JOURNAL of AGING and LONG-TERM CARE

REVIEW ARTICLE

ISSN 2619-9017 | E-ISSN 2618-6535

www.agingandlongtermcare.com • www.jaltc.net

Harnessing Artificial Intelligence (AI) for Psychological Assessment and Treatment in Older Adults

EMRE SENOL-DURAK

Mudanya University

2024, 7(2), 55-82 | **DOI**: 10.51819/jaltc.2024.1595910

Received: December 3, 2024 | Accepted: December 25, 2024 | Publish Online: December 25, 2024

Correspondence: Emre SENOL-DURAK; Department of Psychology, Mudanya University, Bursa, TÜRKİYE / emresenol.durak@mudanya.edu.tr

ABSTRACT

This review article examines the use of artificial intelligence (AI) in psychological health and its contribution to enhancing psychological care for older adults. All over the world, where life expectancy is continually rising, older individuals face major and unique psychological issues, including anxiety, depression, and dementia. AI provides professionals with useful instruments to recognize psychological disorders at the initial stage and create an individual treatment approach. Technologies such as machine learning, natural language processing, and wearable devices can help identify early signs of psychological symptoms, facilitating more accurate diagnoses. In addition, other AI-enabled solutions, including chatbots, virtual assistants, and socially assistive robots, provide better and more timely interventions for older adults with issues including loneliness, cognitive decline, and limited mobility that would otherwise bar them from accessing conventional care. However, some problems can be associated with using artificial intelligence, such as ethical issues like privacy, fairness, and openness. Therefore, new technologies must be designed to address the needs of older adults, be user-friendly, and uphold individuals' dignity. Collaboration in this area is also important because healthcare providers, researchers, and AI developers must work together to ensure that AI technologies are developed to complement human care. Artificial intelligence has the potential to promote psychological well-being and overall life satisfaction by addressing these problems.

KEYWORDS: Older Adults; AI; Psychological Health; Wearable Devices; Machine Learning; Virtual Assistants; Social Robots

KEY PRACTITIONER MESSAGE

1. AI technologies (machine learning, natural language processing, and wearable sensors) can help to provide to older adults for early diagnosis and effective treatment for psychological disorders. Older adults with mobility impairments or those residing in distant locations may get psychological care and assistance via chatbots, virtual assistants, and socially assitive robots.
2. AI applications can raise ethical issues around data privacy, algorithmic bias, and transparency. Therefore, AI developers and implementers should be particularly careful about transparency and ensure that human dignity and autonomy are not violated.
3. Wearable devices and digital health applications can monitor immediate and long-term emotional and cognitive changes and make recommendations for efficient and immediate interventions.
4. It is important to note that the advancement and application of AI are based on integration, solutions that are sensitive to ethical considerations and cultural sensitivity as well as being in line with the needs of the individual. This can be done through the collaboration of healthcare providers, researchers, AI developers, and policymakers.

INTRODUCTION

The use of artificial intelligence (AI) in the assessment and treatment of psychological disorders for older adults represents a transformative opportunity. This review article highlights the importance of AI in psychological care for older adults, aligning with the Journal of Aging and Long-Term Care's (JALTC) objective of emphasizing the critical role of interdisciplinary approaches in enhancing the well-being of this group of people. Focusing on the potential uses of AI in the provision of all psychological services currently provided to older adults, such as assessment, inventorship, and psychotherapy, this article aims to explore how AI-enabled innovations can improve the quality of life of older adults, promote their independence, and provide solutions to their often unique and seemingly incurable mental health problems. As a result of the fact that life expectancy is consistently increasing around the world, there is an increasing need for care that is not only efficient but also easily accessible and sensitive to cultural norms among people of advanced age. Czaja and Ceruso (2022) and Fear and Gleber (2023) suggest that AI offers a promising solution for personalized and efficient care and meeting the evolving needs of older adults while addressing the rising demand for care services.

