PERSPECTIVES OF ALLIED HEALTH PROVIDERS: THE INTEGRATION OF MOXIE WITHIN DEMENTIA CARE SETTINGS

A Thesis submitted to the faculty at Stanbridge University in partial fulfillment of the requirements for the degree of Master of Science in Occupational Therapy

by

Jorge Banderas, Susan Kao, Amanda Lee, and Emily Rosales

Thesis advisor: Eddie Chu, OTD, OTR/L

March 2025

Dedication

To my beloved parents, Kaing Kao and Katie Lim,

Thank you for everything you have done for me – for your unwavering support, boundless sacrifices, and tireless hard work that have given me the opportunity to pursue my education. Your dedication and resilience have been the foundation upon which my dreams are built.

Through your sacrifices, you have shown me the true meaning of strength and perseverance. Your hard work inspires me to strive for excellence and remain grounded in humility and gratitude.

This achievement is as much yours as it is mine.

With all my love,

Susan Kao

I dedicate this thesis to my parents, whose unconditional love, support, and sacrifices have made my journey possible. As a first-generation master's student, I am here because of your hard work and strength. Your belief in me has been my greatest motivation. Los Amo Tanto!

To my grandfather, I wish more than anything that you could understand the work I am doing. Caring for you since your Parkinson's Dementia diagnosis has only reaffirmed that I am exactly where I'm meant to be. This research is for individuals like you and for families like ours.

Con tanto cariño,

Emily Rosales

I would like to dedicate this thesis to my parents, Juanna and Quang.

Thank you for your endless support and for giving me opportunities with both of your sacrifices.

Mom,

You have been my constant rock and support throughout my life. Thank you for always encouraging me to “reach for the stars.” I love you, Mom.

To my late Father,

Thank you for always believing in me and inspiring me to choose my career path in occupational therapy. Thank you for looking over me & our family and pushing me towards my goals and dreams. I love and miss you so much, Ba.

With love,

Amanda Lee

Words cannot begin to describe the emotions I am feeling as I am typing out this message. Everything feels surreal as our thesis comes to a close, and my peers and I inch closer to achieving our dreams of becoming tomorrow's practitioners. I want to give a very warm and appreciative thanks to my parents, Jorge and Consuelo Banderas, for always pushing me to be the best version of myself possible, este logro es tanto de ustedes como es mío. Without your sacrifices, and your unwavering belief in my abilities, I would not be in this position, and I would not be the man I am today, los amo mucho. To my friends, thank you for always supporting me throughout this program and being there for me when I needed you all the most. To our thesis advisor, Dr. Eddie Chu, thank you for always believing in me and my thesis peers, and always guiding us in the right direction with your wisdom and patience. And to my thesis peers, Susan, Amanda, and Emily, you are the best teammates I could have ever asked for. This project could not have been possible without your constant input, hard work, and dedication. We have had our inconveniences with developing this project, but now it is time to bask in the happiness of seeing the fruits of our labor.

With love,

Jorge Banderas

Acknowledgements

We would like to express our deepest gratitude to our thesis advisor, Dr. Eddie Chu, for his unwavering support, guidance, and encouragement throughout this study. Throughout the challenges we faced, he was always there to guide us with wisdom and grace. We could not have accomplished this without his mentorship and commitment to our success. Thank you for believing in us throughout this journey.

Abstract

Social robots in healthcare have advanced in the modern-day as innovative therapeutic interventions. These interventions provide new opportunities to enhance well-being and participation through meaningful activities. Our research began with gathering perspectives on social robots within different healthcare settings. In our project, we created a video showcasing Moxie, a social robot, to highlight its potential in dementia care. Our project utilized a mixed-methods survey to gain perspectives from healthcare professionals on the effectiveness of implementing social robots for dementia care. Key themes that are explored within this project are potential cognitive and socioemotional benefits that Moxie may offer people with dementia (PWD), barriers surrounding the implementation of the technology within dementia care settings, how Moxie differentiates itself from other traditional dementia care interventions, and potential issues surrounding dignity for adult patients. Although Moxie was discontinued in 2024, this did not limit our project, as many other social robots are being introduced for individuals with neurological challenges. Although concerns about patient dignity and reliability remained, our findings demonstrate that allied healthcare professionals perceived Moxie as a potential valuable tool for PWD. A key implication is the importance of tailoring Moxie's design and implementation to support caregivers and healthcare professionals. Future implications for research should include a larger sample size to capture a broader range of perspectives from healthcare workers.

Keywords: Dementia Care, Social robots, Effectiveness, Well-being, Socioemotional

Table of Contents

Perspectives of Allied Health Providers: The Integration of Moxie within Dementia Care Settings

Over seven million individuals in the U.S. are diagnosed with dementia after age 65, with symptoms significantly impacting their ability to engage in meaningful occupations (U.S. National Library of Medicine, 2024). One-third of individuals with dementia often have comorbidities linked to depression and feelings of loneliness. This is often associated with living alone, lower quality of life, and social isolation (Centers for Disease Control and Prevention, 2024). Through our project, we aim to analyze the effectiveness of social robots in increasing cognitive function, occupational participation, and socio-emotional well-being in people with dementia (PWD). It is important to assess the relationship between social robots and PWD because social participation is an essential factor in supporting social independence and cognitive stimulation in individuals. According to the American Occupational Therapy Association (2020), social participation is under the "occupations" section of the Occupational Therapy Practice Framework, which advocates for the need for social participation through peers, family, or the community. Social participation is critical for fostering a supportive environment, a sense of identity, mental and emotional well-being, and connections with others. By using their knowledge of human occupation and intertwining it into the discussion, design, and implementation of social robotic technologies, occupational therapists (OTs) and students can help play a role in finding an interactive, non-pharmacological tool that can be used for PWD (Koh et al., 2022).

Through our project, we aim to gather insights from allied healthcare professionals (AHPs) regarding their perceptions of social robots as therapeutic tools for

PWD and whether they deem the technology to be acceptable for the population. After viewing a video demonstration of the robot's, Moxie, capabilities and interactive features, participants will complete an online survey to share their perspectives. The primary target population for this project is AHPs, such as OTs, physical therapists (PTs), occupational therapy assistants (OTAs), physical therapy assistants (PTAs), speech-language pathologists (SLPs), and speech-language pathologist assistants (SLPAs). This project has the potential to inform researchers and technology developers regarding the persistent gaps present between social robots and dementia care interventions.

Literature Review

As humans, we are innately social creatures seeking connection, compatibility, and communication. As our society has continued modernizing and evolving its technological feats, an apparent disconnect between individuals has emerged. It is a perplexing duality to observe; technology has allowed for global connection yet has created local isolation as people spend less time interacting with their environments. Additionally, society is experiencing the live effects of the aftermath of the COVID-19 pandemic; one of many results of this tragic era in history has been the rise in isolation as social networks suffered from lockdown protocols. Pre-Covid numbers show that approximately 22% of American adults reported often or constantly feeling lonely or socially isolated (Elias, 2024). To combat this, the ever-evolving technology of social robots has seen success in socio-emotional well-being across distinct professions, especially within the healthcare system. Implementations within populations with dementia, autism, and depression have resulted in desirable improvements regarding socioemotional health. Although its accessibility remains to be ironed out, social robotics

can target and alleviate the ever-increasing percentages of loneliness and social isolation that our world faces. This is key because, according to the Centers for Disease Control Prevention (2024), social isolation and loneliness can increase an individual's risk for developing chronic and debilitating conditions like heart disease, depression, anxiety, dementia, and being at risk for suicidal ideation and early death. The following articles discussed within this literature review reveal common themes that depict the multifaceted nature and broad applicability of social robots.

