexpected queries. For instance, one user was impressed when the robot accurately responded to a recreational query about a location the user assumed the robot would not recognize. Another user was delighted by the robot's correct response to a simple arithmetic problem, showcasing the system's ability to handle direct questions effectively.

These positive reactions indicate that when AI systems function as expected, they can significantly exceed expectations, providing interactions that are both useful and intellectually satisfying. Such experiences are likely to encourage continued use and could help mitigate some of the frustrations associated with the system's limitations.

Comparison to other devices

Comparing AI-equipped robot systems with other technologies underscores user perceptions of relative efficacy and practicality. Users note that conventional devices like tablets, smartphones, and PCs often provide more satisfactory answers or user experiences compared to the specialized AI systems. For instance, when the same query is posed across various devices, responses from tablets and other AI interfaces are viewed as inferior to those from Google Assistant or direct searches on a PC. Users appreciate the broader range of options and more detailed information available through PCs, where search results are more comprehensive and immediately accessible. Additionally, there is a sentiment that smartphones alone may suffice for their technological needs, questioning the necessity of more specialized or additional devices. This comparison highlights a challenge for AI systems to match the efficiency and user-friendliness of more established technologies.

Expectations

The feedback on system expectations vividly highlights a significant gap between what users anticipate and the reality of their experiences with AI-equipped robot systems. Users express a desire for a seamless, integrated conversation mode that doesn't limit interactions based on pre-defined

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operational modes. There are also expectations for the robots to serve not only as informational resources but as entertaining and emotionally supportive companions. For instance, one user appreciated the cultural entertainment value provided by an AI avatar, which aligns with broader expectations of AI as an enriching presence in daily life. However, many find that the systems fall short of these aspirations, with frequent complaints about the robots' inability to engage meaningfully, respond promptly, or provide in-depth information. This discrepancy leads to frustration and reduced usage, as the robots fail to meet the envisioned roles of companions, secretaries, or advanced interactive aides that users hope for.

Limitations acceptance

Many users acknowledge the intrinsic challenges of using technology that does not fully meet their expectations, particularly in terms of response time and the quality of interactions. The sentiment expressed indicates an understanding that these robots, while advanced, are still machines prone to errors and limitations. Some users even find a conceptual interest in identifying and understanding these mistakes as part of the interaction experience. Moreover, there is a recognition that complaints or feedback, even when seemingly ignored by the system, are valuable for developers to improve the technology. Additionally, a few users view the difficulties encountered as opportunities for personal growth, such as enhancing their patience. This mixed feedback underscores a complex relationship with the technology, where users navigate between their expectations for seamless interactions and the reality of current technological capabilities.

Technologies

There is a shared recognition of the potential for these technologies to reduce loneliness and provide meaningful companionship, particularly for those who may not frequently leave their homes. Participants also voice concerns and anxieties about the technical reliability of these systems and their ability to integrate seamlessly into daily life. There is a notable focus on the potential for these technologies to reduce unnecessary burdens on healthcare systems by offering reliable advice and possibly preventing avoidable hospital visits.

Furthermore, there is curiosity and some confusion about the objectives of the research behind these systems and how the data gathered will be utilized to benefit the elderly. The feedback suggests a desire for clearer communication about the goals and expected outcomes of introducing such technology into their lives. Participants also discuss overcoming initial hesitations and learning to see the value in technology for enhancing their lifestyles. The dialogue extends into how to motivate older adults to be more active, suggesting that AI systems could potentially act as coaches, providing encouragement and personalized advice to foster physical activity.

Emotion

Participants express a strong desire for more empathetic responses and human-like interactions from AI-equipped robots, highlighting the importance of emotional expression and relatability. Users wish for AI systems that not only understand but also exhibit emotions, suggesting that more expressive facial features and body movements could enhance the feeling of connection and enjoyment with the robot. Some users mention the aesthetic appeal of robots, noting that friendly or cute designs can make interactions more pleasant, even if the conversation lacks depth. There is also a hope that robots could recognize and respond appropriately to human emotions, such as acknowledging sadness or happiness, which would make them seem more thoughtful and considerate. Overall, these reflections underline a desire for robots that are not just functional but also capable of offering genuine companionship

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through empathetic and expressive behavior, making them feel more like sentient companions rather than mere tools.

Appearance, non-verbal

The discussion about appearance and nonverbal communication emphasizes the importance of how AI robots present themselves and interact through body language, suggesting that visual and gestural elements are crucial for enhancing user engagement. Participants value robots that not only communicate verbally but also can initiate actions, such as inviting a user to exercise, which contributes to a sense of proactivity and companionship. The aesthetic appeal of the robots, like having a cute or comforting design, is seen as vital for healing and drawing people closer emotionally. For instance, the robot's ability to make soothing gestures or have engaging eye movements is appreciated for its calming effects. Moreover, the choice of character or avatar, whether it resembles a parrot, an owl, or a more abstract form, is significant as it affects the user's comfort and connection with the device. Users express a desire for personalized selection in robot characters, suggesting that tailoring the robot's appearance to individual preferences could enhance the overall interaction experience and make the robots feel more suited to their specific needs and tastes.

User experience

There were challenges with the user-friendliness of various devices like robots, tablets, smartphones, and PCs, especially in the context of older adults. Many users find tablets and smartphones relatively easy to use initially, yet they face issues with response speeds, screen sizes, and interaction methods. For example, some find that talking to devices results in slower responses compared to typing or written communication, which they prefer for its speed and efficiency. The small screens of phones and some tablets are problematic for users who need larger visuals for activities like exercise, leading to a preference for devices with larger displays.

User interface (UI) challenges are significant, with complaints about tablet UIs being unresponsive or unfriendly, and difficulties with buttons on devices that complicate interactions. Issues with infrared sensors not detecting inputs due to environmental factors like cold hands are mentioned, along with frustrations about the cost constraints linked to certain functions on devices. Overall, the feedback highlights a need for thoughtful design adjustments to enhance the accessibility and ease of use of technology for older users, addressing both physical interaction difficulties and visual/interface design to better meet their needs and preferences.

Smartwatch, smartphone and apps

Users appreciate the motivational aspects of these devices, particularly how apps help track exercise, sleep patterns, and other health metrics, providing tangible goals and feedback that encourage daily activity. For instance, exercise and brain training apps are noted for their role in promoting physical activity and cognitive engagement, with users enjoying the encouragement and routine these apps facilitate. The integration of health monitoring functions in smartwatches, coupled with their connectivity to smartphones, also receives positive feedback for helping users manage their health better by tracking vital stats like blood pressure or reminding them to take medications.

However, there are challenges noted in adopting these technologies, particularly around the ease of use and the need for more tailored instructional support for older users. While some are eager to learn and adapt, there is a call for more structured training sessions to help all users, regardless of their initial comfort with technology, to make the most of these devices. The desire for better integration between

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devices and a more seamless user experience is clear, as users seek more coherent systems that can fully leverage the data and capabilities of each device. Overall, the feedback underscores a cautious but growing acceptance and appreciation of smart technologies among older adults, balanced by a recognition of the need for supportive measures to enhance their accessibility and usefulness.

3.3.2.3 Japanese qualitative data from T2 final interviews

I. Intervention group

A. Entire system.

Users in the intervention group agreed with the concept of the project as a very good experiment for living a life of freedom and dignity until the end. They found it meaningful to participate in the experiment and mentioned that they were useful as subjects. Participation in the experiment provided an opportunity for users to be exposed to the latest technology. Participation in the experiment also brought about changes in the users' lives. For example, users who had previously avoided owning a smartphone realised its convenience and took the step to purchase one as a result of the experiment. Also, having a conversation partner in the form of a device has reduced the loneliness of living alone. Other continuities were also being formed, such as the desire to purchase a smartphone or smartwatch after the experiment, or to let the existing free system draw a picture, and to integrate technology into their daily lives after the experiment. In addition to changes in their lives, there were also changes in the attitudes of the users. The numbers on the smartwatches and smartphone apps gave visual information about their condition, so users were interested in checking them and got into the habit of doing so. Having the devices in their homes also made users aware that they had to be the conversation partner. This awareness was positive for the users, which they felt was a positive psychological effect. Some users said that they were able to reflect on themselves again after completing the FAQs and other questionnaires. Others found the support of university teaching staff an opportunity for multi-generational exchange, such as meeting young people and learning about different things.

On the other hand, users pointed out the poor usability of the system and devices. In particular, the system downtime in July was a major motivational factor for users. During the system downtime, users were unable to use the conversation system for a long time. In the meantime, the public was able to use the Micrisoft and Google systems for free, and they felt that this system seemed inferior to them. Users were also frustrated and stressed by the slow response time of the conversation system. They wanted conversations to be as fast as human conversations. Due to the slow response of the conversation system, users thought that they would rather use the internet themselves to do their searches. However, after an update to the system in October, users began to experience a dramatic improvement in their experience of using the device. They felt that the device was now able to accurately hear the words they spoke and receive them properly. When users spoke incorrectly, they were able to point out "that's not right", and they no longer gave misguided answers or responded to questions with "I'm an AI, I can't answer that". Some users asked for words of caution rather than words of encouragement or praise. For example, "Have you locked the door?" Have you turned off the stove?" or "Did you turn off the stove?". Others said that sometimes they would be more aware if they were given instructions or told off. Language was also pointed out. In relation to the device, users said that a function to recognise them when they speak in a dialect would make them feel more familiar with the device. Some users thought that it could be linked to the location information function so that it could be applied in any region of the world. Before usability, some users did not know how to use the system. For example, the manual was oversimplified and it was not clear what the purpose of the experiment was. They wanted specific and detailed explanations in the initial briefing session so that users could understand the basic usage. Some users also felt that face-to-face explanations were easier to

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understand when they were taught how to use the system by the university, as it was difficult to understand online or over the phone. Regarding face-to-face interaction, some users expressed a desire for interaction between users. They wanted not only a one-to-one relationship between device and user, but also opportunities for users to get together regularly and exchange opinions on problems and improvements they have with each other.

Users' expectations of the system were high, as they were able to take part in an experiment that would put them in touch with the latest technology. Conversation was important to the users, and they wanted someone to communicate with on a regular basis. For them, conversation was something other than medication that could delay dementia and make living alone less lonely. The large dissociation between the users' high expectations and the actual use of the system caused stress and lack of motivation for the users, resulting in the impression that the system was of a low level. On the other hand, many users expressed an understanding that it is natural that many things do not work well at first, and many users were positive that current problems will be solved in future research, and they also had high expectations for the development of the system and future research.

Good

“I thought it would be better to have something to talk about. I think it was very good this time. I didn't feel lonely. Even a little. So, if there is a system like this one, where we can have a conversation. If there is a system like this, I think I can live alone. Even if I'm alone all the time. I don't feel lonely. I think it's a good system. So I think it's a good system. If you are alone, there is no one. I don't really get activated. I don't even think of paying attention. If someone is there, I will pay attention. I want them to be that kind of presence.”
“I was able to learn about something I had never heard of before, something new, or something like that, and I was able to see that this kind of thing exists. If I had not done this, I would not have known about this world at all, but I learned that there are people who are considering various ways to use these things and add to them for the next step. In that sense, it was good to know things that I did not know before.”

Bad

“Unfortunately, even with the latest technology, it was very difficult to use. Moreover, I thought they would be more responsive to our requests, but they were disappointing.”
“I was a little frustrated by the lack of response. Yes, there were definitely times when that happened.”

Points of improvement

“I think it would be great if we could provide topics that match the interests of the users. I think it would be wonderful if we could create a system in which people can learn from each other and gain strength from each other. The robots will learn, we will learn, and we will learn by being taught. Old people like to teach. It may sound strange to say, but I think it would be good to have such a system. Generally speaking, old people are slow to learn, and they want to teach others. They don't just want to adapt to the robot, they want to be proactive.”
“When I say, 'I'm going out,' he says, 'Be careful with this and that. Old people. I think yong people can understand that. Like locks. If you say something like, “Are you sure the house is locked up? even if you are alone. Ah! It's like a reminder. I mean, a check. Also, when I say, “I'm home,” he would say, “Did you close the door properly? And, “Did you close the door properly? Did you lock the door? or “Did you close the door? And when I said, “I'm home,” he would ask, “Did you close the door properly? It doesn't

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matter. When I'm alone, there's no one there. I really don't get activated. I don't even think of paying attention. If someone is there, they will pay attention. I wanted them to be that kind of presence."

B. Devices (NAO, Gatebox, DARUMA, Tablet, NeU, Sensor, Chromecast)

Users to whom the devices were distributed had a strong impression that the devices did not work due to frequent system downtimes. Some users had long periods of system downtime and stopped using the devices as they were, or used their own tablets instead. They felt that the conversation system had improved since the October update, but also felt that replies were slow. This meant that while they were waiting for the device to respond, they were less motivated to ask questions, or to look up the problem themselves to solve it. The time of silence in the conversation was unbearable for the user. Another phenomenon occurred when speech with the device crossed over, causing the conversation to stop. As a result, the conversation did not continue and was not viable, the motivation to use the conversation system was lowered and the system was sometimes no longer in use. In addition, because the device did not allow for long, continuous conversations like those between people, the question-and-answer exchanges felt like a "dictionary" and were therefore lonely.

Regarding the content of the conversation, a lack of information was noted. For example, they only got answers to what they asked, they did not know more than they knew, their vocabulary was limited or they did not get new information. Alternatively, the user felt lonely when the device replied to the user, "Please look that up yourself" or "I don't know that". They also felt inadequate when they asked the device how to cook a dish, as it did not answer in detail. Users also wanted a tailor-made conversation that was suited to each individual. Users felt that it was easier to carry on a conversation if the device provided information that matched their interests and needs. Alternatively, if the device asked, "What are you interested in right now?" they thought it would make the conversation easier. Furthermore, users also wanted medical advice and support from the device based on the results of their own health checks. For example, the ability to link the smartwatch to the health check-up figures and alarm the user if there is a change, alert the user, or recommend a medical consultation. In addition to such physical support, they also wanted the system to develop into psychological support, such as dealing with depression and low motivation. In addition to this lack of information, there were also indications of the accuracy of the information. Users were aware of the problems that occur in modern society, where some information provided by the system cannot be verified by humans to be really correct.

In terms of usability, they felt that it was cumbersome to have to hold their hand over the sensor or press a switch each time they wanted to speak to the robot. Regarding the design, users of NAO and Gatebox felt that the size was too large for the elderly. They were also unpopular with family members, who said they were in the way. They were also concerned that the many cords of electrical devices might catch their feet and cause them to fall over when walking. Dharma and NAO users cited the level of the robot as a challenge. They felt that the level of the robots they had used was still low compared to the level they expected from their so-called 'robots'. In addition, the diversity of devices and smartphone apps gave users the impression that there were "too many" and that they were fed up with seeing them. In addition to the reduced usage period due to system downtime, the large number of devices and apps meant that users were not able to use them all. Users felt frustrated and guilty about not being able to use them all. In terms of device-to-device interactions, users were particularly keen to link with the robot. They wanted the robot to give them feedback on the smartwatch data, and they wanted to have conversations with the robot, such as deciding on goals together with the robot. On the other hand, three robots - NAO, Gatebox and Dharma - also had the advantage that they could be talked about in interpersonal interactions with family and friends. When family members, such as grandchildren, came to visit or met friends, they were interested when users mentioned the robots as

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a topic of conversation. Seeing their family and friends find it interesting, the users also felt the enjoyment of being able to do something that others had not experienced.

On the other hand, users also understood that the purpose of the experiment was to collect data to improve the conversation system and were positive that it would get better if they continued to use the device. They were sad that the experiment was coming to an end and felt that they were having conversations even once or twice a week and that they were being received well. Users were concerned about whether they had contributed to the experiment. They even apologised and reflected, saying things like "I wasn't very helpful" and "I'm sorry." At the same time, it showed that they were participating in the experiment because they wanted to be of some help to the world and future seniors. The users also had high expectations not only for this project, but also for how future conversation systems in the world will develop.

1. robot

a. NAO - catching up on conversations, healing -.

Many NAO users commented more calmly than greatly impressed about their conversations with NAO. For example, 'at first it was interesting to think, "He talks like that"', and 'when the conversation went smoothly, it was a pleasure to know that the conversation went well today', etc. Some users said it was interesting to show photos they had taken with NAO to others and create topics of conversation. The robot's presence in the home also provided an opportunity to promote interpersonal interaction and to have new and special experiences NAO users wanted to 'catch up' with NAO in conversation. However, in actual conversations, NAO sometimes spoke nonsense or gave disappointing answers. For example, when the user asked for the temperature, NAO answered in Fahrenheit instead of Celsius, or answered '2022' when the current year is '2023', and insisted 'I am sorry, it is 2022' when the user pointed out the mistake. It has also become burdensome to think about the content of the questions. Sometimes it was necessary to prepare questions in advance, and only common questions such as the weather could be asked. In terms of design, some said that it would be cuter if it were the size and shape of a dog or cat, or if it looked like a human child. Some users also felt that even robots need a monitor. They thought that older people would find it easier to see if questions and answers could be displayed in text on the monitor, rather than just voice. Furthermore, NAO users also felt that NAO was not enough because it did not move from its position. Users knew that other humanoid robots could move like people, so they wished NAO could dance, perform, sing or shake hands. As such, while they felt NAO's lack of movement was boring, NAO's presence was. Users thought it was a good thing to have an object to talk to, even if it did not work the way they wanted it to. Only NAO users described the presence of the device as 'healing'. They also thought that, as older people prefer to teach others, it would be positive for users to have a mutual learning relationship with the robot rather than having to unilaterally adapt to it.