It is clear that AI has the potential to revolutionize the psychological care of older adults in the early detection and diagnosis of psychological disorders and the development of appropriate and personalized treatment strategies. Technologies such as machine learning, natural language processing, and deep learning are increasingly used to improve psychological assessments and provide ongoing support through virtual assistants and chatbots (Lee et al., 2022).

By increasing the efficiency of the psychological assessment process while at the same time enhancing the precision of diagnosis, the use of AI can assist with tackling psychological problems, including loneliness, depression, anxiety, and cognitive decline, which are prevalent in the older population. In addition, AI has the ability to fulfill the mental health needs of older persons in real-time, which is a significant advantage during the psychological health process. The provision of continuous monitoring and tailored therapy is especially beneficial for those who live alone or who have restricted access to traditional medical care.

There are, however, certain concerns that need to be taken into account when it comes to the application of AI in the treatment of older adults. Some of the challenges that are of ethical consideration, such as privacy, bias in algorithms, and respect for the autonomy of older adults, have to be addressed before the implementation of the use of AI can be expanded (Wei et al., 2023). With the fast advancement of AI

technologies, healthcare professionals, caregivers, and AI developers must work to ensure these technologies are ethical, inclusive, and pertinent to the requirements of older persons (Mhlanga, 2024). To foster trust and overcome skepticism, AI systems should prioritize transparency and accountability. This review article examines the use of AI in psychological care, its potential to enhance older adults' mental health and well-being, and the significant ethical and practical challenges that need to be addressed.

The Effects of Psychological Health on Overall Health and Quality of Life in Older Adults

The mental health of a person is of the biggest significance when it comes to the management of the physical, social, and quality of life experienced by older people. Cognitive impairment, depression, and anxiety all contribute to the worsening of physical symptoms and an increased risk of developing additional illnesses, such as cardiovascular disease, diabetes, and issues with mobility. Individuals who suffered from depression and did not receive any kind of treatment had a 40% greater probability of having cardiovascular disease after a decade, as stated by Taylor (2020). Clearly, this demonstrates how psychological disorders can have a lasting impact on individuals. In order to prevent these problems and to encourage healthy aging, there is a need for therapies that are innovative, effective, and in the early stages. The availability of these treatments should be widespread in order to reach the greatest number of individuals possible.

It has been established that psychological therapies, including Cognitive Behavioral Therapy (CBT), also have positive effects on one's mental and physical health. In a study by Li et al. (2023), the comprehensive benefits of CBT on mental and physical health were revealed after finding that it decreased the levels of depressive symptoms, diabetic self-care behaviors, and sleep quality in patients with type 2 diabetes and metabolic syndrome. In the work by Sharif and his colleagues (2014), they found that CBT helped in managing depression and enhancing the management of diabetes in patients, highlighting the importance of CBT in the treatment of chronic diseases. H. Zhang et al. (2024) identified a significant positive linear correlation between depression and physical health, particularly blood pressure, emphasizing the need to improve mental health to increase physical outcomes.

In the research by Marais et al. (2022), Mindfulness-Based Stress Reduction (MBSR) was paired with better movement and helped people with knee and hip osteoarthritis feel less pain over time. Similarly, Khoo et al. (2019) found that MBSR can help people with chronic pain improve their physical performance and lessen the severity of their pain. These studies

show that getting psychological care not only lessens the amount of mental pain, but it also helps ease the problems that come with physical health, which in the end, makes people happier with their overall lives.

Older individuals' social isolation and loneliness are connected to poor mental health and life satisfaction. Cacioppo & Cacioppo (2018) noted that loneliness worsens psychological discomfort and physical deterioration, making social connectivity essential for mental health. Holt-Lunstad et al. (2020) found that socially isolated older persons had double the risk of functional deterioration over five years. Digital platforms that encourage community involvement and social connection reduce loneliness, boosting mental health and quality of life. These results emphasize the importance of social relationships for aging adults' physical function and independence.