Humanistic Features and Client Outcomes

A common theme between two studies was the effect of a realistic robot design on client outcomes. A social robot, NAO, was employed alongside a cognitive behavioral therapy intervention to understand emotion recognition, emotion comprehension, and emotional perspective-taking (Marino et al., 2019). Using a randomized control trial design, it was found that NAO significantly assisted the children within the intervention group in improving their socioemotional intelligence. NAO's humanoid, child-like appearance and prosocial and natural-seeming behaviors made it approachable to the children and facilitated their learning.

Additionally, in a second study, a social robot named Betty was employed with residents with dementia and similarly embodied human-like characteristics and mannerisms that facilitated a patient-robot relationship built on trust, engagement, and realism (Khosla et al., 2019, p. 62). This was significant because participants expressed the need to always feel in control of the robot during the study. Post-trial survey results, which assessed the engagement and robot experience of five older individuals with dementia, revealed overwhelmingly positive responses, showing a positive and fruitful

human-robot interaction. All participants stated that Betty made them smile, three out of five participants stated that Betty helped them feel better by revisiting old memories, all participants reported that they did not feel afraid of Betty, and four out of five participants agreed that they saw Betty as a friend (Khosla et al., p. 66, 2019).

Ultimately, both NAO and Betty demonstrated how a realistic human design can create meaningful interactions because of their humanistic features. With NAO, children on the spectrum were able to take advantage of the technology and acquire heightened socioemotional well-being, while residents with dementia were able to experience much needed companionship through Betty.

Improvement in Robot Designs

Despite the effectiveness of social robot technologies, participants emphasized the need for further refinement in social robot designs. According to Robinson and Kavanagh (2021), communication with NAO felt disengaging for some participants. NAO's predetermined script was developed with open-ended conversational input in mind, yet the execution lacked the ability to elicit these responses in some individuals. For instance, participants stated, "I've struggled to talk to him because there's no human interaction" and "regardless of what I would say, the responses are pretty set" (Robinson & Kavanagh, 2021, p. 6). Additionally, in Pu et al. (2019), some participants shared the exact sentiment of design improvement. Three participants reported that PARO was too heavy for them to lift, two participants reported that PARO was too noisy, and two other participants reported that they would have liked to have seen more animations to make PARO more interactive. One participant stated, "More things to interact with, you know…I would possibly last longer if the dog (PARO) was better put together and better

animated…Not animated enough to hold" (Pu et al., 2019). Overall, while these two interventions yielded favorable results, some participants reported that the social robotic design felt disconnected and lacked the emotional depth that is often associated with human connection. This highlights the further refinement that is required for social robotics as a medium for AHP, as well as client-centered practices when implementing such technologies.

Research Gap

Given the demonstrated impact of social robots on social-emotional interactions, it becomes clear that research gaps are crucial to identify because they drive the advancement of knowledge and practice in occupational therapy and related fields. One significant research gap is the cultural contexts in which social robots are studied. The existing studies predominantly focus on European and American cultural norms, limiting their applicability across diverse cultural, linguistic, and socio-economic backgrounds. Future research should explore how robot-assisted interventions can be adapted and optimized to serve diverse populations worldwide effectively.

Addressing these research gaps is critical for assisting diverse populations globally who experience loneliness, behavioral issues, and social-emotional challenges. These common themes highlighted the potential benefits of social robots. However, a pivotal question remains: Can these interventions achieve similar effectiveness when programmed in languages other than English and applied within different cultural contexts? Realistic humanoid interactions may be essential for positive client outcomes in relation to communication and social engagement, especially in diverse cultural settings.

Theoretical Framework

The theoretical framework that we utilized to guide our investigation is the Person-Environment-Occupation (PEO) model of occupational performance. This model states that occupational performance is the result of the dynamic interaction between three dimensions, those being the person, the environment/context in which the occupation is taking place, and the occupation itself (Law et al., 1996). As with many other models that discuss the importance of occupational engagement, this model emphasizes that people gain self-fulfilment and identity through participation in meaningful occupations.

By using the PEO model as a reference for therapeutic interventions, it is feasible to modify any aspect of the three-dimensional relationship, to enhance occupational engagement. As the level of interplay between all the dimensions improves, occupational performance may indirectly be enhanced; the three domains are dependent and rely on each other to produce occupational participation (Law et al., 1996). In practice, this means that if a client is struggling to participate in a particular occupation successfully, a practitioner must look at each of the three domains and identify which one needs modification, and how this modification will impact the client's performance. For our project, the specific domain that would be modified to produce enhanced occupational engagement and socioemotional well-being for PWD is the environment.

Unlike other models, the PEO model adopts a lifespan perspective, giving it the ability to analyze occupational performance at every stage of life and allowing it to fit well within our target population of older PWD. By integrating social robots into dementia settings and interventions, OTs can modify the environmental context in which

PWD engage in. By introducing a social robot into dementia interventions, a shift is caused in the way that PWD interact with their immediate surroundings.

By altering the environmental aspect of care, PWD are offered opportunities to engage socially and express themselves, their concerns, emotions, thoughts, and memories more often. Maintaining social connectedness and expression is vital to this population because one-third of PWD experience comorbidities that decrease their socioemotional well-being, and are often linked to feelings of depression and loneliness (U.S. National Library of Medicine, 2024). As patients increase the frequency in which they engage with their surroundings, feelings of loneliness and isolation may be mitigated, leading to an increase in life satisfaction and perceived quality of life. Dynamic interactions provided by social robots may be able to improve, or at the very least, maintain patients' levels of cognition, awareness, and social engagement.

Methodology

For our research project, the research team created a video depicting various functionalities related to Moxie and how they could potentially be applied to dementia care settings and interventions. The video demonstrated three of Moxie's modules, which were the chat function, imagine a place, naming that feeling, and animal breathing. The exercises were explained in detail and showcased to the viewers in a practical format. The aim was to show viewers how Moxie could positively impact the care of PWD, whether it's supporting them emotionally, engaging and producing positive social interactions, and/or encouraging meaningful participation.

Research Design

By distributing a 14-question survey, AHPs were sought out to watch the video and provide the team with their perspectives and feedback on whether they believed Moxie could improve the following domains: socioemotional, cognitive, and occupational performance. We utilized a mixed-methods approach to capture AHP's perspectives on the applicability of Moxie within dementia care settings. We opted to utilize a mixed-methods approach to allow us greater flexibility in our resource gathering. The qualitative portion of the survey allows for a deeper understanding of the opinions of healthcare professionals, as well as a greater ability to uncover any complex nuances related to the technology. To ensure uniform procedures, we provided all participants with the same video and survey.