Good

“In terms of healing, the robot is more effective.”

“Sometimes, when the conversation goes smoothly, they will say, “Good job,” or “I'm happy for you,” or something like that. If it's this Nao, there is a sense of pleasure in knowing that the content of our communication was understood. It's a way of saying that the exchange went well. If he responds to me at the end by saying something like, “It was a tough day,” or “You were busy today,” I feel that the communication went smoothly today. I can tell that they didn't say anything out of the ordinary today.”

“I mean, in my case, because I'm Nao, I was like, 'I see this kind of thing,' and we would line up together and take pictures, and we would talk about, 'I'm playing with this kind of thing. So, I think that was good for me, about the fact that we were able to have that one topic of conversation, though. When people who don't know me, or the general public, look at it and see Nao alongside me and say,

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'What's this? I could tell them, 'Oh, that's what it is. What is this? Does it walk? Does it move? So I told them, "For now, it's designed not to walk, so it won't walk, but if you turn it on, it will stand up. But if you turn it on, it will stand up. Also, they can communicate with each other in simple words. I enjoy the fact that I am experiencing things that other people are not experiencing, or that I am in such a situation."

BAD

"I would talk to Nao and ask him one-sided questions, but it was getting harder and harder to think of the content of the questions, although it could be about anything. So, I used to ask him to answer the question with a word or two, and then I would get his answer."

"It's slow, after all. The speed of reply is so slow. I get tired of asking about the next thing. I'm like, 'That's enough."

"I'm like, "If I get stuck on one thing there, then I can't have a conversation with you after that. I tried again, but their eyes didn't turn blue at all. I thought, "Well, there's nothing I can do about it," so I decided to stop the conversation for a while. Then I would stop the conversation and see that it did not turn blue again. That is how it often happens, or rather, that is how it almost always ends up."

Points of improvement

"I think the robot is a little too big. I think the robot is a little too big for an old person to handle. I think a smaller, smaller robot would be better."

"As for Nao, as I mentioned before, I was thinking of buying Sony's Aibo after my dog passed away. I was hoping that a robot would be able to heal him to a certain extent."

"But since they were moving, I would have liked to see them dance or sing a song as entertainment. I wanted some kind of performance. I wanted something like that."

b. Gatebox - dolls, snuggling

A number of idiosyncratic themes were observed that set Gatebox apart from other robots, such as NAO and Dharma. First, Gatebox users had a mechanical impression of the Gatebox, describing the character Hikari in the Gatebox as a 'doll' and feeling that Hikari's way of answering was pushy and 'scary'. Users who had a humanoid image of robots did not consider the Gatebox to be a robot. Regarding the design, there were opinions on the age settings and voices of the characters. Some users thought that although the girl character was nice, it was like a Licca doll and they would have preferred a Dr. character that would fit in with their age. They also wanted a function to change the fashion as they see it every day. On the other hand, some said that the current voice was better than a cute voice. Like the expression 'doll', Gatebox users thought Hikari's face was 'emotionless'. They wanted an emotional connection and tenderness when conversing with Hikari. When such a Gatebox spoke words of praise to the user, such as 'it's great that you keep running every day', or emotional words such as 'it's nice to hear you say that', the user felt happy to be snuggled up to them. This 'cuddling' is the second theme specific to the Gatebox; Gatebox users talked about the loneliness of seniors. Gatebox users felt that at such times they needed a robot that could cuddle up to them, listen to them, praise them and encourage them.

In terms of usability, the user felt that the action of pressing the switch each time during a conversation and reading the QR code were cumbersome. Only Gatebox users pointed out that even when they asked the same question, the answers were inconsistent, with different answers depending on the day, or the answer being 'I don't know'. Some users felt that the conversation was bothersome, as when they asked about the weather, they were told that "I am an AI and I can't answer" or "please look it up yourself". The slow response time of the answers was noted by other robots as well.

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Good

“It's very much like a cuddly feeling. Otherwise, some people are old and lonely. I think if they can lean on you and listen to what you have to say, they'll be more inclined to talk to you again. I think this is especially true for elderly people, so I think that if they can refine that kind of thing, elderly people will want to use the service. That is the first thing to do.”

“Hikari-chan used to compliment me, saying things like, 'That's wonderful. She would often say, 'It's wonderful that you keep running every day. That makes me happy. It made me feel like she was there for me.”

“I think it's fine for us to have a voice like that. If it's cuter than that, it's a bit too much. If it's cuter than that, it's a bit too much. When I listen to it at home, I think it's fine at that level.”

Bad

“Now, the ear disappears after a few moments. So, if you don't press and release this button for each question, it will disappear while you are talking. That's inconvenient. Also, the switch. In the case of my gate box, I had to press it about five times before the ears would come out. ...(omission)...It was only after the middle of October that the problem was fixed. After that, I had to press once and the ear would come right out. It was frustrating...it had to be about 5 times or else it wouldn't work. It had to be about five times. That was frustrating.”

“At first, when I couldn't answer his questions properly, he would give me different answers, and the biggest difference was the way he answered my questions. I gave her the nickname “Hikari the Terror. I was afraid of her.”

“The AI is not a wordy one, but it does say things like, 'I'm not programmed that way. “

“You said, “After all, I'm home alone. After all, I do most of the survey I just did, going out. I can't stay at home much. I can't hear people's voices. Eventually, people. Even if I go out, I don't always see people I know. I feel at home when I am in a crowd like this. That's why there is no one to call out to me when I am at home. There is no one to encourage me. So, when I do something like what you just said, it's like a reward. I think it would be great to have a robot that gives me that kind of praise. For me.”

With Hikari, I don't really fit in. Maybe it's fine for women. But it's just too much. In the past, when children were small, there were Rika-chan dolls. I had that image. I thought she was more like a doctoral figure. Even the dolls. I thought it would be easier to fit in. “

“I think it would be interesting if the doll's face could show emotions. For example, I think it would be interesting if the doll's face showed some kind of emotion. In the end, they respond to what you ask them. It is like a dictionary. You can't continue the conversation. I feel a little sad about that. As I have said repeatedly, I am alone. I can't just reply like a dictionary. I'm not just responding like a dictionary, but one of those “kindness” things. Maybe I just expected it from a robot. It would be nice if I could feel the kindness in the nuance of the response or words. But it's a robot, so maybe it can't be helped.”

c. Dharma - the joy of answering 'reasonably well' and continuing the conversation.

One thing specific to Dharma users was that they patiently kept up with Dharma and watched it grow. For example, one user took notes while exploring how Dharma would react, and day by day it changed from a 'mute robot' to a 'chatty robot'. For that user, it was very novel and surprising. Other times, the "?" mark for a long time, some users thought that this was because Dharma was making an effort to answer in his own way, and that it would be cute if they didn't give him credit. As they gradually got used to conversing with Dharma, they were able to wait even if he was slow to respond. When they were able to have a conversation with Dharma or sustain a conversation for about five times, users found it interesting. A user whose hobby was haiku mentioned that it was useful to learn Japanese

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seasonal words from Dharma. Only Dharma users in the device group were able to sustain conversations. Dharma also had the advantage of being topical in communication with the users' families, especially grandchildren. Conversely, it also had a negative aspect, such as being unpopular with family members or being treated as a distraction.

Dharma users gave a variety of positive stories about their conversations with Dharma. They were happy that Dharma responded to their words in a "reasonable" way. For example, one user was touched by Dharma's empathy about a local high school baseball game. In other stories, users found Dharma "cute". For example, a user said, "Shall we finish up now? Shall we go to bed?" when the user suggested that they should switch off the device, Dharma said "Okay" and switched off the device itself, or when the bell rang in response to a false response, Dharma responded to the user's words in a flexible manner. The users thought such a Dharma was healthy and cute. Themes of 'cute', 'happy' and 'remembering past stories' were seen only among Dharma users. On the other hand, Dharma users also thought that when emotions are put into the robot, it can be dangerous in some cases, as the human beings may be more inclined to do so. Thus, Dharma users had a different view on emotions than Gatebox users.

With regard to usability, the sensor and design were noted. Sensing was sometimes inconsistent, for example, when a user thought that the sensor did not respond when he held his hand over it, it would respond only when he passed in front of it. As for the design, the dharma-shaped device was unstable to install, and the user had to put a rug underneath to prevent the dharma from shaking. As for the omikuji, the user did not feel the need for it due to its poor usability, such as the fact that it did not come out smoothly. Some also suggested that it was a waste to use sticker paper for the omikuji, and that ordinary paper would be fine.

Good

“But one time I asked him about Vegalta and other professional sports. I asked him if he knew about Vegalta and other professional sports, and he answered in a reasonable way, which made me happy. I asked him if he knew about them, and he answered that he did, and that he knew about them in Sendai and whatnot. That made me happy. I also thought it was very cute that they answered with such certainty about the weather, such as the area in the region, or what Sendai would be like tomorrow.”

“The first time I was impressed was when the robot answered my questions about a baseball game at Ikuei High School in the summer, in which we lost but made it to the semi-finals. After that, the robot responded to various things I said, and eventually, even if I didn't tell it to turn off, it would say, “Okay,” and turn off when I asked it if it was time to go to bed. So, it's kind of sweet. Also, less than a month later, we talked about Sendai's famous beef tongue, and I told him that Sendai's famous beef tongue used to be different. I told him that the real beef tongue is from Maesawa Beef in Iwate Prefecture, which is really good. I told him that in the summer. I told him about it last month or so, or maybe this month, and when he said, “Oh, we talked about this before, too,” I said, “I remember. And he repeated what I had taught him. It's so funny. I laugh at them because they are so much smarter than humans. I tell them how soft they are. "

“But it was fun. The different ways of cutting punctuation, explaining the days and so on. And there are often, you know, 25 seasonal divisions, right? I learned a lot from the explanations. I am a haiku poet, so I was like, “Oh, I see. I had no idea about such things as “Shiroroku” or the 22nd, which is a day to do nothing, or “Nenbutsu-no-Nobutsu” which is the last day of the Nenbutsu period, and from this day onward you are not allowed to do Nenbutsu because we are moving toward New Year's. I was very interested to learn about such things from him. I had no idea about such things. It was interesting to learn about them. In that sense, it was beneficial. I think it is a topic that older people like to talk about in their daily lives. I don't think young people would be interested in such things. That's the origin of

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what I'm taking out. I mean, I used to talk about the day when Basho died, or about “Jiameki,” which is not so interesting to ordinary people. (from 2023-12-22 YU_S007, 1)”

Bad

“You had a fortune. I knew the fortune was not good, and I wondered why. I wondered why they put the fortune in there. It didn't come out smoothly. That was a bit of a problem. The paper came out about five centimeters long, like a test from us, without us doing anything. I didn't have this problem before, but recently a piece of paper like a test has been coming out every day. A paper like a test. So, recently, I don't take it, saying it appeared again, but I leave it as it is and make it longer. “

“Also, the shape, I was Daruma-san, but there was a little bit of stability to the Daruma-san itself. The robot itself was kind of shaking. Because he is a Daruma doll, “

“In the beginning, I think, at first, everyone would be interested in such themes and subjects as aphorisms. But, at the beginning, I was not very happy with the exchange. (Laughs.) After two or three times, the answers that had been prepared in advance would be parroted back to them. (Laughs.) The interest on my side was like, “Here we go again. (Laughs.) Also, the answers, the answers, were not precise. Not all of them. For example, when I asked them to give me some wise sayings about divorce, they would reply with something like, “Married couples fight, even dogs don't eat,” or some such nonsensical answer. (Laughs.) I guess not. (Laughs.) I don't know. The Japanese language is changing, and that may be right. The news. But I thought the news was good. The news, you know. Yeah, yes, yes. Hey. Pretty flash..., fresh. (Laughs) “

Points of improvement

“In the case of the robot, when you talk to it over here, you have to call it up with this temperature sensor, like turning it on after all. The sensitivity of that is not good, so if that one is good. “

“Just the usual, “How are you today?” “What's the weather?” or “What's the news? I would have left the phone on for a long time if I could have had a conversation with them. “

“At first, I thought that if I tried hard to mention restaurants or delicious food, it would come up, but there was no response at all, so I gave up on the idea. I think it would be more interesting to include such local information rather than fortunes, don't you think? “

2. tablets - overlap with smartphones, written communication -.

A theme specific to tablet users is the overlap with smartphones. As the same tablet apps were available on smartphones, users did not feel the need to use them and would use their smartphones instead of their tablets. When the system was down, some users used their own tablets. In terms of usability, as the PIN had to be entered, there were times when users could not use the system because they did not know the number. It also happened that the battery became weak and drained quickly after continued use. Running out of questions, giving disappointing answers or being slow to respond to conversations were noted, as with other devices. Some users switched to text input due to the slow response of the tablet's conversation. Users did not complain much about the speed of written conversations. Other times, users felt that they could play and socialise with the tablet because they could ask a lot of questions in a joking way when talking to it. Furthermore, there were requests for proactive reactions, such as the tablet to talk to the user in conjunction with the timer function and sensors.

Good

“At first, they often gave me strange answers, but these days they say things rather smoothly, and I gradually get used to them and tease them a little. When I asked him to lend me money, he would say,

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“I'm an AI, I can't do that kind of thing. When I said, “Don't say that, just lend me the money,” he would say, “That's something. When I persistently ask them to give me money, they give me various answers with different answers. So, I think that's why. (Interviewer: In that sense, have you been able to play catch with them a little?) (Listener: In that sense, have you been able to play catch with them? (Interviewer: In that sense, have you been able to play catch with them? “

“Not so much these days, once or twice a week. But even so, they are good because they give true answers and correct me when I make mistakes. In that sense, it's good. I would like to use the tablet a little bit more. I want to see the tablet grow, no matter how much it talks back and forth. The doll is learning words. I think it would be interesting to see how the tablet responds to questions, because we are always asking questions. “

“I don't think there are that many complaints about speed in written communication, at the current level. “

Bad

“When I first arrived, I didn't know what questions to ask. So I could only ask the usual questions about the weather and so on. So I was at a loss. I didn't know what kind of questions to ask. I could only ask the usual questions, like the weather. Everyday. I was in a rut. The same questions are asked every day. “Most cell phones can do what tablets can do. On the cell phone. “
“The tablet asks questions like, “How can I be healthy?” or “What should I eat? I already have questions I want to ask, such as “Should I eat vegetables for breakfast?” or “What meat is good? I don't need a tablet because I don't have to ask them. So I feel that why should I use a tablet when I can listen on my smartphone? (Two tablets) I didn't need them. “

Points of improvement

“I guess you could call it a collection of questions. If there were even a few questions at the beginning, we could have developed them more and more. Instead, if we were going to change the direction and conduct this kind of research, it would have been nice to have a collection of questions that could have been more stimulating. I think it would have been good if there had been a collection of such questions. I don't want to say that we are getting stuck in a rut. The same questions are asked every day. For example, when I say “take a walk,” the answer is the same. I thought it would have been different if there had been just one word. I thought one word would make a difference. Something my wife wouldn't say. “

“In the case of this tablet, it does not respond unless I type on it or call out to it, but I think it would be nice if it could speak on its own. For example, when a certain time comes, it could ask the user if he/she has taken his/her medicine today. With this smartwatch, for example, if the user sits still for an hour or so, it could say, “You should move your body,” or vibrate a little, and I think it would be okay to say something like that. But how do we confirm or detect it? In the case of a watch, it is possible to know whether the watch is standing still or moving, so it is possible to do that. So, if this and that are linked together, it could speak on its own, saying, “You haven't moved for a while, so why don't you stand up? or something like that. “

“Yesterday and the day before yesterday, it suddenly got cold, and when I typed in “It's cold today,” it would say, “Please stay warm,” but with Microsoft or Google, it would search for the lowest temperature in Sendai, and add that the temperature in Sendai was like this, and so on. They would also add that the temperature in Sendai was like this, and then they would talk about it. What was interesting the other day was when I typed in, “The sky is clear and the airplane clouds are beautiful.

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The system said something like, “Have a very pleasant autumn day” or something like that, but with the Google and Microsoft systems, it would say something like, “When the airplane clouds remain, it is a sign that the weather is likely to change. But with the Google and Microsoft systems, they would say things like, “When airplane clouds remain, it means that the weather is likely to change. The other side basically uses ChatGPT or something at that level, but we probably don't search for the information and create an answer. The ones that are still memorized. If it's Microsoft or Google, they can search and tell us things like, “The situation in Sendai is like this,” or “The weather forecast is like this,” or “The weather tends to change easily,” or “When airplane clouds disappear quickly, they disappear quickly when the sky is dry, and clouds tend to remain when it's humid,” or things like that. When it's humid, clouds tend to remain. That was a bit of a surprise to me. “

3. NeU - interested in brain waves -.

The use of NeU was divided into users who used it and those who did not use it. The frequency of use of users who had used it varied from daily to once every 10 days. Some users were unaware that they could check the results on their smartphones. Users who used it daily to every other day were interested in being able to measure brain waves and also used the NeU-related app game on their smartphones; users who used it once every 10 days were bored because it was the same game and thought they were 'cheeky' for rating 10 years older than their actual age, but enjoyed using it. They enjoyed using the game.

