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Robots sociales, música y movimiento: percepciones de las personas mayores sobre el robot Pepper para su formación

Social robots, music and movement: Older people's perceptions of the Pepper training robot

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ABSTRACT
Social robotics is considered an emerging technology in the educational context. This research aims to understand the perceptions of older people on the use of social robots in their education through music and movement. To this end, a sequence of activities was designed with the social robot Pepper, which acted as an assistant monitor in a physical exercise class. The study, with a mixed design and a descriptive and inferential approach, involved 41 elderly people who attend weekly training activities at a Day Centre. Data were collected with this convenience sample using an adapted version of a previously validated questionnaire, as well as three focus groups, all based on the conceptual framework of the Unified Theory of Acceptance and Use of Technology (UTAUT). The results point to favourable evaluations regarding the use of Pepper for educational purposes, highlighting the importance of including music in this training. This work can contribute to a better understanding of how older people perceive the use of social robots in order to involve them in their design and development based on Artificial Intelligence

RESUMEN
La robótica social es considerada una tecnología emergente en el contexto educativo. Esta investigación tiene por objeto conocer las percepciones de las personas mayores sobre el uso de los robots sociales en su formación a través de la música y el movimiento. Para ello, se diseñó una secuencia de actividades con el robot social Pepper, el cual ejerció de monitor asistente en una clase de ejercicio físico. En el estudio, con un diseño mixto y enfoque descriptivo-inferencial, participaron 41 personas mayores que acuden semanalmente a actividades formativas en un Centro de Día. Con esta muestra de conveniencia se utilizó una versión adaptada de un cuestionario previamente validado, así como tres grupos de discusión, todo ello basado en el marco conceptual de la *Unified Theory of Acceptance and Use of Technology* (UTAUT). Los resultados apuntan hacia valoraciones favorables en cuanto al uso de Pepper con fines educativos, destacando la importancia de incluir música en esta formación. Este trabajo puede contribuir a comprender mejor cómo perciben las personas mayores el uso de los robots sociales con el fin de implicarlas en su diseño y desarrollo basados en Inteligencia Artificial y obtener, así, beneficios potenciales para su formación integral.
and thus obtain potential benefits for holistic education.

KEYWORDS · PALABRAS CLAVES
Robotics, Music, Adult Education, Artificial Intelligence, Education and training
Robótica, Música, Educación de adultos, Inteligencia Artificial, Enseñanza y formación

1. Introduction

Social robots are robots that interact as equals with humans, including emotionally, and have a humanoid appearance (Eyssel, 2022). Of the several models of social robots, we highlight the Pepper robot (Pandey & Gelin, 2018). Its size and gestural characterisation are very close to those of a person and it has been used for a variety of purposes, including training (Tanaka et al., 2015).

In the field of education, the possibilities of social robots are diverse, including working with ADHD (Amato et al., 2021), Higher Education (Guggemos et al., 2020), virtual environments (Shahab et al., 2022) or Music (Song et al., 2023), among others. In the last case, research has addressed how social bots may have a positive impact on children's performance in learning musical instruments, using a non-evaluative tutor role. In the case of older adults, the main use is for care (Bradwell et al., 2021), and the potential lies in the field of non-formal comprehensive training and skills development. However, as Smakman et al. (2021) suggest, certain ethical issues need to be taken into account when using this type of technology.

Furthermore, several studies have underlined the importance of analysing users' opinions about social robots, in this case, older persons, highlighting the need to involve them in the design and development process to address their specific needs and preferences (Sawik et al., 2023; Søraa et al., 2023). Meanwhile, several studies have analysed the perception of other groups towards social robots. The most numerous are those in which only children have participated (Ching-Ching et al., 2017; Fortunati et al., 2015), with some exceptions, where they are compared with other groups, as in the case of Burdett et al. (2022), in which British children and adults participated. Other groups studied are teachers (Ceha et al., 2022) or future educators of children with disabilities (Conti et al., 2017), among others.

In general, research on people's perceptions of social robots is relatively extensive and has a long history in the field of health, as can be seen in the study by Tinker and Lansley (2005), which can be considered a precursor to the use of care robots. In other fields, such as music, research is highly limited. Examples include the work by Shahab et al. (2022) who use a social robot, albeit a virtual one and not a real one; the work by Song et al. (2023), which concludes that robots with a non-evaluative role are beneficial for children's performance in learning musical instruments; or the studies by Taheri et al. (2019; 2021) on the use of social robots by children with ASD.

As for the specific use of Pepper for music-related training, the literature is practically non-existent, as was reported in a previous study conducting a systematic review, not only of the use of Pepper, but also of any type of social robot in music training (Martinez-Roig et al., 2023). In contexts referring to older adults, no studies were found. Therefore, we sought to take this gap as a starting point and, considering this and the rest of the background, the present research was designed to respond to the following question: What are older persons‘ opinions about the use of the Pepper social robot in movement and music classes?

