What Do Young Adults Expect from Social Robots?

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Abstract—**Personalization of social robots depends on the identification of different characteristics and preferences of the users and, thus, creating a more efficient and adoptable usage/collaboration experience. The first and most important step of the social robot design for specific user groups is determining, analyzing, and learning their preferences and habits. In this paper, the expectations of young adult users between the ages of 18-39 from social robots were investigated using structured interviews. Statistical and qualitative analysis of the obtained results reveal the importance of four dimensions in designing social robots for the specified user category: (1) Routine Task, Education and Learning Support, (2) Mental, Social and Emotional Interaction, (3) Ethics and Privacy, and (4) Physical and Behavioral Design.**

Keywords-social robot; user-centered design; young adult; design dimension.

I. INTRODUCTION

Social robots which aim to offer cognitive support and assistance to humans with meaningful interactions are seen as one of the most transformative technologies of the future [1]. With human-like features, such as speech, emotion, face, and object recognition along with other artificial intelligence-related abilities, social robots are increasingly being utilized for therapy, education, and entertainment [2], [3].

In 2008, Microsoft founder Bill Gates predicted that as robots become affordable to consumers, they will change how individuals communicate, entertain, learn, and work at home [4]. In parallel with this prediction, in 2025, Tesla founder Elon Musk projected that they aim to manufacture 500,000 humanoid robots in three years and that 10 billion humanoid robots will exist by 2040 costing 20-25 dollars [5], [6].

The recent advances in new technologies, such as Generative Artificial Intelligence and the global increase in the aging population have directly affected the interest in social robots with many studies investigating the acceptance and effects of social robots on different user groups. For example, in their research, Søraa et al. [7] examine whether older adult users are properly included in the user-centered approach to robot development. Pu et al. [8] investigate the effectiveness of social robots on the physiological and psychological outcomes of older adults with randomized controlled trials. In another study, the functional and non-functional requirements of an assistive system for the home care of elderly patients with neurological impairments have been examined [9].

Other studies focus on the utilization of social robots for children. Kanero et al. [10] review the literature on child–robot interaction for language learning in young children. In another study, the relationship formation between children and social robots is investigated [11]. Finally, the influence of a social robot modeling prosocial behavior on children is examined by Peter et al. [1].

As shown by the existing literature, social robots have gained significant attention in recent years, especially in education, healthcare, and elderly care in domestic settings [2]. Yet, the consumer interest and expectations from social robots for the other adult population groups have not been studied extensively. Further research is required to understand the human needs and interests of diverse adult population groups, as social robots are anticipated to integrate into societal frameworks for the near future. These investigations will be important to ensure that the development and deployment of these technologies align with the expectations and requirements of various demographic groups [12].

To address this gap, the present study aims to explore the requirements and expectations of the younger population in the age range of 18-39. For this purpose, structured interviews were conducted with a sample of 83 participants to identify the tasks they envision social robots performing and the features they desire such robots to possess. The differences between the genders were also investigated statistically and qualitatively. Based on the findings, the main dimensions for designing personalized social robots for young adults are explored along with their key considerations. Hopefully, the outcomes of this study will provide insight to social robot designers and developers as more social robots are developed for all age groups.

The rest of the paper is structured as follows: Section II introduces the methodology; Section III presents the quantitative analysis of the interview results; Section IV describes important qualitative findings obtained from the user interviews; Section V proposes main dimensions to design personalized social robots for young adults; finally, the work is concluded in Section VI.

II. METHODOLOGY

In this study, data was collected via structured face-to-face interviews conducted within the framework of predetermined questions. The interview questions are provided in Table 1. The first three questions are open-ended focusing on the young adults' requirements in terms of roles, tasks, and capabilities of social robots, whereas the remaining two are multiple-choice type closed questions investigating the young adults' preferences for social robots. As a result of the interviews, participants' preferences on the social robots' tasks and features are obtained.

TABLE I. THE QUESTIONS IN THE STRUCTURED INTERVIEWS

No	Question
1	What role(s)do you expect a social robot to play in your daily life?
2	What are the 3 most important tasks you want the robot to perform?
3	What are the most important features or capabilities you want the robot to have?
4	Would you like to have a social robot designed according to your personal preferences and needs?
5	Do you want the robot to recognize you or your family members?