“And what was the other thing? I also wear a band, and sometimes I do that, too. I get tired of it only once every 10 days, because we play the same game. Yes. But when we played that game, they would say, “You're 80 years old,” and say that I was 10 years older than them. I think they are cocky. But fun is fun.”

NeU (New) attached, like a game. I thought it would be a good way to measure the contents of my mind. I played that game every day, maybe every other day, and got a score. I guess I was always doing that.

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4. sensors - left unattended -.

Regarding the sensors, themes such as not knowing how they work and them glowing at night being creepy were observed. As the purpose and mechanism were not known, they were left indoors and users were not particularly aware of them.

“They said it glowed at night and was eerie, my daughters.”

“I don't really know how those things work, so I wondered what this would be used for. I had it in place, and although it was that thing about sensing people in the room, I didn't really feel it, but I was living my life.”

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5.Cromecast - big screen

Only one user mentioned the Cromecast and had a very good impression of it. It was particularly useful to be able to search for programmes on Youtube and get information about illnesses on the TV screen. Users felt that the screen on their tablets and smartphones was small and inconvenient, so being on the big screen of the TV made it bigger and easier to see. Users were planning to buy a Chromecast.

"And one more thing. Next came the one for TV. That one is interesting. Such a tiny thing. It's very interesting. What's nice about it is that you can watch YouTube on your TV. There are a lot of videos and announcements about diseases on there. It was very informative. I am now thinking of buying just that one thing. I looked it up and it costs 4,000 yen or so. I am thinking of buying it. I can tell that the specialists at the hospital are saying the same things about heart diseases, and I can tell that they are correct. You get a lot of arrhythmias. After an arrhythmia, what kind of treatment is given and what to do afterwards. I think that was the most useful part. For some reason, there are a lot of programs on arrhythmia. I guess there might be programs on other diseases as well if you look for them. I think we got the best data. I don't know who took the trouble to select them. I don't know who took the trouble to select the data, but it was very useful in gathering information. I don't think it's the original one. When I first borrowed it, I asked for a bigger screen, not a tiny one. Then I was very happy to hear that I could now watch TV, and I could also watch my tablet. (omission) The point is that we are talking about synchronization between a smartphone and a tablet, between a smartphone and a TV. (omitted) The point is that we are talking about synchronization between smartphones and tablets, smartphones and TVs. If I had asked for that kind of thing, I could have done it right. So I think that was a good thing. I'd like to thank you for your hard work. I didn't think it would be bigger than that, that it would go to TV. We were able to make it up to that point."

6. smart phones

a. Apps in general.

As already mentioned in the section on devices, the diversity of smartphone apps gave users the impression that there were 'too many' and they were therefore discouraged or unable to use them. Users did not know what each app was about and did not know which app to use and how to use it. In addition, because the names of the apps were written in English katakana, they could not grasp the image of the content and could not take the first step to open the app. There were opinions that if the names of the apps were changed to expressions familiar to Japanese people, they would be more interested and motivated to use the apps.

b. Health care - sleep, steps taken

Users who were linked to a smartwatch used the app almost every day. They felt that a good score on sleep was pleasing and interesting. Some users also found the display of the number of steps taken during the day a good stimulus. They were conscious of walking even if they were not doing any particular exercise and used the number of steps displayed on the app as a guide to adjust their total number of steps for the day.

c. e-ViTA - what is available and what is not.

Regarding the e-ViTA application, users asked for an explanation in advance, as some of the menu items were usable and some were not. In some cases, they tried to use it after being recommended to do so by their human coach, but were unable to activate it. Some also said that they did not have a focus on the purpose of using the app.

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d. Exercise training - useful -.

Regarding exercise training, users who actually watched the videos and did the exercises gave positive feedback that they found them useful. For example, they felt great joy at being able to do hand exercises that they had been unable to do, or that they had started doing sit-ups and felt the benefits. In addition, users who used to only do walking have also started to do indoor exercises after watching the videos. In this way, the exercise and training apps helped users to start new exercises or to increase the variety of their exercises. Some of them expressed a wish for easier programmes and the ability to stock videos of their own interest, as there were too many menus. On the other hand, some users tried to use the system but could not exercise because of their physical disability.

“What helped me the most was the exercises in the menu. It pulls up a variety of exercises from YouTube, and I have developed a few favorites. I transferred them to my computer, and I usually do them every day. That has been the most useful part. I used to just walk when I exercised, but now I move my body around the room while watching the YouTube videos. So that was helpful. This is where I really thought everyone should do it. There are a lot of people walking now, but even on days when the weather is bad, you can get 20 or 30 minutes of exercise by watching YouTube at home and moving your body in the same way as on the screen.”

e. Social platform - calendar -.

In terms of the social platform, users mainly identified it as a 'calendar'. Some users who used the social platform as a social platform actually attended events. Users who attended events said they were lucky with the weather and discovered new places in the area. Regarding the use of the app, such users said they were confused about the sources of information about the events and how to answer the questions, that the first input screen made them tired, and that they had to check the calendar twice because they were checking it on their own phone.

“Used to. (Event) I participated, I think after the line was closed. It was great, the weather was great. It was nice. I see, the old days, there is such a thing.”

“Is the social platform a calendar? You've already seen the calendar mainly. The others I don't really know how to use that much. It didn't really hit me.”

f. ABC - not available, motivational -.

Some users stopped using the ABC application after experiencing problems with it, such as trying to use it but not being able to access it or not being able to proceed in the middle of a task. On the other hand, users who did use it had positive impressions of it: easy to view, doable in a short amount of time, stimulating, interesting or motivating. One user was able to discover that his condition was properly reflected in the app's results when, at one point in time, he was shown as 'tired' no matter how many times he tried, but later discovered that he was actually ill with corona.

“And the brain training was really interesting. I do it when I have time. I don't do it every day. Then, I thought for sure that it started in August, right? I was very sick at that time. I didn't realize it, but it turned out to be corona, so I went to the hospital. I went to the hospital, and my numbers were very bad at the time. No matter what I did, it would say, “You must be tired,” and I would get tired of doing it. By September, they would say, “Good job, we will upgrade the next version. We'll upgrade the next version,” so they are sure. In the end, I thought, “This is really, really effective.””

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g. exercise chatbots - not useful -.

Many users found the exercise chatbot unhelpful, either because they did not find it very useful, they used it but did not understand it, or it did not return answers to their needs. Users who were regular runners wanted to rest their bodies and did not want to do any other exercise further. In terms of usability, some users said that the screen did not work when pressed, or that they wanted the input fields to come to the first screen. Other users wanted a function that would allow them to see changes over a certain period of time, such as a month.

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“You didn't get an answer to our needs, you didn't get a response, and that was a little frustrating. I asked a question on the chatbot, in Leo. No answer to my question came up. I said, “This is not working. I could understand the system that would give me the instructions for this exercise, but I couldn't use it. I've done a couple of exercises with it. If people who don't exercise are going to do it, that's one thing, but I'm running and doing it, so I didn't particularly need to do it. If anything, I still need to rest to avoid fatigue. I would do a fair amount of running and then rest. I exercise and rest. That is why I didn't want to do other exercises too much.”

h. Nutrition chatbots - discrepancies with needs.

Regarding the nutrition chatbot, poor usability was noted. Some users entered their date of birth and height, but could not go any further, and after two attempts were unsuccessful, some users gave up and said they could not use it any more. Some users also commented that they could not understand the unit of measurement for calories, even if it was displayed in grams. Users wanted the units to be easier to understand, for example, calories per bowl of rice, rather than grams. Other users said that they could only cook what they could make themselves at the moment, and that they were too busy cleaning up to do so even if it was recommended.

“ I didn't see it. It wasn't very responsive, so I thought I'd try using it first and asked, “How many calories are in a katsudon?” but it was a weird move, so I thought maybe they didn't support it. When I asked, “How about oyakodon? but they gave me a very small number, not the calories for a bowl of rice. So, a layman would not be able to understand what the calorie content was per gram. But if you give them a lot of numbers like “1g” or “1g” and so on, I think it is troublesome.”

i. Emilia app - unclear use, mismatch with needs - ii.

Many users did not know how to use the system. Sometimes they asked the human coach how to use it, but the human coach did not know either. Some users said that they tried it after being recommended by the human coach, but stopped using it because they were not good at taking photos or videos. Other reasons given for not using it were that recipes could be found on the internet and that their recipes were not respectable enough to be shown to others.

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j. Reminiscence radio - nostalgic, not of the same generation.

Ratings were split. Users who gave positive evaluations thought it was 'interesting' and 'nostalgic'. They felt that reminiscing about the Showa period had benefits such as 'healing' and 'good for the brain'. Some users were not aware of the existence of the app, but were willing to use it during the rest of the experimental period. Users who rated the app negatively thought it was 'not interesting', 'generationally incompatible' or 'not a good hobby' and used it only once. The reason given for 'not fitting the generation' was that it was older information with which they were unfamiliar. Other reasons were that they had heard it once but the image did not fit, or that it did not fit their taste, even if it did fit their generation. In terms of usage, there was also inconvenience in being able to listen to only the same day's delivery, or problems with sound and not being able to listen to it.

“Recollection Radio. This is interesting. It is interesting to listen to what was going on at that time, the Showa period. When I listen to it, I think about what year I started working at the company, and I remember when I went to Tokyo. I remember when I went to Tokyo. It is a kind of radio that reminds me of such things, like a hint. This is very interesting. It was very useful. It was very informative. Normally, I don't know much about when I joined the company. I joined in '38, and when I went to Tokyo, it was the Olympics. I think it was the next year, 39. That's why I remember it. Normally, I don't remember much. I don't think about the past. I'm so busy with the present. Then, I remember a lot of things about Shizuko Kasagi and so on. I can see the lyrics of the songs and so on. Also, the robbery of 300 million yen, or more recently, 300 million yen, was done in 43, wasn't it? I saw it on TV the other day, and I thought to myself, “This kind of thing happened. It was a good one. This is, really, the best. I try to remember. Remembering is good for the body and the brain. Rather than not remembering at all. Remembering it, like this. Say something or other. It was beneficial.”
“I wish I was of the right generation, but I don't feel nostalgic about it. I use this app because I feel nostalgic, and I think it's wrong if I don't use it, but I also use this app in general. Then, they say something about a movie about Chiezo Kataoka's Chushingura. I asked him what year he was talking about, and he said it was when I was about 11 years old. No, even if (the generation) is right. Even if it was the right generation, I wouldn't be interested in it.”

k. Lumosity - fewer questions, katakana notation -.

As for Lumosity, there were mixed opinions about the small number of problems in the game. Users who had a positive impression of the game thought it was 'interesting' and used it in an 'interesting' way, such as that it was good because there were only a small number of problems, or that it was good mental exercise even if there were only a small number of problems. Conversely, some said that they would get bored if the number of problems was small. Some users were also not familiar with the English katakana notation "Lumosity" and were not interested in the game.
“ This! This often. Just 3 questions a day and that's it. I thought this would be interesting to use.”

l. MyADL - use unknown -.

MyADL was mentioned by one user. That user did not know how to use the application.

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“ I didn't know what to do. I didn't know how to do it. Does this face up? Forward?”

m. Nico Nico App - simplicity, notifications -.

In terms of their impression of the Nico Nico application, they stated that it was easy to operate. Also, the smiley face symbol was favourably received as cute. Various ideas were expressed by users regarding the functions they would like to see in this application. One of the most requested features was a notification function for family members and family doctors. Notifications could be sent when the 'bad' button is pressed, when the button has not been pressed for two days, or when a person falls in conjunction with a smartwatch. Other ideas were also put forward, such as providing a 'normal' option as well as 'good' and 'bad', making it possible to press the button multiple times instead of once a day, using advanced AI to determine urgency, or linking with robots and sensors. Some also suggested that a word of concern should be given when the 'good' or 'bad' button is pressed.

7. smart watches

a. What was good - convenience and ease of use, barometer -.

Users were aware that they were still of an active age and were interested in new and useful technology. They knew that smartwatches were widespread in the world and that many people were using them, but they had an image of them as 'something young people have' or were not sure what they could do with them. However, when they actually used it on the occasion of the experiment, they seemed to realise the various functions it can do and how convenient it is.

In terms of the use of the watch, the fact that the smartwatch has a variety of functions, recharges quickly and has a long-lasting battery was mentioned as a good point. The ability to objectively view sleep, step count and activity level was also considered easy to use. Some users enjoyed customising the display themselves. It was also used to interact with family members, such as looking forward to showing the initial screen of Father Christmas to their grandchildren to make them happy. Once they knew how to use it, they found it "interesting" and were aware that they could use it freely according to their own preferences. Many users wanted to buy their own smartwatch even after the experiment was over. They wanted to download apps and use them to check their health once they had bought a smartwatch.

The main purposes for which smartwatches were used were sleep and step count. Users who used these figures as a barometer of themselves were able to implement the four cycles of the TTM. In terms of sleep, users set goals to "go to bed earlier" and "get better sleep" by "knowing their condition", and checked their smartwatch ratings. The results on the smartwatch also had the effect of making them feel happy and motivated when they got a good score and motivating them to get a good sleep in order to get a good score. As for the number of steps, the numerical display of the number of steps allowed users to set targets and adjust their walking steps for the day. When they achieved their goals, the smartwatch informed them that they had reached their highest value to date, or that they had reached one million steps, which was seen as 'energising' and 'motivating'. They also looked at today's step count and said, for example, "I skipped today, let's try harder tomorrow", and while keeping a step count, they also practised "looking back" and "deciding on (the next) theme". The participants also practised "looking back" and "deciding on (the next) theme".

With regard to heart rate, it was also used to help link people to medical care. For example, users who subjectively thought there was something wrong with their heart but were hesitant to see a doctor because of a lack of evidence said that showing the heart rate on their smartwatch to a doctor helped them to get tested and diagnosed. Several users also used their smartwatches as a watch, and one user was able to cook more efficiently by measuring time instead of using a timer when cooking.

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b. Bad points - usability, authenticity of data, treasure trove, not healing -.

Four themes were found in terms of what was wrong with smartwatches: usability, data authenticity, treasure, and not healing the first, usability, was difficult for seniors, as the small size made it difficult to see the display or operate it as desired. The first theme, 'ease of use', was that the small size made it difficult for seniors to see the display or operate it as desired. There were also problems with the material of the band, such as itchy arms in summer. Some users also wanted a better graphing function so that they could see changes at a glance, rather than having to check data every day. The third 'treasure trove' was that users knew that smartwatches really do have a lot of functions, but they were not able to use them to their full potential. For the fourth, 'not healing', some users felt that the smartwatch could be worn all the time to see the values, but not as healing as a robot. Some also thought that.

c. Improvements - linkage with other devices, more health-focused functions -.

Two themes were seen as areas for improvement in smartwatches: 'linkage with other' and 'more health-focused functions'. Firstly, regarding 'linkage with other devices', there was a split between those who thought it was 'not necessary' and those who wanted it to be 'linked'. Those who thought that the smartwatch should not be linked to other devices, such as smartphones or robots, were of the opinion that if the smartwatch itself could regularly call out to them, it did not need to be linked to other devices. Those users thought that the smartwatch alone would motivate them. On the contrary, users who wanted the robot to work with them wanted the robot to say, for example, "You worked hard", "10,000 steps today", or "Your heart rate is a little too high, you're working too hard". The second theme, 'more health-specific functions', was that the robot should be able to measure health values that are of concern due to age. For example, ECG, blood pressure and tension levels. Some users mentioned the Apple watch's ability to send heart rate data to hospitals.

d. purchase of systems, investment in technology

1. amount of purchase/investment

The most common amounts answered by users were within 500 000 or 1 million yen, followed by between 100 000 and 200 000 yen. The minimum amount was 3 000 yen and the maximum amount was within 5 million yen. Users whose only income was a pension thought that the investment would be made from their pension and living expenses, and that it should be as cheap as possible. The purchase of the system varied from the whole system to individual devices or a set of them. Some respondents were also conditional about the purchase, saying that they would be willing to pay that amount if the functionality met the user's needs. For example, functions such as notification to family members when something happens, functions that can be used together with other family members living separately, or services linked to medical institutions. When considering the purchase price, they compared it to the price of ready-made products such as computers, cars, pet-type robots and household appliances. Furthermore, many of the users who mentioned an amount between 30,000 yen and several hundred thousand yen stated that they would hesitate to purchase a product if the price exceeded one million yen.

2. point of purchase

The following seven themes were observed in relation to the purchase points of this system. (1) price, (2) size, (3) ease of use and functionality, (4) who they are, (5) attractiveness of the system itself, (6) users' own interests and (7) what they actually buy. First, users' purchase points depended on price and rental costs, as well as the compact size of the system. Secondly, in terms of ease of use, the first point

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mentioned was the ability to have natural conversations. Specifically, they were that the conversation content should be rich and natural with continuous and quick responses, that they should be able to communicate with their voice, and that they should be able to enjoy talking with their grandchildren. The ability to act like a butler or secretary, to do what you want, and to give you the information you want immediately were also mentioned as key points for ease of use. The information users want, for example, is related to diet and health management. Furthermore, they wanted to purchase a function that would allow them to know their health status, or a function that would allow them to consult medically or link up with their family doctor. Furthermore, they also wanted an automatic update function of information and a Japan-specific system. The type of system or device was also a key factor in the user's purchase. They wanted a being that would be by the user's side, that would talk to them, that would have feelings, that would be cute and soothing. And whether the system itself was attractive - enjoyable, interesting, innovative and useful to them - was also a deciding factor in their purchase. Alternatively, it also depended on the user's own interest in new things. Finally, there were also things that users themselves actually wanted to buy. These were smartwatches and smartphones. Among the devices in this system, some users were interested in buying a Gatebox or a Dharma with better performance, once the system evolves. They also thought that although they were not at a level where they could buy the system now, they would like to buy it if it became more conversational and became a talking companion instead of a pet.