2. Methodology

2.1. Target

The main aim of the research was to analyse the perception and attitudes of older people towards the use of the Pepper robot as an assistant monitor in movement and music classes.

2.2. Approach

The present research adopts an ex post facto, primary (Everitt & Hothorn, 2011), mixed, cross-sectional and descriptive-inferential methodological approach (Hernández-Sampieri & Mendoza, 2018). In particular, a mixed approach was used, as it has been used in previous research in this field (Bradwell et al., 2021; Pino et al., 2015).

2.3. Participants

Non-probabilistic sampling (by convenience) was applied to the 2024 census of users of a Day Centre in a small town in the province of Alicante for older adults who regularly attend training sessions. The final sample consisted of 41 participants, which fully represents the total population. This inclusivity in the selection of the sample allows a variety of perspectives and opinions to be captured, maximising the representativeness of the results obtained.

In terms of gender, the sample was predominantly female, with women comprising 88.1% of the total, in contrast to 11.9% male participation. Age distribution ranged from 59 to 85 years, with a mean age of 71.24 years and a standard deviation of 5.92 years. The median was set at 70 years, suggesting that most participants are clustered around this age.

2.4. Instruments

A questionnaire was one of the data collection techniques used. The conceptual framework on which the questionnaire was based is the *Unified Theory of Acceptance and Use of Technology* (UTAUT), a model developed by Venkatesh et al. (2003). This theoretical framework was developed to better understand the acceptance and use of technology. It differs from previous models, such as the *Technology Acceptance Model* (TAM), by integrating elements from various theories of technology acceptance into a single model (García de Blanes et al., 2022). The UTAUT identifies four key constructs that directly influence the intention to use and the effective use of a technology: Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Conditions. The constructs used, their definition and the items for their operationalisation in this study are listed in Table 1.

We used the questionnaire by Guggemos et al. (2020) based on the UTAUT, adapting it to the characteristics of our study, as the original was administered in the context of an academic writing course. The adaptation consisted of adding 5 self-identifying items (1-5) on competences in handling technological devices and music preferences. The final questionnaire consisted of 28 items, 23 of which refer to the UTAUT model (see Table 1).

All of them were rated on a categorised five-point Likert scale, ranging from 1 ("strongly disagree") to 5 ("strongly agree"). They were preceded by three dichotomous items: two socio-demographic items (gender, age) and one item on previous knowledge of Pepper. Cronbach's alpha coefficient (Cronbach & Shavelson, 2004) was used to calculate the reliability and internal consistency of the questionnaire, with a value of .969 being obtained, indicating an exceptionally high level of internal consistency among the items of the questionnaire (Peterson, 1994). Similarly, a reliability analysis of the questionnaire dimensions revealed high levels of internal consistency, with Cronbach's alpha coefficients ranging from .831 for "Effort Expectancy" (3 items) to .929 for "Performance Expectancy" (7 items), indicating excellent reliability. The dimensions "Social influence" and "Facilitating Conditions" also showed high reliabilities with alphas of .926 (3 items) and .927 (10 items) respectively. These results confirm the suitability of the instrument to reliably assess the corresponding indicators.

The focus group technique was also used with a convenience sample of the total number of participants. Each participant was identified with the nomenclature GXPY (X=no. group (1-3); Y=no. participant in the group (1-4).

Table 1

Constructs of the UTAUT model in relation to the items used in the questionnaire

Designation	Definition	Related items in the questionnaire
Performance expectation	This is defined as the degree to which the use of a technology will provide benefits to consumers in carrying out certain activities.	6-12
Expectation of effort	This is the degree of ease of use associated with the use of technology by consumers.	13-15
Social influence	The degree to which consumers perceive that significant others (e.g. family and friends) believe they should use a particular technology.	16-18
Facilitating conditions	These refer to consumers' perceptions of the resources and support available to perform a behaviour.	19-28

Source: own elaboration based on Guggemos et al. (2020)

2.5. Procedure

Participation was voluntary and was approved by the Ethics Committee of the University of Alicante. A training session with Pepper was held in January 2024 for three groups. It was Pepper that directly and verbally addressed the participants, while showing images on its tablet of how to perform each exercise, which were presented with and without music. At the end, the participants completed the printed questionnaire, after giving their express consent. In addition, once they had completed the questionnaire, 4 individuals from each group went to a private room to participate in the discussion group.

The results of the respective questionnaires were fed into electronic questionnaires generated with Qualtrics, from which the quantitative results were analysed. As for the discourse of the focus groups, specific *software* was used to transcribe it and direct deductive coding was subsequently carried out, based on the four blocks of dialogue coinciding with the indicators of the UTAUT model.