Participants/Recruitment

The survey that was provided to the participants was distributed through direct communication. To ensure that our survey responses were as applicable as possible, we asked participants whether they had previous experience with social robots, from media exposure to personal experiences. If they had no previous exposure, their responses were not taken into consideration.

Data Collection/Analysis

Using Google Forms, the surveys were gathered anonymously to capture authentic impressions of Moxie's potential as an innovative tool for dementia care. After we gathered the responses from our participants, we analyzed the data using Google Sheets. Using Google Sheets allowed us to visualize our data through graphs, charts, and percentages. The qualitative data provided key themes from our participant's responses,

while the quantitative data helped reveal common trends and patterns. We avoided using jargon when providing information in our video and survey. With the help of our thesis advisor, we ensured that our survey questions accurately captured our participant's perspectives and beliefs.

Ethical and Legal Considerations

We kept all participants anonymous by keeping our data collected without personal identifiers; the only information that will pertain to an individual is their occupation. All information obtained will be stored and encrypted. Participants have the ability to be excluded from our project if they choose to do so. Since we are not working directly with PWD, and are only collecting data from healthcare workers, our project will not have any vulnerable populations. Our video will not need consent for copyright issues; we will create a video of Moxie. Our appendices will not contain consent or agreement forms because the project was produced remotely through Google Forms.

Results

Demographics

Our survey obtained 23 responses, with only 14 counting towards our data collection, as nine of the participants responded with not having any prior exposure to robotics in their respective healthcare fields. Two of the participants did not clarify their professions/credentials; of the other 12 participants, four identified themselves as OTs, two as OTAs, one as a PT, one as a PTA, three as rehab aides, and one as a SLP. The results of the survey are as follows.

Quantitative Data

Of the 14 participants, 50% were slightly familiar with the technology, 42.9% were not familiar at all, and only 7.1% were moderately familiar. Initial impressions demonstrated a positive showcase of emotions with 42.9% of participants feeling positive towards Moxie, 35.7% feeling neutral, and 21.4% feeling very positive. When tasked to identify whether Moxie could positively impact the overall well-being of PWD, 57.1% said they felt positive that Moxie could have a positive impact, 28.6% took a neutral stance, and 14.3% felt very positive. To further expand upon the topic of benefits, participants were asked about the potential enhancements that Moxie could offer PWD. See Figure 1 in Appendix A for the full responses pertaining to that question; the majority (78.6%) believed that Moxie could improve social engagement and enhance cognitive stimulation in PWD and that it could support the patients' emotional well-being (64.3%). To identify the areas of dementia care participants believed Moxie could most effectively improve, they were asked to choose which aspects they thought could benefit the most. The responses, available under Figure 2 in Appendix A, reveal that the majority (71.4%) felt social interactions were the most promising area for improvement; 42.9% believed that cognitive function and emotional regulation could also be improved through interactions with Moxie. Interestingly, one participant noted that the potential for improvement depended on the individual client, making it challenging to pinpoint a specific area of enhancement.

Following the questions pertaining to Moxie's viability within dementia care, participants were asked whether they believed the robot could effectively complement human caregivers. The results to this question were relatively mixed; 42.9% took a

neutral stance, 28.6% agreed that Moxie could complement caregivers, 14.3% strongly agreed, and another 14.3% disagreed. To gain a personal perspective regarding the participants' own feelings of implementation, they were asked whether they would consider using a social robot, like Moxie, in their own practice with PWD. To that, 50% responded that they likely would, 35.7% took a neutral stance, and 14.3% said that they would very likely consider it. After gathering the participants' likelihood of personal implementation, they were then asked two separate questions regarding potential complications and concerns that they held about the technology.

The first question specifically asked participants about their own concerns regarding incorporating social robots in dementia care. The results to that question are displayed in Figure 3 in Appendix A, with 64.3% of participants stating concerns regarding technical reliability, 57.1% were concerned about the cost of resource allocation, and another 57.1% were concerned with the robots' limited range of functionality in addressing patients' complex needs. Other concerns that came up were ethical considerations (21.4%), and patients' lack of personal connection with the robot (50%), making adherence and implementation difficult.

The final quantitative question asked participants to state any challenges that they foresaw in integrating social robots into dementia care routines. The responses to that question are displayed in Figure 4 in Appendix A. Three categories of challenges stood above the rest in terms of responses; 85.7% of participants viewed patient resistance or discomfort as a barrier to implementation, 78.6% noted staff training and adaptation as a challenge, and another 78.6% stated that technical support and maintenance was a challenge to consider; 64.3% noted that cost and budget constraints could pose a

challenge, and 42.9 % viewed that the lack of research/evidence backing social robots could be a potential barrier. Interestingly, one participant stated that they perceived that the presence of a social robot could lead to an over-reliance on the technology, resulting in a lack of intentional care. We then asked the participants three open-ended questions towards the end of the survey, to gain an even deeper understanding of their thoughts and perceptions towards social robots.

Qualitative Data

The first question that we asked our participants was: "How do you believe Moxie could enhance social participation and emotional well-being in individuals with dementia, compared to other interventions?" The participants' responses gave way to two common themes, both companionship and consistent service delivery. These aspects of social robot interventions were highlighted as having the possibility to enhance the socioemotional well-being of PWD. The participants' full responses are available in Figure 5 in Appendix A.

The second question that we asked the participants was: "How do you think Moxie's role in dementia care differs from other types of therapeutic interventions (e.g., music therapy, art therapy)?" To this, two differing viewpoints were highlighted in the responses. Some stated that Moxie differs negatively to other therapeutic interventions, mostly due to its lack of human input and connection, which makes other interventions, like art therapy and music therapy, incredibly useful and engaging for PWD. On the other hand, some participants stated that Moxie differs from other interventions in a positive manner, primarily because of its accessibility and ease of use, making it a simple and

convenient tool to utilize, especially as we continue to see a rising shortage of human caregivers. Full responses to this question are available under Figure 6 in Appendix A.

The last question that we asked our participants is: "Do you believe that the services that Moxie offers may unintentionally diminish the dignity of adult clients? If so, what specific adjustments would you like to see to Moxie's design, services, or implementation to make it more age-appropriate?" The responses to this question demonstrate a divide within the healthcare profession as to whether Moxie is appropriate to implement into dementia care settings and interventions. On one hand, you have professionals that believe Moxie is not age-appropriate for PWD, and that interactions with it may also feel impersonal due to its pre-existing programming. On the other hand, you have professionals that believe that if Moxie is intentionally and strategically adapted to each patient, it may serve a greater therapeutic purpose while maintaining the patient's dignity. Additionally, an issue of balance was seen throughout many responses; there must be an adequate balance between technological innovations and human input to produce the best therapeutic outcomes for PWD. Full responses are available under Figure 7 in Appendix A.

Discussion

Our project utilized Moxie, a social robot. Through our data collection, we obtained some common themes among our participants' responses, which will be discussed next.

