Making Meaning Together: Co-designing a Social Robot for Older Adults with Ikigai Experts

Waki Kamino[1] · Long-Jing Hsu[1] · Swapna Joshi[1] · Natasha Randall[1] · Abhijeet Agnihotri[2] · Katherine M. Tsui[2] · Selma Šabanović[1]

Abstract

A sense of meaning and purpose in life–known in Japan as one's ikigai–can lead to better health outcomes, an improved sense of well-being, and longer life as people age. The design of socially assistive robots, however, has so far focused largely on the more hedonic aims of supporting positive affect and happiness through interactions with robots. To explore how social robots might be able to support people's ikigai, we performed (1) in-depth interviews with 12 'ikigai experts' who formally support and/or study older adults (OAs)' ikigai and (2) 5 co-design workshop sessions with 10 such experts. Our interview findings show that expert practitioners define ikigai in a holistic way in their everyday experience and practice, incorporating physical, social, and mental activities that relate not only to the individual and their behaviors, but also to their relationships with other people and to their connection with the broader community (3 levels of ikigai). Our co-design workshops showed that ikigai experts were overall positive towards the use of social robots to support OAs' ikigai, particularly in the roles of an information-provider and social enabler that connects OAs to other people and activities in their communities. They also point out areas of potential risk, including the need to maintain OAs' independence, relationships with others, and privacy, which should be considered in design. This research is the first to explore the co-design of social robots that can support people's sense of ikigai–meaning and purpose–as they age.

Keywords Ikigai · Social robots · Older adults · Meaning and purpose in life · Co-design · Human–robot interaction

1 Introduction

"What can be said from the beginning, without having to bother with research, is the fact that there is nothing more necessary than *ikigai* for human beings to live vigorously," notes the 'mother of ikigai psychology'—psychiatrist Mieko Kamiya [1]. In Japan, realizing one's 'ikigai'—a sense of meaning and purpose in life—is considered a salient goal for everyone, at any age and from any generation. A focus on ikigai for older adults in particular became a dominant theme in popular culture first in the 1970s, and resurged in the early 2000s, along with rising concerns about Japan's aging population and attendant health and economic issues [2]. Ikigai has been associated with health benefits for older adults (OAs) [3], such as increased longevity and decreased need for medical interventions and institutionalized care [4]. Today, it is widely accepted by Japanese policy makers and researchers in the social welfare domain that ikigai is essential for OAs to lead fulfilling and independent lives [5]. On the other hand, aging poses challenges to maintaining and

✉ Waki Kamino
wkamino@iu.edu

Long-Jing Hsu
hsulon@iu.edu

Swapna Joshi
swapna@indiana.edu

Natasha Randall
nprandal@iu.edu

Abhijeet Agnihotri
abhijeet.agnihotri@tri.global

Katherine M. Tsui
kate.tsui@tri.global

Selma Šabanović
selmas@indiana.edu

[1] Department of Informatics, Indiana University Bloomington, Bloomington, IN, USA

[2] Toyota Research Institute, Cambridge, MA, USA

realizing one's ikigai. Loneliness caused by the loss of loved ones and changing social roles and responsibilities due to retirement or children leaving home are just a few examples of life events that can lead to the loss of ikigai in old age [6]. Japanese OAs and policy makers alike, therefore, have started seeking out ways to actively reflect on, develop, and maintain their own and other people's ikigai as they age. Current organized efforts to support ikigai include institutions and community centers where OAs can socialize and engage in continued learning activities, which we describe in more detail in the background section below. It has also been suggested that information and communication technologies may be helpful to OAs in supporting ikigai-related activities, particularly in the circumstances of the COVID-19 pandemic during which OAs experienced a significant loss of ability to participate in meaningful social activities [7]. Hence the scope of our paper is to investigate the current landscape of ikigai promotion for OAs and to identify and envision with experts ways in which robots might be able to contribute in the domain.

1.1 Contribution

This paper explores the potential for developing social robots that can augment existing efforts in Japan to help OAs develop and support their ikigai, or sense of meaning and purpose in life. To ground our understanding of how robots might be helpful to OAs' ikigai, we performed interviews with 'ikigai experts'–scholars and practitioners who study and/or actively work to support OAs' ikigai–to identify the meaning of and existing practices relating to ikigai in OAs' experiences. Subsequent co-design workshops with 'ikigai experts' allowed us to work together with these ikigai practitioners to envision potential future functions and uses of robots that can support OAs' ikigai. Our studies provide an empirical contribution by documenting the contemporary understanding and practices related to ikigai among OAs in Japan, and a design contribution in social robotics by translating these empirical insights into design implications that can guide the future development of robots to support OAs' ikigai. To the best of our knowledge, this is the first interview and co-design study to conduct a qualitative investigation with ikigai experts and practitioners (many of them OAs themselves) and bring in-depth, lived knowledge of ikigai to inform the user-centered co-design of social robots. It adds to our previous survey-based study of OAs in the United States, which identified how OAs achieve a sense of purpose in life and found an overall positive attitude towards the potential use of social robots for supporting ikigai among OAs.

2 Background

2.1 The Concept of Ikigai

The Japanese term ikigai consists of two Japanese characters: *'iki'*, which means life, and *'gai'*, which means value or worth. Therefore, in a broad sense, ikigai means that which makes one's life seem worth living [8]. However, it also refers to various additional concepts including: purpose and meaning of life [9], self-actualization [1], psychological well-being [10], or at a smaller scope, the joy a person finds in living day-to-day [11], such as enjoying a cup of coffee [12]. While these interpretations are often not mutually exclusive, the vagueness of the word makes it challenging to conceptualize and conduct research on the topic and leaves non-Japanese speakers puzzled. However, what seems to be accepted across different interpretations is that ikigai is individual to everyone, and ikigai is a familiar concept deeply rooted in the daily lives of Japanese people, to the extent many of them possess an abstract idea of what it is by without thinking about it [13]. The term has also started garnering broader international interest, with the publication of several popular English-language books [11, 12, 14] and efforts by Japanese scholars and practitioners of ikigai to make the concept and related practices more available to a non-Japanese audience [15, 16].

In Japan, the term ikigai became the focus of significant attention in the 1960s, as people started seeking more psychological fulfillment as the society became economically affluent [5].

"About ikigai", written by Japanese psychiatrist Mieko Kamiya [1] and published in 1966, extensively studies the ikigai of leprosy patients, and remains one of the most influential works in ikigai research [17]. The vital contribution of Kamiya's work is the distinction she makes by describing two aspects of ikigai, *'ikigai-kan'*, meaning the feeling of ikigai, and *'ikigai tai-sho'*, meaning the object or the source of ikigai [1]. Kamiya's work triggered a surge in ikigai-themed research; OAs have in turn been one of the most studied populations in ikigai research from the 1960s onwards [2].