In total, 83 young-adult people within the age range of 18-39 participated in the study and all of them were provided informed consent for the anonymous use of their data. Approval of the research was obtained from the Institutional Ethical Review Board of Atilim University. The results of the structured interviews were then statistically and qualitatively analyzed leading to the development of a conceptual framework for social robot design dimensions for young adults which will be described in detail in the following sections

III. STATISTICAL (QUANTITATIVE) ANALYSIS

Structured interviews were conducted on 83 participants within the age range of 18 to 39. The gender distribution of the participants is given in Table 2. In the structured interview, the participants were inquired about the tasks they would prefer the social robot to be able to perform.

TABLE II. TABLE TYPE STYLES

Gender	Count	Percentage
Male	51	61,45%
Female	32	38,55%

As illustrated in Figure 1, the two most preferred tasks were those of assistant and house chores. The assistant task was chosen by 59% of the participants representing a significant margin while the house chores task was favored by nearly half of the participants (49%). According to the responses of the participants, the constituents of the tasks can be seen in Table 3.
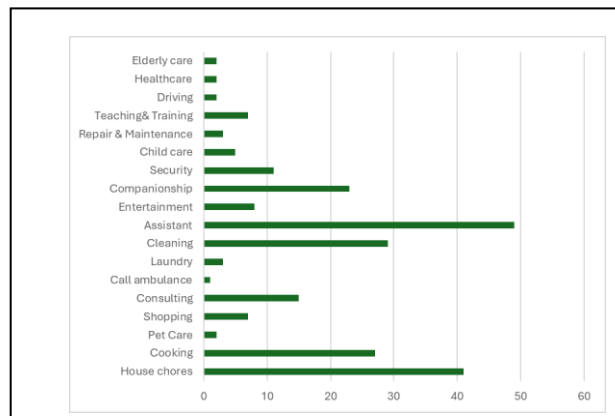

Figure 1. Task preferences of the participants.

TABLE III. CONSTITUENTS OF THE TASKS

Task	House chores	Assistant	Consulting	Teaching & Training	Cooking	Entertainment	Security
Elements	Wash dishes	Reminding	Recommendation	Diet coaching	Make coffee	Play games	Check oven
	Make bed	Alarm	Answer questions	Sports coaching	Make break-fast	Play music	Check risky places
	Tidy the house	Daily plans	Decide what to wear	Language tutoring			
	Turn off lights	Time management					
	Bring drinks	Personal care (hair, makeup)					
	Ironing	Research					
	Fold laundry	Grade homeworks					
	Carry items						

In addition, the participant responses for task preferences were statistically analyzed based on gender where they were initially converted to their percentage values to generate standardized results.

As shown in Figure 2, the assistant task is preferred by the female participants by a wide margin. Male participants showed a greater interest in tasks related to shopping, entertainment, security, and healthcare, whereas female participants demonstrated a stronger preference for tasks involving cleaning, household chores, companionship, and the care of the elderly and children.
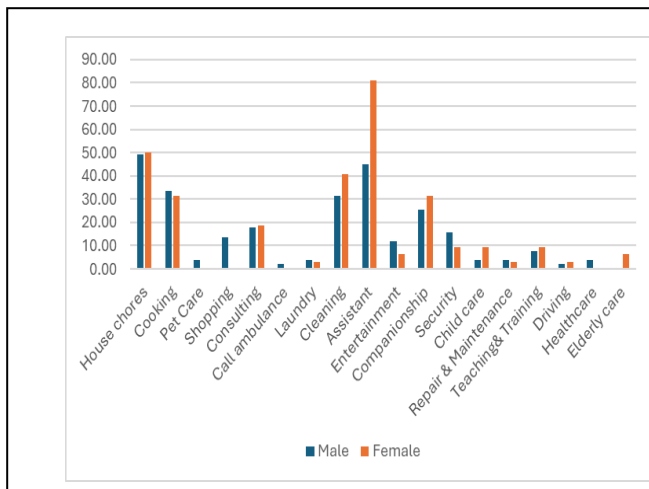

Figure 2.   Task preferences according to gender.

The preferred features of social robots were also investigated in this study. As illustrated in Figure 3, the most requested features were for the social robot to talk and communicate through speech, to exhibit empathy and emotional intelligence and possess security and privacy features. The feature preferences according to gender were also investigated and the results are shown in Figure 4.

The features where there were differences in the preference of genders were as follows. Male participants were more interested in a small and quiet social robot prioritizing security and privacy, having fast and long-lasting charge, capable of multimodal interaction. On the other hand, female contributors focus more on the social robot displaying empathy and emotional intelligence with problem solving skills and quick response features.

IV.   QUALITATIVE ANALYSIS

The qualitative findings obtained from the user interviews in this study are presented in this section based on all questions. The interview results revealed that young adults have expectations from social robots in three main themes: making life easier, emotional and mental support, and physical and behavioral features. These themes are explained below and sample comments obtained from the user interviews for each theme are presented as an excerpt in quotation.

