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Understanding interactivity for the strength-training needs of the elderly at nursing homes in Indonesia

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Understanding interactivity for the strength training needs of the elderly at nursing homes in Indonesia

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Abstract: Regular exercise has been shown to be beneficial for the elderly. However, the prevalence of the elderly doing exercise is low, and muscle-strengthening exercise is even lower. Therefore, physical inactivity has been reported as a significant health problem worldwide. Many assistive devices have been developed to overcome the problems of lack of engagement. This study explores opinions from the elderly regarding an acceptable and affordable technology-based design that focuses on the strength training specific to the elderly in two middle-class nursing homes in Indonesia. This paper presents qualitative findings from 37 participants who are part of an ongoing study. The results of this study show that when creating an interactive device for the elderly, easy procedures, a small lightweight-looking device, direct rewards, and instructor companionship should become the main considerations.

Keywords: elderly; interactive device; nursing home; strength training

1. Introduction

The concept of healthy aging emphasizes how people have the opportunity to live a long and healthy life. This concept is supporting the World Health Organization idea about creating opportunities for the people to be and do what they value throughout their lives based on intrinsic capacity and relevant environmental characteristics (www.who.int/ageing/healthy-ageing/en/). Thus, the success of medical research will result in increasing the life expectancy rate, which is best supported by the ability to maintain functional capacity and obtain a longer health span. This present research continues from the earlier study (Wianto et al., 2019), focusing on the intrinsic capacity of the elderly, specifically on their

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physical activities (PA) and lifestyle. The preliminary study showed that the elderly, especially those in a nursing home, are generating a sedentary lifestyle due to their low PA scores when compared to the ones in a community-dwelling. The Physical Activity Scale for the Elderly, an inventory instrument owned by New England Research Institute, was used to measure the PA developed by Washburn (Washburn, Smith, Jette, & Janney, 1993, pp. 153-162). This instrument breaks down the typical activities used by the elderly into leisure time activities, household activities, and work-related activities. Although the elderly self-reportedly practicing regular PA related to walking outside the home, they infrequently or never practiced muscle strengthening to detain mobility limitation (Bohannon, 2019, pp. 1-4; Dodds et al., 2016; Wianto et al., 2019). Then this current condition is not ideal.

Exercise as part of PA, according to National Institute on Aging and the Medline official websites, should be differentiate into endurance, strength, balance, and flexibility (<https://go4life.nia.nih.gov/4-types-of-exercise/>); each type will provide different benefits (<https://medlineplus.gov/exerciseforolderadults.html>). Thus, focusing on to one type of exercise is not enough. The increased urgency also takes sarcopenia into consideration, as the 2019's European Working Group on Sarcopenia in Older People review on muscle strength argues that this progressive skeletal muscle disease now can happen earlier in life because of the loss of strength and performance of the muscle (Cruz-Jentoft et al., 2019, p. 16).

However, emerging challenges regarding the development of the Internet of Health Things are predicted to grow relentlessly, as are the issues related to a lack of engagement by the stakeholders and a disregard of culture (Tsekleves, 2018, pp. 2377-2379). Assistive technology should not be a source of frustration that invokes reluctance in the elderly (Shore, 2018, pp. 1919-1937). Thus, the effort to understand the preferred interaction to enhance muscular fitness appears to be feasible and becomes the primary context of this study. As such, the general purpose of this ongoing study is to gain a better understanding of how a technology-based design will be accepted by the elderly, which focuses on the elderly in nursing home with their living arrangement advantages, limitations, and a specific muscle-strengthening exercise using a free-weight device.

2. Sarcopenia, sedentary lifestyle, and a lifelong sport experience

The optimum benefit of doing PA needs to include duration, frequency, intensity, and type. This consideration was also implemented on the PA intended for the elderly. The benefits will improve cardiorespiratory and muscular fitness, bone and functional health, and reduce the risk of non-communicable diseases, such as depression and cognitive decline (WHO, 2010, pp. 8-10; 2011).