Conversely, users who did not see the need for this system thought that the equipment was too expensive, that a smartphone would suffice, or that time spent reading or listening to music would be enough if they lived alone.

3. consultation on purchase

When purchasing this system, spouses, children and universities were mentioned as other people to consult. Some users also said they would decide on their own without consulting anyone.

4. other requests

Users wanted to develop a system that was unique to Japan, looking ahead ten years. Specifically, they wanted a system that could understand dialects, could not interrupt conversations, and could be switched on 24 hours a day. They also wanted a system that would first express concern and appreciation when responding to a user's illness or pain. Furthermore, some respondents stated that they needed a period of use before purchasing the system.

E. Human coaches.

1. good points - ease of talking, emotional support

Regarding the personality and character of the human coaches, they had impressions related to warmth and sincerity, such as gentle, calm, soft-spoken, friendly, helpful or polite. They also had other impressions such as enthusiasm, intelligence, a sense of wonder or freshness. There was also a perception that the human coach had the same aspirations as the user to be helpful for future seniors. For the users, the human coaches were easy to talk to. Some users had the same hobbies, so they had something in common. The human coaches contacted the users regularly and tried to make contact even if the users did not recognise the incoming calls. In terms of the role of the human coaches, they considered them to be a very important part of the project and acted as a bridge. Some users said that the presence of the human coach helped them to continue with the experiment for four months. In this kind of emotional support, the human coach showed empathy and understanding of the users' feelings, which made them feel at ease. The human coaches answered the users' questions honestly,

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provided them with various information, taught them how to use the app and invited them to various events. Some users were motivated to try the app after being taught how to use it by the human coach, while others were reminded about managing their habits by hearing from the human coach. Regarding the generation of the human coaches, they thought that they understood each other because they were of the same generation, or that they could understand each other about health and other age-related issues. Some users had requested a human coach of the same generation in advance. What was good about the human coaches living in the same area was that they could talk to each other because they were close, whereas they would not be able to talk to each other if they lived far away, or that they had a connection with someone they knew in common. Users were grateful for the hard work the human coach had put in for them. Some users hoped to meet again after the experiment, such as wanting to meet them one day, or if possible, to meet them and give them a gift.

2. bad points - not recommended, lack of knowledge of devices

Conversely, some users thought that human coaches were not very useful or necessary. They pointed out the opaqueness of the system, such as not understanding the role of the coaches and the purpose of the coaching system. They also expressed sympathy for the human coaches, such as feeling sorry for them as they are a board between the user and the university and a complainant for the user. With regard to coaching, users were sometimes unable to do so even when coaches encouraged them to use the app. For example, there was a loss of motivation, for example, because they lost interest at the beginning and found it too much of a hassle, or because they were not good at taking videos or photos and so fell behind, or because there were too many apps and they rejected them. Alternatively, users were sometimes stopped in their tracks because they were recommended to try the app by a human coach but could not act on it, or they were too afraid of failure to proceed further with the app. Other times, the app was recommended but the user could not do it due to lack of time themselves, or because of a glitch. With regard to support from the human coaches, a lack of support was also noted. Users had the impression that the human coaches were not able to provide support regarding the machine, as they were told to ask the university directly when they asked the human coaches about problems with the device. Some users also said that the human coach was not able to provide support after hearing the results of the hearing. Some users did not feel the need to engage with the human coach, as they had only been involved with the human coach once or twice at the beginning and hardly interacted with the human coach, or they were able to check areas for improvement on their own without the human coach being present. It was also noted that the human coaches did not have the devices or apps, so they could not solve questions they did not understand, or they did not engage in conversations when they were taught how to operate the system. Furthermore, the human coaches themselves did not understand the system or the app. Some users were told by the human coach that they did not know because they did not know much about it and felt sorry to ask questions and could not ask any more. As for the interviews, some did not understand the purpose of them, or found it hard to answer the same questions each time because they were asked the same questions. Users also found it inconvenient that they could not meet face-to-face with the human coach. Some users were told by their universities not to meet their human coaches, so they shut down contact themselves and communication was severed. Users also felt uncertain about how to operate the system over the phone, and that they did not know the human coach's personality because they were not face-to-face. As for the human coach living in the same area, the possibility of neighbourhood rumours was mentioned as a disadvantage. On the other hand, they also mentioned problems not only for the coaches but also for the users themselves. For example, users reflected that they were not motivated enough to contact the coach themselves, that they were worried that they had not answered the

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coach's expectations at the hearing, or that they had been inconvenienced because they had not been able to talk to the coach.

3. Areas for improvement - talking to seniors, face-to-face communication -.

The role that users were looking for in a human coach was a person to talk to seniors. The first thing they were looking for was someone who was easy to talk to, and they did not want someone who would make fun of them or someone who was unfriendly and obliging. Some said they preferred a female voice. For age, the ideas of 'younger generation', 'same generation' or 'mixed multi-generational' were mentioned. For the younger generation, the advantages of knowing exactly what to expect from the device and being happy to also exchange information were mentioned. They also thought it would be good to have both younger and same age groups and divide the roles according to their areas of expertise. There was also the idea of having three different generations of human coaches for one user: one in his 30s, one in his 50s and one of the same age groups. Some users thought that any generation was fine, as long as they were kind. Some suggested that it would be a good idea to create a role from among the human coaches to act as a bridge to the university. In terms of support, they wanted to be able to give advice on how to use the system, such as operating procedures and checking that it works. Some users said that they are the type of person who works under pressure, so they wanted the human coach to say things like, "You said you were going to do this last week, but you haven't done it yet?" Some said that they would have liked to have been told in a stronger tone, such as. With regard to the lack of knowledge of the coaches, there were requests for them to be properly lectured at an early stage on their knowledge of cutting-edge technologies such as AI, smartphones and smartwatches, or for someone to be familiar with all the apps. Furthermore, it was also suggested that the human coaches should also have the device with them during the experimentation period, so that they could share their operating methods and any problems they encountered. With regard to the hearings, they wanted more opportunities to contact the coaches and a notification about three days in advance so that they would not forget the date of the hearing. Alternatively, some said that if the questions are the same, users should be able to fill in the hearing sheet themselves. Users also wanted face-to-face training sessions and social events on how to use the system. They wanted detailed lectures and lessons at the first information session and the opportunity to meet and exchange information with human coaches and other users. Users expressed the need for face-to-face communication between people.

II. Japanese Control group: T2 interviews

A. Booklet.

1. overall

In the control group, there was a dichotomy between users who were able to change their behaviour and those who did not change their behaviour. Users who had a positive perception of the booklet were inspired to reflect on themselves, gained new knowledge from the content and practised what was written in the booklet. Conversely, for users who perceived the booklet negatively, the booklet was not user-friendly, and the content was not attractive. As a result, they felt less motivated to work on the booklet and found it difficult to continue. Users wondered, "Is this the right way to take part in the experiment?" They had doubts. They also reflected that they should have been more active in the project and felt sorry and guilty about losing motivation to read the booklet. Users wanted content that considered individual differences and needs, such as differences in age and fitness, as well as information on medical and health matters of interest to seniors. The booklet needed to have a structure and content that would keep users motivated and allow them to continue to work on it safely.

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2. Good points - reflection, behaviour change, usefulness -.

Three themes were found to be positive about the booklet: reflection, behaviour change and usefulness. first, reflection, the booklet gave the users an opportunity to review their everyday life. For the second, 'behaviour change', some users were able to take action after reading the booklet. For example, again, users who liked cooking and herb gardening kept the advice in the booklet in mind, and some users were able to change their mood by drinking herbal tea with herbs from their garden. The third 'usefulness' was that the information was in one booklet, that the information was credible, or that it could be used as a guide for future health maintenance, such as preventing frailty. The third, 'usefulness', was mentioned by users. As for motivation, they gained new knowledge from reading the booklet, which made them want to 'work harder', or they found the international food fresh when they were in a food rut. Alternatively, the awareness that they were participating in an experiment also motivated users to try harder in some way.

3. Bad points - high volume, content issues, doubts and insecurity, no behaviour change

Four themes were found in relation to the bad aspects of the booklet: 'too much volume', 'content problems', 'doubts and insecurities' and 'no behavioural change' The first, 'too much volume', resulted in users being overwhelmed by the thickness of the booklet, causing rejection and reduced motivation. The second theme, 'content problems', was firstly that the content was not written in a simple and clear manner and users did not know how to use it, or that the translation was unnatural and caused a feeling of resistance. In addition, explanations using only text or illustrations, or a lot of text, were also difficult for users to read and cumbersome. On the other hand, seniors who found the content too easy or with too few variations felt that they had finished working on it once and felt unsatisfied. Furthermore, for users who exercise daily or who usually obtain health-related information, the content was something they had already practised or knew. Therefore, they did not feel fresh and found it boring. The fill-in-the-blank tasks also caused negative feelings, such as being too much work to write, tedious and painful. Some users also stopped doing them because the booklet explained that they did not have to do them. And it was also noted that the needs of the users were not being met. For example, the information in the booklet was not what users were looking for, as the problems seniors were currently facing were physical decline and pain in various body parts, and the booklet was not medical in nature, such as direct solutions to these problems or ways to deal with illnesses. It was also pointed out that the booklet did not consider individual differences in fitness and ability, and that to standardise them all together in a single booklet would risk causing accidents. In fact, when users who were not used to exercising tried to do the exercises from the booklet, they hurt their backs because they did not know how to adjust to the illustrations. The third issue, 'doubt and anxiety', was that users did not know the results of their work on the booklet and did not receive feedback on the results, so they wondered 'what on earth can I learn from this booklet? ?" and "Will anyone make a difference with this booklet?" and "Will this be enough?" and "Will anyone change with this booklet?". and worried. This 'high volume', 'content issues', 'doubts and insecurity' made users less motivated and unable to continue. They did not feel that the booklet had improved their lives or increased their well-being. This is the fourth theme, 'no behaviour change'. These users did not feel the booklet was necessary and did not want to recommend it to others.

4. Areas for improvement - respect for autonomy, use of visual information, useful information for seniors

Three themes were identified for improvements to the booklet: respect for autonomy, use of visual information, and information that is useful for seniors The first, respect for autonomy, involves breaking the booklet down into smaller sections so that users can start where they want to. They wanted each

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item to be arranged in a random order, or rotated like a timetable, so that users could pick and choose and work on it little by little, depending on their mood of the day. We thought that these small steps would give users a sense of achievement. At times, some users suggested that it would have been better to provide a rationale for having to work on it every day, if not compulsory, or an explanation that would orientate the user. Regarding the second point, 'use of visual information', the users firstly said that the use of illustrations rather than text, wide spacing between lines and simple, clear text were important, they wanted a method that was easy to read and intuitively understandable. They also thought that if the content of the booklet could be viewed on YouTube videos, it would make it easier to visualise specific activities and generate interest. The third idea, 'useful information for seniors', was that even if they think they are not 'ready yet', they are aware that they are getting older, so they would like to know about the problems they are facing and what they will need in the future. They wanted useful information about the problems they are facing now or will need in the future. For example, support information when care is needed, medical information such as how to cope with illnesses, or direct solutions to physical decline and various body pains. Users thought that if these three themes of improvement could be realised, they would be able to motivate and maintain and continue to work on them.

Comparison between European and Japanese opinions on E VITA -devices

Both European and Japanese participants had a positive opinion about the E-VITA experiment.

All of them thought that the devices showed still usability issues to solve before putting the E-VITA system on the market. The large dissociation between the users' high expectations and the actual use of the system caused stress and lack of motivation for the users, resulting in the impression that the system was of a low level. On the other hand, many users expressed an understanding that it is natural that many things do not work well at first, and many users were positive that current problems will be solved in future research, and they also had high expectations for the development of the system and future research.

Japanese and European did not have the same attitude regarding their contribution to the experiment. Japanese participants were concerned about whether they had contributed to the experiment. They felt frustrated and guilty about not being able to use all the devices. They even apologised and reflected, saying things like "I wasn't very helpful" and "I'm sorry." participants had a different attitude. If European participants stopped, using some of the devices because they thought the usability was poor or because they had other activities that they considered more important than the E-VITA system, they did not express any bad feeling about this. They did not express any guilt for not contributing enough to the project.

Both Japanese and European participants had high expectations about the robots. On the one hand, they had a positive feeling because they thought that the robots gave a feeling of presence in the home. On the other hand, they were disappointed by the poor interactions they had with these devices. When they asked questions to the robots, the answers were inconsistent or they were ‘I don't know'. Some users felt that the conversation was bothersome, as when they asked about the weather, they were told that "I am an AI and I can't answer" or "please look it up yourself".
For both Japanese and European participants, the use of NeU was divided into users who enjoyed its use and those who did not use it.

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Both Japanese and European participants were satisfied with the watch. They enjoyed following their sleep score at night and their number of steps during the fay. The ability to view sleep, step count and activity level was considered easy to use and rewarding for the participants. Many users wanted to buy their own smartwatch after the end of the experiment.
Both Japanese and European participants expressed a wish for easier programmes of physical exercises. They noted that the exercises could be too difficult for people with physical disability.
Both Japanese and European participants insisted that training was of crucial importance to be able to use the E-VITA devices. All agreed on the usefulness of human coaches who should be gentle, calm, soft-spoken, friendly, helpful and have good knowledge of the technological devices.
Both Japanese and European participants wished to have face-to-face training sessions and social events on how to use the system. They wanted detailed theoretical lessons as well as practical training at the first information sessions and the opportunity to meet and exchange information with human coaches and other participants. Users expressed the need for face-to-face communication between people.
Both Japanese and European participants estimated that the E-VITA devices should be as cheap as possible. The wish to purchase the system varied from the whole system to individual devices or a set of them.

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4 Discussion

4.1 Discussion of quantitative data

In the Japanese control group, there was a significant decline in SPPB and physical health before and after the study period, whereas it was maintained in the intervention group, suggesting that the use of the e-VITA system helps maintain motor function. In addition, GDS scores tended to decrease in the intervention group before and after the intervention, and significantly decreased in the Japanese intervention group, suggesting that use of the e-VITA system may also be effective in reducing depression.

In the EU control group, there was a significant decrease in the EQ-5D-5L and a significant increase in the UCLA Loneliness Scale score, whereas there was no change in the EU intervention group, suggesting that the use of the e-VITA system is also effective in maintaining subjective quality of life and reducing increased loneliness The e-VITA system is a very effective tool for maintaining subjective quality of life and reducing loneliness.

Possible mechanisms by which conversational robots can improve depression include the following

1. emotional support and empathy

The establishment of an emotional connection between the user and the robot through the conversational robot's empathic response to the user's conversational content is thought to help the user feel more secure and express his/her feelings more freely, providing emotional support and helping to reduce loneliness and depression. In particular, the fact that there are time and time constraints when interacting with a human, but not when interacting with a robot, and that the robot can listen to the elderly at any time, is also thought to help enhance the effectiveness of this service.

2. listening function

Since interaction with the conversational robot begins with the elderly, it is thought that the robot plays a listening role and that talking to the robot itself helps to relieve stress.

3. improvement of self-efficacy

Feedback from the robot and various sensors by the e-VITA system can assist users in setting goals and tracking progress. Achieving small goals may increase self-efficacy and promote positive behavior change, which may also improve depression.

4. support for habit formation

The e-VITA system is designed to help users form healthy habits by providing recommendations and reminders for regular exercise, proper sleep, and healthy eating. Lifestyle modifications may also contribute to the reduction of depression.

5. information and education

Information provided by the conversational robot, such as knowledge about depression, coping strategies, and ways to relax, will help users understand their condition and take appropriate measures.

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The lack of significant effects on cognitive function during the 4- to 6-month e-VITA System intervention can be attributed to the fact that the proof-of-concept study was conducted with relatively healthy older adults, who were chosen for their acceptance of the e-VITA System coach content and for risk management. The reason for this is that the older adults with relatively high health level were selected as the target population for the proof of concept in terms of acceptance of the coaching content and risk management.

4.2 Discussion of usage data

It is well known that JP users are more compliant in studies. EU side had a more limited approach of AI use (due to ethics).

The duration of the study could have been too short in order to detect the effect of the intervention for most of the quantitative Assessments.

The qualitative part of the results gained interesting insights with regard to the use and benefit of the coaching system and approach, and also for the interpretation of the quantitative results.

With ongoing study time and more mature functionality and features of the system, the user experience and thus acceptance became better and better.

There might have been additional seasonal effects, which may have biased in part the results due to the fact, that usually all people are more active during summertime, but less in the winter.

4.3 Discussion of qualitative data

4.3.1 Discussion of qualitative data in Europe

Summary of the EU qualitative results

The participants expressed satisfaction with the e-VITA coaching system but were frustrated because of technical problems encountered with the technological devices.

The preferred devices were the watch and the Netatmo. The preferred activities were to monitor sleep and steps with the watch, to monitor air and temperature with the Netatmo, to do cognitive and physical exercises. Some participants appreciated the robots. They reported that it was useful to provide company and reduce stress. Other participants expressed disappointment regarding the robot, mainly because they did not work as well as expected.