Theme 1: Accessibility of Moxie in Dementia Care

The participants described Moxie as an accessible tool in dementia care, highlighting its ability to support and complement healthcare workers by filling care

gaps. Participants emphasized that Moxie's availability without scheduling constraints presents a significant advantage. Unlike traditional interventions that involve appointment-based sessions, Moxie provides on-demand support which can be beneficial in environments that have caregiver shortages. One respondent highlighted, "Moxie provides a variety of interventions anytime and/or place". Another respondent stated, "Robotics can be accessed anytime whenever needed, eliminating the need for appointments". This acknowledges that Moxie serves as an accessible outlet for PWD for those who may experience social anxiety and require care when a caregiver is not present. Moxie's consistent availability highlights its potential to complement therapeutic care to enhance the overall well-being of PWD.

Theme 2: Humanistic Interaction

Based on the responses we gathered, a key concern among participants was Moxie's inability to provide a genuine human connection. While Moxie supports communication and self-expression, participants pointed out several key differences. One major concern they mentioned was that Moxie felt impersonal and could not fully meet the emotional needs of PWD. Some participants emphasized that social participation cannot truly be replaced by a robot, as human communication is mostly nonverbal. Moxie may struggle to pick up conversation nuances, and PWD could also have issues understanding social cues from a robot. For example, one participant stated, "Moxie uses overly simplistic language and has cute design that may sometimes feel infantilizing to adults, especially older clients who value their autonomy and maturity. For Moxie to truly serve adult clients without diminishing their dignity, the design and implementation must focus on empowerment, respect, and personalization". This statement emphasizes

healthcare professionals' skepticism about whether a social robot can be an effective tool when working with PWD.

Theme 3: Companionship With Moxie

Our participants' survey responses showed an optimistic view on the potential of the companionship between Moxie and PWD. Participants emphasized the companionships that can be fostered through interactions with Moxie. A participant stated, "Moxie helps to reduce loneliness by promoting communication and offering companionship." Moxie utilizes active listening through story-telling prompts, which provides cognitive stimulation for PWD and creates a possibility of an emotional connection with Moxie. Moxie's ability to recall previous conversations helps promote communication and companionship with PWD. Another participant stated, "Individuals can communicate with a physical object with facial expressions as compared to using a phone/Alexa." Moxie's facial expressions showcase companionship because of its ability to show engagement and emotional responsiveness. This highlights how Moxie can be perceived as a companion, enhance social participation, and reduce feelings of loneliness in individuals with dementia.

Theme 4: Consistency of Delivery

As mentioned earlier, we asked our participants how they believed Moxie could enhance socioemotional well-being in individuals with dementia, especially when compared to other interventions. The responses revealed a key feature that set Moxie apart from other dementia care options: its consistent service delivery. Participants emphasized that consistent interactions and support are essential for PWD to see improvements—and this is something Moxie excels at. Moxie's consistency was evident

in three main areas: providing a controlled and supportive environment, offering assistance when caregivers were unavailable, and delivering interventions without the risk of fatigue. Intentional support paired with consistent and controlled environments are particularly important for PWD, as it can help them establish and maintain routines, prevent neglect or oversight, and potentially slow their cognitive decline. Consistent engagements that prioritize cognitive stimulation, emotional regulation, and social connectedness can foster more stable and enriching living situations for patients. Moreover, Moxie's potential to assist caregivers in delivering interventions and dementia care is worth further investigation, especially given the growing shortage of human caregivers for our aging population.

It is important to begin identifying viable alternative therapeutic services for our older adults, not only to promote their quality of life, but to also meet the needs of caregivers globally. Social robots may be able to reduce the need for direct supervision of patients, as they can monitor the patients' behaviors and ring for assistance whenever professional involvement is necessary, ultimately allowing caregivers to attend to more responsibilities. Additionally, caregivers and patients alike can benefit from the companionship of a social robot—patients benefit from being engaged and seen more often, while caregivers can benefit from knowing that their patients or loved ones are receiving attention and support when they are not present.

Diverging Perspectives of Allied Health Providers

Although impressions were mostly positive, we encountered mixed opinions regarding Moxie's applicability in dementia care. Participants showed concern about costs, technical support, and staff training. However, Moxie has been shown to be a more

budget-friendly option as a social robot. Many of our participants' responses also showed a 50/50 response on the applicability of Moxie. This is due to Moxie's appearance and its age appropriateness. Designed for children with cognitive challenges, its appearance is friendly and toy-like. Engineers can alter designs by making the robots look more humanistic, with clothes and human body movements. Participants showed a neutral attitude towards its simplistic language features and interactions. The simplistic interactions can be beneficial for individuals with progressed dementia because it can enhance recall, encourage engagement, reduce confusion, and reduce anxiety. However, Moxie's simplistic interactions with less progressed dementia may be a barrier due to PWD feeling patronized, which can impact their self-esteem, become frustrated, or reduce their cognitive engagement. This result aligns with the findings of other research, showing a disengagement in conversations for individuals engaging with NAO, the social robot (Robinson & Kavanagh, 2021). Participants of our project still agree that social robots are applicable in dementia care settings, if used to complement traditional interventions.

Limitations

The limitations of our study include a small sample size gathered from responses. This was limited due to the number of participants exposed to social robots. As a result, we were unable to capture a diverse range of perspectives from AHPs. Additionally, time constraints posed a barrier for our thesis project. Due to our time constraints, we only had a week to collect and analyze data. This restricted our ability to gather a broader spectrum of opinions and insights.

Another challenge we may have faced is technological disruptions. Participants in this project may have encountered issues accessing the survey or viewing our video, especially if they have a bad connection. We noticed that some responses were missing from our open-ended questions, which led us to believe that technical difficulties may have taken place. Technical interruptions can cause frustration and lead to disengagement from participants, which affects the data collection process. Although this may have been out of our direct control, future projects can benefit from double checking the functionality of their tools to minimize the probability of technological issues. Optimization of media and forms should also take priority.

Ethical considerations can have also limited our project. Although we stated that we will not be collecting personal information, some participants may have still been cautious of their confidentiality. We addressed this to the best of our ability by emphasizing that participation was completely voluntary and clarified that their responses could not and would not be traced. Participants also had the choice to be excluded from this project if they chose to do so.

Implications for Occupational Therapy Practice

The findings from this study highlight significant implications for occupational therapy practice in dementia care through the use of Moxie. AHPs recognized Moxie's potential in promoting companionship, consistency, and social engagement in PWD. Moxie can complement traditional therapeutic care and provide meaningful engagement when healthcare staff or caregivers are unavailable. OTs can leverage Moxie as a complementary tool to support social participation while tailoring personalized interventions to meet the needs of PWD. However, concerns remain regarding Moxie's

ability to foster authentic human connection, toy-like design, and its potential impact on client dignity. OTs can advocate for staff training, technical support, and personalized interventions to optimize the benefits of Moxie. Failure to adapt to such technologies can be a disservice to PWD, given Moxie's potential to enhance therapeutic outcomes and alleviate caregiver burden.