A.   *Support for easy life*

Young people expect social robots to make their lives easier and save them time by performing monotonous and routine tasks that they need to do. For example, while some participants stated these requests in general terms as "Doing routine tasks for me and saving me time", "Representing me in various environments" and "Making my life easier", other participants expressed them with much more specific and defined expressions, such as "Being able to do monotonous, periodically required tasks and meetings", "Entering classes and taking notes, signing for me", "Earning money for me (by doing extra work)" and "Doing homework and similar things for me". The expectations stated in this group also revealed the need for social robots to learn habits or routines and act accordingly. For example, while some participants stated their general requests as "Following personal routines" and "Learning my habits", another expressed a similar request much more clearly as "Remembering past teachings (favorite table in the restaurant)".
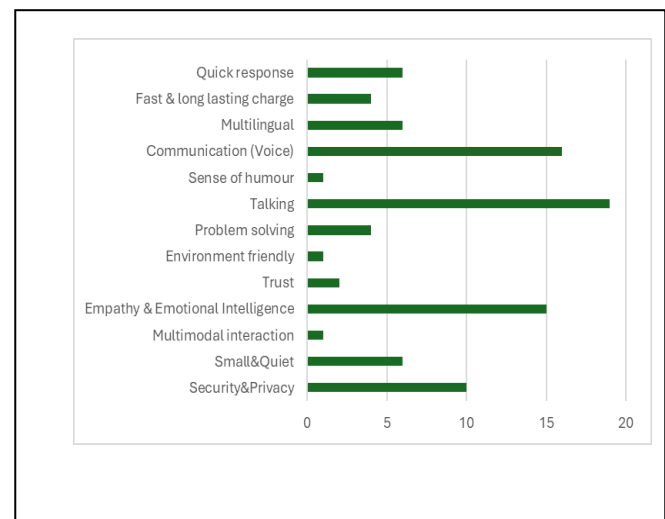

Figure 3.   Feature preferences of the participants.

B.   *Emotional and mental support*

Among the expectations of the participants from social robots, emotional and mental support also have an important place. In this category, all participants stated their expectations regarding the request for mental support. For example, an interesting expression used by one participant, "Let it be a second brain, like my clone", expresses this need. A similar demand is also seen in the sentence "It should be able to transfer the information it acquires to my brain by telepathic method" by another participant. Some

participants stated that they expected a rather standard level of mental support with expressions, such as "Budget planning, ability to make investments", "Plan and remember instead of me" and "Make my day more productive". One participant's specific expectation from the social robot was "Helping to socialize". In this category, it is observed that there are differences in the expectations of male and female participants regarding emotional support.
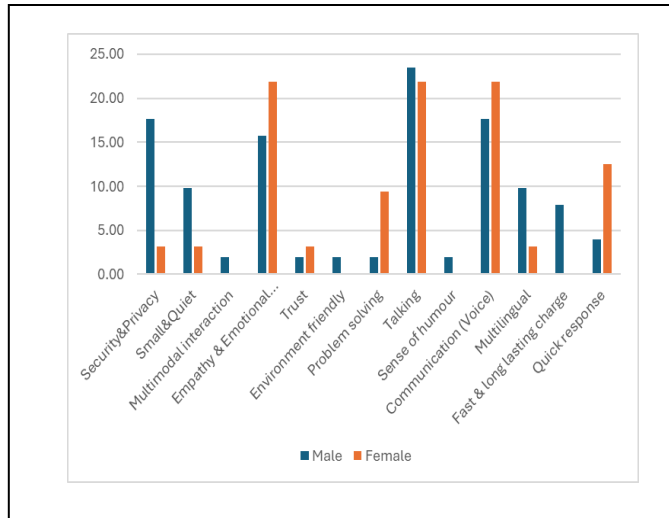

Figure 4. Feature preferences according to gender.

For example, among female participants, there is an expression emphasizing the need for "Providing mental and emotional support". Another female participant expressed the importance of emotional support from social robots and her expectation in this regard as "Providing morale and motivation". Male participants generally do not demand emotional and moral support, and some, even, have opposite expectations. For example, one of the male participants stated that a social robot should be "unemotional and have no empathy".