Ikigai research in Japan became highly active again in the twenty-first century–"*the Renaissance of ikigai research* [18]." Various ikigai models as well as scales to conceptualize and measure ikigai were developed during the period. While earlier Japanese researchers adopted and modified scales made in the West to quantify ikigai, including the Philadelphia Geriatric Center (PGC), Morale scale [19], and Purpose-in-Life (PIL) test [20], three scales were newly developed specifically for measuring the Japanese concept: K-1 scale [9] by Kondo and Kamada, the ikigai model [17] by Hasegawa and authors, and ikigai-9 [21] by Imai and authors.

The Japanese term ikigai has also attracted attention overseas since the 1980s. Anthropologists like Mathews [8] and

Fujita-Sano [22] investigated ikigai in cross-cultural contexts, between Japan and the US, through qualitative analysis including ethnographic observations and interviews. Mathews [8] suggests, while no term exactly equivalent to ikigai exists in the US, there is a parallel, shared common sense of ikigai as *"what one most deeply lives for"* in both countries. More recently, there has been an increase in ikigai publications written in English, especially in the last decade [2], across areas including positive psychology and preventive medicine, as ikigai has been associated with health benefits [15]. While the concept enjoys increasing international recognition, some Western conceptualizations of ikigai (*e.g.* Garcia and Miralles [14]) have been questioned as misinterpreting the Japanese notion [2].

In the field of psychology, ikigai is considered an essential element to well-being, of which happiness is only one component [23]. Happiness is mostly associated with positive affect, negative affect, and life satisfaction [24]. While much of the research on well-being, especially within human-robot interaction (HRI), has focused on happiness, well-being researchers acknowledge that other concepts, like ikigai, contribute to well-being [23]. Within the Western well-being literature, well-being is in fact divided into two branches: one which relates to happiness, and the other which relates to eudaimonic well-being (e.g. meaning and purpose in life, accomplishment, and positive relationships with others) [23, 25]. Ikigai incorporates aspects of both these spheres, and therefore provides a more holistic view of well-being [10, 26]. Some researchers have also conceptualized ikigai as a pre-cursor to and necessary condition for well-being [27]. Research also shows that ikigai is likely a unique component of quality of life (QOL), and should be added as a construct to other commonly measured QOL constructs [28].

2.2 Ikigai Landscape for Older Adults in Japan

In line with the increasing scholarly and popular interest in ikigai, the Japanese government also began designing programs to support OAs' ikigai, led by the Cabinet Office [29]. By the 1990s, 'ikigai and health support for OAs' was established as a central political term in the national social welfare policy [30]. Following the government's ikigai policy, there are hundreds of municipal governments, Councils of Social Welfare (CoSW), and non-governmental (NGO) and not-for-profit (NPO) organizations, such as senior citizens' colleges, playing an active role in formally supporting OAs' ikigai at the different regional levels across the nation.

From the 1990s onward, the government has been encouraging development of "OA leaders" to lead the efforts of ikigai promotion to other OAs [31]. These include "health-ikigai creation advisors (kenko-ikigai-dukuri-advisors)" (hereinafter 'Advisor')—OAs professionally trained to provide ikigai and health-related advising to fellow OAs. Advisors work extensively in the community to coordinate projects and activities to support OAs' health and ikigai in collaboration with various stakeholders, such as municipal governments and local community centers, and CoSWs in the region [32]. There are approximately 6000 advisors across the country with 40 regional branches (as of 2019) [32]. Advisors work in the areas of ikigai and health promotion, 'ikigai employment'—a government-supported scheme to promote healthy OAs to get a new job after their retirement age with a purpose of finding ikigai rather than monetary rewards through the job and for health benefits. These positions also enable social participation, which aims to prevent OAs from being isolated and promotes social engagement through providing places such as "ikigai centers" and "iki-iki salons" [33] where OAs can interact with each other, to name a few examples [32].

The term "co-production (kyo-do)" has been frequently used to describe the collaborative relationship between the local governments, OA leaders, and other stakeholders such as NGO/NPO organizations in leading efforts to support OAs' ikigai at local scales [4]. More details on what each of those stakeholders do in order to support OAs' ikigai are described in the result Sect. 4.1.1.

2.3 Co-designing Social Robots to Support Older Adults' Wellbeing

As mentioned previously, the main goal of our project is to support OAs' ikigai through the use of robotic technology, and researchers have used various design methods to create robots with and for OAs [34]. These design methods include ethnography [35], field studies [36], and co-design [34]. Among the different methods, co-design in particular creates possibilities to use OAs' experiences, capabilities, limitations, and preferences to design robots [37]. Co-design is a process of participatory design [38] that emphasizes the role of the users in defining design problems and solutions [39]. It provides the users with a voice in the decision-making process as they learn with the designers in the process [38]. The user's voice is then often expressed in an iterative and cooperative process that involves telling their experiences and new technological possibilities, making prototypes, and enacting through imagining or acting out their design [40]. Because of the deliberately collaborative process, researchers can ensure that the final design product is usable and meets the user's needs [38, 41].

Given the benefits of co-design, many researchers have increasingly employed co-design approaches [39, 42], particularly with OAs. Prior research includes developing co-design toolkits [42] or co-designing with workshops, focus groups, interviews, drawing, storyboarding, and card sorting methods [37]. For example, Ostrowski et al. [39] incorporated methods such as interview, making an image, host

robot, debrief robot, rapid prototype, design guideline generation, and reflections to co-design a home social robot with 28 OAs. They investigated how Jibo, a tabletop robot companion, could provide long-term support for individuals at home [43]. In another study, researchers collaborated with OAs by putting Bomy, an assistive daily care robot, in their home, and conducting semistructured interviews. Bomy would remind them of their daily tasks (such as medication), and provide cognitive games. In the end, the OAs thought it was a good companion [44]. Similarly, Randall et al. [34]. conducted co-design workshops with OAs diagnosed with depression by showing them robot videos, demonstrating a real robot, and making sketches of the robot together. Another study demonstrated robots and used craft materials to design robots with and for physically ill and depressed OAs [45].

These past co-design attempts with OAs and related studies have explored physical assistance as well as psychological needs such as loneliness and depression [34, 45]. The design outcomes of these co-design workshops all shared similar goals to improve OAs' health and well-being. However, these co-design workshops have yet to focus on the OAs' meaning in life: a factor that significantly influences the health and well-being of OAs [46]. This goal to improve meaning in life is thus the main purpose of our robot.

2.4 Technologies to Support Meaning in Life

Several prior studies describe technologies developed to support meaning in life for their users [46]. One such study used an app to prompt participants to consider how and why their everyday activities added significance to their lives [46]. Scholars also suggest that smart technologies, such as computers, smart phones and robots, can also enhance meaningful relationships, interests, spiritual needs, health and safety support, self-growth, and physical activities that could support OAs' meaning in life [47]. Ikigai has also been mentioned in the context of social robots for OAs [48]. Babyloid is a human baby-like robot that, similarly to a human baby, cannot do anything for itself, but shows its physiological and psychological states, such as whimpering and becoming irritable, to instigate others to help it [48]. Its designers expected to increase OAs' ikigai by building trust with them and providing them with a feeling of self-sufficiency by simulating a child-care context. This robot, however, was designed by researchers without initial participation of OAs, and was later tested to gauge acceptance and initial OA reactions in a few healthcare contexts [48].