Conclusion

In conclusion, our project aimed to identify potential gaps in Moxie's implementation, applicability, and service design within dementia care settings. While Moxie is being discontinued, future research could explore the potential of similar social robots, such as Milo, in promoting social engagement and emotional well-being among PWD. Through our video and survey, we gathered valuable insights from AHPs on how to further develop and innovate dementia care practices. As social robots continue to emerge as a non-pharmaceutical approach to dementia care, ongoing research is essential to ensure their effectiveness. By addressing issues such as personalization and human connection, future advancements in this technology may better support PWD. Our findings contribute to this growing field and may serve as a foundation for researchers and engineers seeking to fine tune and expand the role of social robots in dementia care.

The more research that is gathered, backing up the usefulness of this treatment modality, the better the outcomes and processes may be for patients and AHPs. For OTs specifically, our research outcomes may demonstrate areas of limitation in social robot interventions. These areas may require modifications from the practitioners themselves, to accommodate and enhance therapeutic sessions. In order to promote quality, client-centered care, OTs must be aware of the role that social robots play in dementia care

settings. This knowledge ensures that sessions are risk-free and seamless, are personalized to each individual, goal-setting is realistic for clients, and any necessary complementary strategies are integrated into therapy to take advantage of the technology, not to exploit it. We are excited to see where the technology goes and hope to be able to contribute to its advancement and refinement.

References

American Occupational Therapy Association. (2020). Occupational therapy practice framework: Domain and process (4th ed.). *American Journal of Occupational Therapy, 74*(Suppl. 2), Article 7412410010. https://doi.org/10.5014/ajot.2020.74S2001

Centers for Disease Control and Prevention. (2024, March 26). *Health effects of social isolation and loneliness*. https://www.cdc.gov/social-connectedness/risk-factors/

Elias, M. (2024, May 23). *49 loneliness statistics: How many people are lonely?* Discovery ABA: At-Home & Center-Based ABA Therapy. https://www.discoveryaba.com/statistics/loneliness

Law, M., Cooper, B., Strong, S., Stewart, D., Rigby, P., & Letts, L. (1996). The person-environment-occupation model: A transactive approach to occupational performance. *Canadian Journal of Occupational Therapy*,*63*(1), 9–23. https://doi.org/10.1177/000841749606300103

Khosla, R., Chu, M., Khaksar, S. M. S., Nguyen, K., & Nishida, T. (2019). Engagement and experience of older people with socially assistive robots in-home care. *Assistive Technology*, *33*(2), 57–71. https://doi.org/10.1080/10400435.2019.1588805

Koh, W. Q., Heins, P., Flynn, A., Asl, A. M., Garcia, L., Malinowsky, C., & Brorsson, A. (2022). Bridging gaps in the design and implementation of socially assistive technologies for dementia care: The role of occupational therapy. *Disability and Rehabilitation Assistive Technology*, *19*(3), 595–603. https://doi.org/10.1080/17483107.2022.2111610

Marino, F., Chilà, P., Sfrazzetto, S. T., Carrozza, C., Crimi, I., Failla, C., Busà, M., Bernava, G., Tartarisco, G., Vagni, D., Ruta, L., & Pioggia, G. (2019). Outcomes of a robot-assisted social-emotional understanding intervention for young children with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, *50*(6), 1973–1987. https://doi.org/10.1007/s10803-019-03953-x

Pu, L., Moyle, W., & Jones, C. (2019). How people with dementia perceive a therapeutic robot called PARO in relation to their pain and mood: A qualitative study. *Journal of Clinical Nursing*, *29*(3-4), 437–446. https://doi.org/10.1111/jocn.15104

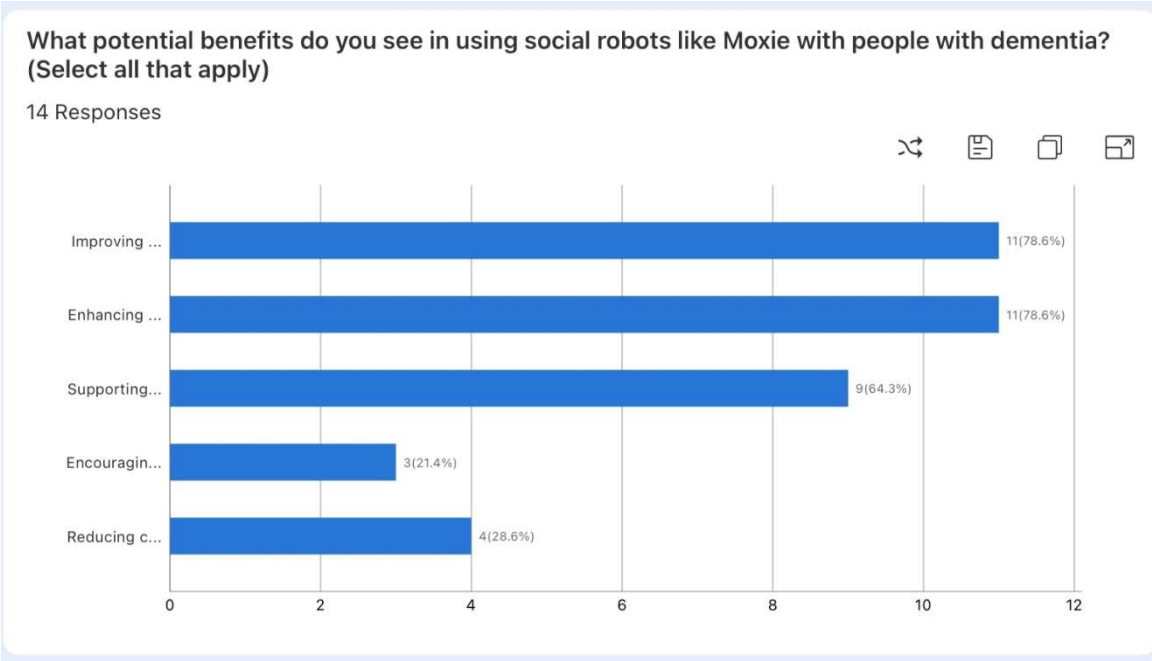
Robinson, N. L., & Kavanagh, D. J. (2021). A social robot to deliver a psychotherapeutic treatment: Qualitative responses by participants in a randomized controlled trial and future design recommendations. *International Journal of Human-Computer Studies, 155,* Article 102700. https://doi.org/10.1016/j.ijhcs.2021.102700

U.S. National Library of Medicine. (2024, May). Alzheimer's disease facts and figures. *Alzheimer's & Dementia: The Journal of the Alzheimer's Association, 20*(5), 3708–3821. https://pubmed.ncbi.nlm.nih.gov/38689398/