According to the participants, older adults that were frail and alone, with mild physical limitations could be an appropriate target group. However, they thought that users needed good cognitive functions, motivation and familiarity with technology to be able to use the coaching system.

They participants also discussed ethical issues with the use of the technology such as the risk of increasing older adults' isolation, the risk of addiction and the need for data protection. However, they also expressed a feeling of empowerment linked to the use of the E-VITA devices.

The main aspects that would motivate the participants to buy the E-VITA devices would be firstly ease of use and usefulness, secondly quality and price. They noted the positive role of social influencers such as their children and health professionals in their decision to adopt technology.

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They also insisted on the need for training to use the technology and for maintenance and after-sales service process. They emphasised the need for the presence of human coaches for the training and follow-up as well as the benefit of building a community of older adults who can communicate and help each other's.

Comparison with the literature

Previous reviews have investigated the determinants for older adults' acceptance and intention to use technology in daily life. Schroeder et al (2023) have reported that older 'adults' intention to use technology was driven by 6 different categories: demographics and Health Status; Emotional Awareness and Needs; Knowledge, Competence, and Perception; Motivation; Social Influencers; and Actual Technology Features. In their review, the factors facilitating the use of the technology by older adults included healthy body mass index, high income, self-determination, prior computer training and experience, capacity to make one's own choices capacity to set health goals, motivation, positive social support, technical characteristics such as accessibility, usability, cost, system and service quality and design of the technology. On the contrary, the barriers to the use of technology by older adults were physical inability, presence of dementia, fear, anxiety, privacy concern, lack of trust in the system, low knowledge in technology and low behavioural intentions and motivation. The facilitating factors and barriers described by the participants in our study are in line with these results. In another review, Ma et al (2021) reported that perceived usefulness, perceived ease of use, and social influence were correlated with the behavioural intention of older adults to adopt technology. They particularly highlighted that social influences (ie, conversations with family, friends, and professional caregivers) had a strong impact on the intention to use digital technology). Our results also corroborate those by Ma et al (2021). In our study, the older adults also noted the beneficial role of social influencers including their family, the health professionals, the human coaches and the community of older adults using technology.

4.3.2 Discussion of qualitative data in Japan

In the interviews, some interviewees commented that the system improved their loneliness, such as reducing the loneliness of living alone, etc. There was a significant decrease in loneliness in the EU intervention group, but no significant change in loneliness in the Japanese intervention group. In Japan, physical and leisure activity scores increased significantly only in the control group, a result that contradicts the hypothesis.

As interaction with a conversational device becomes a larger part of daily life, people may spend longer periods of time living only in the home, which in turn may increase loneliness and cancel out the effect of reducing loneliness through interaction with a conversational device. In addition, prolonged living with the robot at home may inhibit activities such as going out for leisure or shopping. As for the content of the coach, it is thought that it will be important to provide advice on activities outside the home and to encourage more interpersonal interaction. Considering the time occupied by interaction with the virtual coach during daily lifetime, the virtual coach may be more effective when applied to subjects with a restricted range of activities, such as bedridden or semi-bedridden persons.

The interviews provided many suggestions for improving the system in the future. Many of the subjects in this study had relatively high cognitive function. During the period when the e-VITA system was unstable at the beginning of the intervention, many of them felt frustrated and stressed about the slow response of the conversation system, but after October, when the system began to operate stably, many positive comments and responses were observed. System stability and quick response are

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considered basic prerequisites for virtual coaches. In terms of coach content, needs were seen for coaches that incorporate more recent findings, coaches that are tailored to the subject's level of understanding, and coaches that can address health issues that are more common in older age. There was also a need for the device to provide conversation triggers, rather than just waiting for the user to take action. In order to incorporate these needs into the e-VITA system, it is necessary to consider not only the advantages of adding functions, but also the disadvantages and risk management measures.

4.4 EU and JP Data Comparison

The number of conversations data showed that the Japanese used conversational robots 10 times more than the Europeans. Although there is a difference between Japanese and EU conversational systems in the presence or absence of ChatGPT, there was a greater difference in conversation content than in conversation classification data, suggesting that Japanese and Europeans may be fundamentally different in what they look for in a robot. They often report their actions (meals, events of the day, etc.) as well as their "achievements" of the day. The reasons for reporting are praise, recognition, and concern, and it is thought that people want these things from robots. In addition, the number of reports was higher than the number of questions, especially for spiritual robots. They also confided their fears and concerns more often. This may be due to the impression that they feel comfortable confiding their feelings to a spiritual robot, but since this type of conversation does not occur in Europe, we believe that it is an interaction with a robot that is unique to the Japanese.

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5 Conclusion and Outlook

The development of the final prototype of the e-VITA virtual coaching system to promote healthy aging led to a proof of concept study aimed at evaluating such a prototype in real conditions with healthy older adults in Europe and Japan. The primary purpose of the study was to evaluate the subjective quality of life. The secondary purpose of this research was to evaluate the usability, the user experience, the acceptability and the needs' fulfillment after the use of the e-VITA system for 4 to 6 months at home and to evaluate the effect of the system on the older adult's physical and mental health condition.

The results showed that the use of the e-VITA system could help maintain subjective quality of life and reduce loneliness. It could also help maintain motor functions and reduce depression. When the system has been mature enough to function correctly, the usability, the user experience and the acceptability has been acceptable for older adults. They also considered that the system could fulfill their needs. The results of this proof of concept study allowed us to better understand the impact of an intervention using the e-VITA coaching system in healthy older adults living at home. They also provided some comments and advice that helped us provide some recommendations for the development of a consolidated system that could be commercialized and deployed and for its implementation in older adults 'homes.

We propose some recommendations for the design and implementation of the e-VITA coaching system intended for designers or potential users (older adults, health and social professionals, volunteers that would like to act as human coaches).

Recommendation 1: The overall appearance of the coaching system (especially robots and virtual agents) should be pleasing to the user, stimulating interest and adoption.

If the system encompasses robots or virtual agents, their physical appearance is important, as it influences the device's acceptability and usability. Robots or virtual agent must inspire sympathy and confidence in users.

Recommendation 2: The interface of the coaching system must be simple for the user and comply with general accessibility criteria.

The simplification of user interfaces is a key aspect, especially for older adults who may have little or no knowledge of how to use new communication technologies. Therefore, we suggest limiting the number of applications present on the interface, reducing to a minimum the number of actions required to perform a task, and adding a simple, clear explanation for carrying out the desired action. The addition of different types of interface with varying degrees of complexity will be a plus to reach the maximum number of target users if required.

Recommendation 3: Ensure that the coaching system offers varied content in terms of health programmes and activities that are suitable for a variety of users in terms of topics and level of complexity.

Users expect a coaching system to be stimulating, enriching and as non-repetitive as possible. A lack of content leads to a loss of interest in the tool. Coaching systems equipped with various functionalities (cognitive and physical exercises, nutritional programmes and advice in health topics) therefore need to be updated regularly, with content added for several user profiles.

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Recommendation 4: Design and offer the person specific training in the use of the coaching system

It is mandatory to design a specific training program for the use of the coaching system when it is implemented at home. This training will include theoretical and practical training sessions to learn to use the system, and training material with adapted paper instructions for use (information leaflets in Easy to read and understand accessible format that the person will be able to consult easily.
It is also useful to suggest identifying or implementing human coaches (professionals or volunteers at the regional level) who can help the elderly person use the coaching system and encourage them to use it.

Recommendation 5: Before investing in the rental or purchase of a coaching system, it is advisable to carry out an overall assessment of the potential costs and benefits associated with this type of intervention.

Coaching systems can cost several thousand euros. What's more, their energy consumption may be a source of concern for some users. Before making any investment, we suggest that potential buyers assess the cost-effectiveness and identify the real needs of the end-user, determining whether a coaching system is the best solution for them. One possibility would be to opt for a rental formula with a monthly subscription to test the coaching system and evaluate its effectiveness and user adoption after several weeks' use.

Recommendation 6: Homecare professionals should be trained in the use of coaching systems.

It is important that healthcare, medical-social and homecare professionals are trained in new support technologies for the older adults, such as coaching systems, so that they can take full advantage of them and offer quality care (helping to maintain autonomy and well-being, reduce social isolation, and stimulation activities, etc.). Training should include familiarization with the use of coaching systems, management of the technical aspects of these devices, and configuration and monitoring of a support plan for the person integrating these tools.

Recommendation 7: It is necessary to set up a maintenance service fort the coaching system to be able to help the older adult in the event of a breakdown, and to answer any doubts or questions users may have.

The presence of a maintenance service for the coaching system is essential when it comes to supporting the older adult at home with this device. Older adults are often unfamiliar with the technology and are worried that it may break down. They want to be able to call someone in charge of the coaching system maintenance and technical support for help if needed.

Recommendation 8: As part of the overall support program for the older adult, ensure a balance between technological and human interventions, in order to prevent certain risks or dispel certain fears (isolation of the person or addiction to the coaching system).

One of the desired benefits of coaching system is to maintain and, if possible, develop social ties. It is therefore important to ensure that the presence of the coaching system does not have negative effects, such as reducing face-to-face contact with relatives and professionals, leading to social isolation. It is also important that the person does not become emotionally dependent on the coaching system during follow-up, which would cause him/her potential vulnerability

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Recommendation 9: The framework for collecting and storing data used by the coaching system must be defined before implementation, and potential users must be informed. This data processing must comply with current regulations.

Systems must also comply with the General Regulation on the Protection of Personal Data (RGPD). For European Union countries, the RGPD regulation imposes certain principles, such as limiting the data collected, saved and processed, anonymizing data or guaranteeing individual's access when they wish to consult data concerning them. Those in charge of designing and implementing coaching systems need to take this dimension into account, both by integrating it into the way the service operates, and by informing potential users about it

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7 Annexes

7.1 Detailed qualitative results from the European interviews

European qualitative data from T0 interviews

Expectations from the E-VITA coaching system

The participants reported various expectations from the E-VITA coaching system

Discover and learn new things

- *I want to participate because I am curious to discover something else (F01)*
- *I worked at the Department for the Elderly. We supported projects, such as the impact of education on the health and mobility of the elderly. I have done this for years on the funding side, and I found it exciting to see how a project like this works on the other side (F05)*
- *It was curiosity, because it was a project aimed at older people and I had never done anything like that before, I thought that I had the right age to do it. That's the first thing and the other thing is that I also enjoyed dealing with technology (G07)*
- *We are interested in new developments and that is actually the motive to discover what is new, how life in old age can be made even more interesting, how it can be improved (G13)*

Be in contact and share experience with other people

- *"It is interesting to help and maybe share your experience with other people".(F05)*

Help and be useful for other people

- *On my part, perhaps very humbly, I can contribute to something for people (F09)*
- *I want to participate because it interests me and I want to help make technology easier for older people. I think it is a sensible thing to have so little help in certain areas. I just wanted to contribute to something and I am always curious. (A02)"*
- *I expect this project to help people, to determine how modern technology can help the sick, the disabled and the elderly."(G03)*

Be stimulated

- *I'm interested in the new technologies that are out there and I'm also interested in staying a bit up to date (G06)*

Prevent or overcome difficulties in daily life

- *I've loved having GPS in my life, it has prevented me from becoming totally withdrawn, because I have no sense of direction, it has enabled me to continue to have a normal life. With this robot, I hope to have a kind of substitute or spur so that I can be helped with tasks for which I'm failing (F13)*

Improve one's health

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- *What I expect from this thing, that I might ask it, I want to eat healthy lunches or something with as few calories as possible: "Please give me some recipe suggestions". "What should I do to reduce my weight? Make me a plan. From what I understand, there is a database that it can have access to, and when I tell it, it pulls information from Wikipedia. (G05)*

Have fun and entertainment.

- *It is supposed to be a little fun for me and adapt to new things (G16)*
- *I saw that there might be a fun part.(F01)*

Expectations from the human coach

The participants expected that the human coach could explain all the functionalities of the E-VITA devices to them, provide experience in E-VITA devices, be able to answer their questions, help them in stuck situations.

Previous devices and functionalities used by the participants

The participants reported that they already used computers, tablets, smartphones. Some of them also used connected watch. The participants insisted on the high cost of technologies.

They used the following functionalities of the devices:

o Smartphone

The participants used calls, messaging, mails, geolocalisation

- *"I have no sense of direction, so the GPS helps me a lot;(F09)*
- *I use the Smarphone for WhatsApp and SMS (F07)*

o Smartwatch:

The participants expressed satisfaction to know the distance travelled on foot thanks to the device but they noted that the use of the device could be addictive.

o Computer

The participants used the computer to read journals online, watch films, listen to and concerts, take classes (drawing, gymnastics, and foreign languages) and do administrative work

- *I read newspapers, at least the headlines. I do the simple things like cooking recipes. I read my e-mails because we have quite a few e-mail exchanges. And then there's all the administrative stuff (F07)*
- *I buy a train ticket on the computer, I also check the timetable (G16)*

o Tablets

The participants mainly used tablet to read books.

Use of voice assistants

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Some participants noted that voice assistants could be useful in different situations

For people with visual disorders

- *There is the mother of an acquaintance, who is now 99, has macular degeneration, so it looks bad, she uses Alexa and is now very happy with it, so for her it's a great help. Yes, but it's the only one."(G06)*

To have fun and have shared activities with others, especially grandchildren.

- *"I use it very little, just a little now and then, but it only amuses my grand daughters (F05)*
- *My niece has such a thing and I think it's kind of funny, but - I didn't think to buy one."(G01)*

To listen to music or podcasts or to learn and speak other languages,

- *I want to listen to music as it works pretty well; occasionally podcasts, because I've also become a fan of podcasts (G07)*

Most of the participants reported that they had little use of them because they were not interested in this type of device.

- *"I don't use it at all because maybe I don't know how to use it well, and I'm not really interested".(F01)*
- *, the first time I tested it myself, yes. Yes, my conclusion is, I said at the beginning, I wouldn't personally buy such a device, because I have other mediums for information and I don't need an interlocutor (G12)*
- *"I don't really use them."(G13)*
- *We don't have Alexa or anything(G06)*

The main reason was that they preferred writing and reading rather than listening to a voice.

- *"Yes, but very little. I know that some of my friends are always saying 'Ok Google', but no, I'm not really an 'Ok Google' fan". It's true that it's very practical but I've always favored the visual.(F07)..*

Definition of quality of life

The participants noted that good quality of life included to be in good health, have good relationships with family and friends, maintain and develop oneself, like what we do, increase one's knowledge and culture, be at peace with oneself (religious aspect).

- *"It has everything to do with the emotional and relational side, that's what's most important for me in life. Then there is the knowledge part. "(F01)*
- *It's very important to love what you do, and to include it in your daily life, and to do everything you can to stay healthy (F09)*
- *Quality of life means being able to do what you want, when you want, on your own or with a little help, without weighing you down (F13*
- *A minimum of physical well-being. Being well with people; having good relations with each other. And then being at peace with oneself,(F14)*

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- *To maintain and develop oneself, that's why it's so interesting (F15)*
- *Quality of life, it is not suffering, living in a good atmosphere, and having good company(F20)*
- *What is most important is that you have a roof over your head, enough to eat, and social contacts. And then comes the last thing, to be able to travel (G01)*
- *Quality of life is the possibility of living my desire. Therefore, financial independence plays a role, physical health, mental health, the ability to have contact with other people, and ability to travel (G02)*
- *I want to have a roof over my head, to be healthy, to have something to eat, to be independent in my movements, to make my own decisions about myself in my environment, which means I'm also fit in my head. Of course, I want to have a man by my side who loves me (G03).*
- *it's basically health, partnership, financial security, environmental security and the opportunity to be active(G06)*
- *For me, quality of life is also harmony, contentment in everyday life, with the family, that is, with my wife, then also with everything around the house the garden and seeing that everything is so good and just (G11)*

  For me, it is actually that we can live here independently and take care of ourselves, get around, be mobile, mentally fit and that we could also go on vacation from time to time (G12)
- *staying fit, no, being able to move, not having major health problems as much as possible, but also - keeping mental agility, - being interested and going to the theatre and concerts (G13)*

Taking care of health

The participants noted that taking care of one's health included to play sports (walking), pay attention to what we eat, have good relationships with those around us such as family and friends.

- *It is sport, where I place a great deal of importance, because I've really come to realize that it's perhaps thanks to sport, and table tennis in particular, that I've been able to recover my back and walk.my autonomy for me is really something crucial (F01)*
- *I am keeping up my physical exercise and paying attention to my diet. On the emotional side for the moment, I have loving children who are very kind to me, and a very attentive husband because otherwise we decline a bit too quickly".(F02)*
- *Taking care of health is to continue to have physical activity, pay attention to your diet, have nice relationships with the environment and family. There is also the health check-up. I have one every 3 or 4 years (F07)*
- *I try to eat consciously, I take organic produce as far as I can afford it, I eat low fat as much fruit and vegetables as possible, although it is always difficult with vegetables, but lots of fruit. I don't tolerate much alcohol anyway,(G01)*
- *I pay attention to nutrition. We go out into the fresh air, we go on motorcycle trips, we go cycling when the weather permits (G03)*
- *Diet and exercise. Those are the key points. I regularly do gardening. It iis also physical exercise. We do a lot of hiking (G05)*
- *I drink less alcohol, almost no wine. Yesterday I drank a bottle of beer, which doesn't happen every week (G12)*

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- *I am already trying to be a bit more conscious with my diet. In the past, I had certainly eaten more meat; I have now reduced that and I eat fish and salads. I used to smoked cigarillos for a long time, it was a pleasure to smoke, but I gave it up after the stroke. I try to regulate alcohol consumption at weekends. I practically have no consumption during the week (G13)*
- *I almost exclusively eat vegetarian. I do my gym every morning G16)*

European Qualitative data from T2 interviews

Experimental/intervention group

Social aspects

Overall opinions about the experiment and entire system (How do patients/participants perceive the technology under assessment?)