3. Analysis and results

3.1. Identifying data on background knowledge and preferences

A Likert scale (5 items) was applied to measure the level of agreement regarding the ability to use mobile devices, computers and tablets (items 1-3), as well as the liking for music and movement exercises accompanied by music (items 4-5). In addition, there was a question on prior knowledge of humanoid robots such as Pepper (yes/no). The findings revealed a notable discrepancy in the self-perception of digital skills. While a substantial proportion of participants claimed to have a high degree of competence in using mobile phones, with 35.71% strongly agreeing with the question on such skills (Likert scale score of 5) and only 11.90% disagreeing (Likert scale score of 1), confidence in using computers and tablets was significantly lower. A majority (57.14%) reported being unable to use either computers or tablets.

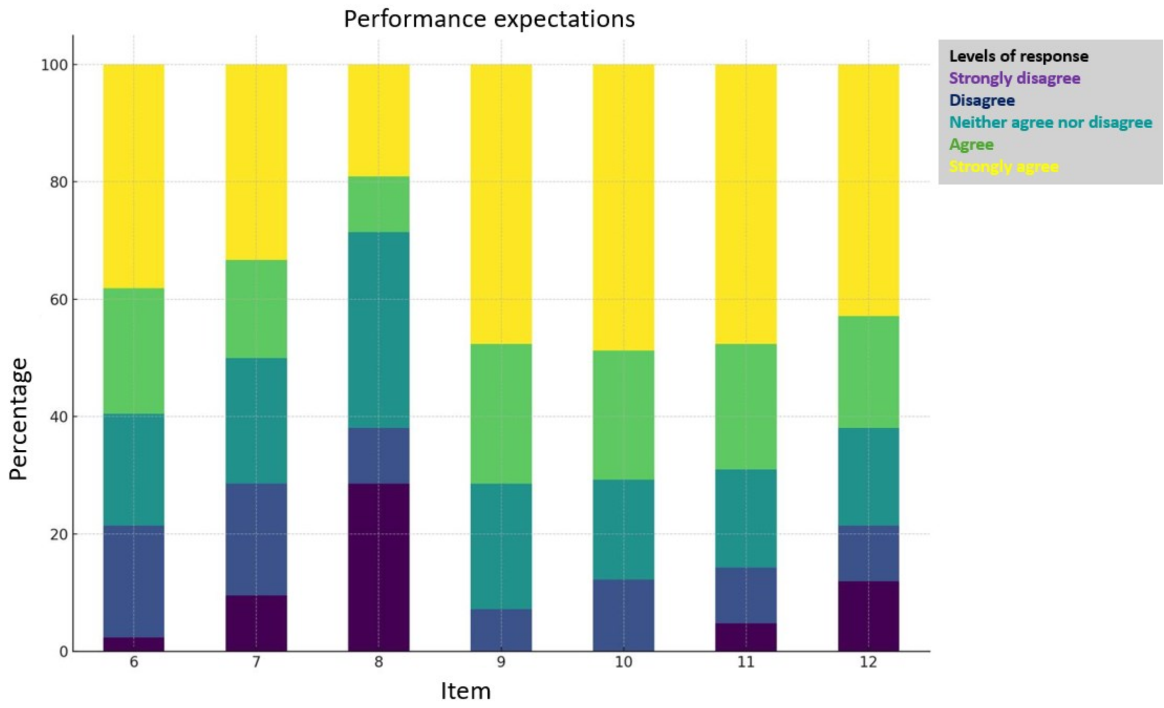
In contrast to technological competence, the inclination towards music was predominantly positive, with 83.33% of participants reporting a great liking for music. Similarly, the preference for performing movement exercises to music also received a mostly favourable response, with 76.19% expressing complete agreement. On the other hand, when exploring familiarity with social robotics, 90.48% of respondents indicated that they were unfamiliar with robots like Pepper before the study, while 9.52% had prior knowledge.

3.2. Expected Return (ER)

Seven items in the questionnaire assess the degree to which the use of a technology is perceived to provide benefits to consumers in performing certain activities (see Fig. 1). In addition to the items *The robot makes lessons interesting* (6) and *I enjoyed the robot when it was talking* (11), other items are also worth highlighting. Regarding item 7 (*It is good to use the robot for these lessons*), a significant percentage, represented by 34.1%, showed a strong positive inclination, stating that they strongly agreed with the suitability of using the robot in the context of the lessons. On the other hand, a considerable proportion, with 22%, adopted a neutral position, indicating neither rejection nor particular acceptance of the use of the robot in the activities. In contrast, divergent responses were evident among those who disagreed or strongly disagreed. A total of 17.1% of the participants had a negative perspective, indicating disagreement or strong disagreement with the suitability of the use of the robot in this specific context.