C. Behavioural features

Participants stated various expectations regarding the behavioral characteristics of social robots. The most requested one is that social robots work in integration and cooperation with other systems. For example, expressions, such as "Home management integrated with smart home systems", "Integration with the devices I use", or "Working in harmony with other electronic devices" used by the participants express this important expectation. Among the expectations, demands, such as "Analyzing what I say and do" and "Improving itself by learning" show that the participants generally expect social robots to be intelligent and able to learn. For example, expressions, such as "Recognizing guests" or "Being able to think" also support this expectation. Young adults expect mental support from social robots, learning many tasks, performing them

autonomously, and thus making life easier. On the other hand, statements, such as "Not disturbing", "Not being too smart", and "Turning off all functions" also show that they want to control the social robots. Participants are also sensitive about the environmental friendliness of social robots. For example, while one participant said, "It completes business processes in an environmentally friendly manner," another emphasized environmental sensitivity by defining the most important features of the robot as "Empathy, trust, and being environmentally friendly." Young participants also expressed the need for intelligent, witty, and skillful social robots with expressions, such as "It should be humorous" and "It should be quick-witted, fast, and agile," sensitive to fragile social groups with the expression "It helps the disabled," and reliable with the expression "It should not perceive me or my loved ones as a threat." Some participants emphasized their expectations regarding the structure and situation-behavior of social robots by using expressions, such as "Warning and assistance in natural disasters," "Arms and legs," and "Doing sports." The comments of young adults between the ages of 18-39, who were considered as the focus group in this research, exemplified under the 3 categories above, reveal the need for a great deal of behavioral personalization of the design of social robots.

V. CONCEPTUAL STRUCTURING OF SOCIAL ROBOT DESIGN DIMENSIONS FOR YOUNG ADULTS

The data obtained from the present research reveals four main dimensions to design personalized social robots for young adults. The key considerations of each dimension that can be addressed in social robot design are depicted in Figure 5 and explained below.

A. Dimension 1: Routine task, education and learning support

One of the most important expectations of young adults from social robots is to take on routine tasks and save time for learning and self-development. Therefore, it would be useful for social robot designers to understand, classify, and prioritize the specified routine tasks in detail and consider them in designing social robots, accordingly. How social robots can improve the learning experiences of young users, how to find the most effective ways to provide personalized education or mentoring for this purpose and how to design robots accordingly, how to encourage and develop creativity and critical thinking in young people with the support of social robots can be considered as design requirements.

B. Dimension 2: Mental, social and emotional interaction

Young users expect assistant and companion roles from social robots. To meet this expectation, designers can focus on how social robots can recognize users' emotions in a natural and meaningful way, and what the most effective verbal and nonverbal communication strategies can be for interaction with young people. In addition, how social robots

can support young users, especially those with anxiety or social communication difficulties, can provide an important design perspective.

C. Dimension 3: Ethics and privacy

In social robot design, issues and questions, such as what privacy and data security challenges are related to personalizing social robots for young users, how transparency and user control can be provided over the collected data, and what ethical concerns young users may raise when interacting with social robots intellectually and emotionally are important. Moreover, the recommendations of UNESCO [13] on ethical issues related to the impacts of AI technologies as well as the standards, analysis and recommendations of UN [14] on the protection of human rights in the digital space should be taken into consideration in this dimension.

D. Dimension 4:Physical and behavioural design

What the basic design principles can be for designing social robots that are both appealing to young people and do not create a perception of threat is an important issue. How the physical appearance of a social robot can affect young users' trust and cooperation has also been evaluated as a design area that needs to be studied. Additionally, how the behaviors of social robots and their multimodal interaction (speech, touch, gestures) can increase the personalization of

these robots for young people are also important considerations.

VI. CONCLUSIONS

In this study, the requirements and expectations of the younger population from social robots are explored. For this aim, structured interviews were conducted with a sample of 83 participants to identify their preferences regarding the tasks and features they expect social robots to possess. In addition, the differences between the genders were also investigated statistically and qualitatively. Based on the findings, the main dimensions for designing personalized social robots for young adults are identified along with their key considerations. The results will hopefully provide insight into social robot designers and developers to reach the expectations of young adults.