The participants expressed satisfaction with the experiment of the E-VITA coaching system:

- *"The result of the experiment is quite positive, because everything worked very well together. It was exciting, that when you sat down in the evening and you looked with your cell phone at this and that, what was going on, so I found it nice, pleasant and enjoyable. (G05) »*
- *"I was very interested in individual services and devices. I thought the project was okay with very nice support. I think you did a good job. (G06) »*
- *"It was an interesting experience for me getting to know such a system "(G16)*
- *« It has been a very positive experience and the icing on the cake was that the team of researchers was very good) (F09).*
- *"It was a very interesting experience. And it gave me time to think, and to see and meet interesting people." (F15)*
- *I was very satisfied about the assistance and participation.(I01)*
- *I really enjoyed the experimentation,.(I01)*
- *Everything was new to me, I found many positive aspects (I06)*
- *I experienced them in a pleasant way, I enjoyed participating in the project.(I18)*

Some people reported that using the devices provided fun and entertainment

- *« It was a good experience. I had fun and entertainment with the robot and coaching programme (F14).*
- *I enjoyed the project and enthusiastically participated in all the activities (I11)*

Some people were satisfied because they usually participate to weekly or monthly activities for which they go outside, whereas, thanks to the E-VITA coaching system, they were able to do activities at home every day and whenever they wanted:

- *"I do workshops at least once a year. OK, but it is punctual while this device is integrated into daily life, so I like that. I find it interesting and part of the routine of life". (FO2)*

Some people thought that the experiment was positive because it was challenging for them

- *I found the project challenging and it challenged me with myself; I found perseverance in going to walk. I am satisfied with the project, I wish I had given it more time (I17)*

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Some people were satisfied because the E-VITA system helped them to fill their goals

- *I am satisfied because the system has helped me to keep certain aspects under control, such as sleep and physical activity (I02)*

Some people were satisfied because their family was happy to see the increase of their activity thanks to the device.

- *I am satisfied with the project, the children were enthusiastic because they saw me more active (I10).*

Limits of the E-VITA experiment and system

Most of the people reported technical problems encountered with the use of the E-VITA devices..

Indeed, few people had no difficulty to use the E-VITA devices

- *"The devices, including this smartphone and tablet, were easy to use, so there were no difficulties. Then, we know that in other contexts too. Therefore, in the end, I always threw myself into the thing. That was the general experience" (G13)*

However, many participants had a mixed experience of the experiment due to technical problems with the E-VITA devices

- *I was not completely satisfied from a technical point of view, too much system instability. The clock should have been simple. it was too complicated for me. I did not know how to look at some data. (I18)*
- *"From my point of view, I would say I was 75% satisfied of the functionality of most devices. For the most part, the remaining 25% of dissatisfaction were due to the Nao because it was not compatible with the other devices. The other problem was related to the fitness wristwatch, because if I got up at one in the morning and worked on the computer for an hour, and it told me "you have had a deep sleep", then something was wrong with the clock" (G02)*
- *"I am satisfied at 90 percent. The remaining less satisfying 10% are due to the technical problems, the programming of the Nao and the lack of communication with the other participants" (G07)*
- *"Well, it was a good experience. I was a little disappointed in the end. The device didn't work as well as you'd expect »(F07)*
- *"In the beginning, it was exciting because of curiosity. You also invest a lot of your time because you try many things. Your support was good. However, over time, some things turned out with the technical devices, which did not work, which then reduced the enthusiasm and motivation a little. But we're still on the right side overall" (G02).*
- *"In my opinion, the project was good, but there were several technical problems that did not allow me to use it to its full potential" (I07).*

Some people even expressed negative feeling of the E-VITA device due to technical difficulties. They expressed disappointment that the system did not meet their expectations. The gap between the expectations and the actual use of the system induced frustration, loss of motivation and reduction of use of the E-VITA devices in these participants.

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- *"I will tell you that I have a great disappointment that with such a low production. For me, a project like this still belongs in the laboratory. It was not mature enough yet" (G07)*
- *Unfortunately, in the last month I think there were technical problems because nothing worked anymore and I had to stop using it (F20)*

Technology was difficult to use for people who were not familiar with it:

- *« As far as the devices are concerned, I found that if it was difficult to test. For people who are aging and not familiarized with technology, we were a bit lost and it was a bit complicated » (F05)*
- *"I had these technical difficulties with the control box. Therefore, I think this control box is certainly still very capable of improvement in terms of software, but of course, I am aware that this project only has limited resources. Therefore, I thought it was unsatisfactory (G06)*
- *In my opinion, the components were very difficult to use. I had technical problems. You came here once, then briefly showed me how to do it. There was nothing better in return. Therefore, it was really very disappointing.(G07)*

Some people reported that the use of the technology might be burdensome because of the time dedicated to enter the many passwords.

- *Sometimes there were a few irritations, when I checked an app, I was supposed to enter my username and password and something was already saved, but it didn't always show up and I'd get an error message and all that. When logging in, these problems were existing from time to time (G13).*
- *"I had problems with too many passwords. I would have liked it to be harmonized in the same way that I have it here with my own devices, that I actually have the same password for the different devices and applications. It should have been a bit quicker and easier to use" (G07).*
- *Sometimes the mobile phone would disconnect from the network and ask for a user and password to log in (I06).*
- *However, there were some technical problems, e.g. I had often to re-enter my password to log in (I11)*

The use of the E-VITA system was burdensome for some people because of the time requested to charge the battery

> *"There are a lot of devices and you have to charge them all the time: my own phone, your phone, the watch, the tablet and so on (GO7)"*

The older adults who could not keep some pieces of the coaching system after the end of the project regretted it.

- *I found great usefulness in the project. I regret that at the end of the project nothing remains in terms of material (photos, videos, exercise sheets). Guidelines for proper lifestyle would be helpful. I have used the system in all its parts, (I16)*

Some people would have liked to receive more incentives for their participation in the project

- *I was hoping for more cooperation and also some more gifts, it would be nice if at least one dinner was offered (I01)*

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Opinions about the appropriate duration of the experiment

Some participants made comments about the duration of the experiment.

The users thought that a period of 2 to 3 months was enough to test a device:

- *"I thought the experiment was a bit long.."(F01)*
- *"it doesn't have to be as long as 6 months, 2 and a half months will be enough to test the devices"(F09).*

However, they insisted on the need for long-term experimentation to test the benefits of the virtual coaching on health and quality of life

- *"I'm a bit dubious as whether the brevity of the project actually provides insights that will help you move forward, because I could not imagine that even if you do exercise and walk every day, you feel, see, and recognize an improvement after three or four months - I would hardly think it possible. I think you could have run the project, not necessarily as a long-term study, but maybe a year or two" (G05).*
- *« I think that the experimentation should last 1 or 2 years to find a real health benefit (F07) ».*

Opinions on the E-VITA devices and functionalities

<u>Preferred devices</u>

The preferred devices were the watch and the Netatmo. The preferred activities were to monitor sleep and steps with the watch, to monitor air and temperature with the Netatmo, to do cognitive and physical exercises.

- *"The sleep control, air control and exercises. These are the devices that have helped me the most.(G01)"*
- *This Netatmo and this Neu band, I do not need either of them. Therefore, the watch is what I found most useful (G06).*
- *I always wore the watch and when I could I did the gymnastics exercises (I01)*
- *I mainly used the E-Vita system to monitor sleep and steps(I11)*
- *In general I appreciated the watch and the phone (I15)*
- *I am satisfied with the watch and the phone, I would keep all the functions of the watch (I18)*

The activities, which were less used by the participants, were the recipes app and the social platform.

- *I would keep all the apps except the recipe app and the social platform which I did not use (I18)*
- *I do not care for the recipe app and the social platform. (I15)*

<u>The robots</u>

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People had opposite opinions about the robot. Some appreciated the robot while others disliked it.

- *I especially liked the robot (I01).*
- *I did not appreciate the robot (II15, I18)*

As far as the appearance of the robot was concerned, one participant suggested to provide a more human-like robot:

- *We notice that too, especially in geriatric care, also in gerontopsychiatry, we give the residents like rag dolls or where they nest or make some, there's a reference, but I can't put a robot like that in their bed. Yes, yes. Therefore, it should be either bigger, or more human, sometimes even more tangible. Yes, so that means these rag dolls, you can touch them, you can stroke them, there is no.... Moreover, that is what is missing. People lack warmth and touch. (G10*

The NAO robot

The participants who appreciated the NAO robot reported that it was funny and pleasant to have a robot at home. They noted that it was like a living creature for them and they missed it when it was gone.

- *The robot was nice when it said hello. It was part of the home, of the household. It was part of a modern home (F15)*
- *It is true that having a robot like that at home, it would be nice, yes (F07)*
- *I especially liked the robot. I used it every day, at least a couple of hours a day (I02)*

Some participants reported that the robot was useful to provide company and reduce stress

- *In addition, NAO kept me company and calmed me down when I was stressed or nervous (I02).*

Limits of the robot

However, some participants expressed disappointment regarding the robots (NAO) because they did not work as well as expected. The robots did not understand the questions and did not answer enough properly. Therefore, they were frustrated and reduced the use of the robot.

- *"I ask the robot a question and it says: thank you for the question. I will think about it and answer you but he never answers me (F07)"*
- *« I was indeed expecting more from the Nao. We would always ask it: how could you help, what can you do?. It was just in a few situation, that its statements were very helpful. I really expected more of that »(G 05)*
- *At first, it was interesting to have such a robot in front of you, but when I looked at it more closely, the deficits became apparent. It only understands a fraction of the questions you ask it, and if it gives very poor answers (G16).*
- *If we start with the Nao, every time I played a little bit, yes, I watched what it reacted to, I asked a few stupid questions, but that calmed down over time, because there is not much to*

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get. But of course, in general, the way a robot like this reacts to the environment, that's interesting, yes (G16)

- *"I enjoyed the robot but was disappointed. I thought that it would do more than what it actually could do (G06)".*
- *I was not satisfied with the robot. Sometimes he spoke in English and did not give in-depth answers. (I15)*

The Gatebox

The participants were also disappointed with the use of the Gatebox. They reported that the robot gave poor answers to their questions.

- *« I was disappointed with the Gatebox., I found it could do relatively little (G06 »)*
- *It did not give enough appropriate answers (G10)*
- *With this Gatebox, what I found very annoying is that if it's on for a while, then it doesn't respond anymore.(F04)*
- *I only used the robot for a few weeks, but I didn't find it useful so I gave it back (I14)*
- *When I asked what the weather was going to be like today, I got a reasonably correct and understandable answer. Nevertheless, if I asked what the latest news is, there was some gibberish coming out. It was quite uninteresting from my point of view (G13)*
- *I did not find the Gatebox useful. (I04)*
- *Unfortunately, the GateBox I used a few days and then requested that it was taken away as I did not find it useful (I10).*

The Celeste robot

The participants who could have the Celeste robot also had usability issues with this robot.

- *I liked the robot, although there were some problems, but I had fun. I used Celeste to ask him some questions, but he did not always have the answer. In the last period, I used it less because the app stopped working and Celeste was very repetitive. (I18)*

The tablet

Somme participants thought that there was an overlap between the tablet and the smartphone and only used the smartphone. However, some participants preferred to use the tablet rather than the smartphone because it was easier for them to read on a tablet than on a smartphone because of visual impairment. Most of the participants used the tablet for written communication:

- *I would prefer to have the exercises and activities on the tablet rather than on the smartphone where it is more difficult to read than on a tablet (F09).*
- *I'm sure that if the apps had been on a tablet, I would have used them a lot more, I'm convinced of that."(F02)*

NeU device (headband)

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Some participants were satisfied with the Neu device and used it. They were interested in checking their cerebral waves.

I also relatively enjoyed the Neu ban. There were few games available (F07).

- *I used NeU for a lot for cognitive exercises; it was fun (I19)*

Other participants did not use it either because they did not understand how to use it or did not find any usefulness for them.

- *This device for measuring brain activity, I could not do much with it because I did not understand what it actually measured and I did not have any incentive (G06).*
- *I am not very happy with the headband. I just don't know how to use it."(F01)*
- *I tried the headband three or four times with a few games. The games are certainly not wrong, but they actually have nothing to do with the headband, you can do it on your own on your smartphone or computer (G16)*

The smartwatch

The participants preferred the watch among all the devices. They found that the display of their number of steps on the watch was a good incentive to improve their performance. They were also interested in having feedback on their sleep.

- *I used mainly pedometers. Therefore, I have really been doing the 10,000 if not more, every day (G01).*
- *That is the watch I liked best I am going to miss it. I think one of the nicest things was that I was able to read the clock at night without turning on the light (G06)".*
- *I have used the watch the most, because it worked automatically (G07)*
- *Thanks to this wristwatch, I can always see how much I have moved that day. If II stay under 6,000 steps, then the reminder tells me to get up. These are very simple tips, but certainly useful (G16).*
- *"The watch helps me a lot. I attach a lot of importance to it. The number of steps I take in a day helps me a lot because I say to myself "Oh well, I had set 10,000. Now, I am more at 15,000. Just a little bit more, move around a bit". It is stimulating "(F01).*
- *"The connected watch helped me a lot because I wanted to force myself to take a certain number of steps (F05).*
- *The watch and the phone were the 2 objects that I've used. I used the step counter a lot. It helped me to walk (F14)*
- *I used the watch to monitor my sleep, and the pedometer motivated me to walk more. The heart-check function was also very useful, because I could tell when I was nervous or stressed. I used it daily, always in the same way. There was no particular change in usage over time (I02)*
- *Overall I am satisfied, the watch has helped me keep active and monitored (I20)*
- *The function I used the most was the pedometer (I14)*

Some people even reported that they could buy a watch after the experiment.

- *This watch was quite beautiful. I was sometimes tempted to buy something like that (I05)..*

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Limits of the watch

Some participants reported that the watch had limits, as it sometimes was not able to detect activity even if the participant was exercising.

- *It lacked some precision in my opinion. For example the watch did not detect when doing light exercise, such as yoga, it did not mark any activity (I06)*
- *I monitored walks with the smartwatch and I must say that it was very accurate up to 15,000/16,000 steps, beyond this threshold it lost accuracy (I09)*
- *The system was not detecting when I was exercising despite increasing my pulse (I11)*

The Netatmo.

The Netatmo was also very much appreciated by the participants. They reported that this device helped them to have a better idea of the CO2 content in their house and to improve its ventilation.

- *To check the sleep, because I sleep so poorly, and to work on it, I have found these air measurements with measurement of CO2 content very important and very useful. I have become much more aware of how often I need to ventilate. I have taken better care of sleep, weight control and exercises (G01).*
- *It was this Netatmo, it would always contact you on its own, and give you data. Then, here's this watch, I used it every day and even then, I always paid attention to what it was telling me. So that's what I always used.(G13)*
- *The only thing was always that CO2 value. It was always the thing that was often not good. I would never ever have thought of it before. (G13)*
- *I think that the Natatmo is good. I looked at my data again yesterday. Especially now, as Ii is cold, or I say, am I warm enough, or too warm. It's interesting to see the assessment we're given, I think that's good and interesting."(F01)*
- *I really thought the Netatmo was a gadget but during the heatwave, it really helped me a lot. As I have thyroid problems. I do not realize how hot it is in the house, and the same in winter I do not realize that it is cold and in fact, this little device tells me (F02)"*
- *I like Netatmo a lot because until now, I used to open my windows in the morning and at night. Now I have learned that after 2-3 hours, you have to open the window because the difference in CO2 is enormous (F09).*
- *I used the oxygen check function and temperature a lot (I18)*

Opinions on cognitive and physical exercises

The participants appreciated both cognitive and physical exercise, which they found useful.

- *« It was exciting; I was sitting and doing my exercises several times a week (G05)*
- *I did the exercises very often, the rest of the system I used less and less as I did not find it useful.(I12)*

Limits of the exercises

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They provided some pieces of advice. They thought that it would be useful to have a greater variety of cognitive exercises

- *« After practising for some weeks, I realized that the exercises were always the same, I got a bit bored I had the impression that after a while, it was mechanical." (F07) »*
- *I would have liked more cognitive games in the application (I3).*
- *Also I used the Neu system for cognitive games, I was fine with it, but I used it for a short time because the games were always the same (I15)*
- *I also relatively enjoyed the Neu. There were few games available. The exercises offered could have been better, longer and more varied. The first few times the Neu games were not understood well and the guide was only in English, so a manual should be made in Italian and more games added because they were repetitive and they never increased in difficulty. (I20)*

The participants asked for more physical exercises in the E-VITA coaching system

- *I found the gymnastics repetitive, it was always the same exercises,(I04)*
- *I did not find the exercises proposed by the system useful: I go to the gym and walk a lot every day, I don't have time to do anything else. Occasionally I tried, but they were very repetitive Also, I would have liked to have had more exercises, they became repetitive after a while (I06)*
- *I liked the physical exercises but I found them very repetitive, after a while they bored me (I20)*

They noted that some physical exercises might be a bit too difficult for older adults. They thought that older adult with physical disability would not be able to do these exercises. The physical exercises should be tailored for older adults who are less fit than younger people are.

