Humanoid and Socially Assistive Robots in Mental Health Care: A PRISMA Guided Systematic Review of Therapeutic and Emotional Outcomes (2021–2025)

1st Ayesha Noshin
Department of Computer Science
University of Minnesota Duluth
Duluth, Minnesota
noshi002@d.umn.edu

2nd Varshini Bhavanam
Department of Computer Science
University of Minnesota Duluth
Duluth, Minnesota
bhava008@d.umn.edu

3rd Arshia Khan
Department of Computer Science
University of Minnesota Duluth
Duluth, Minnesota
akhan@d.umn.edu

***Abstract*—We systematically reviewed research published from 2021 to 2025 on humanoid and socially assistive robots in mental health care to examine therapeutic and emotional outcomes. Following PRISMA 2020 guidelines, multiple databases were searched and 20 studies met inclusion criteria. Due to heterogeneous study designs, findings were synthesized qualitatively. Participants included older adults, university students, and children. Interventions utilized humanoid robots, pet-like companion robots, and other socially assistive robots to provide emotional support. Outcomes were broadly positive; many studies reported reduced anxiety or distress alongside improved mood and decreased loneliness. Companion robots alleviated loneliness in isolated older adults. Humanoid robots delivering guided therapy improved mood and reduced anxiety in young adults. Child-friendly robots helped relieve procedural anxiety in pediatric settings. These findings indicate that socially assistive robots are feasible and beneficial adjuncts to traditional mental health care. Careful integration of such robots in real-world settings could enhance emotional well-being and extend support for vulnerable groups, provided that ethical and user-centered practices guide their use.**

***Index Terms*—Humanoid Robots, Socially Assistive Robots, Mental Health, Human Robot Interaction, Emotional Wellbeing**

I. Introduction

Robotics and artificial intelligence are transforming mental health care. Mental illness affects millions of people worldwide and continues to increase each year. Depression, anxiety, dementia, and loneliness remain major global concerns. Traditional therapy alone cannot meet the growing demand for psychological support. New technological approaches now offer complementary solutions. One emerging direction is the use of robots to promote emotional connection and wellbeing [1].

Socially assistive robots focus on human interaction rather than mechanical function. Their role is to provide motivation, empathy, and companionship. They use voice, gesture, and expression to create social presence. Such interaction can ease isolation and support emotional regulation [2]. These systems often help with mindfulness, therapy routines, or stress reduction. Engaging with them may enhance mood and encourage participation in care activities [3].

Humanoid robots bring additional advantages. Their human-like faces, voices, and movements make them relatable. They can conduct guided breathing, mindfulness, or cognitive exercises with natural flow [4]. Progress in affective computing and language processing now allows robots to detect emotional tone and adapt their responses [5]. This ability strengthens connection and helps build trust during interaction.

The introduction of robots in therapy also brings challenges. Privacy, consent, and authenticity remain central concerns. Emotional data must be protected and collected responsibly [6]. People with dementia, children, and other vulnerable groups require special attention. Critics fear technology may weaken genuine human care. Others believe it can extend access to those who might otherwise receive none [7]. Ethical design and transparent use are therefore essential for safe integration.

Research on mental health robotics now covers hospitals, community centers, and long-term care homes. Robots have supported people living with anxiety, depression, or cognitive decline. Many studies report higher engagement and improved mood after robotic interaction [8], [9]. These results suggest that well-designed robots can strengthen emotional wellbeing when introduced with clinical guidance.

This review analyzes the growing body of work on robotics in mental health. It explores how humanoid, companion, and socially assistive robots contribute to care. It also identifies limitations, ethical risks, and future directions. The aim is to understand how intelligent robots can promote psychological health in ways that remain person-centered and evidence-based [10].

II. Methods

This systematic review followed the PRISMA 2020 guidelines [11]. We conducted a structured search of bibliographic databases to identify studies evaluating humanoid, companion, and socially assistive robots used to support mental health, wellbeing, or emotional regulation in human participants.