Progressive attempts to change the sedentary lifestyle of the elderly, such as giving information on the direct benefit of PA, whether specified (Lavin et al., 2019, pp. 112-122; Schott, Johnen, & Holfelder, 2019, pp. 15-24), or general (Gine-Garriga, Roque-Figuls, Coll-Planas, Sitja-Rabert, & Salva, 2014, p. 754; Nielsen et al., 2019, p. 10), or to the healthy or frail (de Labra, Guimaraes-Pinheiro, Maseda, Lorenzo, & Millan-Calenti, 2015, p. 14), or with

different methods: changing the intensity and time consume (Felipe Garcia-Pinillos, Jose A. Laredo-Aguilera, Munoz-Jimenez, & Latorre-Roman, 2019, p. 1445), or using optional or specific device such as elastic tubes for resistance training (Souza et al., 2019, p. 132), or combining with non-PA related such as naps (Arakaki, Tufik, & Andersen, 2019, pp. 886-887), still resulting in inactive behavior or a sedentary lifestyle (Rezende, Rey-López, Matsudo, & Luiz, 2014, p. 2). This fact proves that the knowledge, benefit, and awareness of PA have not been able to trigger the elderly into doing PA regularly.

The fact is there are difficulties motivating elderly people to do PA, so this current study tried to align with the idea stated by Karahanoğlu (Karahanoğlu, 2018, pp. 2116-2125) suggesting a lifelong sports experience, which emphasizes injury prevention, sustained lifelong training, and recognition of the elderly's capabilities.

3. Study approach

3.1 Methods

This study followed the qualitative method based on the experiences, meanings, and perspectives of the chosen group of elderly people (Hammarberg, Kirkman, & Lacey, 2016, p. 499). The qualitative descriptive design in this study uses semi-structured interviews generated from the interviewing method into textual data (Simon C Kitto, 2008, pp. 243-246) and is supported by exploring the behaviors, willingness, gestures, and figures of speech of the elderly to obtain natural context and meaning. Before the interview process, potential participants performed the following pre-screening tests: Mini-Mental State Examination (MMSE), SARC-F Questionnaire (SARC-F), Hand Grip Strength (HGS) test, and 1-Repetition Maximum (1-RM) to obtain reliable participants.

The MMSE, or Folstein test, was used to detect cognitive impairment and validate a given statement by the elderly (Tombaugh & MA, 1992, pp. 922-932). The SARC-F test was used to rapid screen the presumption of the elderly regarding sarcopenia (Malmstrom, Miller, Simonsick, Ferrucci, & Morley, 2016, pp. 28-36; Malmstrom & Morley, 2013, pp. 531-532). There is no minimum point set for the SARC-F, as the purpose of classification was to find whether any clustered opinions emerged based on health conditions. HGS was tested using the Jamar Dynamometer and Electronic Hand Dynamometer (EHD) according to the American Society of Hand Therapists protocols used to measure grip strength and to classify overall strength as a presumptive value to identify frailty, sarcopenia, and malnutrition (Bohannon, 2019, pp. 1-6; Roberts et al., 2011, pp. 423-429; Sousa-Santos & Amaral, 2017, p. 15). Figure 1 shows participants holding the EHD. 1-RM was measured in this study because of its high reproducibility and safety (Barbalho et al., 2018, p. 171) to define a baseline weight suitable for the elderly (Reynolds, Gordon, & Robergs, 2006, p. 584).

Figure 1 Participants were recorded while doing Hand Grip Strength's test.

3.2 Ethics

The study protocol was approved by the Research Ethics Committee of Universitas Kristen Maranatha (Maranatha Christian University) – Immanuel Hospital, number: 179/KEP/VIII/2019. The submission of the protocol included the pre-screening test, the intervention using the proposed free-weight device, and informed consent form templates for the participants.

3.3 Participants

A convenience sample of individuals living in two selected nursing homes was recruited in this study. Both of the nursing homes are located in Bandung, West Java, Indonesia, as they suit the socio-demographic. All participant considered eligible are a minimum age of 60 years old, are fluent in Bahasa Indonesia and/or Sundanese or Javanese and have lived in the designated nursing home for at least six months. The additional pre-screening test is preferable but not mandatory. The chosen nursing homes consist of around 90 elderly, separated into potential and non-potential categories. All of the participants in this study categorized as potential were able to do at least one basic daily living activity, such as taking a bath, dressing, eating, or managing their mobilization.

Both of the nursing homes selected in this study are ministered by the Christian Church coordinating with the Social Department of the Indonesian Government. This arrangement was established more than thirty years ago and provides not only for shelter and nutrition but also manages activities for the residents. Regular activities held in the nursing home consist of Sunday Service, singing/playing musical instruments called Arumba or Angklung, and stretching as exercise.

3.4 Data Collection

A semi-structured interview using a questionnaire was conducted with all participants after they received an explanation about the study. Before or after the interview, participants did the pre-screening test. Guideline questions consist of:

1. What is your effort to live independently?
2. What is your opinion about preferred exercise, frequencies, and duration?
3. How you explain the difficulties in training regularly?
4. What is your reason to stop exercising?
5. What are your good habits and motivation to do those habits?
6. What is your preferred condition to motivate you doing exercise?
7. What is your visceral perception regarding the prototype free-weight device offered?
8. What is your opinion regarding the feasibility of using the prototype free-weight device for future muscle-strength enhancing exercise?

The guideline questions are arranged from a broader opinion regarding life itself, and then to how the participants have managed life until now, how exercise helps them to maintain their desirable life, and finally how they feel about the strength-training type of exercise.

In order to visualize the free-weight device indicated in the guideline questions, a proposed prototype device in 3D modelling and snap shots taken while the participants were holding the dummy are presented in Figure 2 and Figure 3, respectively.

Figure 2 3D modelling of the proposed free-weight training device.

Figure 3 Participants experiencing the proposed free-weight device.

3.5 Data Analysis

Interviews were done in Bahasa Indonesia and transcribed verbatim from audio recordings to text. The transcript was imported into NVivo 12 for data management. In order to have broader information and to cross-check whether the participants' answers contradicts their conditions, cases were separated into age, gender, HGS status, medical history, MMSE, nursing home, and SARC-F. The first coding process refers to the guideline questions without considering the cases to avoid researcher bias on health stereotyping. The second coding was generated manually based on the participants' answers because sometimes their answers were overlapping from one context to another. Following coding, the researcher categorizes the theme and then concludes referring to the aim of the study. As for the data referring to the intercontextual answers, coding can fall into one or more categories and subcategories when necessary.

4. Results

4.1 Characteristics of Participants

This research includes 37 participants, consisting of 35 women and 2 men (age range: 63-94 years). An MMSE screening test was given to the elderly. The results were moderate, mild, and normal for 3, 4 and 26 participants, respectively. Perceived sarcopenia screening using SARC-F was done. The results were suspicion and normal for 7 and 26 participants, respectively. 1-RM was tested using 0.3-, 0.5-, 0.75-, and 1-kilogram weights. Based on the 1-RM test, one, two, six, and four participants were suitable to use the 0.3-, 0.5-, 0.75-, and 1-kilogram weights; the other participants were able to use heavier weights.

The handgrip strength ranges using the analog Jamar Dynamometer and the EHD according

to their guidelines (https://www.performancehealth.com/amfile/file/download/file_id/6971/product_id/27106 and <https://www.camryscalestore.com/pages/manuals-catalog-and-downloads>) were between 8.67 kg to 33.33 kg and between 8.87 kg to 33.93 kg, respectively. Both dynamometers indicated a similar result: the Jamar Dynamometer showed 20 and 13 statuses below and between the average, while 19 and 14 statuses showed weak to normal using the EHD. The slightly different results might be caused by the hand position of the participants while doing the test. The results of handgrip strength showed a similar result of below average for the participants over 81 years old; only one participant (code: D10, age 90) obtained a better result of between average. Characteristic details of the participants are presented in Table 1.

Table 1 Participant Characteristics.

No	Participants Code	Ethnicity	Age	Sex	Medical Historic
1	D01	Tionghoa	77	F	hypertension, dyslipidemia
2	D02	Tionghoa	84	F	diabetes, hypertension, cholesterol
3	D03	Tionghoa	88	F	wheelchair, dyslipidemia
4	D04	Tionghoa	80	F	hypertension, dyslipidemia
5	D05	Javanese	89	F	hypertension, dyslipidemia
6	D06	Tionghoa	94	F	wheelchair, heart, insomnia
7	D09	Tionghoa	74	F	dyslipidemia
8	D10	Tionghoa	90	F	walker, osteoarthritis
9	D11	Tionghoa	89	F	-
10	D12	Tionghoa	82	F	-
11	D13	Tionghoa	84	F	osteoporosis
12	D14	Javanese	81	F	hypertension
13	D15	Tionghoa	75	F	hypertension
14	D16	Tionghoa	72	F	gastritis
15	D17	Javanese	70	F	-
16	D18	Tionghoa	76	F	cane, diabetes, hypertension, dyslipidemia
17	D19	Tionghoa	75	F	Eye, low back pain, neural,
18	S01	Tionghoa	83	F	Bell's palsy (1989)
19	S02	Ambonese	80	F	heart
20	S03	Javanese	63	F	hypertension
21	S06	Sundanese	77	F	cataract
22	S07	Minahasan	66	F	hypertension, asthma
23	S08	Sundanese	74	F	hypertension, diabetes
24	S09	Batak	86	F	-
25	S10	Tionghoa	89	F	-
26	S12	Ambonese	81	F	hypertension

No	Participants Code	Ethnicity	Age	Sex	Medical Historic
27	S13	Javanese	89	F	-
28	S14	Tionghoa	75	M	-
29	S15	Tionghoa	70	M	diabetes
30	S16	Javanese	70	F	-
31	S17	Tionghoa	81	F	left pelvis fracture
32	S18	Tionghoa	79	F	cataract
33	S19	Javanese	77	F	stroke (2007)

Only 33 participants able to finish all four pre-screening tests, but there are four participants which haven't done the pre-screening tests are willing to share their opinion. Those participants coded with S04, S05, S11, and S20.

As Indonesia has much ethnic diversity, the ethnicity of the participants was also stated in Table 1. We assumed that with the ethnic differences, there would be different levels of fitness in the maximum gripping dimension when they tried to hold the prototype device. The participants came from Ambonese (Moluccans), Batak, Javanese, Minahasan (Manado), Sundanese, and *Tionghoa* (Chinese Indonesian). Of the 33 participants, 2 had an elevated risk of doing muscle-strengthening exercise because of osteoarthritis and osteoporosis, while the others' medical histories mostly stated hypertension, which generally will decrease when using muscle-strengthening exercise. The notions of gender and ethnic group in this study were used to provide background information about whether the participants' ethnicity and gender affected their opinions. However, since the participants live in a nursing home, they have some similar conditions: the majority are female, they do not have children or were never married, or they do not have a family to support their living arrangements in a community-dwelling.

4.2 Findings

The first coding was categorized based on eight guideline questions. This first coding was manually coded by the researcher with the help of Nvivo 12, which generated 1,488 references from 37 participant expressions. Those 1,488 references were then re-categorized based on the answers of the participants into six categories: value, an existing nursing home condition, acceptance of current state, togetherness, exercise as PA, and feasibility of new device. The breakdown of the categories, descriptions, and subcategories are presented in Table 3.