With the increasing use of technology across the globe and the digitization of the world, there is a growing application of AI in improving mental health assessment and treatment. By applying AI technologies such as machine learning and natural language processing it is possible to enhance the analysis of big data. The use of data and analysis in healthcare is made possible by the use of algorithms, which support the AI systems that are able to learn from the data and make inferences about it and the natural language processing that allows the robots to understand the language. This makes it possible to improve the diagnostic accuracy as well as the therapeutic interventions to be tailored to the individual. Some of the applications include the identification of cognitive decline and psychiatric disorders at an early stage thus enabling the provision of better treatments. Furthermore, non-staffing augmented reality aids, such as virtual companions and social robots are used to reduce feelings of loneliness. These technologies help to have real conversations with older adults, support the caregivers, and help older adults to get the proper care that they need while maintaining their independence. Thus, these advancements increase the well-being of older adults, which in turn increases the level of care and connection.

Despite the potential for AI to revolutionize healthcare, its use in healthcare raises numerous ethical dilemmas and violations, including data privacy, informed consent, and the risk of over-reliance on technology. As AI becomes more integrated into psychological healthcare, it is necessary to balance innovation with ethical concerns. In fact, it will be more important for AI to complement human care than for AI to replace humans in healthcare processes. Continued research should be supported to understand the long-term effects of AI on psychological care and to ensure its responsible use. In the end, the well-being of older people depends on

giving psychological health a top priority, so creative ideas like artificial intelligence may help in better aging. These technologies should be used, therefore, under ethical considerations and in a manner that improves rather than compromises the quality of life of the aging population without complicating their lives.

AI in Healthcare: Integration into Medicine, Psychology, and Care for Older Adult

As discussed above, psychological health plays a critical role in the psychological well-being of older adults because the effects of mental health on physical health and quality of life are profound, influencing not only how older adults manage day-to-day activities but also their long-term health outcomes. Building on the critical importance of psychological health and integrating AI presents a promising approach to addressing both the mental and physical health challenges faced by older adults. Moreover, AI has the potential to significantly enhance care delivery, promote healthy aging, help older adults manage their health more effectively, and transform gerontological and geriatric care in meaningful ways.

As the global population continues to age, healthcare systems worldwide are under increasing pressure. As a result, the demand for long-term care and support for older adults is growing, making it more important than ever to find innovative solutions. This is where AI comes in. With its potential to enhance the delivery of care, promote healthy aging, and reduce the burden on healthcare infrastructure, AI is increasingly being recognized as a notable change in the field of gerontological and geriatric care. For example, technologies like smart homes and remote patient monitoring are already being used to help older adults live more independently. These technologies are continuously tracking health and providing support with everyday tasks. According to the highlights of Koc (2023), medication management, monitoring potential drug interactions, and even suggesting personalized treatments are being carried out by AI. As a result, all of these advancements contribute to better care and an improved quality of life for older adults.

The detection of cognitive decline, which is a major worry as individuals age, is one area in which AI is transforming mental health treatment for older adults. It is able to discover early indicators of illnesses such as dementia and depression by analyzing data from medical records and brain scans. This allows AI to spot patterns that would otherwise be missed. As Graham, Lee, and others (2019) have pointed out, AI makes it possible to intervene sooner, which results in better treatment outcomes when compared to more conventional approaches. In the long run, this technology has the potential to improve the quality of life for older adults by providing care that is both more accurate and more timely.

Additionally, AI goes beyond just biological factors; it takes into account psychological and social variables, thereby providing a more holistic approach to mental health care, as highlighted by Renn et al. (2021). However, due to the complex nature of psychosocial factors as opposed to biological ones ethical challenges can be quite difficult for AI to navigate in this area. For instance, there are ethical challenges like making sure data privacy is upheld and tackling the ethical issues surrounding AI's involvement in mental health care. This is particularly important considering the intricate nature of diagnosing conditions that frequently intersect with normal aging, as noted by Ray et al. (2022).