Appendix A

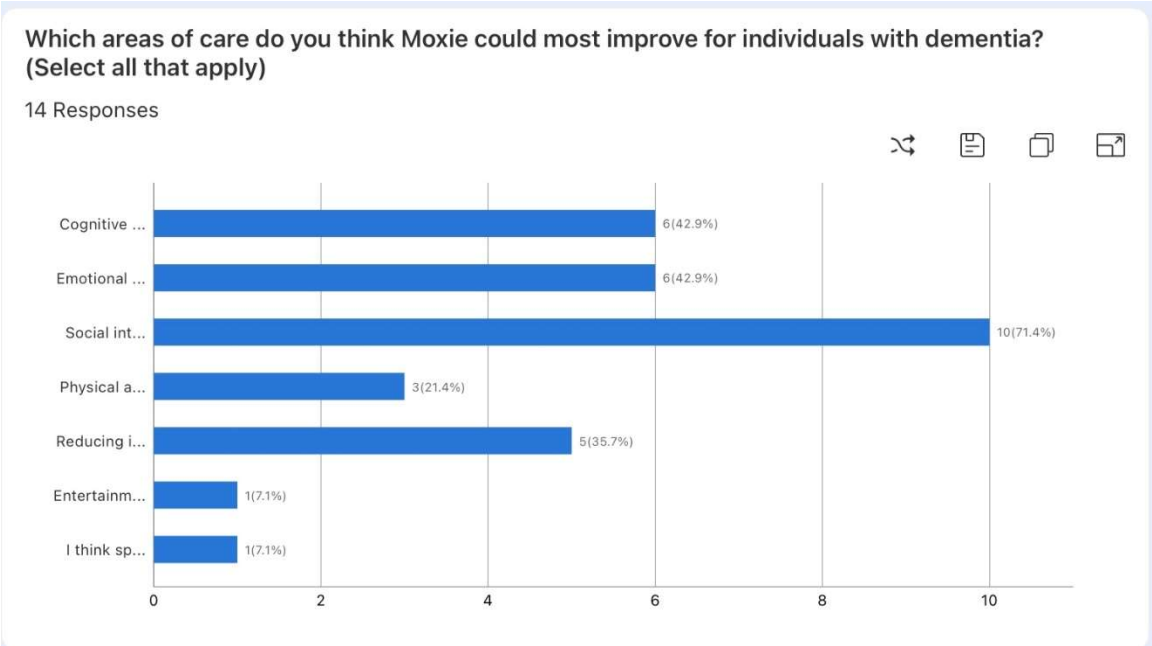
Survey Data

Figure 1



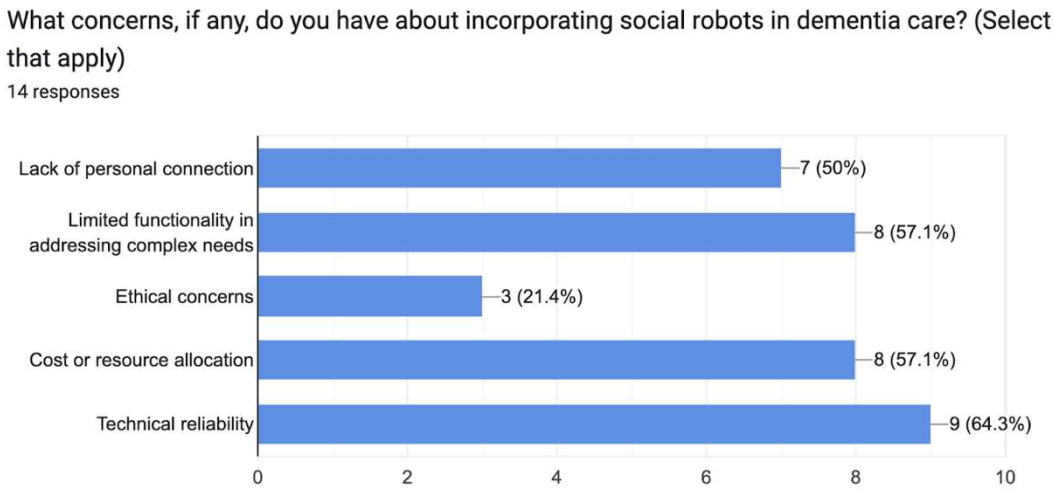
Note: Majority of AHPs responded that they believed social engagement and enhanced cognition could result from Moxie's services.

Figure 2



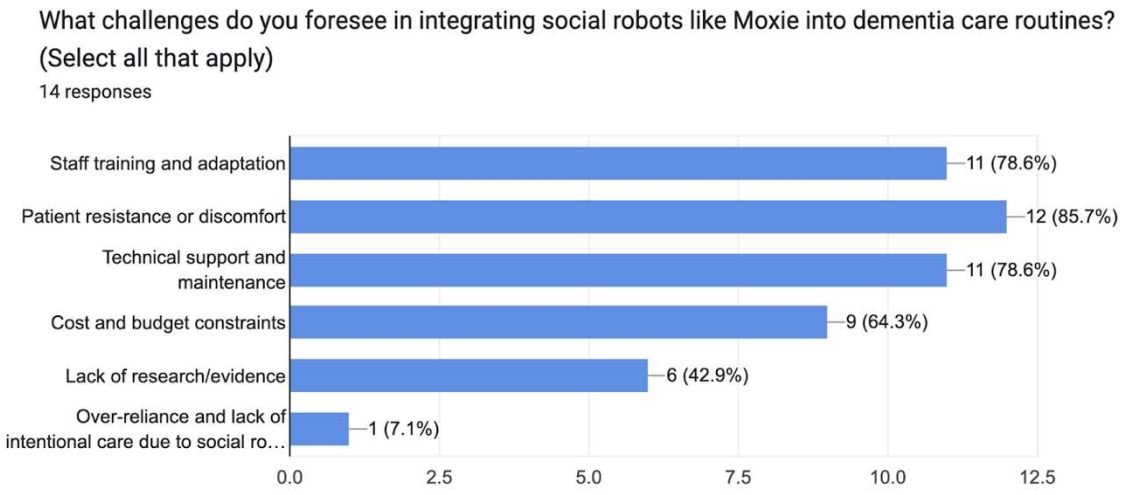
Note: Participants believed that social interaction can be improved the most.

Figure 3



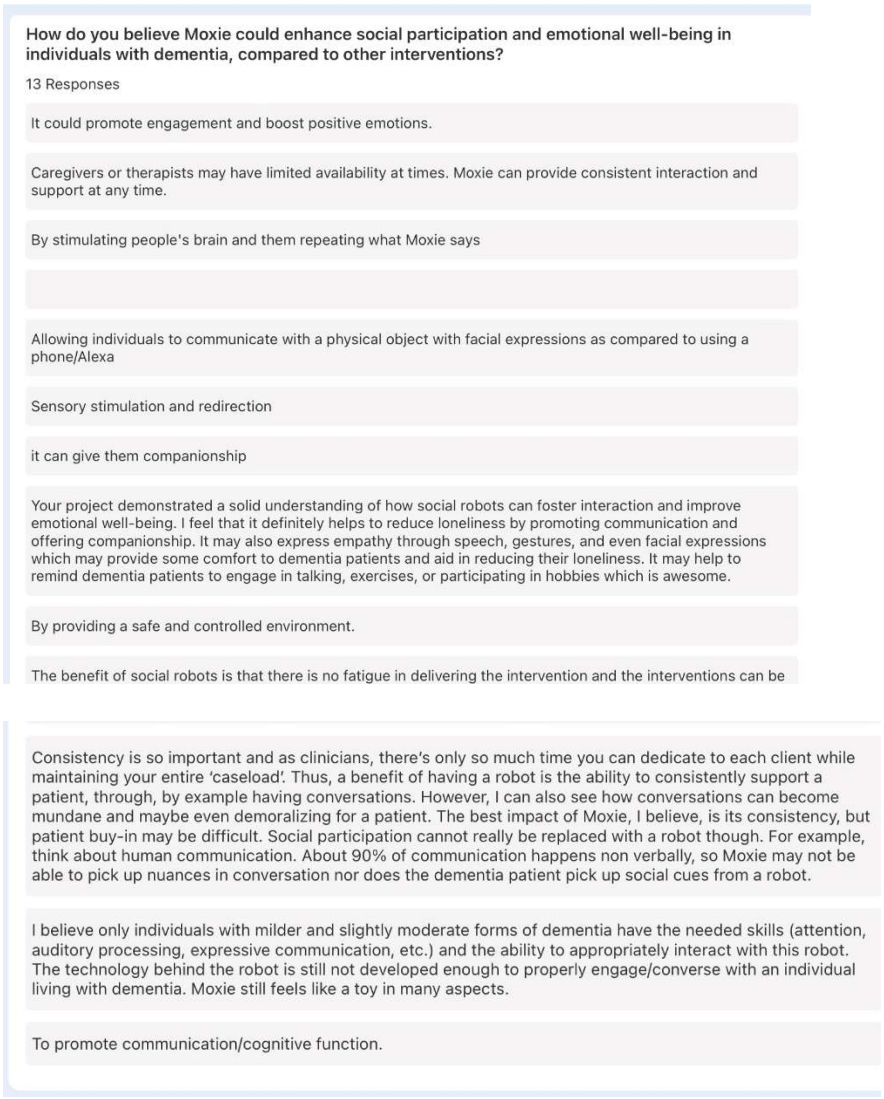
Note: Majority of AHPs had concerns regarding Moxie in dementia care.

Figure 4



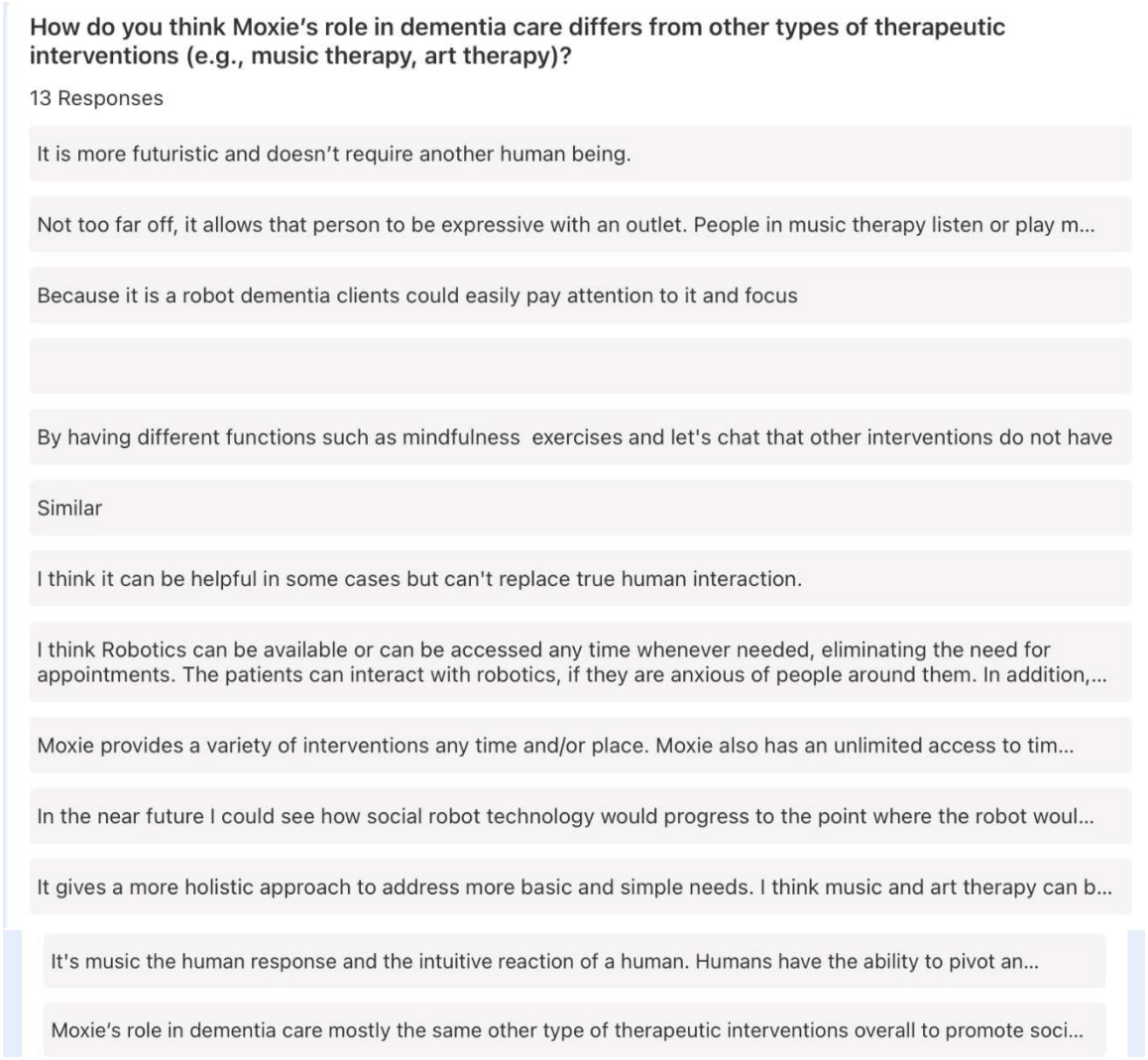
Notes: Participants did not believe that over-reliance would become a challenge with the integration of Moxie.