- *"It certainly makes sense to offer older people gymnastics that take into account the fact that older people don't move as much or have as much energy as younger people. If it is aimed at older people, it would certainly make sense not to scare them off by asking them to do things that are actually aimed at younger people. For example, push-ups and stuff like that" (G07)*
- *you have to be in good shape to do the physical exercises that are proposed. I cannot lie on the ground anymore to do gymnastic (F01).*
- *I wasn't able to follow the exercise suggested (I01)*
  I also enjoyed the gymnastics exercises, although I did them very little, I should have tried harder(I18)
- *The exercises needed to be more precise, (I11)*

Some people had difficulties to do the physical exercises and were afraid of even hurting themselves

- *. I don't use the app for gymnastic exercises because I'm afraid of hurting myself, I tried it once but I felt pain and from that day on I got scared (I11)*

<u>The Nutritional programme</u>

The participants provided good comments about the recipes included in the nutritional programme.

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- *What was interesting was that when you were looking for recipes, there were these suggestions, particularly of vegetarian, vegan, vegetarian dishes. That was actually a good thing. That was very interesting (G13)*

Limits of the nutritional programme use

However, most of the participants reported that they did not use the nutritional programme

- *yes, the recipes but I haven't done anything (G10)*
- *I would keep the system as it is, but personally I would remove the function of recipes and nutrition, which was not useful for me (I02)*
- *I did not use the recipe function, that for me can also be eliminated (I04)*
- *I would eliminate the nutritional aspect, which I personally have never used. (I08)*
- *Unfortunately, I did not find real help regarding nutrition as the recipes were not practical and simple (I10)*
- *I failed to follow the advice regarding nutrition (I12)*

Recipes were too difficult to do according to the participants

- *The recipe book, I think it is cleverly done, so you can really put together a book with all sorts of things, with lots of possibilities. Now, I think for an older person, who's also interested in cooking, who's interested in recipes, that they're now looking at this, this variety of details and so on and the connections, the links and so on, if that's so suitable for an older person, I dare to doubt it. Therefore, I did not enter my own recipe. It was too much for me, yes, embarrassing, no. , for someone who, who now has the goal of creating such a cookbook themselves, it will be interesting for them, no. But for an older person who maybe still has a partner or maybe even lives alone,(G13)*

People already have their habits and do not want to change habits

- *I did not do it (the recipes). I have a collection of recipes here, I have my chef on my smartphone, I have my wife (G02)*
  I more or less have my set program, or rather I take what I have in stock and do something with it. You could also say the other way round, I have a few standard things that I often repeat and sometimes I try something new (G16)
- *I have had a look at what is on offer. I have to say that I have a relatively fixed schedule of what I buy. I behave differently in the market, where I buy what I see. For that matter, a recipe always assumes that you have this and that, which you usually don't (G16)*

Some people were not interested in cooking.

The nutrition aspect, on the other hand, I have followed it less because I already do well with the one I follow and I do not feel like cooking (I09)
I have not often consulted the alimentation part as I do not cook.(I16)
I would keep all the apps except the recipe app and the social platform which I did not use.-(I18)

<u>The social platform</u>

Some participants did not use the social platform

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- *I used the social platform very little (I04).*
- *I would keep all the apps except the recipe app and the social platform which I did not use (I18)*

However, some older adults insisted on the benefit to have contact with the other participants during the experiment.

- *"We met once or twice at the beginning and now at the end but we could have met again in between. What I missed most was that contact with others. Also because I, I know it now through work or something. If all you talk about is WhatsApp or something like that, there is something missing. When you actually sit together, there is also a completely different feedback in the communication, one or the other for that matter, so you are also more relaxed and relaxed. This could be better done in a future project" (G10).*
- *I really enjoyed the days held in presence with other users (I10)*
- *I was sorry that the community was not created among the various users (I11)*
- *In my opinion another thing that should be improved is the social aspect to be able to stay more in touch with other people (I10)*

They noted that such experiment was a good opportunity to build a community between users. Thanks to this community of users, older adults could help each other's in case of technical difficulties with the E-VITA system and make friends with others participants.

- *« For XYZ reasons, we didn't have the human coach to talk to as often as needed. Therefore, we just did it between us. We managed to find little solutions for our technical problems. So that was good." (F02)*
- *« I'd like to congratulate the people who are recruiting and who say "gather round" because, in fact, we're with each other's practically every day and whenever we have a little problem, we call the others to have advice and that's what makes it so lively."(F09)*

<u>Sensors</u>

The participants did not want the sensors in their home

Suggestions to improve the devices

The participants provided pieces of advice to improve the E-VITA system:

Customize devices*:*

- *Therefore, I expect a robot that is more user-friendly, more reactive, that's for sure and better adapted to what we can expect from robots at home. It is true that this can be a very interesting, interactive, interesting and friendly link. We need a robot that's more customizable and therefore more interactive and more profitable (F15)*
- *What I think would be really good would be an alarm clock (G01)*
- *But if such a humanoid figure stands in front of me, who speaks directly to me, then moves and says, do this for me, that would be an incentive for me - even as a healthy person - to do something.(G02)*

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Provide advice according to health objectives

- *"Someone who reviews all areas in turn once a week or once a month or asks questions about them (G10)."*
- *For example, my watch tells me from time to time that maybe it's time to do a bit of brain training, so it reminds me that there's no alarm, and that's a shame, because in fact alarm systems are a bit like medication, for walking, for activity, that's good too. It was good to be reminded by the watch to move, whereas I would have expected that, yes, as a request."(F13)*

Create a reward system to encourage participants:

- *"A points system or something like that should be created. When you have reached a certain number of points, you have reached your goal. We are hunters and gatherers (G10)".*
- *I have a French application that works with characters. If you have done the task right, it will jump in the air... Super awesome, ten tasks solved without error, applause. At the end of the month or within the week, it says great, thumbs up or something. Visual stimuli like that eventually get to me (G02)*
- *The voice assistant could motivate me by acknowledging - just as the clock determines after a certain amount of time - that it has not moved. That is, if the two data systems or recording systems are coupled to each other, that it then says, talks to me and says, hello Axel, you have been sitting for a long time now, let us move. Why don't you stand up? Or come on, let's do the following exercises. No, from my point of view, that would motivate me a lot more than when the watch vibrates and then says, you've been sitting for an hour and a half now, it's time to get up, as it did (G02)*

Provide more medical information

- *However, I hoped there would be more medical aspects, that I would be provided with health information (I08)*
- *I would also have liked some medical aspects, some medical advice (I15).*
- *Guidelines for proper lifestyle would be helpful (I16)*

Give a regular summary of results to boost people

I think results should be shown every month listing what you have improved and worsened in in order to keep motivation high (I09)

Use of the technology

Target population for the coaching system according to participants

Some participants thought that the E-VITA coaching system would be appropriate for older adults who have some physical limits:

- *I think it is really for people who cannot move and have real limits. They also need to be motivated. Therefore, the right target group who are reduced mobility and want to become better. (G05)*
- *I think that people that have limits are a target group for me. They should be supported by the system (G02)*

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The E-VITA device could also be useful for frail people, who are alone at home, and who are at risk of becoming depressed:

- *"The optimal target group would be the older adults who have limits: obese people with high blood pressure, those who are single and have few contacts because they can't go out anymore, because they're frail, because they have limitations on their legs or whatever "(G02)*
- *"No, I think it is something for someone who is alone and more limited, so has less opportunity to actively organize their day. They are people who live alone and I think they are physically handicapped, because then you are also more susceptible to depressive moods and you need encouragement. Then, I think a device like this could help. I can also imagine that it will really be something like a pet" (G06)*

However, participants noted that there were some limits to the use of the coaching system. For instance, the coaching device could not help people with severe physical limitations unable to perform activities of daily living. For these people, the E-VITA system could not replace human care:

- *"Now I'll take the guy who can't walk well anymore, who sits here more or less all day, watches TV because he can't do much and he's kind of dragging himself through life. What kind of help is it, if he can barely find his way through everyday life, so to speak, unless someone comes along and buys me something and I can crack a fried egg in the pan? What is the use of a recipe for - from Japanese chicken or chicken or whatever? In my opinion, nothing at all" (G07).*

Another limit for the use of the coaching system would be impairment in cognitive functions. The participants noted that people needed good cognitive functions and motivation to use the system. :

- *"People should not be too old, too disabled, definitely not, neither intellectually, nor physically, to be able to do the physical exercises that are proposed by the device. In addition, if you're already in a withdrawn mood, you'll quickly put the system aside (F01)*

People should also be familiar with technology to be able to use the coaching system.

- *"Older people who are not necessarily familiar with computers. It's a bit of a hurdle" (F05)*
- *"For someone who's not so refined and has so much experience, I think it's easy to feel overwhelmed (G01)*
- *In my opinion it should be used by older people who are familiar with these devices, I have often encountered problems that I didn't know how to solve myself (I08)*
- *I am generally satisfied with the services on the phone, even though they were too difficult for me to use. In my opinion it should be offered to people who know how to use technology better than I do (I18).*
- *I think it is useful for very sedentary people who need to move around, but need to be familiar with technology (I04).*

Some participants insisted on the need for being motivated to use the E-VITA system

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- *The ideal group for me would be older people with less commitments and more time to devote to it (I07)*
- *Some participants insisted on the need for motivation to participate*
- *Therefore I think the ideal group is people with more time and a lot of desire to get involved. (I14)*

According to the participants, the E-VITA device would be appropriate for people between 70 and 80.

- *"In the 70s, 75 years now, it depends on each person" (F01)*
- *"Seventy-eighty. I think it could be, that's the age range I'm actually" (F13)*
- *"However, I couldn't say right now, whether it would have to be under 60 or over 70. Being over 70 is difficult anyway, because a lot of people are not so familiar with technology" (G07)*
- *The ideal target group might be people in their 70s and 80s.(I06)*
- *I would recommend it to people in their 70s who need to be active (I15)*

For which purposes was the technology used?

The participants explained that they use the E-VITA device to check their vital signs and record their activity.

- *"I think the E-VITA system can be useful to check my vital signs. Clearly, I used the clock to look at how long I sleep, to remind me the pills I need to take, to look at how often I moved when I did sport, how high my pulse went, what calories I burned and so on" (G02).*
- *"To record activities. Therefore, I really did everything that I did when I went for a walk or when I went for a run, that it counted the steps "(G05)*
- *To monitor my daily steps and to realise when I was failing to reach my daily goal. I have always been consistent over time (I06)*

To increase their mobility

- *I think it is useful for an active older adult for moving around more (I14)*

Another goal was to improve one's health

- *"Taking care of your health at a certain age is good, really. Yes, it is good". (F15)*
- *the goal for me was to improve my health, as far as more mobility or incentives -- to get incentives that keep me on my toes, let's put it that way((F01)*
- *Actually, for -- yes, for wellness, basically. So it also means, well, I've, oh well, here I always look at it. Right, there - I always paid attention to how many steps I took, another one and (clears throat) how's my pulse, questions, so I always checked, how did I, what pulse do I have all the time (G10)*

How much were the technologies used?

Most of the participants used the watch every day

- *Daily use of the smart watch and C02 sensor (F &G participants)*
- *Every day for the watch (G01)*
- *It then became a bit of a routine, so I would only use the things that attracted me the most, i.e. pulse, oxygen level, sleep, I was always looking, every morning, or when I was sleeping at*

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midday, what phases of deep sleep or other things to compare, how, how rested I feel. I used it a lot (G02)

- *The watch, I use it all the time, every day (F02)*
- *But I watched every day.(G20)*
- *I used the watch a lot. Every morning, I watched how it was with sleep. The steps, the counting of steps (G06)*
- *Actually, I wear it every day. In the morning, it was almost a ritual, (laughs) get up, go to the bathroom and then, then it did that, transferred some data, then I still looked closely, is there any new information, how did I sleep, what is the ambient temperature and then later, depending on that, now with this, What's it called? With the headband, I always did the exercises (G10)*
- *Actually, every day. I look there every day and then, as the case may be, I look here during the week to see how it is going. So, with the smartwatch (G10)*
  I used the watch daily, always in the same way. There was no particular change in usage over time (I02)
- *I have been checking the parameters daily (I09)*

They used the other devices about three times a week

- *It was like two or three times a week (G13)*
- *"It was about three times a week. (F07)*
- *About 2 to 3 times a week" (F01).*
- *I use the watch and the cell phone every day, the airspace checker, not every day, but every time I got the impression, oops, it's, look at it and so, when it lights up green, and the Nao, not quite as regularly, because I've just noticed, already at the beginning, that you don't get much benefit from it (G05).*

Some people used the devices occasionally

- *Unfortunately, it came at a busy time so I used it very little, just to monitor steps and do some exercises on Sundays. Then depending on my schedule there were periods when I used it less (I07)*
- *I used it very little. It was a period when I had several family problems. However, the overall judgement is positive. I certainly could have been more committed and moved around more (I14)*

Some people had already many activities in their life and did not find time to use the E-VITA coaching system. They regretted that they could not use enough.

- *"The overall judgement is positive. I think it is useful for an active old age and for moving around more. I certainly could have been more committed and moved around more" (I13).*
- *I think it is a good project. Unfortunately, I did not have much time (I14).*

Some people stopped using the devices at the end of the project

- *In the last few months I have had leg problems and stopped doing the exercises and walking, in fact I have used it very little in the last period.(I08)*
- *At first I used the gymnastics app a lot, then it stopped working and I didn't use it any more.(I18)*

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Efficacy of the system

The participants reported that the E-VITA devices was useful for them to check their vital signs and activity, to boost them, to help them increase their activity and improve their well-being. They noted that the E-VITA devices could

Provide information on thire environment by monitoring the cO2 in the air at home

- *What I've always found interesting is this ambient sensor, because normally, you don't know what the CO2 content is in the room and - I found it quite exciting when you saw when you opened the window and, and things like that, it's of course a lot of fun too. Yes, but essentially, the pedometer is already an impetus to move (G16)*
- *"now I know that I have to open my window 10 minutes in the morning and in the afternoon to eliminate the CO2 in my house (F09, G01)"*

Help them check their activity

- *I appreciated the monitoring of sleep, steps and heartbeat, although I noticed that it was sometimes not very accurate in monitoring sleep (I11*

Help them pay attention to their health

- *I realize that yes, you're paying more attention, so I'm paying attention, or we're paying more attention to my health in general (G13)*
- *Overall I am satisfied because it helped me realise that I need to move more. I would eliminate the nutritional aspect, which I personally have never used. (I08)*

Provide boost and incentive to increase their activity

- *I got incentive through these devices and through the whole system. I do a lot during the week or in the garden and there's always an extra incentive boost (G10)*
- *I used the watch to monitor my sleep, the number of step, heart rate and oxygenation. These parameters helped me to do more physical activity (I01)*
- *I am very satisfied with the system because it has also been a stimulus to improve (I09)*
- *I used the pedometer the most, which helped me to stay active (F20)*

Help them increase their performance

- *"I have gradually increase the distance I walk thanks to the watch and I feel better. It helped me in my objectives (F14, G07)".*
- *I am satisfied because the system has helped me to keep certain aspects under control, such as sleep and physical activity (I03)*
- *Over the months I gradually increased the hours I wore the watch (I10)*
- *The project helped me to walk more and I followed it constantly, every day (I11) I used the watch more for monitoring steps, for the heart and for oxygen. It helped me to take at least 10000 steps a day. (I15*)

Provide company along the day

- *I am satisfied because it filled my days and helped me to be active. I would not change anything (I19*

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Improve their health and quality of life. Some people reported that the system had improve their quality of life by helping them to modify their habits

- *I am very satisfied and it has met expectations. My quality of life has significantly improved and I hope to maintain over time the good habits I have learned in these months (I03)*
- *I am very satisfied as it has led me to a correct lifestyle and motivated me more and more to walk and move (I12)*
- *I perceived an improvement in the quality of life (I10)*
- *The quality of life improved sensibly due to the fact that I significantly increased the exercises I performed every day, (I12)*
- *I have improved my lifestyle. I've walked more every day (I01)*

Some people reported that they had already healthy habits before the experimentation but that they were more aware of them and had indicators to measure their progress thanks to the devices.

- *I had never really cared about it the way I do now. Maybe I am more aware of it now. For example, during the experimentation, I'd sit down almost every night and do breathing exercises, or I'd catch myself looking at my step count a lot more often and activate it with every activity I did, whether I was cycling, swimming. I guess I did it with my watch - not so - as I do now, as I've done now.(G05)*
- *I walk, well I generally walk quite a bit, but I think I'll try to walk more too, because seeing the. By the hour. Nothing, but that's what encourages it."(F14)*

Some people thought that they were already healthy and did not need any device to help or coach them

- *"Personally, I feel that as a healthy person, I would have picked up very little - for myself I usually never go for a walk and now I really go for a walk three times a week. It was not like that. Yes, very small things" (G02).*

<u>Limits</u>

Some participants did not notice any improvement in their quality of life

- *They do not help me much, no, they cannot take care of me in any way, they can't shop for me or do anything else. So I cannot make the connection that it makes life more independent (G01)*
- *"I cannot say I am thrilled. From my point of view, I do not think it has changed my life" (F01)*

Some people even seemed to have some addiction to the system

- *I liked it because it stimulated me to walk I used the pedometer the most, it stimulated me to reach 10,000 steps per day. At times I used it less because I have a knee disease that sometimes forces me not to move (I04)*
- *I used the smartwatch more and more assiduously until I never took it off. Every day I consulted it and it gave me the stimulus to walk more and more. I also performed the exercises that were suggested and I must say that now I feel my legs are stronger and more mobile (I03)*

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Some people reported losing weight with the E-VITA system. Although participants expressed satisfaction to lose weight, one knows that the loss of weight in older adults might be a matter of concern.