A. Search Strategy

We searched PubMed, Web of Science, IEEE Xplore, and Google Scholar for studies published between January 1, 2021 and October 15, 2025. Search strings combined terms for mental health outcomes (e.g., depression, anxiety, wellbeing, dementia, loneliness) and robotic interventions. The representative PubMed query was:

> ((”mental health”[Title/Abstract] OR depress*[Title/Abstract] OR anxi*[Title/Abstract] OR ”emotional wellbeing”[Title/Abstract] OR dementia[Title/Abstract] OR loneliness[Title/Abstract]) AND (robot*[Title/Abstract] OR ”social robot”[Title/Abstract] OR ”humanoid robot”[Title/Abstract] OR ”companion robot”[Title/Abstract] OR ”socially assistive robot”[Title/Abstract])).

Equivalent terms were adapted for Web of Science and IEEE Xplore (using the `TS=` field). No language restrictions were applied at the search stage, but only English-language full texts were included in the final analysis.

B. Eligibility Criteria

Studies were eligible if they (1) reported primary empirical data involving an embodied robot designed for mental health or psychosocial support; (2) targeted psychological or emotional outcomes such as mood, anxiety, loneliness, or engagement; and (3) enrolled human participants in clinical, community, or laboratory contexts. Eligible robot modalities included humanoid robots (e.g., Pepper, NAO, Qhali), socially assistive robots (e.g., PIO, Ommie), and companion or zoomorphic robots (e.g., Paro, Lovot). Both randomized controlled and pilot feasibility designs were included.

C. Exclusion Criteria

We excluded (a) studies on non-embodied digital agents (e.g., text-only chatbots or mobile apps), (b) papers focusing exclusively on motor or physical rehabilitation without mental-health outcomes, (c) conceptual or theoretical articles lacking participant data, and (d) secondary research such as reviews, protocols, or commentaries.

D. Screening and Selection Process

All retrieved records were de-duplicated and screened in two stages. Titles and abstracts were first reviewed against eligibility criteria, followed by full-text assessment of potentially relevant studies. Two reviewers independently conducted each stage, resolving disagreements by discussion or consultation with a third reviewer. The PRISMA 2020 flow diagram (Figure 1) summarizes identification, screening, eligibility, and inclusion.

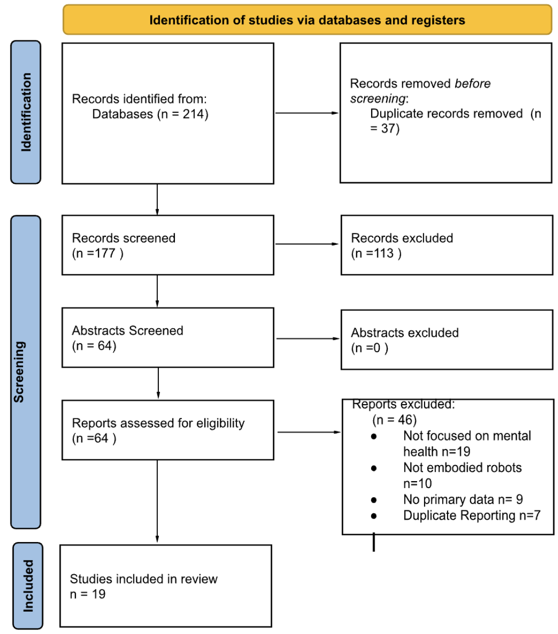

Fig. 1. PRISMA 2020 flow diagram summarizing identification, screening, eligibility, and inclusion.

E. Data Extraction

For each included study, we extracted: author(s), year, title, population characteristics, robot type, study design, healthcare application, intervention features, and key outcomes. Data were organized into three analytic categories—*humanoid*, *socially assistive*, and *companion/zoomorphic*—to facilitate comparison of emotional, behavioral, and ethical findings across robot types.

F. Data Synthesis

Given the heterogeneity of study designs and outcome metrics, quantitative meta-analysis was not feasible. Instead, we used thematic synthesis to identify common patterns in intervention aims, emotional outcomes, and design factors influencing engagement. Themes such as *emotional connection*, *therapeutic engagement*, *trust and acceptance*, and *ethical design* were derived inductively across studies.

III. Results

The reviewed studies collectively highlight the growing role of social and humanoid robots in promoting mental health and emotional well-being across diverse populations. From older adults in care settings to university students and hospitalized children, researchers have explored how robots can act as companions, therapeutic facilitators, and supportive partners in psychological interventions. This section presents key findings from recent research, organized by population groups 1) older adults, 2) adults, and 3) children to illustrate how robots have been applied in different mental health contexts, the outcomes achieved, and emerging patterns in their effectiveness and design.