In addition to mental health, a crucial role is being played by AI in managing chronic diseases that are prevalent among older adults. It is known that many older individuals live with multiple chronic conditions, such as heart disease or diabetes, which require constant monitoring. Health indicators can be tracked in real-time by AI systems, with potential issues being flagged before they become serious. Therefore, this proactive approach is considered vital, as the health of older adults can deteriorate quickly without timely intervention. As emphasized by Czaja and Ceruso (2022), AI technologies, like machine learning and deep learning, can be used to tailor care to the individual needs of older adults, making it possible to deliver personalized, timely interventions. Furthermore, this ability to provide continuous monitoring is regarded as crucial in supporting aging individuals in living independently and reducing their reliance on caregivers, as discussed by Sapci and Sapci (2019).

Nevertheless, as promising as AI is, there are significant challenges to its implementation in geriatric care. For one, AI systems need to be accessible and easy to use, which requires integration into existing healthcare systems. Czaja and Ceruso (2022) highlight that AI must be user-friendly and designed to complement, rather than replace, traditional healthcare services. Additionally, AI models must be inclusive, considering the diverse needs of older adults from diverse backgrounds. This highlights the importance of collaboration between engineers, healthcare professionals, and aging individuals to ensure that AI technologies meet the specific needs of older adults.

To fully unlock AI's potential in geriatric care, ongoing investment in research and development is crucial. As Czaja and Ceruso (2022) highlight, the creation of new tools alone is insufficient; we must also carefully consider the ethical and social implications of integrating AI into healthcare. By ensuring that AI is used responsibly and effectively, we can improve caregiving and health management for older adults, complementing the expertise of healthcare

professionals. The future of AI in geriatric care holds exciting possibilities, such as predictive analytics, real-time monitoring, and personalized care, which could drastically improve health outcomes and quality of life for aging populations.

AI is revolutionizing clinical psychology and mental health interventions by offering innovative tools to enhance assessment, treatment, and care delivery, particularly for older adults who may face barriers to traditional in-person care. AI technologies, including machine learning, deep learning, natural language processing, wearable devices, virtual assistants, and predictive analytics, are transforming the way mental health services are delivered, improving diagnostic accuracy, tailoring personalized treatment plans, and increasing accessibility to essential resources (Czaja & Ceruso, 2022).

These advancements address the unique psychological needs of aging populations, supporting mental health care, fostering independence, and improving overall quality of life (Bogoslov et al., 2024; Pollack, 2005). However, ethical considerations such as privacy, autonomy, and responsible integration must be carefully addressed; only in this way can these technologies be used fairly and effectively in mental health care (Mhlanga, 2024). Ultimately, only by doing so can AI be fully utilized to support the mental health of older adults and meaningfully improve their lives.

AI in Psychological Assessments: Integration into Medicine, Psychology, and Care for Older Adults

Current Methods in Psychological Assessments

Psychological assessment, as defined by the American Psychological Association (APA, 2018), is a systematic process for gathering and integrating data to evaluate an individual's behavior, abilities, and characteristics. Traditional methods, including standardized tests, clinical interviews, and behavioral observations, have been foundational in addressing complex clinical, educational, and organizational referral questions, ensuring validity and reliability by combining empirical evidence with clinical expertise and considering individual and cultural differences (Naglieri & Graham, 2012; Weiner, 2003). In spite of the fact that conventional procedures are successful, they require a significant amount of resources and sometimes fail to take into consideration the inconsistent character of symptoms. According to Nelson et al. (2017), this highlights the need of novel approaches such as ecological momentary assessment (EMA) and dynamic, person-specific assessments, which provide data in real-time and insights that are specifically suited to the individual participant. On the other hand, in order to satisfy the growing need for psychological evaluations among older populations, these developing systems need to be scalable.