To our knowledge, the study presented in this paper is the first to focus on identifying how OAs define ikigai and exploring the potential broader design and use of social robots with ikigai experts to help support OAs' experience of ikigai. By using co-design, we aim to work together with ikigai experts–who are both OAs' and practitioners who help other

OAS–to explore the design of a robot that promotes OAs' ikigai and supports ikigai-related activities.

3 Methodology

In this paper, we engage with participants we call "ikigai experts." Although we might argue that anyone can have personal experience and expertise regarding their own ikigai, the people we termed "experts" engage with ikigai not only personally, but in a professional way. This includes scholarship on ikigai, volunteer work or/and paid work in community-based ikigai organizations, as well as paid labor in educational and governmental organizations focusing on supporting OAss' reflection on and maintenance of their ikigai.

We recruited our OA expert participants by reaching out to ikigai organizations, our scholar participants through literature review of ikigai related publications and searching information on ikigai on the internet (e.g. "ikigai promotion project" mentioned on their website). We first contacted potential participants by email or letters. For health-ikigai creation advisors, we contacted a prefectural branch based on the available information on their website and worked with a representative to recruit 6 advisors. We recruited participants for the interview. For the workshop, we invited back interview participants who agreed to participate in the co-design activities. We excluded scholars for this part of study as, as we wanted to work with OAs who directly led ikigai-related activities. Our recruitment for the workshop partially used snowball sampling, with two participants bringing a colleague and a family member, respectively, who also worked in the same domain.

The number of participants who took part in our study was limited by the availability of OAs who also engage in ikigai-related activities professionally and could be deemed 'experts.' In our previous qualitative interview and co-design studies with OAs, such as [34, 45], meaningful results have emerged from a relatively small number of participants (8–10). Other co-design of human–robot interaction studies have also worked with similarly limited sample sizes; for example [49] worked 8 and [50] with 12 participants, respectively. We therefore focused on collecting rich qualitative data on their experiences and perceptions through interviews and co-design activities. In analyzing our interview transcripts and co-design session materials, we were able to achieve data saturation [51], meaning that new interviews or workshops did not yield new insights, in identifying themes relating to participants' conceptualization of ikigai and ways in which social robots were seen as potentially supportive of OAs' ikigai. We therefore deemed our sample size to be appropriate for this exploratory inquiry.

Table 1 List of ikigai experts participated in the study (W stands for 'Workshop' and the number represents the session group)

ID	Gender	Age	Occupation	Affiliation	Participation
P1	M	n/a	Psychologist	Toyo Eiwa University	Interview only
P2	M	n/a	Anthropologist	Chinese University of Hong Kong	Interview only
P3	M	73	Advisor	A prefectural branch	Interview/W1
P4	M	80	Advisor	A prefectural branch	Interview/W5
P5	F	68	Advisor	A prefectural branch	Interview only
P6	M	70	Advisor	A prefectural branch	Interview/W4
P7	M	73	Advisor	A prefectural branch	Interview/W5
P8	M	80	Advisor	A prefectural branch	Interview/W4
P9	F	n/a	Employee	A prefectural CoSW	Interview/W3
P10	M	n/a	Employee	A prefectural CoSW	W3(no interview)
P11	M	n/a	Vice principle	Inamino Senior Citizen's College	Interview/W2
P12	M	n/a	Researcher	Inamino Senior Citizen's College	Interview/W2
P13	M	73	Employee	An intensive-care OAs' home	W1(no interview)
P14	M	n/a	Employee	A city CoSW	Interview only

Our research was approved by our institution's regulatory review board, and all participants went through an informed consent procedure prior to participating in the study.

3.1 Expert Interviews

3.1.1 Participants

We engaged with 12 individuals whom we identified as "ikigai experts" through semi-structured interviews. Our interviewees included: Dr. Akihiro Hasegawa and Dr. Gordon Mathews—two academic researchers who have studied and published on the topic of ikigai; 6 health-ikigai creation advisors (*kenko-ikigai-dukuri advisor*) from the same prefectural branch—certified OAs who work with different stakeholders in the their community (e.g. municipal governments, NGO/NPO organizations, local community centers) to support OAs' health and ikigai; 2 individuals (i.e. a vice principal and a researcher) from Hyogo Inamino Senior Citizen's College [52]-the oldest senior citizen's college in Japan that has been providing OAs with systematic learning opportunities as part of their life-long learning; and 2 individuals who work at the Councils of Social Welfare (CoSW)—regional organizations that promote community welfare, giving high priority to public interests [53], including OAs' ikigai, at a city and prefectural level and engage in ikigai promotion projects, respectively. Each participant signed an informed consent form, and received a digital gift card (unless declined by the participant) worth approximately 50 USD (Table 1).

3.1.2 Study Design

12 semi-structured interviews were conducted by the first author, who is a Japanese speaker, except for P2, which was conducted in English by the first and last authors. 9 interviews were conducted via video-conferencing, and 3 interviews were held in person per request from participants. The one-on-one interviews with experts typically lasted an hour (ranging from 38 min to 2 h), and all interviews were recorded, then transcribed and translated from Japanese to English by hired translators (except for P2 which was conducted in English) prior to analysis. A set of 15 interview questions were iteratively developed through discussions among researchers, inspired by prior informal conversations we had with workers at a local 'ikigai center' and based on relevant academic work—both the theme of ikigai (e.g. [8, 15, 17, 22]) and methodology (e.g. [54]) (see Table 2 for a complete list of questions).

3.1.3 Analysis

We conducted inductive thematic analysis on the written materials produced in this study [55]. Researchers collaboratively and iteratively generated codes for the analysis through discussion, after which we conducted line-by-line coding. Inter-rater reliability was 87% as measured by percent agreement. Disagreements were later resolved through discussion.

Table 2 List of questions prepared for the semi-structured interviews

	Demographics and Experiences
1	Age, gender, [expert domain] details
2	How long have you been working in the domain of ikigai?
3	What made you interested in ikigai?
4	What kind of work have you done as a [expert domain] ?
	Ikigai Definition and Approaches
5	How do you define ikigai? Has the definition changed over time?
6	Multiple stakeholders (e.g. local governments, advisors) have engaged in and worked on the topic of ikigai and OAs—have you noticed any difference in how they see and address ikigai or/and their purpose for doing so?
	Ikigai Factors and Influences
7	Have you noticed that ikigai has been attracting attention overseas? If so, have you observed any difference in how the Japanese and non-Japanese see and address ikigai?
8	Based on your experience, what kind of factors (e.g. gender, socio-economic status) significantly influence individual OA's ikigai?
	Ikigai Support and Information
9	Where do OAs seek support to improve their ikigai?
10	Where as a [expert domain] do you seek information to that can be helpful to support OAs' ikigai?
11	Each person has their own ikigai—how do you support the diversity of OAs' ikigai?
	Ikigai and Technology
12	Have you observed any instances in which technology is used to support OAs' ikigai?
13	What potentials of social robots do you envision in supporting OAs' ikigai?
14	What kind of relationship between the robot and the OA would be desirable in supporting OAs' ikigai with a robot?
15	What are some of the undesirable outcomes and/or concerns (if any) of supporting OAs' ikigai using social robots?

3.2 Co-design Workshop with Experts

3.2.1 Participants

10 participants participated in the co-design workshops in pairs, which typically lasted for 1 and a half hours (ranging from 1 to 2 hours). 8 participants were the same experts who participated in the interview study, and 2 more participants were recruited through experts' connections: P10 a colleague at a CoSW; P13—a family member of an advisor who works in an intensive nursing facility. While P13 technically does not have 'ikigai' as his job title, we invited him as we valued his experience of working with OAs requiring a higher level of care, which could bring us a more inclusive perspective in designing social robots for ikigai. Four workshop sessions

were held through video-conferencing, and one session was held in-person. Each participant signed an informed consent form, and received a digital gift card (or physical gift card per request) worth approximately 100 USD for their participation (unless declined by participants).

3.2.2 Study Design

Our workshop was designed to typically take 1.5 hours to complete. The researcher facilitated the workshop and took notes in a form of stickers on digital Jamboard. We conducted codesign activities for LuxAI's QT (see Fig. 1), a programmable humanoid robot—equipped with microphones, speakers, and 3D cameras, QT provides a wide array of communication and interaction capabilities for human–robot interaction design. Each workshop consisted of: (1) ice breaker-expert introduction; (2) QT introduction video and discussion; (3) ikigai robot application discussion; (4) overall discussion and reflection. In session (2), we showed participants a 5 min 'QT introduction video' which introduced QT's basic functions, including verbal communication, animated facial expressions, and movement of arms as well as several basic application examples (e.g. exercise with the OA, greeting the OA). Following the video introduction, we also made sure to address any questions from OAs regarding QT or robot functions in general before moving forward in the activity. We then asked experts to mention what they liked about QT and what they thought could be improved about QT. We then asked experts to list features and functions that were important for the QT to have if it were used at OAs' homes. Also in this session, we asked experts to mention any other functions that were desirable for QT. In the third session (3), we asked experts to develop application scenarios in each area of ikigai—1st/2nd/3rd person ikigai. 1st person ikigai involves the self (e.g. developing new skills on their own); 2nd person ikigai also involves people close to the person (e.g. travelling with close friends, or "my ikigai is my grandchildren."); 3rd person has to do with 'others' (e.g. contributing to society, or helping community). This conceptualization of ikigai is based on the advisor's text book [4], and the idea was explained to all participants prior to the session. We then discussed ideas with experts on what kind of applications of QT might be helpful to support OAs' ikigai in each area. Lastly, in session (4) we reflected on the discussions we had so far with experts and freely talked about concerns and ideas that experts had not mentioned.

3.2.3 Analysis

Similarly to our analysis of the interview data, we conducted an inductive thematic analysis for the conversations recorded during the co-design workshops. Jamboard (a digital whiteboard) used in the workshop sessions were also utilized as a
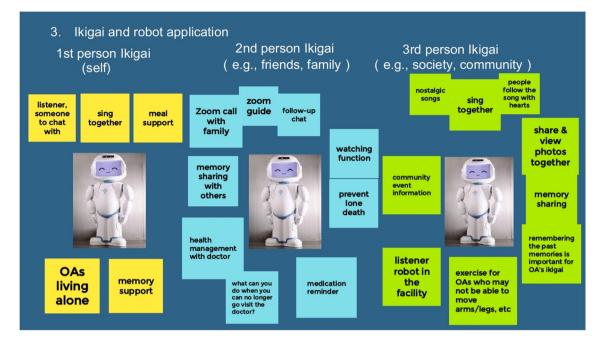
Fig. 1 An example of Jamboard with QT robot images (translated from Japanese) from a workshop

reference during analysis. Inter-rater reliability was 78% as measured by percent agreement. Disagreements were later resolved through discussion.

4 Results

4.1 Expert Interview

4.1.1 Demographics and Experience

Overview. All the health-ikigai creation advisors were over 65 years old, making them OAs themselves ((ranging from 68 to 80 years old (M = 73, SD = 4.6) at the time of study conducted)). Other participants were often younger, though we did not ask them their exact age.

Ikigai support practice by experts. Two academic professionals—Dr. Hasegawa (P1) had been engaging with ikigai from a clinical psychologist perspective, his work includes constructing psychological models and scales of ikigai model, while Dr. Mathews's (P2) work included cross-cultural comparison of ikigai in the US and Japan from an anthropologist point of view. The 6 advisors who participated in the interview had each engaged in various projects to support ikigai and health of OAs. These included running community cafes where OAs can visit and interact with others over a cup of coffee (P5, P7), hosting educational field trips (P3), planning and hosting lectures to educate OAs on ikigai and related topics (e.g. frailty and health) (P4, P7, P8), and running exercise/health promotion programs (e.g.

Nordic walking events) (P4, P5, P6). Moreover, all advisors' activities were either supported by and/or in partnership with municipalities (i.e. prefecture, city, ward) in a form of funding and access to local resources such as Community General Support Centers and Community Care Plazas (= community-based welfare/health facilities for OAs) in the area advisors are based. Similarly, the city CoSW (P9) and prefectural CoSW (P14) we interviewed each closely worked with their city and prefectural governments, respectively, to promote OAs' ikigai in the form of commissioned projects. P9's prefectural CoSW ran an "iki-iki information center" to support OAs' ikigai by creating volunteer opportunities for OAs to work with local stakeholders (e.g. care facilities) and matching up OAs and the facilities based on each other's interests. P14's city-level CoSW, on the other hand, runs an "ikigai promotion project" which provides OAs opportunities to engage in life-long learning through hosting lectures and organizing a senior citizen's college program, and promoting health by hosting exercise classes. Similarly, P11 and P12's Senior Citizen's College is also partially sponsored by and closely works with the prefecture, and provides OAs in the local area with opportunities to gain new knowledge and build peer relationships through classes and various club activities that OAs themselves run and organize, which can lead to adding "depth to life after retirement (P11)."

4.1.2 Ikigai Definitions and Practices

Ikigai defined by experts. The definitions of ikigai provided by experts in their interviews were diverse and wide-ranging,

underscoring the individual nature of the sources and feelings of ikigai OAs experience. Most of the interviewees themselves pointed out that ikigai is very individual and subjective (P1, P2, P3, P4, P5, P6, P7, P9, P11)–a "different shape and different size for each person" (P9). Ikigai could also come from many different sources: objects of interest or affection, such as grandchildren (P7, P8); specific feelings (P5, P7), such as a sense of fulfillment, satisfaction, achievement; or as the result of an activity, such as being helpful to society (P8) or other people (P11). Ikigai in general was not tied to material gain or profit (P7, P11), but to a feeling of accomplishment from doing something worthwhile, having a joyful experience, or connecting with others.