Table I summarizes the key findings from reviewed studies, organized by population group: older adults, adults, and children. The table highlights the diversity of robot applications in mental health contexts, including companionship, therapeutic engagement, and emotional support. Consistent positive outcomes such as reductions in loneliness, anxiety, and depression are evident across age groups, especially when robots are physically embodied, interactive, and integrated into structured interventions.

A. Social Robots in Older Adult Care

Multiple studies have explored companion and socially assistive robots in eldercare settings, often showing positive psychosocial outcomes for older adults. For example, in long-term care residents with dementia, engaging with pet-like robots (such as Paro the seal or Lovot) led to reduced loneliness and improved mood compared to baseline interactions [12]. Similarly, socially assistive robots introduced in dementia care evoked immediate positive emotional responses; notably residents' smiling and showed reduced apathy or agitation during robot activity sessions [13]. The multi-sensory stimulation provided by these robots (especially tactile interaction like petting) was cited as particularly effective in lifting mood.

Design features also play a role: one trial in a senior living facility found that an "empathic" robot companion (programmed to show attentive, caring responses) was rated as more engaging and likable, and it produced greater self-reported mood improvement than a less interactive version of the robot [14]. Social robots have additionally been used to promote social engagement among isolated elders. Group activities with a humanoid robot (e.g., Pepper) increased seniors' sense of community and active participation in care homes [15].

Home-based robot companions appear feasible as well; a recent pilot with older adults living alone reported high acceptance of a personal social robot in the home and noted decreases in loneliness and mild depression over the program period [16]. These findings collectively suggest that for older people, including those with dementia or those at risk of loneliness, robot companions can provide comfort, social interaction, and modest improvements in mental well-being.

Beyond emotional support, robotic interventions have been applied to cognitive and therapeutic activities for older adults, yielding promising results. In community-dwelling seniors, a structured cognitive training program delivered via a social robot (known as the "PIO" robot intervention) produced significant gains in cognitive function and reductions in depression compared to a control group without the robot [17]. Another study targeting older adults with mild dementia found that those who interacted regularly with the PIO robot showed improved memory scores and lower depressive symptom levels relative to controls receiving standard care [18]. This indicates that robots can be more than companions they may also effectively deliver elements of therapy or cognitive stimulation for the elderly.

Even when robots are used as a medium for human-guided therapy, they show potential: in one reminiscence therapy program, a therapist remotely operated a humanoid robot to lead group sessions for nursing home residents with dementia. The outcomes (in terms of residents' mood, engagement, and behavior) were comparable to in-person therapy sessions, demonstrating the feasibility of robot-mediated therapy without sacrificing efficacy [19].

Overall, results in older adult populations consistently point to the benefits of using robots to support mental health; from alleviating loneliness and uplifting mood to maintaining cognitive engagement and facilitating therapeutic activities.

B. Robots in Adult Mental Health Interventions

Research on robot-assisted mental health interventions in adults (particularly young adults and university student populations) also shows generally positive outcomes in mood and stress reduction. In a controlled pilot study of a humanoid robot named Qhali, college students received a brief guided psychological intervention via the robot. The majority of participants (about 85%) preferred the robot-based session to traditional formats and exhibited a significant improvement in emotional state pre- to post-intervention [20]. Participants also rated the robot highly in likeability and perceived intelligence, suggesting strong engagement [20].

In a larger randomized trial ($N \approx 230$) with young adults, an autonomous robot delivered a brief wellbeing training (e.g., a mindfulness meditation and positive psychology exercise). Mood improved significantly after the session, and the robot condition was found to be enjoyable and useful overall [21]. Notably, this study observed that certain subgroups for instance, male participants with high initial distress responded especially well, rating the robot intervention very positively [21]. These results indicate that robot-delivered mental health exercises are feasible and can yield mood benefits on par with more traditional approaches in adult populations.