However, traditional assessment methods face significant limitations. Clinical interviews and self-report questionnaires are often resource-intensive and fail to capture the dynamic nature of psychological processes, such as symptom fluctuations and behavioral changes (Meyer et al., 2001; Wright & Hopwood, 2016). Moreover, cultural biases in standardized tools can hinder accurate evaluations, underscoring the need for culturally sensitive frameworks, such as the DSM-5 Cultural Formulation approach (Leong et al., 2019).

Innovations such as ecological momentary assessment (EMA) and person-specific dynamic assessments address these limitations. EMA captures real-time data on symptoms, behaviors, and emotions, while advanced statistical techniques in person-specific assessments reveal interconnections between individual symptom patterns, informing precise treatment strategies (Fisher, 2015; Moskowitz & Young, 2006). Additionally, frameworks like dynamical systems theory and network theory model the evolution of psychopathology, uncovering symptom interdependencies for more effective interventions (Nelson et al., 2017).

Technological advancements such as computer adaptive testing (CAT) and item response theory (IRT) have further improved the efficiency, precision, and accessibility of psychological assessments. Evidence-based assessments (EBA) enhance clinical evaluations by focusing on prediction, prescription, and process measurement, addressing the resource-intensive nature of traditional methods (Meyer et al., 2001; Youngstrom et al., 2017).

AI-Driven Tools for Cognitive and Emotional Evaluations

AI is fundamentally transforming psychological assessments by improving the precision, accessibility, and efficiency of cognitive, emotional, and behavioral evaluations. Traditional methods often fail to capture the complexity of psychological phenomena or provide scalable, real-time solutions. In contrast, AI tools can analyze large and diverse data sets, such as speech, movement, facial expressions, and neuroimaging, to detect early signs of psychological disturbances, enabling more accurate and timely diagnoses.

Behavioral assessments use machine learning algorithms to analyze speech and movement patterns, allowing for the early detection of neurodegenerative conditions like dementia and Parkinson's disease (Favaro et al., 2022). Emotional assessments leverage facial recognition and voice analysis technologies to identify subtle changes indicative of anxiety or depression. Recent studies have explored these technologies, demonstrating their potential to detect mental health issues. Significant advancements in video-based assessments (Grimm et al., 2022) and multimodal approaches

(Barra et al., 2023) have improved diagnostic accuracy by combining multiple data sources. Wearable devices continuously monitor physiological parameters, such as heart rate variability (HRV) and electrodermal activity (EDA), which can help detect stress and anxiety in real-time, facilitating health tracking and enabling timely interventions (Y. Zhang et al., 2024). These devices also have the potential to monitor biomarkers in body fluids like sweat, saliva, and interstitial fluid, offering valuable insights into metabolic health and stress levels. This provides a non-invasive alternative to traditional monitoring methods (Hickey et al., 2021). AI-powered platforms, such as the Integrated Cognitive Assessment (ICA), support cognitive assessments by utilizing biomarkers and serious games to detect cognitive decline with high sensitivity and specificity (Kalafatis et al., 2019). Furthermore, neuropsychological assessments combine advanced neuroimaging tools with AI algorithms to detect Alzheimer's disease early and support targeted interventions (Rai et al., 2020). These innovations are especially crucial for aging populations, as early detection of cognitive decline and emotional distress can significantly enhance overall quality of life.

AI in Emotional Assessments

AI's integration into emotional health assessments has significantly advanced the detection of emotional disturbances such as anxiety, depression, and stress. Leveraging technologies like facial recognition, voice analysis, and sentiment detection, AI systems analyze subtle cues in facial expressions and vocal tones to identify emotional fluctuations (Graham, Lee, et al., 2019; Shimada, 2023). These systems are particularly effective in detecting signs of anxiety and depression, even when individuals do not explicitly report them, a finding supported by research indicating that AI tools can identify emotional disorders by analyzing facial images, speech signals, and other features (Barua et al., 2022). In fact, social robots powered by AI, such as "Furhat," have proven to be effective tools in assessing emotional states like stress and depression, offering a more comfortable, non-traditional alternative to conventional methods of emotional health assessment (Nandanwar & Dutt, 2023). Wearable devices contribute to the real-time monitoring of emotional health by measuring physiological markers such as heart rate and skin conductance (Shiwani et al., 2023). These tools continuously track mood shifts and stress levels, offering clinicians a dynamic view of patients' psychological profiles and enabling personalized interventions (Ding et al., 2022). Tools like EmoGlass, which recognizes facial expressions through wearable glasses, have shown promise in detecting emotions during daily life and improving emotional awareness through a mobile app. What makes EmoGlass even more