Figure 1

Results for the Performance Expectations construct



In turn, when asked about item 9 (*Was the class with the robot beneficial)*, a positive trend was observed in most of the older participants. A significant 48.8% of respondents expressed a very positive assessment, indicating that they considered the classes with the presence of the robot to be beneficial, while 24.4% held an intermediate position, rating the usefulness of lessons with the robot with a moderate level of agreement.

Additionally, 22% of the participants took a more neutral stance, expressing neither a favourable nor unfavourable perception of the benefit of the Pepper lessons. Turning to the items on the inclusion of music in the lessons, *I enjoyed the robot when the music was playing* (10), the data revealed a varied distribution of responses from the participants. A notable 48.8% of respondents expressed a high level of enjoyment, indicating that they had experienced a positive connection with the robot when the music was played during the lesson. An intermediate level of enjoyment was expressed by 22.0% of participants, suggesting that some participants experienced a moderate connection with the robot during music playback. Meanwhile, 17.1% of respondents reported a lower level of enjoyment, indicating a limited or less intense connection with the robot in situations where music was present.

In the same vein, on item 12 (*The robot can be good for learning music*), 12.2% of the respondents showed a low inclination, indicating a less favourable perception of the robot's ability to be beneficial in music learning. In contrast, 43.9% of the participants expressed a high perception, suggesting a strong belief in the robot's efficacy in facilitating music learning.

In addition, 17.1% of respondents express a moderate opinion, indicating a favourable perception, albeit with some reservations. However, with regard to items such as *I think I would use the robot for other daily activities* (8), the data revealed a diversity of responses, with 29.3% of respondents showing a low inclination to incorporate the robot into their daily activities, indicating a low willingness to use the robot in contexts beyond music and movement classes.

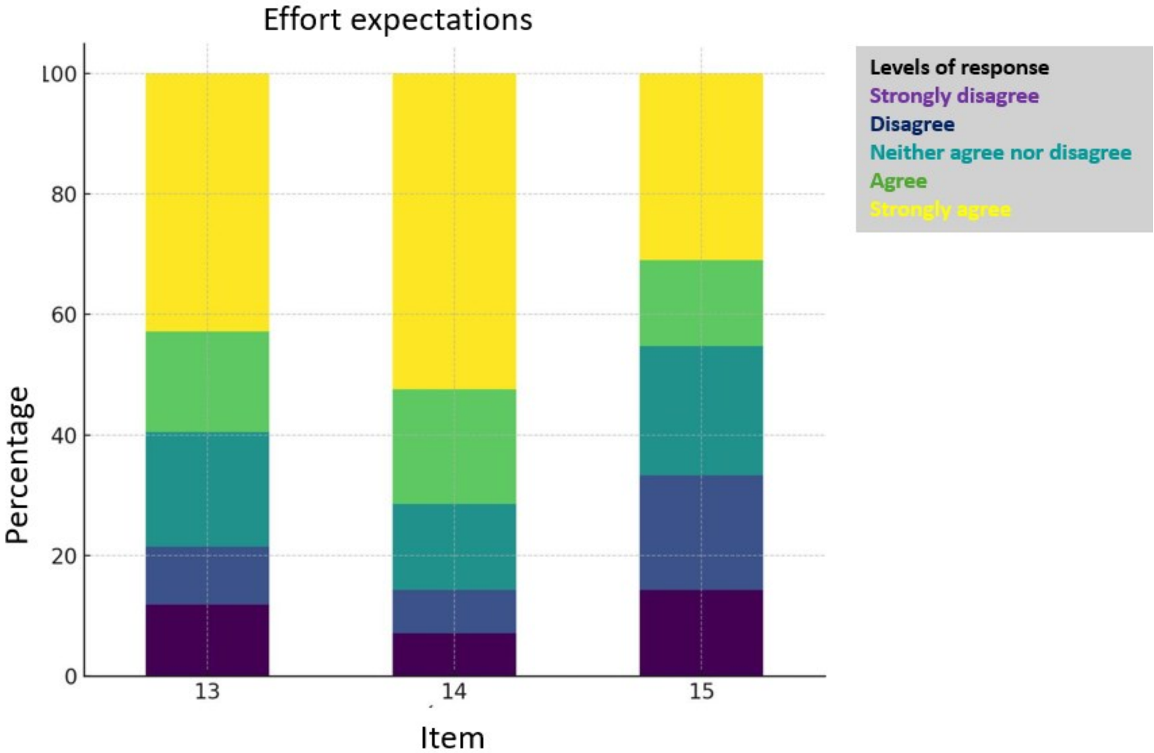
On the other hand, 34.1% of the participants expressed a moderate willingness, suggesting an inclination towards integrating the robot into their daily routines, but with some reservations. In addition, 19.5% of respondents showed a higher willingness, indicating a greater likelihood of using the robot for additional daily activities.