Earlier formative studies by the same group also reported that participants found the robot sociable and helpful in prompting behavior changes (e.g., some users adopted healthier habits after interacting with a robot "coach"), further supporting the viability of robots for mental health and wellness coaching [21]. Emerging evidence suggests that embodiment (physical presence) may enhance the effectiveness of automated therapy agents. A novel study compared an LLM-powered socially assistive robot to purely digital formats for delivering self-guided cognitive behavioral therapy (CBT) to college students. Over a two-week program, the group engaging with the physical robot showed greater reductions in psychological distress than the group using a text-based chatbot, and they also reported more frequent moments of anxiety relief during sessions [22]. In contrast, the chatbot-only condition showed little improvement, implying that the

TABLE I
SUMMARY OF KEY FINDINGS BY POPULATION GROUP FROM REVIEWED STUDIES ON SOCIAL ROBOTS AND MENTAL HEALTH

Population Group	**Setting**	**Robot Type / Function**	**Main Findings**
Older Adults	Care homes, community, individual homes	Pet-like robots, humanoid companions, therapeutic robots (e.g., PIO)	Reduced loneliness, agitation, and depression [12], [13]; empathic robots boosted mood [14]; group robot sessions enhanced social engagement [15]; home companions accepted well [16]; robot-led cognitive therapy improved memory and mood [17], [18]; robot-mediated reminiscence therapy matched in-person outcomes [19].
Adults	University and home settings	Humanoid robots, social coaches, LLM-powered CBT bots	Qhali robot improved emotional state and was preferred over traditional formats [20]; autonomous robot-led well-being sessions enhanced mood, especially in distressed subgroups [21]; embodiment boosted effectiveness over chatbot-only CBT [22]; robot-guided relaxation helped reduce anxiety [23]; chatbot-only intervention had no significant effect on depression [24].
Children	Clinics, hospitals, online platforms	Humanoid robots, social companions, emotional check-in tools	Robot companions reduced anxiety and distress during procedures [25]; hospitalized children reported improved emotional wellbeing [26]; meta-analysis confirmed significant anxiety reduction [27]; online check-in sessions showed high engagement and comfort in sharing emotions [28].

tangible, interactive nature of the robot added therapeutic value beyond what a screen-based chat agent could achieve [22].

Similarly, other robot-mediated interventions for stress and anxiety have demonstrated positive results. For example, a pilot study had adults practice deep breathing and relaxation with guidance from a tabletop social robot; participants reported lowered anxiety levels and found the robot-guided exercise helpful for emotional regulation [23]. However, not all trials have been successful, highlighting the importance of context and design. One study tested an AI therapy "chatbot" for depression and found that it did not significantly outperform a passive control group in reducing depressive symptoms [24]. This null finding raises caution that simply introducing a conversational bot is not guaranteed to improve mental health outcomes, especially if the intervention lacks engaging or personalized elements.

Taken together, most adult-focused studies suggest robots can effectively deliver mental health interventions (such as mindfulness, CBT strategies, or health coaching) and improve users' emotional states. At the same time, these results underscore that certain factors like embodiment, personalization, and user engagement are critical. Well-designed robot interactions appear beneficial, whereas a generic or passive bot may have limited impact.

C. Robots in Pediatric Mental Health Settings

In pediatric populations, robots have been utilized to help alleviate anxiety and distress, with encouraging results. In healthcare settings where children often experience fear or pain, a friendly robotic companion can provide distraction and comfort. For instance, the presence of a humanoid robot during pediatric medical procedures (such as a dental visit) led to significantly lower anxiety levels in children, as well as improved cooperative behavior [25]. Children who interacted with the robot displayed fewer signs of distress, and physiological measures (such as stress hormones or heart rate) indicated a calmer state compared to children undergoing the procedure without robot support [25].

In hospital environments, social robots have been used to comfort and engage young patients. A recent study reported that hospitalized children who spent time with a social robot showed reduced stress and anxiety during their hospital stay, relative to standard care; notably, while psychological indicators improved, the robot intervention did not change pain levels, suggesting its effect was specific to emotional well-being [26]. Beyond single studies, a broader evidence base is emerging. A 2025 review aggregated findings from multiple pediatric trials and concluded that social robot interventions produce a significant reduction in children's anxiety in clinical settings [27]. This meta-level evidence strengthens the claim that robots can meaningfully help children cope with stressful or anxiety-provoking situations.

Robots have also been tested as tools for engaging children in mental health education and monitoring. One study implemented a series of online sessions where children interacted with a robot to discuss their feelings and complete well-being check-ins. The approach was found to be feasible and child-friendly: over repeated sessions, children remained willing to talk with the robot and even reported more positive perceptions of the robot over time [28]. This suggests that children can build rapport with a supportive robot, which may be leveraged for ongoing mental health support or assessment.