Figure 5



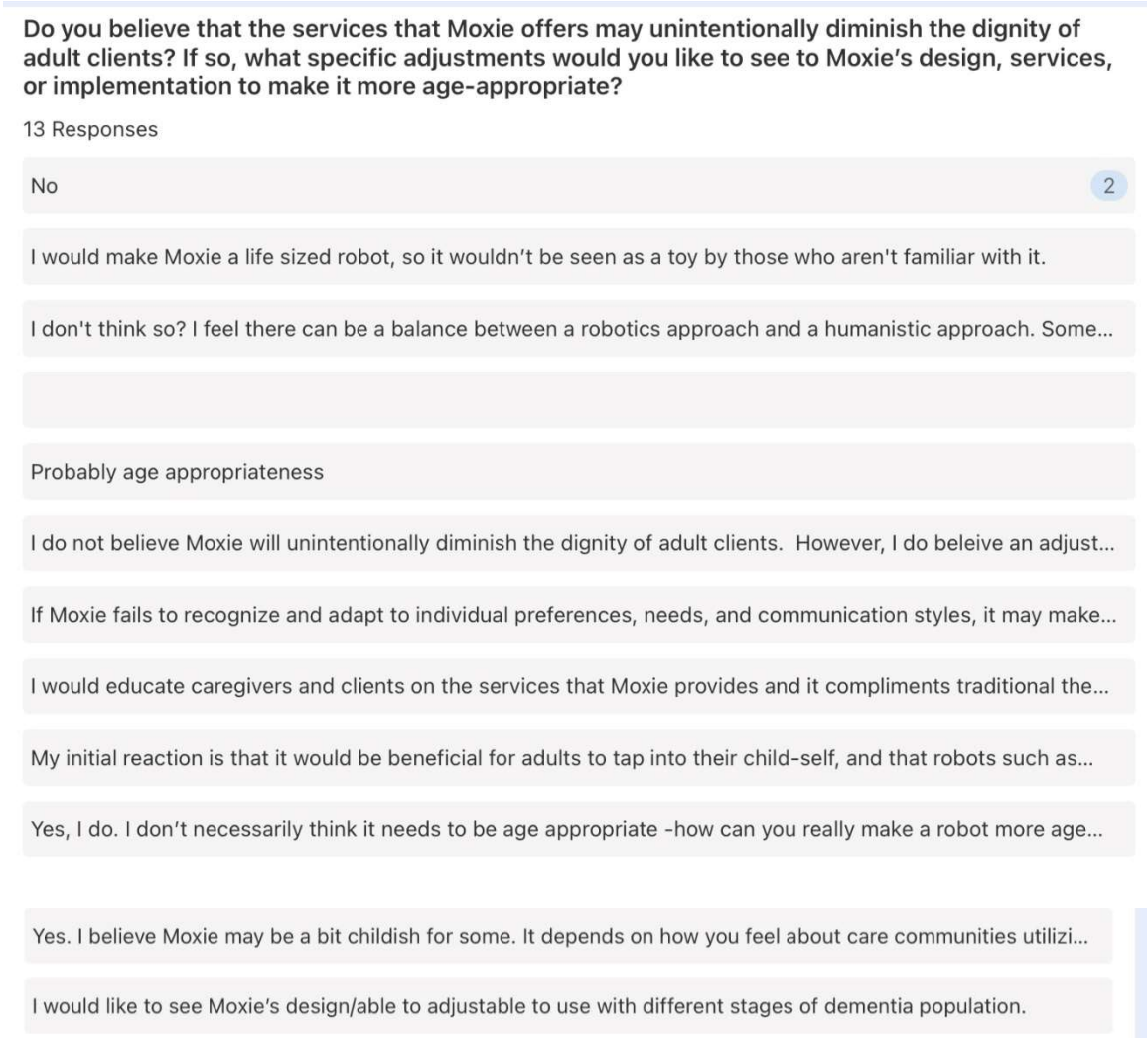
Note: First of the open-ended questions we asked our participants, which asked them how they believed socioemotional well-being could be improved through Moxie's services, as compared to other interventions.

Figure 6



Note: One participant chose not to respond to this survey question. There were mixed findings on the responses. While some believed that Moxie's lack of humanistic connections negatively differs it, others believed its convenience could be useful.

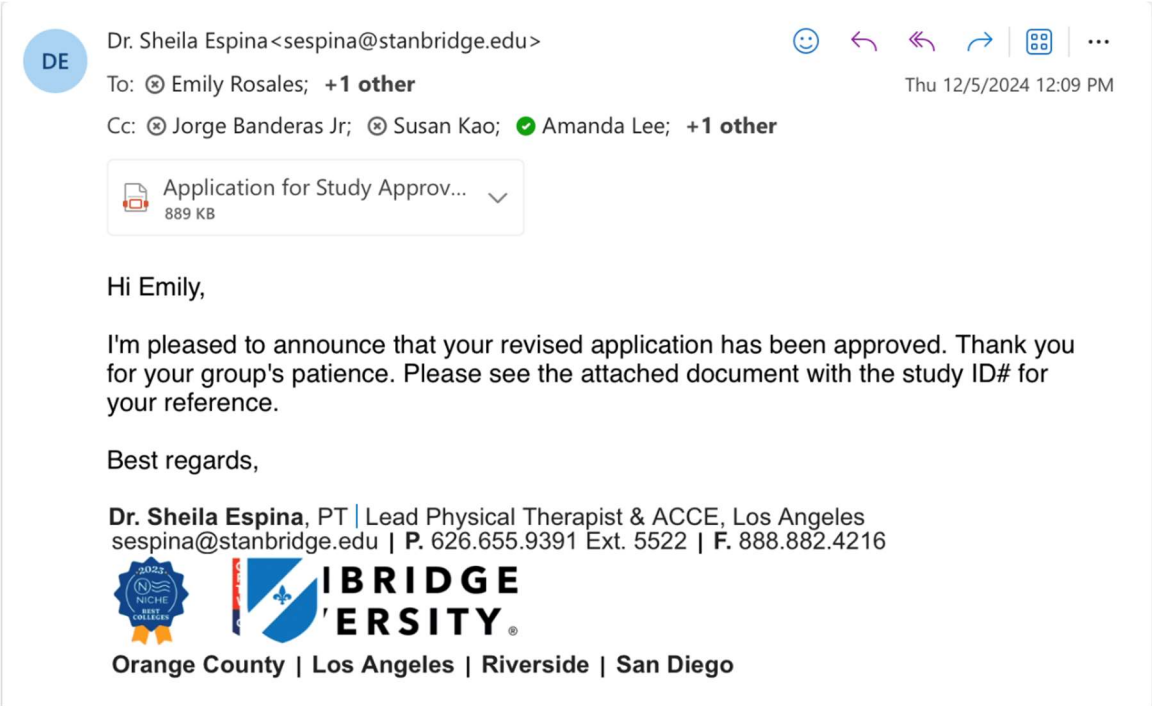
Figure 7



Note: Participants had a divided opinion on Moxie's suitability for adult clients, regarding its alignment with their dignity. Some AHPs felt that Moxie was not age-appropriate, while others believed its design could be adapted to meet the needs of PWD.

Appendix B

University Approval to Conduct Research



DE

Dr. Sheila Espina<sespina@stanbridge.edu>

To: Emily Rosales; **+1 other**

Thu 12/5/2024 12:09 PM

Cc: Jorge Banderas Jr; Susan Kao; Amanda Lee; **+1 other**

Application for Study Approv...
889 KB

Hi Emily,

I'm pleased to announce that your revised application has been approved. Thank you for your group's patience. Please see the attached document with the study ID# for your reference.

Best regards,

Dr. Sheila Espina, PT | Lead Physical Therapist & ACCE, Los Angeles
sespina@stanbridge.edu | **P.** 626.655.9391 Ext. 5522 | **F.** 888.882.4216

IBRIDGE
'ERSITY

Orange County | Los Angeles | Riverside | San Diego