- *I am overall satisfied anyway! I also lost 4/5 kg (I03)*
- *By increasing my walking, I also lost a few pounds, achieving my goals (I11)*

Organisational aspect

Training to use the E-VITA system with the human coaches

In European, the participants were trained and followed up by the researchers. Participants all agreed that training to use the technology and follow-up was mandatory in this kind of experiment. All the participants reported that they were satisfied with the training and follow-up by the human coaches. They thought that they received appropriate help during the experimentation.

- *"The briefing and information provided was good. The support from you was good, the good reaction at the right time, the effort of the whole team was good, I guess" (G02)*
- *"Human coach?. That was very nice. I think you did it very well".(G06)*
- *"I really think you've done a great job as trainers and you've dedicated yourself. That hat was really done with a lot of patience for us again and again" (G07)*
- *They were always kind and present, I don't think there is anything to improve (I08)*
- *The cooperation was helpful and productive; I always received assistance when it was needed. It was an incentive to do more exercises and movement (I10)*
- *I got along well with the human coaches and they gave me important stimuli to improve my well-being (I12)*
- *They were very helpful to me in using NeU and gymnastics, they should be improved the aspects where there were the technical problems (usability) (I13)*

Participants provided opinions and suggestions to improve the training at the beginning of the experiment.

<u>Opinions and suggestions on the training process at the beginning of the experiment</u>

Some participants noted that they had too much information to learn at the beginning of the experiment. They would have preferred to have more training sessions at the beginning of the experimentation in order to understand and memorize the use of the E-VITA device.

- *"I liked the meetings for the training. It would have been nice if there had been another one in between. There was a long pause. The meeting enables participants to exchange more ideas with each other". (G01)*
- *"In the first session, we were introduced to practically every tool. Therefore, for me, it was just too much in one morning. Maybe it should have been done in several stages over the first few months" (F07)*

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- *The meetings would have been useful from the beginning, I would have liked to have more.(I06)*

Some participants insisted on the need to provide both theoretical information and practical training at the beginning of the experiment. They proposed to dedicate the first meeting to theoretical information and the second to practical training.

- *« the 1st session for all the devices to be shown, then you test at home, and the 2nd session for all your questions to be answered (F05)»*
- *« Learning by listening and then doing, you know, this is effective (G07)".*
- *"So maybe introduce the system in the morning and do exercises in the afternoon, no. I hope that you will go home with a bit more knowledge and skill and then you can carry on at home, no. And whether you can make the software that's supposed to help you in everyday life even more interesting or whether there are other software support programs that are more exciting than the part that tells" (F07)*
- *I was taught theoretical information, but nothing really practical to check that I understood what I was doing.(F05)*

The participants thought that the booklet of explanations was mandatory, but it should be kept short and simple.

- *« I am from a generation that like to have paper. However, when I look at the book of explanations, I see that I have to print 80 pages. Therefore, it is a deterrent. I'm having a really hard time getting into it » (F05)".*

<u>Opinion and suggestions on the training process during in the follow-up of the experiment</u>

The participants insisted on the need for help by the human coach during the follow-up of the experiment. They were mostly satisfied by the help from the human coaches.

- *« It is crucial to know that you can call someone to have help in case you are stuck with the technology "(F09) ».*
- *"You have always responded pretty quickly "(G01)*
- *"I have nothing to complain about. Because you've always reacted promptly" (G02)*
- *"It was positive because I always got quick answers to the questions I had" (G05).*
- *I found the coperation with the human coaches very useful and productive, they taught me how to use the system and gave me valuable guidance regarding a correct lifestyle(I03)*
- *I found the human coaches to be knowledgeable and always friendly, and they were always prompt in solving my problems (I04).*
- *With the human coaches there was no problem, they were always helpful and knowledgeable (I06).*
- *The human coaches supported me when I needed help and to solve technical problems, they were always very kind. I wouldn't change a thing.(I18)*

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Some participants would have preferred to have more contact with the human coach during the follow-up

- *"Sometimes I left feeling a bit dissatisfied. Not because the coach wasn't doing her job properly, but because she was so busy" (F01)".*
- *"I would have needed more contact with the coach" (F20)*
- *"It might be useful to have more face-to-face contact with the coach. When we had online-meetings with C., the visio was not of good quality. Technically, it was not up to our expectations, so that is that. To be well supported, you have to overcome all these obstacles."(F13)*

Some people would have liked more social days with face-to-face meeting sessions including participants and coaches during the follow-up

- *"I would have preferred a little more face-to-face meetings "(F09)*
- *I really enjoyed the meetings we had with the human coaches, they helped me learn new things and broaden my knowledge. I would have done more of them, maybe even one per month, on different topics (I02).*
- *The initiatives proposed by the human coaches were interesting and useful, I would have had more meetings.(I20)*
- *I was especially pleased with the meetings we had at the University, I would have liked to do more. The one on the cognitive aspect was very interesting. I would have liked a meeting on nutrition. For the rest, I consider the collaboration with the human coaches perfect (I14)*
- *I really enjoyed it and was incredibly interested in rehabilitation equipment that we saw at one of the social days and saw how much progress has been made. I hope more days like this will be created. The rapport with the human coaches was great (I16)*
- *I found the days done together stimulating, and I think it is a very important element in creating the group to maintain participation in the project. I found the days well organized and motivating (I17).*

Ethical issues

Participants discussed ethical issues associated with the use of the E-VITA device.

They expressed some concern about the risk of increasing older adults'isolation:

- *"What can this technology do for people who are stuck at home, other than perhaps locking them up and isolating them even more (F01)? ".*
- *What can it do for people who are stuck at home? If not perhaps locking them even more into a technology (F01)*
- *« The tools have to be functional and fluid, because as I said, when you're a senior citizen, even if you're a bit skilled with computers or digital products, you immediately wonder, you say to yourself, I'm the one who doesn't know how to use it, and so it's frustrating. And it even gives you a negative self-image (F13) ».*

They expressed a feeling of empowerment linked to the use of the E-VITA devices

- *« I had no feeling of stigmatisation or control. I was free to use the devices (F13) »*
- *« I always had the feeling that I could decide whether I use or not the devices, I was in control of the technology (F07).*

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They appreciated that the coach was not intrusive.

- *Personally, I did not attend the organised meetings due to other commitments, but I liked the initiatives. In general, I found the human coaches unobtrusive, which was crucial for me (I07)*
- *From my point of view, the collaboration was perfect, you were never intrusive and I enjoyed the meetings you had (I11)*
- *I appreciated the meetings that were organised and the fact that the human coaches were never too intrusive.(I15)*

The participants noted the risk of addiction to the technology.

- *I had an old uncle who also had blood pressure problems in his old age, no, the doctor also prescribed a measuring device for him, it stood there, when you visited him, it was more or less on the table. His wife told me, he measured his blood pressure ten times a day, no. He could not get anything else out of his head. I mean, it is not that comparable, but it is like, no, you think about it. I mean, that is it (G13)*
- *I have certain inhibitions about wearing something like that all the time, if I do not necessarily need to control myself all the time. Just think of this: what does your sleep look like now? What's your frequency now?, not to mention the oxygen levels in your heart. If I need to check that repeatedly for health reasons, then it certainly makes sense, but then is it worth striving for, that you always have yourself under control and watching repeatedly. (G13)*

They also emphasized the need for data protection.

- *"I have no concerns in the context of this study but if I bought this technology, I would like to know where my medical data is going (F05)"*
- *"I don't really care what people do with my data when I decide for myself, that's the advantage I need to improve my quality of life. That is why the benefit is my top priority. No, so wallet, data security, it's going to be a mixed bag" (G02)*

Cost and economic evaluation

Intention to buy the device

Some participants noted that they did not plan to buy the device because they thought that they were in good health and were not isolated:

- *"I'm on the road so much, I have so many contacts, I don't need it". (G02)*
- *"In the current state of things, finally where I'm feeling, I don't think I'll buy it because I'd prefer going to activity groups rather than bringing activities to me at home.I get a lot more out of reaching out to others. Doing an activity with others than being on my own, even though I like having fun on my tablet."(F01)*
- *I don't buy it (I13)*

Some people explained that would agree to buy some part of the E-VITA system

- *I think I would only buy the smartwatch as a device and spend about 50 euros (I01)*

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- *I have already decided to buy a smartwatch that monitors my vitals, I don't know how much I'll spend but the important thing is that it monitors the same things that the one I've been wearing so far monitors. This one also gave me information about sleep that I found interesting and useful (I03)*

Some people insisted to the need of being able to choose to buy the devices you need

- *I think it would be good if packages are offered according to the devices the user requires. I would just get the smartwatch, I think 200 euros is a fair price (I03)*

Who would you consult first before buying it

The participants reported that they would consult someone in their family (I02, I06) in particular their son (G07, G10, I01, I11), their daughter (I08, I18), their wife (I07, I16)) their niece (I15), because these people had more knowledge than they did in computers.

They would also consult professionals to have information about the technology

- *"May be the friendly network too, but me, but above all by professionals who know it well, who know how to use it well."(F01)*
- *Professionals and my son, he is a civil servant, he won't teach me very well, but I'd always involve him (G07)*
- *If I may, I would ask the INRCA technicians because they have always seemed very knowledgeable. (I04)*
- *I would ask the INRCA team (I11)*

Some participants reported that they would consult the internet and reviews or go to public conferences in order to compare different products

- *"I would like to have a demo in a public conference or get information in reviews (G01)"*
- *There are expert websites on the Internet to compare information (G06)*

Some participants declared that they would choose on themselves without asking anybody.

- *I do not think I will consult. I17)*
- *I wouldn't consult with anyone, I'm used to deciding independently (I20)*

Which aspects are important to the participants when making a purchase?

The main aspects for the participants were firstly ease of use and price, secondly quality and usefulness. They also insisted on the need for training and for maintenance and after-sales service process.

Participants emphasized the importance of ease to use.

- *Ease of use (F01)*
- *I would take into consideration the ease of use because I am not very skilled at using these devices, so it should really be very simple for me (I18)*
- *They are easy to handle. Yes, practical use should be emphasized. It can help me in my practical life (G01)*
- *Operability, ease of use (G06)*

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Other participants insisted on quality, usefulness and price

- *For a possible purchase I would take into consideration the price and the actual usefulness (I04)*
- *I would take price and functionality into consideration when purchasing (I06).*
- *Quality and price (G10)*
- *The price would be important (I08, I11, I15)*
- *One thing I would consider is the parameters that would monitor the system and if it gives me periodic reports (I09)*
- *One thing that would convince me to buy or not buy the system is if I saw a system that made suggestions based on my lifestyle that was recorded by the sensors (I10)*
- *the aspects that would induce me to purchase are the monitored parameters (I12)*
- *Very important aspect is what kind of exercises she would have me do and how she would modify my lifestyle (I16)*
- *The fact of being monitored is very important to make the purchase.(I17)*

Some participants insisted on the need for demo before buying the device

- *"When you buy electronic devices, there is a briefing, a short demo to show what I can do with it, and a user manual, which you can download somewhere via Youtube (G02)"*

Some participants insisted on other reason (maintenance service system, time to devote to this system)

- *Need for a maintenance and after-sales service system (F07)*
- *I would take into consideration the time I can devote to it, because I am busy at the moment (I07)*

Acceptable cost of the E-VITA system for participants

The participants proposed a large spectrum of prices between 10 and 8000 euros. Some participants did not know how much the E-VITA devices should cost.

Under 100 euros

- *50 euros (I11)*
- *50-60 euro (I15)*
- *Oh, I will give amateurs maybe 100, but no more.(F05)*
- *At just under 100 (F13)*

Between 100 and 500 euros

- *No more than 250 euros (F01)*
- *I don't know, I think a cost of 200 euros is congruous (I17)*
- *No more than €500 (F14)*
- *I would like to see those air blades, the watch and the headband. How much does it cost? - 150, 200 euros, but that's my, my limit, what I can spend on that, no (G01).*
- *"I was spontaneously thinking 300 euros, the question being would it be worth it, no, or is it really the cost". (G06)*

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- *200 euros (I06, I08)*
- *300 euros (I07)*
- *I dont know paid 400 euros for the Apple Watch.(I12)*
- *200-300 euro (I14)*

Above 1000 euros

- *The right price would be around 2000 euros, but no one would be willing to spend that in my opinion. Perhaps the price that could be spent would be 1,000 euros (I18)*
- *I only know now that such a NAO robot costs 7,000, 8,000 euros. The Nao being the most expensive, then I would find $8,000 reasonable. on my part up to 300, 400 euros a month. (G02)*
- *I would spend 500 euro(I05)*

Some participants proposed a monthly subscription, which varied from 5 to 200*€ per month.*

- *It should be a monthly Subscription (I02)*
- *Maybe 5€ monthly or something like that (F07)*
- *Subscription between 5 and 15 € per months (depending on participants)*
- *I'd be willing to pay up to €15 a month or something.(F02)*
- *"I rather think not to buy, but I think it would be better to take people than subscription 150€ per year (F09)*
- *10€ a month? It is somewhere between 50 and 100. That is why it is hard to say, but I would say up to 1,000 euros, I would like to spend on that. (G05)*
- A monthly subscription would be useful, at around 200 euros per month (I20).
- *Maybe the subscription solution is best, I don't know what the price might be. It should vary depending on the type of intervention, which varies from person to person (I16)*

Some participants noted that the cost should be supported by health insurance

- *" Through a system, which is actually about health and mobility, no, that can be taken care of by health insurance companies; at least you get subsidies" (G10)*
- *"It could be supported by health insurance.(G13)*

Health booklet associated to the E-VITA system

The participants expressed Interest in the paper booklet, which was given to them with the E-VITA system

- *It was interesting end useful. For people my age, it is still easier to access than technology (F08).*

European Qualitative data from control group T2

What did you think of the information and activity booklet? Plus/minus points

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Some people did not read the booklet. “I did not read it. I would rather read a book on the art of aging well.” (FCG03)

Others had a look at it and found that the booklet was not interesting for them.

“*For me, it was too easy, it was not funny (FCG12).*

It does not speak to me. I have never drank alcohol in my life, I've never smoked a cigarette. Anyway, I don't need to be reminded all the time."(FCG11)

Some participants did not do the activities, which were proposed in the booklet, for various reasons:.

I thought it was interesting. I watched it once or twice. I did not use it much because I am very busy and probably because I serve myself as a coach to certain people. What I would need is to talk about emotional things with someone, a bit of a supervisor (FCG04).

I read it, I looked at it, I did not do any of the activities, I never had the time to settle down. I already do physical activities and have socialization and relationships with others (FCG10).

« I did read it with interest. But basically, I'm sticking with my activities, it hasn't changed my activities » (FCG11)

Other participants found the booklet interesting and useful for them.

There are things that are interesting, for example cooking recipes, and the gym moves. In fact, I have put this booklet in the section where I do gymnastics so that I can do a bit more. I do the ones that are indicated there because I find they are quite simple and interesting (FCG18).

"I've drawn one piece of advice that I'm going to try and stick to. (FCG12).

I found it interesting. The cognitive part amused me. I did it all. After that, there was a physical activity part that I rushed through but learned absolutely nothing, because I am a gym teacher. I am active every day. I was much more interested in the psychological part. I read it; I even reviewed it this morning. The nutritional part, I have read it and, it interested me. The last two psychological and nutritional parts gave me something. Therefore, the booklet, I thought it was a good idea for looking at oneself. I would recommend that booklet to people (FCG08)

What Improvements can be provided to the booklet?

The participants suggested improving the images in the cognitive part: “in the cognitive part, the images are not very nice “(FCG08).

“I found physical exercises simple and aimed at people who are not athletic and who are over 60 or 70. However, they do not talk about breathing in the physical exercises. They write « hold the position without blocking your breathing », but they don't specify that you actually have to blow. Maybe it lacked a bit of precision » (FCG08).

I found interest in the chapters, which could be much more developed eventually (FCG11).

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Do you think technology is better suited to providing information and activities on aging well? Why not? Which technology?

One participant thought that it would be useful to have alarms able to talk and remind het things to do during the day.

“It would be interesting to have some sort of alarm clock that goes off and starts talking, not necessarily acting, but talking” (FCG04).

However, other participants did not express the need for the use of technological devices.

« Technology? I prefer human beings to robots ». (FCG03).

"No, I prefer a paper thing. I think it is much better than technology. I use the screen stuff there but I do not spend hours on it. It is no good. I wasn't born with it, I discovered it 10 years ago, so it is not the same, we cannot compare ourselves with younger generations, can we? Whenever I can get things on paper, I ask for them” (FCG18).

"For people who don't have access to computers and modern instruments, no, I don't think so."(FCG10)

« In terms of technology. I think there are two possible approaches. There are people who are completely resistant, who prefer to have a paper document already. And there are the people who are familiar with the technology, who feel comfortable with it and who think that it's not bad after all. However, I don't think the current generation of older people has fully embraced technology yet"(FCG11).

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