Overall, across pediatric applications, the results indicate that robots can serve as effective allies in reducing anxiety and providing emotional support for children. Whether through acting as a calming companion during procedures or as an engaging partner in psychological exercises, robots appear to help put children at ease and contribute to better emotional outcomes in challenging settings.

IV. Discussion

A. Cross-Study Patterns

Across the diverse studies reviewed, there is a consistent pattern of robots conferring measurable benefits to mental health and well-being in various populations. Socially assistive robots tend to improve subjective emotional states; many studies reported decreases in negative feelings (anxiety, loneliness, distress) and increases in positive mood or engagement following robot interaction. These effects were observed in older adults (reducing loneliness and agitation), young adults (improving mood and stress levels), and children (reducing anxiety), indicating a broad applicability of robotic support for mental health.

A common thread is that robots often serve as a form of social or therapeutic presence that can supplement traditional human contact. For example, companion-like robots in eldercare provide comfort and stimulation to residents who may otherwise lack sufficient social interaction [12], [16]. In therapeutic contexts, robots can guide users through evidence-based exercises (mindfulness, CBT techniques, or reminiscence activities) and achieve outcomes comparable to human-led interventions [19], [21].

The engagement and acceptability of these robots have generally been high: participants frequently describe the robots as friendly, likable, and helpful [14], [20], which likely contributes to the positive outcomes. Indeed, studies that measured user feedback found that people were open to robot-assisted therapy and often even preferred it in certain ways (e.g., finding it less intimidating or more novel than traditional therapy) [20]. This suggests that robots, when designed and deployed appropriately, can successfully establish rapport and trust which are key ingredients for any mental health intervention.

B. Comparisons and Critical Insights

Notably, the degree of benefit appears to depend on how the robot is implemented. Interventions featuring physically present, interactive robots tended to show stronger effects than those using non-embodied or less interactive agents. This is evident in the study where an embodied robot coach outperformed a simple chatbot in reducing student distress [22], as well as in pediatric settings where a tangible robot toy or humanoid was able to comfort children [25].

The importance of embodiment and multi-modal interaction (voice, facial expressions, touch) is highlighted by these findings. A robot that can hug, gaze, or speak may engage users on a deeper emotional level than an app or screen-based agent. By contrast, a purely conversational AI without physical presence showed negligible impact on depression in one trial [24], underscoring that technology alone is not a panacea; the form and context of interaction matter greatly.

Another important factor is the content and quality of the intervention programmed into the robot. Many successful studies used evidence-based frameworks (like CBT, reminiscence therapy, or mindfulness techniques) and tailored the robot's behavior to be empathetic and responsive [14], [21]. This suggests that robots act best as mediators of proven therapeutic activities, rather than as novel gadgets with no structure. When a robot simply delivers generic conversation or lacks a clear therapeutic protocol, it may fail to produce meaningful change [24].

Furthermore, some studies explicitly note that user characteristics can influence outcomes. For instance, one large study found that gender and baseline distress levels affected how participants perceived the robot. Highly distressed males responded most positively to the robot coach [21]. Such nuances imply that while overall trends are positive, robots might be more effective for certain individuals or groups, and personalization (adapting to user needs and preferences) could enhance efficacy even further.

C. Limitations in Current Literature

Despite promising outcomes, the existing body of research has several limitations and gaps. First, sample sizes are often small. Many of the cited studies were pilot projects with only dozens of participants or fewer (e.g., $N = 10$ in an older adult robot trial or $N = 13$ in a student pilot) [14], [20]. Small samples limit the statistical power and generalizability of findings. Only a few studies (such as one with $N \approx 230$ young adults or an $N = 66$ dementia trial) enrolled larger groups, and such studies are still relatively rare.

Second, there is a lack of long-term data. Most interventions reported outcomes immediately after a session or over a short term (a few weeks). It remains unclear whether the mental health benefits from robots are sustained over months or years, or whether novelty effects wear off. Longitudinal studies and follow-ups are largely missing in the literature.

Third, there is a noticeable population bias in published research. Much of the work focuses on specific groups like older adults in care facilities or college students in mild distress. Few studies have examined robot interventions for people with serious mental illness (e.g., major depression, PTSD, or psychotic disorders), and almost none have looked at middle-aged adults or other underrepresented demographics. Untested areas include whether robots could help in clinical therapeutic settings for diagnosed psychiatric conditions, or how they might be used in family or home contexts for adolescent mental health (an age group between the pediatric and young adult range that has seen little robot research).