3.3. Effort Expectation

Three items assessed the degree of ease associated with the participants' use of the technology (see Fig. 2). Regarding the item *It was easy to work with the robot* (14), more than half of the participants (53.7%) perceived ease of interaction, reflecting a positive experience. However, a small percentage (7.3%) experienced difficulties. Moderate and intermediate responses accounted for 19.5% and 14.6%, respectively.

Figure 2

Results for the Effort Expectancy construct



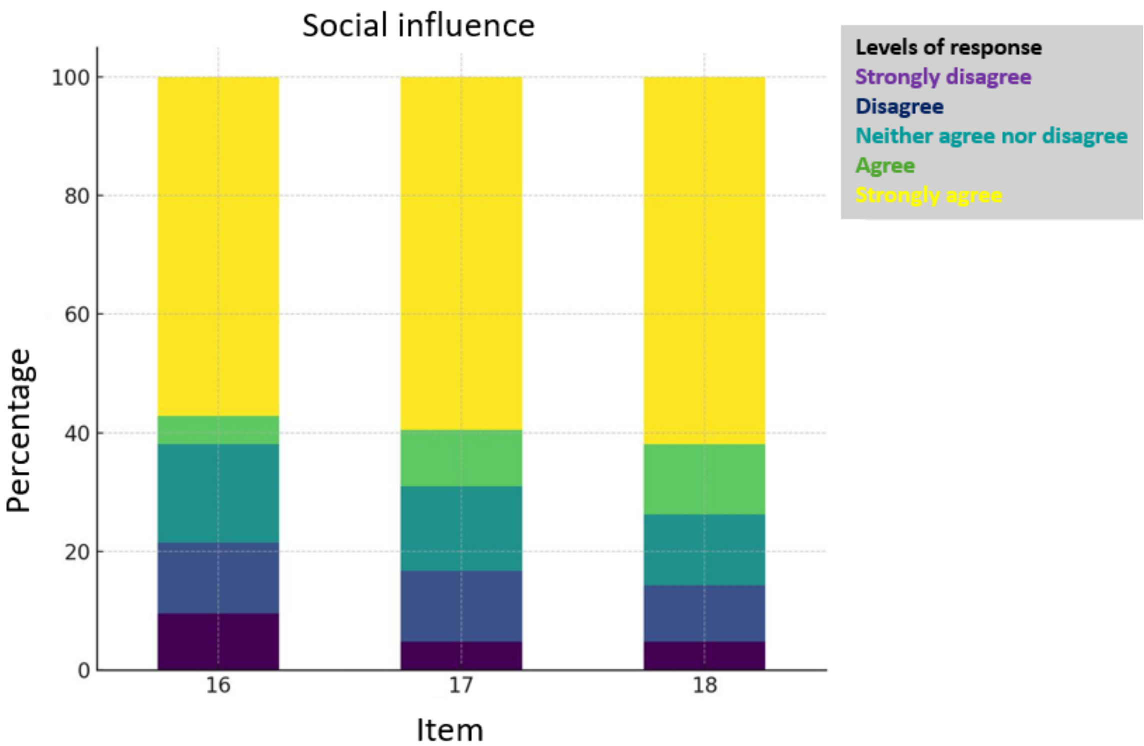
In relation to the item *It is easy to adapt to the robot* (13), different perceptions are evident among the participants. While 12.2% found it difficult to adapt, 43.9% adapted easily. Meanwhile, 19.5% indicated a moderate adaptation, which underlines the variety of experiences in this aspect. Finally, the item on the ease of use of the robot (15) showed that 31.7% of respondents found the robot easy to use, in contrast to 14.6% who encountered difficulties. Moderate and intermediate perceptions were reported by 22.0% and 31.7%, respectively. These results reflect the diversity of participants' perceptions towards the adaptation and use of the robot in their music and movement classes.

3.4. Social influence

Three items were used to assess the extent to which participants perceive that significant others (e.g. family and friends) think they should use a particular technology (see Fig. 3). Examples to highlight would be *My family will see it as good that I have used the robot* (16). A majority (58.5%) perceived a high family acceptance, while 17.1% reported moderate acceptance. 9.52% expressed low acceptance, followed by 11.9% and 4.9% with intermediate and high inclinations, respectively.

Figure 3

Results referring to the Social Influence construct.



Regarding the perception of friends‘ acceptance (17) of the use of the robot, different perspectives are evident among the participants. While 59.2% perceived strong acceptance, indicating a positive outlook, 14.3% showed moderate acceptance. The low, intermediate and high levels of acceptance were 4.7%, 11.9% and 9.5%, respectively. Finally, with respect to sharing the classroom with the robot (18), 61.9% reported a very positive perception. 11.9% had a moderate experience, and the percentages of low, intermediate and high inclinations were 4.76%, 9.52% and 11.9%, respectively.