Our interviewees generally described ikigai in positive terms. One view of ikigai was as a *natural part of everyday life*, a consequence of simple daily activities and interactions (P1). Several interviewees mentioned that ikigai is often taken for granted and not something people thing much about as its happening (P3, P5, P6). For example, experiencing a busy and fun day everyday can lead to ikigai (P6). Another interviewee mentioned that ikigai is something that you can feel in a comfortable life (P4). Interviewees also described ikigai as a general feeling of joy throughout the day (P4, P6, P9, P12), or a "patch-work collection of little joys" (P9).

Along with joy, another repeated theme described ikigai *as providing motivation in life* (P1), "what keeps me going in the morning" (P2). This notion relates to OAs having and working towards their goals (P4, P12), working hard at something they enjoy (P3), and expressing their own interest/curiosity and getting recognised for their achievements (P11). Here ikigai is seen not as something that is given, but as something to create by yourself (P4). In these terms, ikigai can be seen to relate to self-actualization (P4) and a type of agency, which enables the person to do certain things because they want to (P7).

Ikigai was also often mentioned as having a *social component*, as something that ties people to the social world (P2). Many examples related ikigai to social connections and interactions people had with others (P3, P4, P7, P11, P14) and the stimulation OAs can get from social interaction (P5, P15). Our interviewees distinguished between 1st, 2nd and 3rd person ikigai, a framework described in one of the training textbooks for advisors: 1st person as ikigai that only concerns self, 2nd person as ikigai that concerns close friends and family, and the 3rd as ikigai that concerns 'others' (P4, P5, P6, P8). In this case, being helpful for others in society can make both them happy (3rd person) and yourself happy (1st person) (P5).

Finally, while ikigai tends to highlight the positive aspects of life such as joy and happiness in relationships and activities, interviewees also discussed it can be important to acknowledge *painful experiences* in life for ikigai. This can be especially important for OAs that have experienced many

things and have a rich accumulation of life (P1), including ikigai loss and how to bounce back–"Life has its ups and downs" (P4). As people age, ikigai can also take into account people's realization that they do not know many things, and need to work harder to know more (P5). Interviewees also mentioned that ikigai can have the power to transform a negative experience into a positive one (P1, P4, P5), like saying "I want to live longer than that bastard!", to spite someone you had negative interactions with (P1).

Multiple stakeholders working together. As described previously, ikigai support of OAs is often supported by municipalities and governmental organizations. Experts frequently addressed the societal benefits of supporting ikigai of OAs, which is why the government has been promoting ikigai, in relation to national finance issues that concerns OAs, including social welfare costs, medical costs and nursing costs (P4, P5, P6, P7, P8, P9, P14). Essentially, ikigai and health promotion of OAs within the government policy is a preventive measure in order to extend OAs' healthy life expectancy and therefore save on costs associated with the physical and cognitive decline and need for additional care. Moreover, experts described the role of active OAs like advisors themselves as providers of care for other OAs in the areas where the government and municipalities fall short of, through various activities mentioned above (P4, P8, P12), which is a "win–win relationship (P4)" for both parties.

4.1.3 Ikigai Factors and Influences

Ikigai factors. Experts discussed various factors that could affect individual OA's ikigai. One of the most commonly mentioned was *gender* (P2, P3, P4, P5, P6, P7, P8, P11, P12, P14).

The different dominant social roles of males and females–work for males and raising children for females in the OA's generation–were often cited as the reason female OAs seem to be better at finding ikigai or/and have a stronger sense of ikigai based on experts' observation. The experts explained that child raising encourages females to be social and build their own network (e.g. 'mom friends'), while males tend to have work as their main source of ikigai—a place to belong and where they can get rewarded, therefore after retirement male OAs tend to struggle with finding new ikigai and get socially isolated (P2, P3, P4, P5, P6, P7, P8). Another factor frequently mentioned by experts was *socio-economic background* (P3, P4, P5, P6, P7, P8, P9) including types of jobs OAs have/had (P8) and amount of knowledge based on their educational background ikigai (P7), and societal changes, at a larger scale (e.g. emergence of individualism, social norms) (P2). Several experts mentioned that financial security is often a prerequisite for pursuing ikigai since certain types of hobbies/activities can be expensive, and

"financial security equals psychological security (P3)" therefore "socio-economic inequality is ikigai inequality (P4)". In addition, individual's *health status* including dementia and illness (P1, P2, P4, P6, P7), age (P1, P2, P4, P6), personality (e.g. curiosity) and values (P3, P4, P7, P9), and regional differences (P6, P7) (e.g. more close-knit community in rural area vs urban) were mentioned as factors that influence OAs' ikigai.

4.1.4 Ikigai Support and Information

OAs' sources of ikigai-related information. We asked experts where OAs seek support and information that can be helpful to find or improve their ikigai. Experts highlighted the role of municipal offices and local facilities such as regional community centers and libraries at different levels (i.e. ward, city, prefecture) close to OAs as the place OAs visit to gain information (e.g. related to local events and classes) (P4, P5, P7, P8, P9, P14), as well as the magazines and flyers delivered to OAs' houses from their prefecture and city of residence (P9, P14). Experts also mentioned media and online resources including internet (P4, P5, P7, P8) for those who know how to use PCs, advertisements in local TV programs and news- papers (P4, P7, P9). Experts also indicated the role of word of mouth among OAs' social networks (P3, P4, P6, P8, P14), including through friends and family members, to create opportunities for OAs to participant in new things and expand their social participation which can lead to their ikigai.

4.1.5 Experts' sources of ikigai-related information.

We also asked where experts themselves seek information that are useful to support OAs' ikigai. Experts mentioned utilizing resources provided by the government, including white papers (P4, P7) and symposium/events hosted by the government or/and the Cabinet Office (P5, P6, P7) and information available at municipal offices (P5, P6).

Internet (P4, P7, P8), and books, magazines, and newspapers (P4, P8, P14) as well as research articles (P7) were also cited by experts as the source of relevant information. Networking with different stakeholders—for advisors, meeting with fellow advisors and joining their training programs (P4, P7), and for P9's CoSW, for example, networking with local care takers and conducting hearing from facilities such as local schools and other CoSW served as an information source. In addition, thorough social media (P9), and gathering information through the advisor's own hobbies and activities of interests were mentioned (P5).

Supporting diversity of ikigai. We asked experts for strategies to support diversity of ikigai that each OA has. Experts often encourage OAs to try new things by suggesting events/hobbies/activities based on each OAs' interests

and providing relevant information (P4, P5, P6, P9) and the place and/programs for them to explore their interests with others (P4, P7, P8, P9, P11, P12, P14). P14 suggests the need to accommodate different groups of OAs (i.e. OAs who actively participates in activities by themselves, OAs who are isolated due to motivational reasons etc. and OAs who are isolated due to physical disabilities etc.,), by working with and connecting appropriate local facilities such as local health care support centers and community social workers to enable OAs' social participation.