powerful is its ability to integrate additional data, like electrodermal activity (EDA) and photoplethysmogram (PPG), improving its accuracy and offering users continuous support for emotional tracking and self-regulation (Kwon et al., 2021; Yan et al., 2022).

AI in Cognitive Assessments

AI technologies have significantly enhanced cognitive assessments, especially in the early detection of neurodegenerative diseases such as Alzheimer's. AI-based tools like the Integrated Cognitive Assessment (ICA) provide diagnostic accuracy by analyzing data from multiple sources, including neuroimaging, speech patterns, and biomarkers (Kalafatis et al., 2019). The ICA has demonstrated superiority over traditional tests like MoCA and ACE-III, particularly in its ability to identify mild cognitive impairment and Alzheimer's disease (Kalafatis et al., 2019). Digital biomarkers derived from tests assessing memory, executive function, and tasks like handwriting or serious games have proven effective in distinguishing between healthy individuals and those with cognitive impairments (Ding et al., 2022; Stuck & Walker, 2018). These AI-driven approaches enhance sensitivity and specificity by incorporating factors such as professional skills, personal traits, and communication, which are critical for building trust in technology. As a result, they offer more efficient and culturally unbiased early detection methods (Li et al., 2022; Modarres et al., 2021).

AI in Neuropsychological Assessments

AI has revolutionized neuropsychological assessments by integrating advanced neuroimaging techniques with AI algorithms to detect biomarkers of Alzheimer's and other cognitive disorders. Tools like MRI, PET, and CT scans, when analyzed using AI, facilitate early and accurate diagnoses by identifying subtle brain changes that traditional methods might overlook (Kale et al., 2024). Digital biomarkers, such as those used in the Altoida ADPS app, employ gamified exercises to detect early signs of cognitive decline, offering sensitive, objective, and continuous monitoring (Rai et al., 2020). AI's ability to combine genetic, imaging, and behavioral data enhances the accuracy of disease progression predictions, aiding in the development of effective treatment plans (Kale et al., 2024). Despite its promise, ethical challenges such as data privacy and algorithmic bias remain significant concerns in the implementation of AI-driven neuropsychological tools (Dashwood et al., 2021).

Integrating AI into Psychological Care

AI is revolutionizing healthcare by offering personalized solutions that are crucial for psychological care in older adults. Mody and Mody (2019) highlight that AI's capacity to customize care plans based on individual needs, especially for those with complex psychological conditions, marks a transformative breakthrough. By analyzing

diverse data points, AI can recommend interventions tailored to the cognitive and emotional health of each person, enabling more targeted and effective strategies. However, this potential must be realized while considering the ethical implications, including informed consent and transparency in decision-making.

AI enhances personalized care planning by adapting interventions based on specific behavioral triggers continuously assessing patterns and emotional responses to suggest real-time adjustments to care plans (Mody & Mody, 2019). This adaptability is crucial for addressing the dynamic nature of psychological conditions in older adults, whose needs often evolve due to cognitive decline, emotional changes, or the progression of chronic conditions. For instance, AI technologies can dynamically adjust care strategies to manage memory impairments in dementia or shifts in emotional states caused by social isolation. Social robots like Paro further exemplify AI's potential by enhancing emotional health and reducing loneliness, offering companionship, facilitating social interactions, and providing therapeutic benefits (Chen et al., 2020; Randall et al., 2019). