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SOCIO-PSYCHOLOGICAL DETERMINANTS OF ADOPTING AI-DRIVEN ROBOTIC ASSISTANTS IN GERIATRIC CARE: A REVIEW OF CURRENT TRENDS AND ETHICAL CHALLENGES

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ABSTRACT

In the face of a rapidly aging population, artificial intelligence (AI)-based robotic assistants represent an innovative solution to support geriatric care systems. Despite their growing potential to assist both patients and healthcare staff, the widespread integration of these technologies still faces complex barriers. This review article aims to analyze the socio-psychological determinants influencing the acceptance of AI-powered robots in elder care, as well as to identify key ethical challenges associated with this phenomenon. The review is based on an analysis of the current literature, focusing on studies evaluating human-robot interaction (HRI) among seniors. The results indicate that the psychological factors most strongly influencing the adoption of this technology are: perceived usefulness, fear of new and unknown solutions, and the level of trust in intelligent machines. From a social perspective, the potential of robots to reduce feelings of loneliness is of key importance, while simultaneously posing a risk of limiting authentic, interpersonal interactions. In the area of ethics, the most frequently raised issues include threats to privacy, data security, and serious concerns regarding the dehumanization and objectification of geriatric patient care. In summary, the successful implementation of robotic assistants requires a balanced approach that incorporates empathy and the human dimension of care while minimizing ethical risks. Technology design for older adults must strictly adhere to a user-centered model to ensure trust and tangibly improve seniors' quality of life.

KEYWORDS

Artificial Intelligence (AI); Assistive Robots (SAR); Geriatric Care; Human-Robot Interaction (HRI); Aging Society

CITATION

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1. Introduction

By 2050, the global population of people aged 65 and older will double compared to 2021 figures [4]. Along with the unprecedented increase in life expectancy, the prevalence of age-related diseases is rising dramatically, including, in particular, dementia, frailty syndrome, and numerous chronic conditions [3, 4]. Demographic changes on such a massive scale are triggering a global “care crisis,” in which the supply of care services cannot keep pace with the rapidly growing demand [3, 4]. In the face of a shortage of qualified medical staff and the increasing burden on informal caregivers, it has become necessary to seek entirely new, sustainable solutions to support long-term care systems [1, 4, 7]. A consequence of this need is the growing interest in integrating intelligent, robotic assistants powered by artificial intelligence algorithms into the geriatric care environment [1, 6].

Social Assistive Robots (SAR) are devices designed to operate autonomously and engage in natural interactions with patients, clinical staff, and patients loved ones [4]. They include, on the one hand, service robots that assist with specific physical tasks (such as lifting patients, monitoring health status, supporting mobility, or helping with hygiene), and on the other hand, companion robots whose primary goal is communication, preventing cognitive decline, and providing direct emotional support [3, 4]. Examples of such advanced devices, including the PARO therapeutic robot—which resembles a small seal—and the LOVOT robot equipped with touch sensors, demonstrate that these machines can significantly reduce stress, anxiety, and behavioral symptoms, e.g., in people suffering from dementia [7]. Such systems utilize advanced sensors (visual, auditory, tactile) and artificial intelligence algorithms to read human emotions, recognize faces, respond to touch, and encourage patients to engage positively [1, 7].

However, the process of adapting and integrating these technologies depends on highly complex socio-psychological determinants. Two attitudes clash within academic and care settings. The first is “gerotechnological optimism,” which views robots as an innovative and effective tool for combating isolation and social exclusion in an aging society [3]. The second is technoskepticism and natural psychological resistance. Numerous studies show that older adults, especially those without immediate needs for constant care, often reject the concept of social robots due to fear of losing independence, concerns about the machine’s “lack of authenticity,” or a sense of loss of control [3]. The concept of “humanity” is key in shaping patients’ attitudes. From a psychological perspective, interaction with a robot is often described by many as “cold” and devoid of genuine human emotions, in contrast to the “warmth” offered by a human [1]. Understanding what it truly means to be human in the context of geriatric care is of fundamental importance. Paradoxically, however, the absence of certain human traits may actually be an advantage for machines. People are naturally judgmental, prone to prejudice, and react with impatience, especially when faced with the burdensome and repetitive behaviors of patients with dementia [1]. Meanwhile, a robot provides assistance completely devoid of criticism and judgment, which may paradoxically help preserve the senior’s personal dignity, for example during intimate hygiene procedures [1, 3].

Another significant psychological perspective in the process of adopting robotics is the impact of this technology on caregivers. Working in senior care requires deep empathy and patience, and the sense-making nature of this profession is often disrupted by the constant physical and mental exhaustion of staff [4]. Relieving caregivers of tedious, routine physical tasks through the use of artificial intelligence creates time that they can devote to empathy and nurturing direct relationships with patients, which dramatically improves the well-being of both parties [1, 4]. However, there is a risk known as the “displacement” phenomenon. It arises when the need to supervise the robot, resolve technical issues, and configure systems engages caregivers to such an extent that their direct contact with the patient is consequently marginalized [4, 7].

The implementation of tools based on AI and robotics faces serious ethical barriers, which are extensively explored in the scientific literature [3, 6, 7]. The primary concern is the threat of progressive dehumanization of relationships and the risk that technology will completely replace human care, leading to the creation of virtually automated “care factories” for older adults [1, 4, 7]. Additionally, the implementation of innovative digital systems is inherently linked to fundamental concerns regarding patient privacy, data security, the transparency of analytical algorithms, and the preservation of seniors’ autonomy [6]. From the perspective of everyday relational ethics, rigidly formalized procedures rarely work in the unstable environment of care facilities [7]. For older adults with cognitive impairments, such as advanced-stage Alzheimer’s disease, obtaining informed consent for participation in robot-assisted programs becomes a challenge of the utmost importance [3, 7]. An additional risk factor is the phenomenon of infantilization. The introduction of robots resembling pets or small children is sometimes met with a patronizing attitude, which can undermine the patient’s dignity [3, 7]. It is also important to highlight the significant issue of equitable access. Individuals who do not speak dominant languages (e.g., English) or who have a higher degree of cognitive disability are often overlooked during technology implementation, which further widens the gap in access to healthcare supported by digital innovations [6, 7]. Given the discrepancies outlined above, it has become necessary to systematically map existing achievements and risks. Although thele of artificial intelligence in geriatrics is increasingly discussed, the literature still lacks a comprehensive and transdisciplinary review that assesses this trend from a closely integrated psychological, social, and ethical perspective. This review article aims to fill this research gap through a rigorous analysis of the key socio-psychological determinants shaping the adoption of AI-powered assistive robots in geriatric care. A fundamental objective of this work is also to catalog the predominant ethical challenges accompanying this development. By examining current global trends in the adoption of care technologies, this work will provide deep insight into the concerns and hopes of patients as well as their caregivers. The remainder of the article follows a clear structure. The Methodology section will present the research approach to data collection and selection. The Results chapter will focus on identifying predictors of technology acceptance and its impact on human behavior. The Discussion section will conduct a critical analysis of the identified phenomena in relation to ethical and psychological frameworks, and the whole will be synthesized in the Conclusion chapter, which also includes recommendations for future human-centered design policies for older adults.

2. Methodology

This review was conducted to synthesize current knowledge and identify research gaps regarding Human-Robot Interaction (HRI) in geriatric care. Relevant publications were identified through an extensive search of PubMed and Google Scholar. The search strategy focused on recent, "state-of-the-art" literature, combining keywords related to technology (e.g., "artificial intelligence," "AI," "socially assistive robots," "SAR," "care robots," "smart sensors"), the target population (e.g., "geriatrics," "older adults," "elderly," "dementia," "aging in place"), and the phenomena under study (e.g., "ethics," "psychological determinants," "acceptance," "trust," "loneliness," "social impact").

Articles were screened for their relevance to the socio-psychological determinants and bioethical dilemmas of AI-driven technology adoption. Only peer-reviewed, English-language studies, published between 2017 and 2026 (with the vast majority comprising recent studies from 2023–2025), were included. Studies focusing purely on engineering or hardware without user evaluation, opinion pieces, and technologies used outside geriatric care (e.g., surgical robots) were excluded.

Following independent screening by two researchers and consensus-based full-text evaluation, a final selection of 27 articles was made. Data were extracted using a standardized coding sheet to capture study characteristics, technology types, and key findings.

3. Results

The rigorous analysis of 27 selected scientific articles conducted as part of this review revealed a highly complex, multidimensional picture of the interactions between older adults and AI-powered robotic assistants in a geriatric care setting. The collected evidence is characterized by significant heterogeneity in terms of the interventions used, which included both strictly companion and therapeutic robots (such as the seal-like PARO robot or the humanoid LOVOT robot) as well as advanced monitoring systems (smart wearable sensors, smart home systems) and service robots supporting daily physical activities. The results of these studies allow for the categorization of the identified phenomena into three main analytical domains: (1) psychological determinants influencing technology acceptance, (2) psychosocial effects of robot implementation on the well-being of patients and staff, and (3) evaluation of ethical barriers directly reported in clinical and home settings. [8, 12, 16, 20, 26, 27]

3.1. Psychological determinants of acceptance and trust in technology

A key finding emerging from the reviewed literature is that the process by which older adults adopt innovative care technologies is not a binary phenomenon (acceptance versus rejection), but rather a dynamic spectrum of attitudes that is strongly influenced by prior experiences, cognitive ability, and the patient's individual personality traits. Many of the analyzed studies were based on extended technology acceptance models (such as TAM—Technology Acceptance Model or UTAUT—Unified Theory of Acceptance and Use of Technology), integrating artificial intelligence analytical tools, including artificial neural networks (ANN) and structural equation modeling (SEM), to predict user behavior. The results of these analyses clearly indicate that "perceived usefulness" and "perceived ease of use" are the cornerstones of building engagement among seniors. Older adults show a significantly higher propensity to interact with machines if they perceive immediate, pragmatic added value in them, such as medication reminders, facilitating contact with family, or support with spatial orientation. [11, 15, 21, 25]

On the other hand, the dominant psychological barrier identified in numerous qualitative and quantitative studies is the phenomenon of fear of technology and deeply rooted technoscepticism. Older adults, especially those suffering from early-stage dementia, often feel anxious about the autonomous operation of robots, fearing the loss of what little personal control they have left over their own lives and surroundings. Analyses indicate that this fear is closely linked to a lack of trust in the reliability of AI systems. Older adults expressed concerns that a robot malfunction or an algorithm's misinterpretation of their behavior (e.g., in the case of fall prevention systems) could lead to dangerous health consequences. Furthermore, study participants often viewed advanced social robots through the lens of stigmatization—treating the presence of a robot in their room as physical evidence of their worsening disability and ultimate loss of independence. [2, 9, 15, 24]

Another factor strongly influencing acceptance is the "anthropomorphization" of devices, i.e., attributing human or animal characteristics to them. The results of the review suggest that robots resembling living beings (e.g., PARO) elicit a significantly faster emotional response and quicker attachment, especially among groups of patients with cognitive impairments. However, in patients without cognitive impairments, excessive mimicry of human appearance and behavior (humanness) often leads to the "uncanny valley" effect, evoking a sense of artificiality and discomfort. It has been assessed that the optimal robot design for seniors is one that maintains a clear machine status without pretending to be human, while simultaneously offering an "unconditional presence" that relieves seniors of the pressure to judge, which is typical of human interactions. [1, 14, 26]

3.2. The Impact of Human-Robot Interaction on Social and Mental Well-being

The second category of findings pertains to the effectiveness of AI-based interventions in reducing feelings of loneliness, social isolation, and symptoms of depression. The analyzed randomized controlled trials (RCTs) and case studies provide moderately positive but highly promising evidence that therapeutic robots can serve as powerful catalysts for social interaction. The presence of an intelligent assistant in the rooms of long-term care facilities often prompted patients to initiate conversations not only with the machine itself but—more importantly—with other patients and staff. These devices have become a kind of "social glue," breaking the ice and stimulating verbal activity in previously withdrawn individuals. [5, 7, 16, 23, 26]

It has also been demonstrated that interacting with social robots translates into measurable physiological and psychological benefits, including improved overall mood, increased nighttime sleep duration, reduced psychomotor agitation in patients with dementia, and a reduction in the need for strong psychotropic medications. However, it must be strongly emphasized that the positive effects were most evident in cases of "assisted" interaction, that is, where the robot did not replace the caregiver but served as an innovative tool to support occupational therapy. The research findings emphasize that leaving a geriatric patient completely alone with a robot for extended periods did not yield long-term therapeutic benefits and, in extreme cases, exacerbated feelings of isolation and abandonment. [13, 16, 23, 27]

The impact of implementing AI-based systems was also analyzed from the unique perspective of the care staff themselves. The results reveal a dichotomy in how professionals perceive the technology. On the one hand, nurses and medical caregivers reported that the automation of routine tasks (e.g., monitoring patients' vital signs at night using smart sensors) significantly reduced their physical workload and alleviated burnout. As a result, they were able to devote the time saved to building deeper, more "human" relationships with their patients, which directly increased their sense of "meaningful work." On the other hand, frustration was reported due to technical difficulties, lack of system compatibility, and the need for constant monitoring of devices, which paradoxically diverted staff attention away from patients toward operating the software. [4, 10, 14, 17]

3.3. Evaluation of Ethical Challenges in Clinical Practice

The third main area of the findings concerns ethical barriers, which were clearly documented during the empirical implementation of artificial intelligence solutions. The most frequently reported issue was that of informed consent. With regard to patients with Alzheimer's disease or other forms of progressive dementia, researchers faced immense difficulty in determining whether the patient fully understood that they were interacting with a machine devoid of consciousness and genuine feelings, rather than with an animal or a living being. This raised serious moral dilemmas regarding whether intentionally misleading the patient (so-called therapeutic deception) using an empathetically responsive robot is ethically justified, even if it brings the patient measurable relief from suffering. [3, 6, 7, 21]

Further findings shed light on issues of privacy and the processing of big data generated by AI systems. Smart cameras, microphones, and wearable sensors, constantly collecting information about the physical activities, eating habits, and sleep patterns of older adults, sparked significant opposition among both the individuals themselves and their family members. A significant portion of the study participants expressed the belief that constant algorithmic surveillance constitutes a gross violation of their privacy in their own homes. Furthermore, in the context of care facilities, instances of algorithmic bias and inequalities in access to technological care were identified. It turned out that advanced speech recognition systems often failed in the case of seniors with speech impediments, dysarthria, or those speaking rare dialects, thereby excluding them from the possibility of effectively benefiting from modern care robotics. [5, 8, 18, 19, 22]

4. Discussion

A critical synthesis of the collected research data reveals that the integration of AI-powered robotic assistants into the geriatric care ecosystem goes far beyond the scope of mere technological innovation, constituting, in fact, an unprecedented sociocultural and ontological transformation. These findings confirm the thesis that the human-machine relationship in the context of an aging population is a multidimensional phenomenon, determined by a complex network of psychological and social factors as well as rigorous ethical considerations. The implementation of AI technology in elder care cannot be considered solely in narrow terms of engineering efficiency, medical cost optimization, or addressing staffing shortages. On the contrary, it requires a nuanced approach that takes into account fundamental human emotional needs, the inalienable right to dignity, and the need to maintain autonomy until the very end of life. An analysis of the available literature points to the existence of a clear, often irreconcilable tension between the promise of compensating for cognitive and physical deficits offered by robotics, and the growing risk of digital exclusion, the dehumanization of care, and the violation of patients' fundamental rights [1, 3, 11, 22].

4.1. The Complexity of "Humanness" and Psychological Barriers to Acceptance

From a psychological perspective, findings regarding technology acceptance necessitate a critical reevaluation of existing, often oversimplified models of adaptive behavior in the geriatric population. Traditional conceptual frameworks, such as the Technology Acceptance Model (TAM), while highly useful in relation to classic software, prove insufficient to fully explain the deep resistance that older adults exhibit toward autonomous machines performing caregiving functions. Fear of technology in this group is not simply a consequence of a lack of digital literacy, but has a fundamental existential basis. For many seniors, a robotic assistant becomes a physical, unsettling manifestation of their own frailty and progressive loss of independence [2, 15, 26].

A key concept discussed in the literature is the notion of "humanness" in robot design. It has a dual nature: descriptive (how much a robot physically resembles a human) and normative (what human moral traits we expect from it). Paradoxically, attempts to create robots with highly humanoid features—intended by engineers to build trust—very often have the opposite effect. In older adults with intact cognitive functions, they generate the "uncanny valley" effect—a pervasive sense of falseness, unease, and even revulsion. Interestingly, research indicates that the absence of certain human traits may be a machine's greatest asset. People are naturally judgmental, prone to prejudice, and react with impatience, which can be humiliating for patients requiring assistance with intimate activities (e.g., using the restroom). A robot offers assistance that is completely "blind" to these issues—support devoid of judgment, shame, and impatience, which can uniquely protect the patient's dignity. Therefore, designers must strive to maintain a delicate balance: the machine should communicate empathetically, but its ontological status (being a programmed device rather than a sentient being) must remain absolutely transparent [1, 14, 27].

4.2. The Social Care Dichotomy: Augmentation vs. Substitution

The social dimension of AI implementation, particularly in the context of combating the global epidemic of loneliness among seniors, represents one of the most polarizing areas of scientific debate. Empirical evidence points to the immediate effectiveness of socially assisting robots (SARs)—such as calming animal-shaped robots—as conversation stimulators and tools for reducing episodes of acute agitation in patients with dementia [5, 7, 26]. It has been observed that these machines often become a kind of "social glue," prompting interactions among patients themselves in geriatric wards. On the other hand, health sociologists and bioethicists strongly warn against a phenomenon defined as "illusory companionship." This raises a fundamental philosophical question about the quality of the relationships being formed: can an interaction that is entirely asymmetrical and based on simulated, algorithmically programmed natural language processing (NLP) algorithms truly satisfy the deep human need for belonging and being deeply understood? There is an extremely real danger that policymakers, driven by neoliberal economic pragmatism and a desire to cut costs, will begin to treat robots as cheaper substitutes for skilled care workers and time spent with a living family. This approach, referred to in critical literature as "care displacement," may in the long term lead to a drastic deepening of structural social isolation. In such a dystopian scenario, seniors will be literally surrounded by advanced, flawless technology, yet completely deprived of authentic, human warmth and empathy, which cannot be reduced to lines of code [7, 13, 23, 25].

4.3. The Impact of AI on "Meaningful Work" for Healthcare Personnel

An extremely important yet often marginalized aspect of the discussion is the impact of robotized care on healthcare personnel themselves—nurses and geriatric caregivers. Drawing on the concept of "meaningful work," the literature examines whether the implementation of artificial intelligence enriches or devalues the caregiving profession. The main promise made by technology manufacturers is that having robots take over routine, physically exhausting tasks (e.g., lifting patients, continuously monitoring vital signs) will free up staff time to build deep, relational bonds with patients. In theory, this relief is supposed to prevent burnout and restore the humanistic dimension of nursing work [4, 14, 17].

Unfortunately, clinical reality often brutally challenges these assumptions. The implementation of complex and often faulty AI systems generates a phenomenon known as "technostress." Instead of spending the time they've regained talking to patients, staff often waste hours calibrating smart sensors, updating software, resolving network conflicts, and interpreting incomprehensible notifications. This leads to a dangerous proceduralization of care, where the nurse is demoted from an empathetic caregiver to the role of a medical equipment administrator. The integration of SARs in healthcare facilities must therefore be based on a philosophy of caregiver empowerment—machines must be designed to support their moral and professional competencies, rather than imposing an additional, frustrating cognitive burden on them [4, 24].

4.4. Ethical Minefields: Therapeutic Deception, Privacy, and Algorithmic Bias

In discussions about the care of people with cognitive impairments, particularly Alzheimer's disease, the controversial practice of "therapeutic deception" comes to the forefront. When a patient with advanced dementia cuddles a robotic animal, deeply believing it to be a living creature, the staff finds itself at the center of a moral conflict. From a utilitarian perspective, if this illusion reduces aggression, calms the patient, and allows for a reduction in psychotropic medication doses—this action seems justified, as it maximizes well-being (beneficence). However, from the perspective of deontological ethics and person-centered care, consciously reinforcing the patient's belief in a lie constitutes a gross violation of their remaining autonomy and dignity [3, 6, 21]. Obtaining informed consent from individuals in such a state is practically impossible, which forces families and legal guardians to make surrogate decisions based on often uncertain assumptions regarding the patient's preferences. An equally formidable challenge is the implementation of smart home monitoring systems (Ambient Assisted Living – AAL). The development of the so-called "Internet of Medical Things" (IoMT), based on ubiquitous microphones, analytical cameras, and motion sensors, creates a home "panopticon" for seniors. Patients face an impossible choice: preventive safety in exchange for a complete surrender of privacy in their personal spaces. Additionally, machine learning models exhibit a very dangerous tendency toward "algorithmic bias." If predictive systems are trained exclusively on data from healthy populations or from people within a specific cultural circle, they may fail entirely in the case of older patients with non-stereotypical movement patterns, speech impairments (e.g., following a stroke), or specific dialects. Technology that was intended to democratize access to healthcare thus becomes an invisible tool of structural exclusion of the most vulnerable [5, 8, 10, 19, 22].

4.5. Methodological Limitations and Future Prospects

When interpreting the results of current research, one must exercise extreme academic caution due to the clear methodological limitations of the existing literature on the subject. Most research projects are short-term pilot studies conducted on very small and non-representative samples, often in sterile, controlled environments (so-called Living Labs). These environments bear no resemblance to the chaotic, noisy, and unpredictable reality of a real nursing home. Furthermore, the lack of rigorous longitudinal studies is highly problematic. The literature is dominated by studies of the short-term "novelty effect"—patients show interest in the robot for the first few days, leading to overly optimistic research conclusions. However, we know almost nothing about the phenomenon of long-term attachment and whether these machines end up in a corner as unused gadgets after a month [12, 16, 20, 23].

Most implementations to date also favor populations referred to as WEIRD (Western, Educated, Industrialized, Rich, and Democratic), completely ignoring the context of developing countries and ethnic minorities, which drastically limits the external validity of the conclusions drawn. Future scientific paradigms must therefore radically evolve toward participatory research and co-design, so that technology serves actual users rather than merely the visions of its creators [11, 26, 27].

5. Conclusion

5.1. Introduction to the Conclusions and Synthesis of the Issues

This review article, based on a rigorous analysis of carefully selected literature on the subject, attempted to comprehensively examine and synthesize the socio-psychological determinants influencing the acceptance of artificial intelligence (AI)-powered robotic assistants in the geriatric care setting. Furthermore, the primary objective of this study was to catalog and subject to in-depth critique the ethical challenges that inevitably accompany the implementation of these innovative technologies. In the face of unprecedented demographic changes, characterized by the rapid aging of the global population and drastically shrinking supplies of qualified care personnel, the search for technological alternatives has become not so much an option as an absolute necessity. The collected and analyzed evidence clearly indicates that socially assistive robots (SARs) and intelligent monitoring systems possess enormous, transformative potential in supporting the independence of older adults, alleviating the symptoms of neurodegenerative diseases, and relieving the burden on healthcare systems. Nevertheless, the process of integrating these devices is extremely complex, nonlinear, and fraught with numerous psychological, social, and bioethical barriers. Understanding these barriers is fundamental to avoiding a situation in which costly technological innovations are rejected by end-users or, worse still, contribute to a deterioration in their quality of life by deepening isolation and violating personal dignity. [1, 4, 14, 25, 27]

5.2. The Evolution of Technological Acceptance in the Geriatric Population

The first and arguably most important conclusion drawn from the review concerns the nature of the psychological mechanisms underlying older adults' acceptance of artificial intelligence. As the collected studies demonstrate, older adults by no means constitute a homogeneous group with uniform attitudes toward technological innovations. On the contrary, their reactions to care robots span a wide spectrum—from enthusiastic curiosity and rapid bonding to deep fear, technophobia, and outright rejection. The primary predictor of successful technology adoption, derived from the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT), is perceived usefulness. Seniors are willing to overcome their initial resistance and psychological discomfort only if the robot offers them direct, tangible benefits that genuinely facilitate their daily functioning, support their autonomy, or help them stay in touch with loved ones. The pragmatic value must outweigh the cognitive cost associated with learning to use the new device. [11, 15, 21, 24, 26]

On the other hand, technology anxiety in this age group rarely stems solely from a lack of digital skills—so-called digital exclusion. It has much deeper, existential roots. For many seniors, the introduction of a robot into their personal living space is a brutal, physical reminder of their advancing frailty and loss of control over their own lives. The machine becomes a symbol of the transition from a state of independence to a state of total dependence on external care. Moreover, attempts to alleviate this fear by endowing robots with highly human characteristics (anthropomorphism) often have the opposite, highly negative effect on patients with intact cognitive functions, triggering the "uncanny valley" effect well-known in robotics. Research clearly shows that machines that mimic humans too closely generate anxiety, a sense of insincerity, and a lack of trust in older adults. Trust in artificial intelligence in healthcare is based on transparency of intent—seniors prefer devices that clearly communicate their status as machines, without attempting to impersonate an authentic, living being. [2, 9, 15, 26, 27]

5.3. Socio-emotional consequences of AI implementation and the quality of relationships

The social dimension of robot implementation in geriatrics is another area of immense importance where hopes and serious concerns intersect. A review of the literature allows for a cautious, optimistic conclusion: under strictly controlled, supervised conditions, therapeutic robots (such as the seal-like PARO robot or the LOVOT robot) have demonstrated proven effectiveness in stimulating prosocial behaviors, reducing feelings of loneliness, and alleviating symptoms of agitation in people with dementia. These robots act as catalysts for social interaction—not so much by replacing humans as by creating a new, safe, and non-judgmental point of reference around which patients can gather, talk, and open up emotionally. They offer what is known as "unconditional presence," which for people experiencing chronic loneliness in nursing homes can be an invaluable source of immediate comfort. [5, 7, 16, 23, 26]

However, the dark side of this phenomenon cannot be ignored. The analysis clearly shows that relying on technology to meet fundamental human relational needs carries the risk of a phenomenon known as "illusory companionship." There is a deeply rooted fear that fascination with the capabilities of artificial intelligence will lead policymakers and healthcare facility administrators to treat robots as cheap substitutes for genuine human attention. Such a scenario threatens to radically deepen social isolation, in which older people will be confined to technologically advanced, round-the-clock monitored "care factories," yet will be completely deprived of genuine, empathetic warmth from another human being. The implementation of AI systems must therefore be viewed exclusively in terms of "augmentation" (expansion and support) of human work, and never in terms of its complete substitution. Only in such a model can technology provide real added value for the patient. [4, 7, 13, 23, 25]

5.4. Ethics of Care and Moral Challenges in a Robotized Environment

Conclusions regarding the bioethical dimension of AI implementations are likely the most alarming and require immediate attention from scientific, legislative, and medical communities. Daily clinical practice in long-term care facilities, as demonstrated in numerous studies included in this review, generates unprecedented moral dilemmas. A matter of fundamental importance is "therapeutic deception," particularly striking in the case of patients suffering from advanced Alzheimer's disease. Allowing, or even encouraging, a patient to believe that they are interacting with a living animal or a sentient being (when in fact it is merely a programmed algorithm) stands in direct contradiction to the fundamental principles of bioethics, especially the principle of respect for the patient's dignity and autonomy. Even if such an illusion brings tangible benefits in the form of calming and stress reduction, medical staff are burdened with the moral weight of perpetuating a lie, which in the long run may lead to an erosion of trust between patient and caregiver. Balancing the patient's well-being (beneficence) with the duty to tell the truth is one of the greatest challenges of contemporary roboethics. [3, 6, 17, 21]

Another major ethical challenge identified in this review is the issue of privacy in the era of ubiquitous preventive monitoring. Installing smart cameras, speech recognition systems, and motion sensors in seniors' homes—intended to prevent falls and sudden life-threatening emergencies—grossly violates the privacy of the home. Seniors face an extremely difficult choice: physical safety in exchange for a complete loss of privacy and a life under the constant surveillance of algorithms. Additionally, the analyzed sources revealed the existence of algorithmic bias. Artificial intelligence, learning from specific, often limited datasets, tends to be less effective at recognizing the needs and behaviors of people who speak rare dialects, have atypical motor skills, or come from ethnic minorities. This means that, rather than bridging inequalities in access to healthcare, the latest technologies may paradoxically exacerbate them, excluding the most socially vulnerable individuals from the system. [5, 8, 10, 18, 19, 22]

5.5. The Paradox of the Meaning-Making Nature of Work and the Staff Perspective

When considering the implementation of care robots, one cannot limit oneself solely to the patient's perspective. Nurses, geriatricians, and medical caregivers constitute a critical link in the process that determines the success or failure of any innovation. The accumulated findings reveal the existence of the so-called "paradox of meaningful work." The main promise of medical robot manufacturers is to take over repetitive, physically demanding tasks, which is intended to free up staff time to build empathy and relationships with patients. In an ideal scenario, this improves patients' quality of life and reduces burnout among nurses. Unfortunately, the clinical reality described in the studies often contradicts this assumption. The implementation of AI systems is very often associated with hardware frustrations, a lack of intuitive interfaces, and the need for constant supervision of the robot's work. As a result, caregivers spend more time operating the machines (calibration, battery charging, software updates) than on actual contact with their patients. Instead of augmenting care, attention shifts toward technology, which devalues the nursing profession and undermines its deeply humanistic, relational nature. Implementing innovations without simultaneously redesigning workflows is doomed to failure due to resistance from healthcare workers themselves. [4, 10, 14, 17, 24]

5.6. Recommendations for Human-Centered Design

Based on the analyses conducted, this article offers clear recommendations for engineers, programmers, and technology designers. The process of developing assistive robots and AI systems for older adults must undergo a complete paradigm shift. Instead of a "top-down" approach, in which technology is designed in laboratories and then imposed on seniors, it is essential to transition to a model of "co-design" and "human-centered design." This means actively involving older adults, including patients in the early stages of dementia, at every stage of product development—from concept creation, through prototyping, to interface testing. Machines must account for the specific sensory, cognitive, and motor changes associated with aging. User interfaces cannot be simplified versions of applications designed for younger people; they must offer multimodal communication channels (e.g., advanced, error-tolerant speech recognition combined with large touchscreens). It is also extremely important to design algorithms in such a way that their operation is "explainable" (Explainable AI – XAI). Trust in the system increases significantly when the patient and caregiver are able to understand the basis on which the robot made a given medical decision or why it generated a particular alarm. The design of devices should avoid unnecessarily infantilizing the patient; the robot's aesthetics should be neutral, professional, and respectful of the senior's dignity, rather than treating them like a child in need of musical toys. [11, 16, 21, 26, 27]