4.1.6 Ikigai and Technology

Ikigai-aiding technology observed by experts. We asked experts for examples of technology being useful for OAs' ikigai, if any. Smartphones and PCs were the most mentioned (P1, P3, P3, P9). P1 explained, how smartphones are "something we touch everyday and part of the daily routine [..] Smartphones, in a sense, have become an object of ikigai." A mobile game Pokemon Go (P14) used by OAs to talk to their grandchildren and socialize among OAs, and physical support robots (P8) were also mentioned.

Potential of social robots in supporting OAs' ikigai. We also asked experts where they saw the potential of social robots in supporting OAs' ikigai. Conversational partner and listening partner was by far the most popular idea of application (P3, P4, P5, P8, P11, P12). Helping with OAs' hobbies and learning (e.g. singing) (P3, P7, P8), exercise (P3, P9), encouraging and enabling human–human communication (P5, P8, P14), helping independence of OAs (P7), information provision (P4), and watching OAs' for their security (P14) were also suggested as ways to use social robots to support OAs' ikigai.

Desirable relationship between OAs and social robot in ikigai support. Several experts mentioned the importance of personalization (P4, P7, P8) so that the robot becomes the "only one for me" (P8). Other ideas often mentioned in relation to OA-robot relationship included: the robot should not overpower human users (P3, P12), pet-like relationship (P11), and making OAs take care of the robot as a way of providing them with something that gives them ikigai (P1). The question of whether the robot itself could be the object of ikigai or rather a facilitator of ikigai was also raised (P2).

Undesirable outcomes and concerns in using robots to support OAs' ikigai. We asked experts potential undesirable outcomes and concerns when it comes to using social robots to support OAs' ikigai. Some experts mentioned the ease of maintenance of the robot as a concern (P1, P9), as the sudden failure of robot can cause OAs emotional damage—"robot-loss (P1)". Technological dependency and resulting decline in human abilities, such as the fear of communicating with humans (P5, P7, P9), privacy and surveillance concerns (P7, P8), as well as physical safety of OAs in using social robots

(P8) were mentioned. The need for extra consideration when communicating with sensitive populations (e.g. those who are isolated, financially insecure) (P14), novelty effect (P9), as well as the issue of infantalization of OAs were also mentioned—"Pet robots feel like OAs are treated as children—robots can be 'cooler' than that (P7)."

4.2 Co-design Workshop with Experts

4.2.1 QT Perception by Ikigai Experts

The overall impression of QT by experts was positive, as experts perceived QT as "cute" (W1, W3), "soft" (W4), "makes you feel comfortable" (W2), and "decently advanced" (W5). Especially, facial expressions of QT, including the 'smiley face' animation and changes in facial expression were frequently mentioned as QT's likeable feature (W1, W2, W3, W4), while some experts (W1, W4, W5) suggested more variation in facial expression as desirable (e.g. 'sad' or 'bored' face). Health-related functions such as exercising (W1) and motion detection (W3, W5) also gained positive feedback from experts.

On the other hand, one of the most frequently mentioned features needing to be improved was the voice, as many experts expressed concerns as to whether OAs would be able to hear and understand QT's current voice (W1, W3, W4, W5). Experts pointed to various aspects of QT's voice, including the tone, the pronunciation, as well as the choice of vocabulary, as important factors for the voice to be easily understandable to OAs. Another concern related to voice mentioned had to do with the human-like quality in the auto-generated voice, as one expert (P7:W5) mentioned that the "machine-like" voice of QT could make it difficult for OAs to emotionally engage with QT. However, other experts perceived the same QT's voice positively as "gentle" (W2) and "not metallic unlike other robots" (W4). Limited mobility and arm gesture (W2), the size of the face monitor (W1, W5) and its plastic body that "looks a little cold" (W1), as well as the frequency of questions (i.e. too many questions asked by QT) (W3) were mentioned by experts as features that could be improved.

4.2.2 Envisioning Activities with QT and Desirable Features for OAs

When asked what types of uses experts envisioned after watching the QT video described above, experts highlighted providing companionship to OAs, including becoming a conversational partner for OAs who live alone (W1, W2, W3, W4, W5), an exercising partner (W1, W2, W4, W5), and a singing partner (W5).

Important features for OAs. Some of the frequently mentioned important features of robot when designed for OAs included:

- *Companionship & emotional support*: experts highlighted the importance of building emotional connection by doing things 'together' (W5), building a peer-like relationship (W2), and listening, empathizing with OAs and then cheering them up (W1, W2, W4).

  - *Variability & personalization*: experts also discussed the advantage of QT being adaptable and personalizable to OAs' needs and contexts, such as meeting OAs' gender preference (W3), localization of speech (W2, W3) being able to greet OAs differently each time (W5), showing a bit of whimsicality (W2) and 'irregularity' to be "more than just a comfort *(iyashi-kei)* type" (W5).
  - *Risk management*: experts also stressed the importance of mitigating risks and eliminating anxiety factors that hinder OAs' sense of ikigai, including decline in health and frailty (W4) and fear of lonely death "*kodokushi*" (W4, W5).

Additional functions desired. Additional functions experts requested of QT often reflected their views on what is important for OAs's ikigai, as discussed above. In addition to various activities in which QT can provide *companionship*, such as playing music (W1, W2, W4, W5) and reading activities (W2, W3, W4), *daily assistive functions* to support OAs' health and security were most frequently desired by experts. Those functions included: health and medication support (W1, W2, W3, W4, W5) such as reminding OAs to take medication via speech and managing contact information of primary care doctors, and providing meal and nutrition support (e.g. personalized meal suggestion) (W1, W2, W4, W5), and scam prevention (W3, W5) functions to protect OAs from crimes to which OAs are vulnerable e.g. telephone fraud. Experts also desired functions for QT to offer OAs *cognitive support* and keep OAs informed including: time management & reminder (W1, W2, W3, W5) to support OAs when they are forgetful and informative provision function (W1, W2, W5) to keep OAs updated on local news and events, for example. The importance of stimulating OAs' memory and its 'therapeutic effects' were emphasized by experts, as they desired integration of various entertainment contents for reminiscing, such as playing nostalgic songs and videos (W1, W2, W3) for OAs. Furthermore, experts also desired *customization/personalization features* in a range of areas including gender & age (e.g. feminine vs masculine) (W1, W2), appearance (e.g. pet-like outfits and customized clothing) (W1, W2, W3, W4), as well as personalized 'mode' (W2, W3, W4, W5) that suits OA's preference and context of use (e.g. intellectual mode vs cute mode, 'sleep-mode' on when

there are guests). It was also mentioned that QT's ability to notice change in OAs (hairstyle, for example) and give customized reactions (e.g. "Did you change your hairstyle?") will "make OAs feel closer to QT (W5)." Another feature desired by experts related to customization was the option for haptic interaction with QT through "touch" (W3, W4) by allowing OAs to customize QT's surface texture to achieve "a good fitting feel (W3)". Finally, the idea of changing the voice of QT to more familiar sounds and using the voice to motivate the OA was also mentioned—e.g. cheering up the OA in OA's deceased grandmother's voice, "I am by your side (W3)."