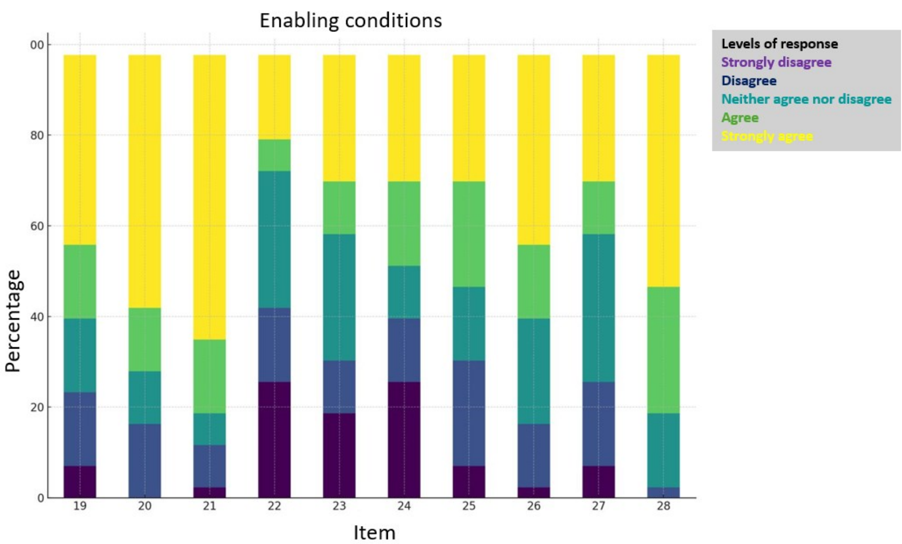
3.5. Facilitating Conditions for the use of Pepper

To assess consumers' perceptions of the resources and support available to perform a behaviour, nine items were used (see Fig. 4). Along with items such as *I liked the robot (*20), I *felt good with the robot in class* (21), *I know enough about the robot to use it well* (22), *I think the robot could adapt to what I need* (24), I *think the robot would help me when I need it* (25), *I liked doing things with the robot* (26) and *I found the robot fun* (28), the item *It is a good idea to use the robot for music and movement lessons (19)* is worth mentioning. For this last item, 43.9% showed strong acceptance, followed by 17.1% with moderate acceptance. The intermediate, high and low levels of acceptance were 14.6%, 14.6% and 7.3%, respectively.

Along the same lines regarding the willingness to use Pepper in future music and movement classes (23), 29.3% of the participants indicated a strong inclination, suggesting a great likelihood of using the robot in the future. 29.3% indicated a moderate inclination, suggesting certain reservations or a neutral attitude towards the future use of the robot. Finally, 19.5%, 12.2%, and 9.8% indicated low, intermediate, and high inclination towards future use of the robot, respectively.

Figure 4

Results for the Facilitating Conditions construct.



In terms of the perceived ease of adapting to the robot to participate in music-related activities (27), there was a diverse distribution in the participants' responses. Some 7.3% were unwilling, 17.1% expressed some reservations, 34.1% indicated a moderate inclination and 29.3% a high propensity, reflecting significant confidence in the ability to quickly learn to use the robot in music-related activities.

3.6. Calculation of means and range estimation

In order to comprehensively understand attitudes and perceptions towards the perceived use of Pepper, we also chose to calculate means and estimates with a 95% confidence interval. Not only does this statistical approach allow central trends in participants' responses to be identified, but it also facilitates assessment of the accuracy and reliability of these trends within the context of the sample studied. Thus, the results highlight positive perceptions in the dimensions of Performance Expectations, Effort, Social Influence and Facilitating Conditions, reflecting a generally favourable attitude towards their adoption. Performance expectations, with means between 2.83 and 4.17, underline confidence in technology to improve performance on specific tasks, although some items suggest reservations regarding certain aspects of performance. Effort Expectations, with means of 3.32 to 4.07, show an anticipation of easy integration of technology into everyday life. Social Influence, with means of 3.93 to 4.22, emphasises the crucial role of the social environment in shaping positive attitudes towards technology. Finally, Facilitating Conditions, with means of 2.78 to 4.37, indicate a favourable perception of the support and resources available for technology adoption, although areas for improvement in the support provided are identified.