Table 2 Categories, Descriptions and Subcategories.

Categories	Description	Subcategories
value	Opinion regarding their way of life	acceptance of something new, collective context, direct benefit oriented, discipline, expertise or pride, independent life, joyful in life, locus of control, related to beliefs, tolerance
existing condition	Opinion indicating daily living in a nursing home	boredom, daily activity (non-physical activities and physical activities related), helped by others, interesting activities, unsatisfied condition
acceptance of current state	Opinion regarding health, including achievements in the past to support current condition	physical limitation, previous activity
togetherness	Opinion regarding preferred way of doing the activities	alone, together with others
exercise as PA	All opinion about exercise or physical activity base	commitment for exercise, concept of exercise as basic needs, duration for exercise, excuse to avoid exercise, preferred exercise, stop exercise, willingness for exercise
feasibility of proposed device	All opinions regarding the proposed free-weight training device	affordance on strength training, familiar concept of strength training, requisite to do strength training

4.3 Categories, Subcategories, and Themes

The six categories were divided into the more specific opinions of the elderly, which were further divided into subcategories that were generated manually by the researcher into 104 codes and 1,818 references. The graphical image is shown in Figure 4.

Figure 4 Proportion of Categories and subcategories in tree map style generated from NVIVO

In order to share the data expressed during the conversations, Table 3 to Table 8 show highlighted comments under categories and subcategories.

Table 3 Highlighted Comments Categories: Value.

Sub categories	English translation from Bahasa Indonesia	Participants Code/ Age/ Jamar status
acceptance of some-thing new	(The design) looks like a traffic light. It must be like a mineral bottle movement. (We) can learn how to do weight training, ... but let's try.	S01/ 83/ between average
collective context	...for me, I do not have any difficulties in doing exercise, but for [the name of the elderly], it must be difficult [because using a walker]	D05/ 86/ below average
direct benefit oriented	... lazy because there is no result, exception if it has some effect ... or something to achieve or expect. ... [reward], get mango (or presents) ...	S04/ -/ -
discipline	... obey the rules, life in mens sana in corpore sano. [a healthy mind in a healthy body]	D13/ 84/ below average
expertise or pride	...I was good at basketball... at home, there are many devices for exercise...	D19/ 75/ between average

Sub categories	English translation from Bahasa Indonesia	Participants Code/ Age/ Jamar status
independent life	... the most important things are (our) heart, think naturally (do not judgemental), and character. My principle is: as long as we can, (we) must do it by ourselves	D14/ 81/ between average
joyful in life	... feel grateful for what it is, do not have to be sorry or grumble about why we end up living here.	D17/ 70/ between average
locus of control	... It depends on how the coach teaches us, whether it is one-on-one or together at once.	S15/ 70/ between average
related to beliefs	... pray for God to (get) strong faith.	D01/ 77/ below average
tolerance	... we can't be egoistic if we have to live together, we came from many different cultures, (so we) have to love and forgive, (so we) will feel peace...	D13/ 84/ below average

Table 4 Highlighted Comments Categories: Existing Condition.

Sub categories	English translation from Bahasa Indonesia	Participants Code/ Age/ Jamar status
boredom	I like to help in the kitchen, so (I) have things to do, but nowadays I am starting to feel lazy, bored... Get bored with the life itself.	D09/ 74/ between average
daily activity: non-PA	Reading the Bible (is our) responsibility and our longing, listening to some preaches on the radio, and have the morning prayer.	S02/ 80/ below average
daily activity: PA related	... Exercise, I cannot stand, so training in my bed after I wake up, done repeated movement 15 times to flex my body... watering flower...	D10/ 90/ between average
helped by others	Now it's better here, mopping and sweeping and getting helped by others.	D07/ -/ -
interesting activities	Together with playing angklung, we recognize the character of each other. The happiest times are singing, chit chatting, and playing angklung.	S10/ 89/ below average
unsatisfied condition	I like sewing, also knitting, but because there is much stock [the result is displayed], I quit and now don't have anything to do (as a hobby).	D05/ 86/ below average
	No routines, I got a stroke, so I feel pain now.	S19/ 77/ below average

Table 5 Highlighted Comments Categories: Acceptance of Current State.