4.2.3 Envisioning QT Applications—Supporting 1st/2nd/3rd Person Ikigai of OAs

In this session, experts discussed QT application scenarios in supporting OAs' in each area of ikigai: 1st, 2nd, 3rd person (concept explained in 3.2.2).

1st person ikigai—doing things 'together'. For the 1st person ikigai, providing companionship in various activities including conversation (W1, W2, W3, W4, W5), music and singing (W1, W3, W4, W5), gaming (W2, W3, W4) and hobbies and learning (W2, W5) was the central application scenario experts envisioned. In addition, cognitive assistance through schedule management (W2, W5), health support through exercise activities (W4, W5), meal suggestion (W1, W4) and medication support (W3, W4), and watching OAs who live alone (W2) were also suggested as applications to enhance OAs' 1st person ikigai.

2nd person ikigai—connecting people around OAs. The most desired application scenario by experts to support OAs' 2nd person ikigai was connecting OAs and family members and friends via telepresence function (W1, W2, W3, W4, W5), such as live-streaming events such as grandchildren's birthdays and weddings (W3) and grave visits (W4). Similar to the 1st person ikigai application, OAs' health support and watching function were desired (W1, W3, W5), but with doctors of OAs and family members checking in on OAs through QT as part of the support system. In addition, in the area of the 2nd person ikigai, experts expected QT to play a facilitator's role in activities which OAs enjoy with family and friends, such as gaming (W4), hobbies and learning skills (W4, W5) and image/video content sharing for memory recollection (W3). Moreover, QT was also pictured to play a role of a house- hold consolidator (W2, W5), such as consulting on intergenerational gaps between OAs and their kids and supporting independence from each other (W5), promoting communication and enhancing the relationship between husband and wife and among family members (W5). Some experts (W5) referred to the role of household pets as providing a shared conversation topic (i.e. pet animals) therefore

increasing communication among family members, and suggested that QT could also play the role.

3rd person ikigai—connecting OAs and community. For supporting 3rd person ikigai of OAs', care facilities and local community centers were suggested by experts to place QT and facilitate various activities such as singing and music activities (W1, W2, W4), sharing image and video contents (W1, W3), exercise lessons (W1, W2, W4) including for those with limited physical capabilities (W1, W2) and sports games (W3). For the household use, experts suggested several applications in which QT connects OAs and the surrounding community. For example, experts suggested using QT to inform OAs of events happening in the community and adding schedules for OAs' to join (W3, W5), such as neighborhood cleaning days and events advertised by local community centers. Experts also mentioned integrating QT into some existing mutual support systems in the community, such as 'garbage disposal support' where volunteers go to the houses of OAs and the disabled who cannot take garbage out and do it on behalf of them. Experts suggested QT could help the process run smoother by sending notifications for those who are in need (W5), for example. Another application scenario mentioned by experts to support OAs' 3rd person ikigai was providing advice to OAs to enhance human relationships (W3), such as giving advice on manners including make-up advice and pointing to nose hair, instructing OAs on appropriate attire based on occasions and greeting manners (W3). Lastly, experts also suggested QT to be used to provide opportunities for OAs to not only receive but provide information to the community (e.g. events and classes that the OA plans to organize), especially for those who have limited technology literacy by supporting them via speech-to-text function (W5).

4.2.4 Reflection and Concerns

In this session, experts reflected on the discussions we had so far and discussed concerns and critical points in using QT to support OAs' ikigai.

Target OA population. Overall experts saw the biggest potential of QT application for OAs who live alone and at care facilities (W1, W2, W4, W5), and social robots like QT as "not luxurious items but daily essentials for OAs to live healthy lives with ikigai (W4)" and "a social mission to address problems like lonely death (W4)".

Concerns about QT application for ikigai support of OAs. One of the most frequently discussed concerns by experts related to the price of QT robot (W1, W4, W5) and implementation and maintenance system (W1, W3, W4, W5), such as whether the financial assistance from the government would be available and the ownership (e.g. personal vs public). The privacy issue also raised concerns by experts (W1, W2, W3,

W4), especially in the context of use at community centers/facilities where there are multiple users of the robot. Side effects of OAs' dependency on QT due to its convenience was also discussed as a concern (W2, W3), including not using brain and staying at home all day. A rewarding system to combat the latter (e.g. giving rewards to OAs when they go out and speak to certain number of people) was also suggested by experts (W3).

5 Discussion

Our research describes a variety of meanings and activities associated with ikigai, and suggests various potential ways in which social robots might be used to support OAs' ikigai.

5.1 Older Adults' Ikigai in Daily Life

Our findings show that OAs' experiences of ikigai can be associated with a broad variety of individual interpretations and motivations, including everyday moments of joy, opportunities for learning, growth and self-actualization, and social interactions with others. Similarly, approaches to supporting OAs' ikigai described by participating ikigai experts involve a diversity of activities, including creative hobbies, skill development and learning new things, helping others, and getting together socially with friends and family members. While some of these activities correspond to personal development, others involve sharing experience with or caring for others. Previous research has similarly shown that both self-actualization and prosocial efforts that benefit the community [8], or activities that help others, can lead people to experience ikigai [56]. Moreover, our findings illustrate how the support of OAs' ikigai is practiced at a variety of levels in community-based settings, through collaboration by local stakeholders including OAs themselves and municipal organizations, and as projected by the national policy [57]. This is mirrored in our participants' focus on 3 levels of ikigai, which brings attention not just to the individual and their behaviors, but to their connection with the community (3rd person ikigai).

5.2 Design Ideas for a Robot to Support Ikigai

The 'ikigai experts' we interviewed and co-designed with generally considered social robots to have significant potential for being used to support older adults ikigai through in-home use. Some of our participants even considered that robots might become a daily necessity for some OAs, particularly those who might have difficulty accessing information available only in specific locations that they may not be able to get to easily, such as in community centers, or who might not be able to get ikigai support (e.g. encouragement, lessons)

in other ways. This also suggests that the use of robots in the home might be particularly appropriate for supporting ikigai in ways that are currently not available to OAs. These findings add to our previous survey-based study of OAs in the United States, conducted as part of this same broader project on developing robots to support OAs' ikigai, which found that OAs often obtain ikigai by helping others, through family connections, and/or through activities of daily life, that sources of meaning often differ based on the OAs' living situation, and that OAs are generally positive about the potential of using social robots to assist in supporting meaning in later life [58].