Table 2

Means and interval estimates (own elaboration)

Item	Mean	95% CI Lower	95% CI Upper
YIELD_EXPECTATION_1	3.78	3.4	4.16
YIELD_EXPECTATION_2	3.49	3.05	3.92
YIELD_EXPECTATION_3	2.83	2.37	3.29
YIELD_EXPECTATION_4	4.17	3.87	4.47
YIELD_EXPECTATION_5	4.05	3.69	4.41
YIELD_EXPECTATION_6	4.02	3.65	4.4
YIELD_EXPECTATION_7	3.76	3.31	4.2
EXPECTATION_OF_IT_WAS_1	3.73	3.29	4.18
EXPECTATION_OF_IT_WAS_2	4.07	3.68	4.47

EXPECTATION_OF_IT_WAS_3	**3.32**	**2.86**	**3.78**
SOCIAL_INFLUENCE_1	**3.93**	**3.47**	**4.38**
SOCIAL_INFLUENCE_2	**4.12**	**3.72**	**4.52**
SOCIAL_INFLUENCE_3	**4.22**	**3.84**	**4.6**
EASY_CONDITIONS_1	**3.76**	**3.33**	**4.18**
EASY_CONDITIONS_2	**4.17**	**3.81**	**4.53**
EASY_CONDITIONS_3	**4.37**	**4.03**	**4.7**
EASY_CONDITIONS_4	**2.78**	**2.33**	**3.24**
EASY_CONDITIONS_5	**3.22**	**2.75**	**3.69**
EASY_CONDITIONS_6	**3.12**	**2.61**	**3.63**
EASY_CONDITIONS_7	**3.46**	**3.05**	**3.88**
EASY_CONDITIONS_8	**3.88**	**3.5**	**4.25**
EASY_CONDITIONS_9	**3.39**	**2.99**	**3.79**
EASY_CONDITIONS_10	**4.37**	**4.12**	**4.61**

3.7. Gender differences

In the analysis of the responses to the questionnaire, we sought to identify significant differences in perceptions between male and female participants. Due to the absence of significant differences in most of the items assessed, men and women were considered as a single group for the overall analysis. For this purpose, the Mann-Whitney U test was used, which is suitable for comparing distributions in ordinal data, such as responses provided on Likert scales.

The results of the analysis reveal that, of all the questions tested, a statistically significant difference between males and females was only found in the question related to "It is a good idea to use the robot for music and movement classes" (U=41.0, p=0.037594), indicating a variation in responses between genders for this specific item. These statistics suggest that, in general, females scored higher on this item compared to males. The median response for females is 4, indicating that the majority rated this condition positively, while the median for males is 2, reflecting a less favourable perception.

However, for the remaining questionnaire items, the differences between men's and women's responses failed to reach statistical significance, with p-values above the .05 threshold. This suggests that, overall, there are no marked gender differences in participants' perception and experience of the Pepper social robot.

3.8. Relationship with music in the use of Pepper

It was decided to analyse the association between the independent variables "Liking for music" and "Liking for exercising with music" with the rest of the variables of the scale, using the Contingency Coefficient. In the case of the variable "Liking for music" and its association with the Social Influence construct, moderately strong values are obtained (C=.505, p=.16; C=.480, p=.036 and C=.490, p=.014, respectively), indicating that social influence may play an important role in the answers provided by the participants in the study. Similarly, a moderately strong value was observed for one of the items of the construct "Facilitating Conditions", namely the enjoyment of having done things with the robot (C=.595; p=.01) and the perceived enjoyment towards the robot (C=.719; p=.00).

As for the variable "Enjoyment of exercising with music", its association with the robot's ability to make lessons interesting, within the Performance Expectations construct, indicates a moderate association between the variables, suggesting a statistically significant and moderately strong relationship, although not as strong as in other cases (C=.447, p=.011). We also found significant values for the variable associated with enjoyment of the robot when it talks (C=.064; p=.017), as well as when asked whether they considered the robot good for learning music (C=.648; p=.016), both with considerably strong values. Within the Facilitating Conditions construct, two items relating to liking the robot and enjoying doing things with the robot show moderately strong values (C=.535, p=.012). The item relating to having fun with the robot is also associated with the independent variable, but with a somewhat lower intensity than the rest of the items in its construct (C=.394; p=.000).

3.9. Qualitative results on the use of Pepper

The contributions of the participants in the three focus groups shed light on the quantitatively recorded perceptions. For example, regarding the Performance Expectation construct, the participants expressed a variety of opinions about Pepper's expected performance in the sessions, highlighting both positive and negative aspects. Regarding the positive aspects, the general perception of Pepper was remarkably positive, highlighting its potential as a companion and emotional support. Participants valued the robot's capacity for interaction, suggesting that it could serve as a substitute for human interaction in certain contexts, such as in the care of older adults. The possibility for Pepper to offer conversation, entertainment, and even warning in emergency situations was considered extremely useful:

> G1P4 "This robot, as it’s also funny, people in care homes would laugh, and when you laugh you’re healthy. It would be very positive.