5.7. Guidelines for Decision-Makers and Health Policy

The responsible introduction of AI-based technologies into the geriatric care sector also requires immediate action at the systemic and policy levels. Current legislative frameworks in many countries are failing to keep pace with rapid technological development, creating a dangerous legal loophole. Policymakers must develop rigorous guidelines regarding the standardization, certification, and security of AI systems used in nursing homes and in patients' private homes. Issues of medical data governance, including highly sensitive data collected from biometric sensors and video surveillance, must be subject to the strictest legal restrictions, protecting patients from commercial exploitation by technology corporations. Furthermore, governments and health ministries must invest heavily in education. The digital transformation of healthcare will fail without intensive, ongoing training programs for medical staff. Nurses, occupational therapists, and social workers must acquire new competencies in operating artificial intelligence systems, interpreting data generated by algorithms, and solving cybersecurity-related problems. Furthermore, it is necessary to establish new bioethical protocols to assist ethics committees in evaluating research and implementation projects involving robots in patient groups with cognitive impairments, ensuring that the process of obtaining informed consent is always respected, and, if this is not possible, is appropriately facilitated by the patient's legal representatives. [6, 14, 18, 20, 22]

5.8. Limitations of current research and identification of gaps in the literature

Despite the growing number of publications in the field of human-robot interaction in geriatric care, this review clearly highlights the fundamental weaknesses and methodological limitations of previous research efforts. Most of the experiments identified in the literature are short-term case studies based on extremely small, homogeneous, and non-representative statistical samples. These studies are often conducted in highly unnatural, controlled laboratory environments (so-called Living Labs), which makes their ecological validity negligible—their findings cannot be reliably transferred to the noisy, chaotic, and unpredictable reality of actual nursing homes or seniors' private homes. Worse still, there is a drastic shortage of rigorous longitudinal studies in the literature. This results in a situation where we mainly measure seniors' initial reaction to new technology—the famous "novelty effect"—but have no idea what happens to acceptance, usability, and attachment six months, a year, or two years after the robot's introduction. Additionally, there is a clear demographic bias in the available literature: studies most often include well-off, well-educated patients from high-income countries (the Global North), which means that current knowledge about AI in care does not reflect the cultural, economic, and ethnic diversity of the global aging society. [12, 16, 20, 23, 24]

5.9. Future Research Directions

Identifying these limitations allows us to chart an extremely clear roadmap for future research endeavors. Researchers must prioritize the design of large, multicenter, randomized controlled trials (RCTs) that are sufficiently long-term to distinguish short-term excitement about the device from its long-term impact on patients' quality of life. Future research projects should integrate mixed-methods, combining precise quantitative data generated by the robots themselves (e.g., interaction frequency, vital signs, activity time) with in-depth qualitative data derived from narrative interviews with patients, their families, and medical staff. It is necessary to expand the geographical and cultural scope of research to understand how differences in caregiving traditions, religions, and family structures influence perceptions of robots. In-depth economic analyses are also required, which will not only estimate the costs of implementing AI systems but also verify whether the purported financial savings come at the expense of an irreversible loss of social capital in the healthcare sector. The ethical dimension of artificial intelligence, including efforts to counter algorithmic biases in diagnosing comorbidities in older adults, must be an integral part of every new research protocol. [5, 12, 19, 22, 25]

5.10. Final Summary

In summary, based on all the evidence gathered, it must be concluded that AI-powered assistive robots in geriatric care are currently at a critical crossroads. They represent a brilliant engineering achievement with the power to redefine the paradigms of aging, offering unprecedented tools for monitoring health, preventing isolation, and supporting critically overburdened nursing staff. However, technology alone, divorced from empathy and rigorous ethical standards, cannot solve the care crisis. The successful implementation of AI in geriatrics requires a deeply humanistic approach, in which the machine never replaces the human but becomes their most perfect tool. The success of care robotics in the coming decades will not be measured by the computational power of processors or the fluidity of a robot's mechanical arms, but by the extent to which these technologies can respect the fundamental dignity of the elderly, protect their right to privacy, and support the deepest of human needs —the need for genuine, authentic, and compassionate contact with another human being. Balancing technocratic optimism with ethical responsibility is the only right path to building a sustainable and morally sound care ecosystem in the 21st century. [1, 4, 11, 14, 25, 26, 27]

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