Fourth, variability in robot types and modalities makes it difficult to compare results directly. The studies reviewed employed a range of robots from cute animal-like companions to human-like androids to simple tablet-based avatars each with different capabilities. This heterogeneity means we do not yet know exactly which robot features (appearance, ability to exhibit emotions, touch interaction, autonomy level, etc.) are most critical for mental health outcomes. For instance, while tactile pet robots seem effective for dementia patients [13], humanoid robots with conversational AI excel in coaching scenarios [22], and it is not well understood if one approach could translate to other contexts or populations.

Setting differences also matter: some interventions were done in controlled environments (lab or clinic), while a few were in real-world homes or hospitals. Real-world deployment can introduce challenges in adherence, privacy, and technical support that are not fully addressed by current studies.

Moreover, researchers have pointed out ethical and practical challenges that need consideration. Using robots in vulnerable populations (such as those with dementia or children) raises questions about consent and autonomy. For example, ensuring that individuals understand the robot's nature and are willing participants [12]. There are concerns about equitable access: advanced social robots can be expensive, potentially creating disparities in who can benefit from them [12]. The possibility of robots replacing human care is another debated issue; while robots can supplement care, families and professionals worry that over-reliance on robots might reduce valuable human contact or lead to the "infantilization" of elderly patients with simplistic toy-like robots [12]. These concerns were explicitly documented alongside positive outcomes in some studies, suggesting that successfully integrating robots into mental healthcare will require careful ethical guidelines and training.

In summary, while the literature to date demonstrates that robots can help improve mental health outcomes, it also highlights the need for more rigorous, extensive research and thoughtful implementation strategies to address these limitations. Table II provides an integrative overview of the literature discussed, illustrating consistent trends across age groups and robot types, as well as remaining research gaps.

V. Conclusion

In conclusion, the collective evidence suggests that robots can indeed assist in improving mental health across a variety of contexts, though the extent of their impact varies. Social and companion robots have shown tangible benefits such as reduced loneliness in older adults, lower anxiety in children, and improved mood in adults participating in wellness interventions. These findings support the idea that robots, as interactive and engaging tools, have a useful role to play in mental health support, whether by providing companionship, delivering therapy techniques, or simply making therapeutic activities more enjoyable.

Importantly, robots are not a magic solution but rather an emerging adjunct to traditional care. The overall trend in recent years is one of cautious optimism: as robot technology becomes more advanced and socially intelligent, their effectiveness and acceptance in mental health applications appear to be increasing. However, it is also clear that this field is still in its infancy, and many questions remain unanswered. The positive outcomes observed so far are mostly in short-term, controlled studies; we do not yet know how robots perform in the long run or in more naturalistic, everyday use. Going forward, researchers and practitioners should build on the current work by addressing the identified gaps and challenges.

A. Larger and Longer-Term Trials

Future research should conduct robust randomized controlled trials with larger sample sizes and follow-up periods. These will help confirm the efficacy of robot-assisted interventions and determine whether the benefits are sustained over time.

B. Diverse Populations and Settings

Studies should expand to include broader demographic and clinical groups. For example, testing robot interventions in individuals with different mental health diagnoses (depression, anxiety disorders, autism, etc.), in adolescent populations, and across varied cultural settings. Such research will help determine where robots are most effective and where they may require adaptation.

C. Optimization of Robot Design

Future investigations should explore which robot features are essential for therapeutic benefit. Key aspects may include physical embodiment versus virtual agents, emotional expressiveness, tactile interaction, and personalization. By identifying and refining these design elements such as empathic personalities or tailored responses developers can create next-generation mental health robots that maximize engagement and therapeutic impact.

D. Integration with Human Care

Another critical direction involves studying how robots can best complement, rather than replace, mental health professionals. Hybrid models could allow robots to handle routine coaching or monitoring tasks, freeing clinicians to focus on complex therapeutic interactions. Understanding this balance will ensure that robots enhance care quality without undermining human relationships.

E. Ethical and Accessibility Considerations

Clear guidelines and frameworks, such as those based on relational ethics (Hung), should be developed to address consent, privacy, and equitable access in robot-assisted therapy. Research should also aim to make these technologies affordable and user-friendly to avoid exacerbating existing healthcare inequalities.