However, some participants noted limitations in Pepper's response speed, expressiveness and clarity of voice, which could affect the interaction experience. These criticisms point to areas for improvement in programming and designing social bots to make their communication more effective and natural:

> G2P3 "It’s all those human expressions that the robot doesn't have that make us uncomfortable".

Regarding Effort Expectation, some participants expressed concerns about the learning curve and adapting to the robot. While some compared it to becoming familiar with a new household appliance, others mentioned linguistic and technical barriers, such as difficulty understanding the robot and the expectation that it would have a larger screen and perform more movements. These concerns underline the importance of designing social robots that are intuitive and accessible to users of all ages and abilities:

> G1P3 "I'm foreign... I don't understand the robot well, there are people who can do the task better... It can be useful but the interaction's different... It's a machine".

In terms of Social Influence, participants mentioned the positive impact that Pepper could have on family members with disabilities or communication difficulties, indicating a recognition of the social and emotional value of interacting with the robot. This aspect suggests that, beyond functionality, the presence of social robots can have a significant effect on the emotional well-being of users and their families:

> 12NY "I've got a brother that can't talk... But if Pepper sang him a song or talked to him, he'd be happy... He'd be really happy".
>
> G2P1 "My daughter would be fine with it... I don't learn because I don't want to".

Finally, regarding Facilitating Conditions, the need for adequate time and training to understand and interact effectively with Pepper was a recurring theme. The participants stressed the importance of sufficient training sessions tailored to individual needs in order to avoid frustration and maximise the robot's potential. This indicates the need to consider support and training as essential components when introducing robotic technologies in educational and therapeutic contexts:

> G2P3 "To avoid frustration, they have to be adapted to our needs and to what we ask for on a day-to-day basis".

4. Discussion and conclusions

Based on the research question focusing on older people's perceptions of the Pepper humanoid robot in movement and music classes, the UTAUT model was found to provide a robust framework for exploring not only individual perceptions of Pepper's usefulness and ease of use, but also how the influence of the social environment and support conditions can facilitate or impede its acceptance and effective use, as noted by Guggemos et al. (2020). In our study, this approach helps to identify specific measures to be improves, in this case, the adoption of innovative technologies in training contexts aimed at older populations, emphasising the importance of adequate support and the creation of a positive social environment that encourages their use. We concur with several studies that highlight the importance of understanding what older people want from social robots, such as that by Søraa et al. (2023), underscoring the need to involve them in the design and development process to address their specific needs and preferences.

Thus, the expectation of performance may be influenced by the perception that the use of Pepper will help improve their physical and cognitive well-being, in line with other studies albeit with other populations: Burdett and Nakawake (2022) -children and adults, Ching-Ching et al. (2017) -children, Ceha et al. (2022) –teachers, and Conti et al. (2017) -teaching professionals. The expectation of effort is particularly key, given that complex technologies can be daunting for older persons, a circumstance that has not occurred as in other studies (Ceha et al., 2022). Therefore, Pepper's intuitive interface and natural interaction capabilities are crucial aspects for its acceptance, as noted by Conti et al. (2017) in a study on childcare robots. Social influence plays an important role, as older people may be motivated to use Pepper if they observe that their peers do so and recommend it. In this respect, it is worth noting the social factor highlighted by Eyssel (2022). In addition, the support of family members and caregivers is essential to encourage its use. Finally, facilitating conditions, such as the availability of technical assistance and the adaptation of the environment for the use of the robot, are determinants for the successful integration of Pepper in the daily activities of older people.

The results of the focus groups reveal a mixed perception of Pepper's implementation, a perspective that coincides with Sawik et al. (2023). While positive aspects highlight its potential to improve well-being and provide companionship, negative aspects highlight areas for improvement in communication and interaction. Effort expectations, social influence and facilitating conditions underline the importance of careful design and implementation to ensure the acceptance and success of social robots in educational and therapeutic settings.

Our study is not without its limitations. The working session with Pepper lasted only 45 minutes. With this duration, it is possible that the participants had insufficient time to test Pepper's possibilities. Moreover, we have used the results in a descriptive way in terms of perceptions, without delving sufficiently deeply into predictor values. Therefore, we cannot generalise the results obtained. However, it should be noted that we sought to complement the quantitative results with qualitative results, thus yielding a deeper understanding of the subject. On the other hand, the constructs of the UTAUT model have their own scope and do not cover other aspects that could be of interest, such as the anxiety a new technology may generate, or the comparison with other types of assistance in training environments around music and movement.

In terms of future work, it should be noted that the scientific literature on the topic addressed is not extensive, and so this is a promising avenue for future research, in line with the contribution of Amato et al. (2021) on social robotics and Artificial Intelligence. Additionally, developing a longer training framework, as well as a larger and more diverse sample would enrich the results.

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