Sub categories	English translation from Bahasa Indonesia	Participants Code/ Age/ Jamar status
physical limitation	... since last year, I frequently fall, not really often though, because of being tired and I lose my balance. This year I've already fallen more than twice.	D13/ 84/ below average
previous activity	When I was young, I liked to swim. After (I) got old, it is difficult and depends on friends [accompany with] ...	S08/ 74/ below average

Table 6 Highlighted Comments Categories: Togetherness.

Sub categories	English translation from Bahasa Indonesia	Participants Code/ Age/ Jamar status
alone	I prefer to do it alone. When (alone) it will be freer for me; I walk back and forth.	D01/ 77/ below average
together with others	Happy when doing activities together, there is someone to chat with. If someone's sick, (the other) will be able to call out for the nurse.	D02/ 84/ below average

Table 7 Highlighted Comments Categories: Exercise as Physical Activities.

Sub categories	English translation from Bahasa Indonesia	Participants Code/ Age/ Jamar status
commitment for exercise	I will follow once or twice but do not know whether the others decide to (exercise) or not.	D04/ 80/ between average
concept of exercise as basic needs	... doing exercise during school time, but after that, never intended to do it because I don't pay attention to this aspect	D04/ 80/ between average
duration for exercise	Thirty minutes is too long, maybe 15 minutes (is enough), other exercises only took 3 minutes.	S07/ 66/ between average
excuse for exercising	(This) exercise (I am) afraid will make my arms bigger...	D16/ 72/ between average
preferred exercise	As long as there is guidance (I am) willing to do it, feel guaranteed... Happy because there are plenty of friends doing activities together.	S11/ -/ -
stop exercise	When I stopped my education (school), then I also stopped doing exercise.	D01/ 77/ below average
willingness for exercise	... never done it before, so I would like to try it first, just try it first (is okay).	S03/ 66/ between average

Table 8 Highlighted Comments Categories: Feasibility of New Device.

Sub categories	English translation from Bahasa Indonesia	Participants Code/ Age/ Jamar status
affordance on strength training	... it is too heavy for me (0.75 kg), (measurement) of the cylinder is enough; it's easy as long as it is light.	D12/ 82/ below average
familiar concept of strength training	... oh, there was exercise similar to this... The previous (dumbbell) has a more solid grip, so when we hold it (our hand) can fully grab it...	D03/ 88/ below average
requisite to do strength training	... it will be (more) okay if there is coach (to guide) ... because the coach can tell jokes and be suitable for feedback.	S05/ -/ -

The above comments were brief insights from the participants. This selection was made from the most explicit comparisons of expressions. From the subcategories, we found that three themes emerged from the participants:

1. Collectivity and Dependency;
2. Boredom;
3. Awareness to Exercise.

Collectivity and Dependency appeared the most within the participants' commentary. Some examples are whether their opinions were similar with the others' or not, whether they were answering on behalf of the others, and whether their request to exercise together with peers or with the instructor was shared. Most participants expressed their acknowledgment of the importance of exercise. Hence, the reluctance to exercise has appeared within many premises under physical and time limitations. Those answers contradicted their explanations regarding idle time and prioritizing. Many participants feel satisfied living in a nursing home even though it is boring. They feel bored because there are not enough suitable occasions to interact with others.