Besides technical aspects, social expectations have strong potential in developing social robots in the foreseeable future. From this perspective, we will need to develop function-, behavior- and emotion-based responses into the design of these systems. It will not be surprising that social robot design will evolve in such a way that user- and context-specific approaches and behaviors will appear. Young adults are an important user group who have the ability to integrate social robots into their daily lives and collaborate with them
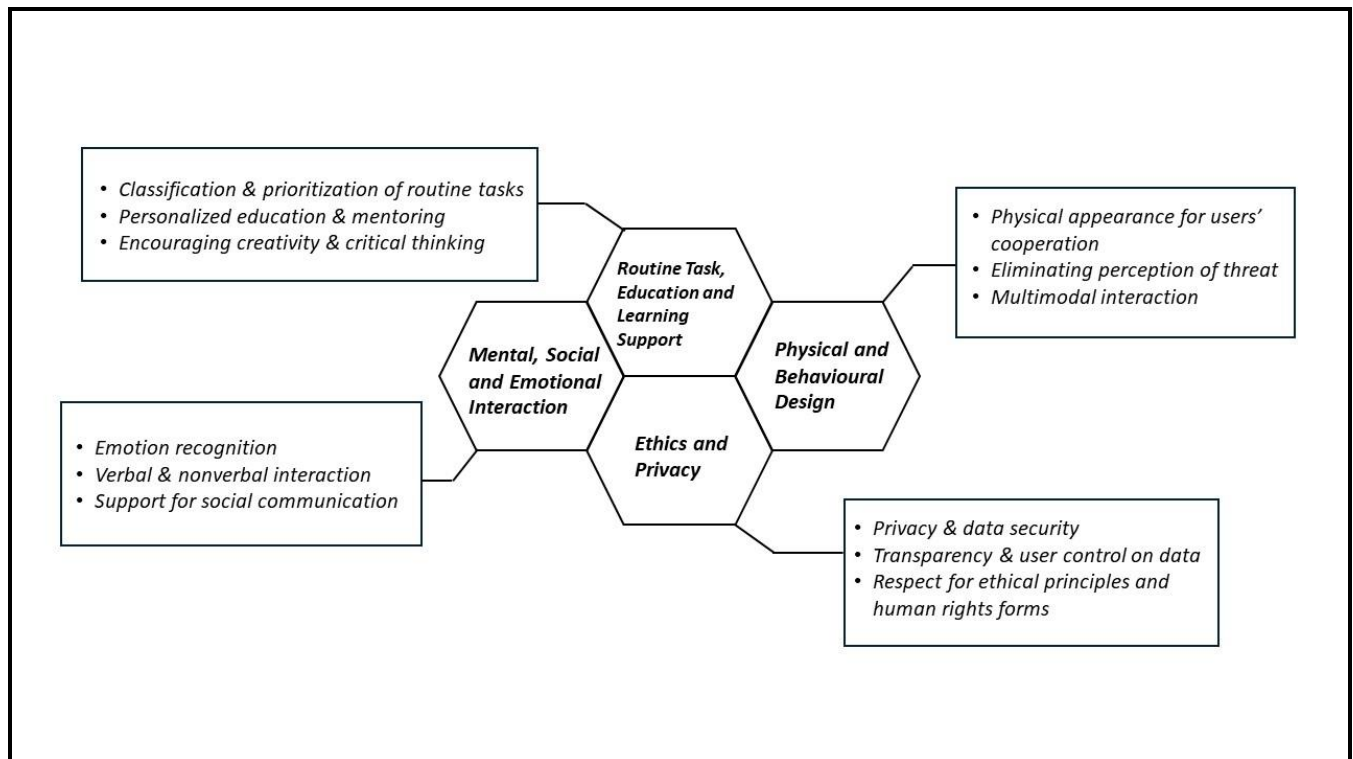

Figure 5. Dimensions and key considerations to designing social robots for young adults to gender.

One of the limitations of the study is the sample size. Data from a larger number of participants can be collected and analyzed, yielding more accurate results. Also, the respondents were mainly university students, thus the preferences of young adults with different educational backgrounds can be explored. In addition, the preference differences in young adults with and without children was not taken into account. As for future work, the expectations of various age groups, such as the elderly and children can also be investigated and compared against the findings to achieve a more personalized social robot design for all age groups. In addition, the study can be extended so as to include the ethical dimension in a systematic way from the beginning, starting with the design of interview questions, such as "Do you see any risks or harms that could arise with the integration of robots into your daily life?" or "Are there any tasks which you would not want to delegate to a robot and why?" The answers to these types of questions can shed light on the ethics and privacy dimensions giving the same importance as the other topics that were covered by the present study.

The increasing penetration of robots in our daily lives in different social environments and contexts requires not only technical but also ethical, social and normative assessments. It should be noted that robots may pose potential risks, such as reinforcing discrimination, exclusion or deepening power imbalances, especially for marginalized groups. For this reason, "ethics by design" approaches that integrate human rights principles into the design processes of robots from the very beginning are of great importance. These approaches not only ensure user safety, but also enable the development of fair, inclusive and socially responsible technologies.

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