Overall, robots have begun to demonstrate meaningful benefits for mental health; from easing loneliness and anxiety to delivering structured therapeutic exercises. The reviewed literature shows an encouraging trajectory of increasing sophistication and success, while emphasizing the importance of ethical diligence and methodological rigor. Robots are poised to become valuable companions and tools in mental health care, provided that future work continues to refine their use and clearly establishes when, how, and for whom they are most effective. With further study and responsible integration, robotic helpers could significantly enrich the mental health support landscape in the years to come.

TABLE II
SUMMARY OF KEY STUDIES ON ROBOTS AND MENTAL HEALTH

Study	Population / Setting	Robot Type / Function	Main Findings / Contribution
Pérez-Zuñiga et al. (2024)	13 university students	Humanoid robot for telepsychology	Majority (85%) preferred robot-delivered therapy, with significant improvement in emotional state. Robot rated highly likable and fairly intelligent.
Hung et al. (2025)	46 older adults with dementia in long-term care	Companion robots (Lovot and Paro)	Reduced loneliness and improved mental health. Identified ethical challenges (e.g., access, consent) and proposed relational ethics framework.
Otaka et al. (2024)	Dementia patients in care facility	Socially assistive robot	Evoked immediate positive emotions, especially through tactile interaction. Reduced apathy and agitation.
Robinson et al. (2024)	230 university students and staff	Humanoid robot for mindfulness training	Improved mood comparable to human-led condition. Distressed male subgroup responded especially positively.
Kian et al. (2024)	38 university students	LLM-powered humanoid robot	Delivered CBT sessions. Robot reduced distress and immediate anxiety; chatbot did not.
Robinson et al. (2023)	230 university students and staff	Autonomous humanoid robot	Feasible delivery of mindfulness training. Moderate enjoyment and mood improvement.
Abdollahi et al. (2022)	10 older adults in a senior facility	Empathic social robot	Improved mood and engagement. Empathic robot preferred over non-empathic version.
Robinson et al. (2021)	Adults in pilot wellness study	Humanoid robot coach	Supported behavior change (e.g., healthier eating). Robot perceived as sociable and helpful.
Eltahawy et al. (2024)	Adults with depressive symptoms	CBT-based chatbot	No significant improvement over control. Highlights limitations of non-embodied agents.
Abbasi et al. (2024)	40 children	Telepresence robot	Enabled repeat well-being check-ins. Children remained engaged and accepted the robot.
Matheus et al. (2022)	Adults in relaxation pilot	Tabletop social robot	Guided deep-breathing exercises. Reduced anxiety and high usability.
Blindheim et al. (2023)	Older adults in a nursing home	Humanoid robot (Pepper)	Increased group activity and social engagement. Boosted sense of community.
Tan et al. (2024)	Older adults living alone	Pet-like companion robot	Improved social well-being and reduced loneliness. High acceptability in home setting.
Kasımoğlu et al. (2023)	Children in dental clinic	Humanoid robot	Reduced anxiety and improved cooperation. Lower salivary amylase levels indicated reduced stress.
Lim et al. (2023)	Older adults living alone	PIO companion robot	Improved cognition, reduced depression and loneliness after multi-week intervention.
Lim & Oh (2025)	66 older adults with mild-to-moderate dementia	PIO robot	Better cognitive outcomes and reduced depression compared to control.
Ma et al. (2023)	Older adults with dementia	Teleoperated humanoid robot	Used for group reminiscence therapy. Positive mood changes comparable to human-led sessions.
Or et al. (2025)	Hospitalized children	Social robot	Reduced stress and anxiety (but not pain). Effective emotional support during hospitalization.
Wu et al. (2025)	Children in clinical settings (meta-analysis, N=877)	Various social robots	Confirmed significant anxiety reduction across 10 RCTs. Strong evidence base for pediatric anxiety management.

VI. APPLICATIONS ACROSS POPULATIONS

The reviewed studies collectively highlight the growing role of social and humanoid robots in promoting mental health and emotional well-being across diverse populations. From older adults in care settings to university students and hospitalized children, researchers have explored how robots can act as companions, therapeutic facilitators, and supportive partners in psychological interventions. This section presents key findings from recent research, organized by population groups—older adults, adults, and children to illustrate how robots have been applied in different mental health contexts, the outcomes achieved, and emerging patterns in their effectiveness and design.

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