5. Discussion

The findings presented in this paper illustrate the experiences of the participants living in nursing homes with regard to their daily activities and how they perceived exercise in general and muscle strengthening in particular. This study establishes that a sedentary lifestyle has multi-faceted aspects and contributes to a decline in the health-related quality of life of the elderly. Significant themes generated in this study show that the current situation is potentially influenced by a low internal locus of control. The locus of control is defined as the degree of belief in external or internal forces that influencing one way of life (Timmins & Martin, 2019, p. 97). This results of this study also agree with the findings from Zhang et al., which stated that other constructs to support the control of beliefs in the elderly are higher

sleep self-efficacy, positive effects, higher perceived competence, and a higher internal locus of control (Zhang, Gamaldo, Neupert, & Allaire, 2019, p. 1). A low internal locus of control, together with the collectivistic culture commonly found in Asian societies (Riediger & Mosquera, 2015), arguably reduces the willingness of the elderly to participate in individual exercise sessions. Confirming the indication of a low internal locus of control, some of the participants demanded guidance or accompaniment from an instructor or their peers while doing an exercise. Other probable conditions also indicated that there was an ineffective training method in the nursing home since more than 30% of the elderly's grip strength was weak or below average, even though they said they exercised regularly.

The topic of physical activity shared with the participants responded with a limitation of the type of exercise performed, which mainly concentrated on walking and doing chores. Both activities need to improve to ensure that activities help maintain functional ability. Walking as the primary physical activity not only occurs in Indonesia, as another study confirms similar results (Steve Amireault, Baier, & Spencer, 2019, p. 137).

Interestingly, the proposed free-weight training device shown to the participants was not perceived as a peculiar assistive device which separates their daily lives with unfamiliar technologies. Although most of the participants could not express how to make this device more suitable for them, they did not refuse the idea of muscle strengthening.

The term *muscle strengthening*, which was assumed to be more suitable for men than women, only appears used by one of the female participants (D16), who stated that she did not want to do the muscle-strengthening because she was afraid of having muscular biceps the way a man does. A male participant, (S15), who had experienced muscle-strengthening exercise in his younger years, stated that the proposed device is not substantial enough for him. The rest of the participants did not state the 'gender' of this type of exercise, and they also did not refuse to do the 1-RM measurement, which is a bicep curl movement.

Another interesting finding in this study was the frequent expression of "I like to try it first" over "I cannot" or "I am not able" to exercise with the new device. Those positive indications provided accurate feedback and was acquired by the designer in order to create the device with meticulous consideration of easy procedures, a small lightweight-looking device, direct benefits, and instructor involvement.

5.1 Research limitations

This paper discusses the perspectives of a limited number of participants residing in a nursing home in Bandung as the selected socio-demographic of Indonesian elderly. This was the second time data was gathered here, as the researcher's previous study was also held in the same institution. There is a risk that the general topic of exercise might already have influenced their perceptions regarding PA. However, the familiar face of the researcher possibly increased the participants' comfortability to share their opinion. This study might not be suitable to generalize the behavior the elderly in general, as it is intended for the participation of the elderly with middle to middle-low class economic status. In the future,

more male participants and additional researchers to run the coding should be included in order to explore some hidden aspects and to cross-check whether the results will still show similar expressions to enrich the findings in the study.

The topic of increasing muscle strength in this context is based on physical activity as well as the intention to change behavior, and it is separate from changing nutrient intake.

6. Conclusions and further work

Collectivity traits were shown to be the main expression of the participants, and this will create opportunities for the researcher to focus the free-weight design based on this value along with the described aspects. The direct benefit orientation requires further analysis of the specific cohort so that this construct will correctly interpret the elderly's expectations and needs. Hence, the instructor's involvement signifies the reciprocity expectancy.

A similar result of handgrip strength with an economic status below the average for participants with an age of greater than 81 years old needs to get individualized attention. A suitable cohort of subjects should be limited to a younger generation of the elderly in future experiments. The findings of this study must be tangible to test the prototype free-weight device to measure the effectiveness of the device and the user engagement of the participants. When the experiment is completed, it will be able to be compared within subjects as to whether there is any significant improvement in functional capacity and behavioral modification.

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