Our participants pointed out a variety of potential capabilities that the robot could have to support OAs' ikigai, which responded to the diverse potential sources of ikigai that OAs might have. These include companionship, reminders and information provision, entertainment (e.g. singing), and facilitating social activities. While several of these applications are similar to those suggested for social robots for use by OAs in the home more generally to support well being through physical, mental, and social assistance, as described in these recent reviews of the literature [59–61], the focus on supporting ikigai–a sense of purpose and meaning–suggested specific nuances of these familiar features that distinguish them from prior robot applications.

One of the main themes that emerged from our discussions with ikigai experts is the need for *personalization of robot behaviors and activities to individual needs.* Due to the high level of individualization of ikigai feelings and sources among OAs, it was particularly important for OAs to be able to select features that were most meaningful for their needs. This suggests not only personalization in terms of surface level features (e.g. gender or tone of voice) but also of the types of activities that the robot suggests or performs with the user (e.g. language learning or reminders to call friends). As a single robot is unlikely to be able to provide such a wide variety of activities by itself, its role is likely to be that of information provider and social mediator, connecting OAs with existing activities, people and opportunities in their community. Such robots will also require the construction of personalized user models that the robot can learn and adapt over time through interaction with the OA (e.g. [62, 63], with a focus on understanding the level and sources of the user's ikigai and making relevant conversation, activities, and suggestions. A second function of an ikigai-supportive robot could be *fostering connections for helping others.* As one of the main sources of ikigai for many came from their relationship with and benefit to others, finding ways to connect people not just with those they know, but also with the broader community and potential events and volunteer opportunities can be very significant. Furthermore, developing the robot as an agent that inspires prosociality [64] in its users seems highly relevant to supporting ikigai. In some cases, this

could even take the form of users helping the robot, which could become another form of taking care of others (P1).

Finally, feedback from our participants suggests the need for developing a **holistic approach to support OAs' ikigai**, which acknowledges the interconnected nature of physical and mental health, self-development, social connection. Additionally, rather than supporting a one-dimensional approach focusing on increasing happiness, our discussions with ikigai experts suggest that an ikigai supporting robot should also help OAs embrace negative emotions (e.g. the ups and downs of life).

To achieve this kind of highly personalized robot design in the everyday environment of the home, it seems necessary to develop specific ways of first gauging what kinds of relationships and activities provide feelings of ikigai to the participant. Additionally, developing ways for the robot to track (e.g. through conversation, sensors) ongoing behaviors and habits of people (see for example, [65]), along with their changing ikigai status, and change its recommendations and behaviors accordingly, is necessary. Moreover, at the future implementation stage, it is essential to carefully consider the existing system and practices of OAs' ikigai support and how the robot application could fit into them, utilizing available resources that are often highly localized, which may be a challenging process due to the diversity of potential stakeholders involved.

In this domain, it is also important to minimize risks of using robots to support OAs' ikigai. Our participants suggested that too strong of a connection to the robot could lead not only to disappointment, but loss of independence, which has also been a concern in prior critiques of robots for older adults [66]. Furthermore, it will be important to ensure that the robots do not take over for OAs who are helping each other–this is a particular form of ikigai for some OAs, including several of our ikigai experts. The robot should be a mediator between OAs at home and those that are in the community centers, but should act to foster these interpersonal relationships rather than focusing the user on attributing great importance to their relationships with the robot itself. Finally, privacy emerged as a central concern, especially in application scenarios where they are multiple users might involved in interactions with the same robot.

5.3 Limitations

Our study participants represent experts and OAs involved in a wide range of activities to promote OAs' ikigai, but there are still more practices of ikigai support that we did not cover in depth, such as ikigai employment and other projects carried out across the nation. Another limitation comes from the fact that most of the experts who participated in the study were healthy, active OAs. We also acknowledge the gender imbalance in the participant demographics, and the fact that most

of our participants are OAs in Japan, so likely have culturally specific experiences of ikigai. Moreover, while we provided experts a general guidance on the robot and functions, we acknowledge that their prior knowledge of and experience with robots could have influenced their responses to the questions. In addition, while our study guides designing social robots for OAs' ikigai as a first step, more participants will be required to support more specific robot design. We will be conducting further studies with a broader set of participants to address these demographic and methodological limitations.

6 Conclusion and future work

In this paper we present results from (1) in-depth interviews with 12 'ikigai experts' who formally support and/or study older adults(OAs)' ikigai and (2) 5 co-design workshop sessions with 10 such experts to explore how social robots might support OAs' ikigai. Our study findings reveal in-depth insights into how ikigai support for OAs in Japan is performed, and point to design implications for social robots to enrich OA's lives with ikigai. To our knowledge, this is the first research that focuses on identifying how OAs' ikigai is defined in contemporary practice, and explores the use of social robots with ikigai experts that formally practice support of or study ikigai of OAs.

Declarations

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Waki Kamino is a Research Assistant at Indiana University Bloomington and a PhD student at Cornell University. Her research focuses on studying and designing human-robot interaction in various social-cultural contexts.

Long-Jing Hsu obtained her Master of Science degree from National Taiwan University. She is currently pursuing a Ph.D. in informatics, specializing in the Human-Computer Interaction track, at Indiana University Bloomington. Her research focuses on co-designing social robots with older adults in the field of Human-Robot Interaction, for positive experiences and empowerment of the older adults with their assets.

Dr. Swapna Joshi is a Postdoctoral Researcher and an NSF Computing Innovation Fellow at Northeastern University in Boston, USA. Through intensive research engagement with communities, such as assisted living facilities and senior care centers, her research emphasizes communal aspects of human-robot interactions and presents critical perspectives on the design and deployment of robotic technology for achieving communal goals.

Natasha Randall is a PhD Candidate at Indiana University Bloomington. Her research explores the design features and demographic and psychographic variables that influence purchase intent of domestic social robots, particularly in areas that have high potential for individual and societal good. Therefore, she often blends consumer research and UX research techniques. Additionally, much of her research involves the general design and evaluation of social robots for the home.

Abhijeet Agnihotri is a Humans and Autonomy Interaction Researcher in the AI/ML group at Aurora Flight Sciences in Cambridge, MA. His expertise is in liaising with a team of multiple engineers, researchers, and designers to solve the many human interaction problems with the use of Autonomy. Being at the intersection of UX, research, and engineering, his passion is to prototype and create robot behaviors and learn by deploying these robots in the real world.

Dr. Katherine Tsui is the Manager of Human-Robot Interaction Research at Toyota Research Institute. Her assistive robotics research focuses on developing trustworthy interactions in which home robot

helpers assist Older Adults in both functional ways to maintain their independence (e.g. physical assistance for sit-to-stand) and social ways (e.g. achieving and maintaining their desired level of social connection and ikigai).

Selma Šabanović is a Professor of Informatics and Cognitive Science at Indiana University Bloomington, and director of the R-House Human- Robot Interaction lab. Her research combines the social studies of computing, focusing on the design, use, and consequences of social robots in different cultural and organizational contexts, with research on human-robot interaction and its applications in healthcare, education, homes, and other domains.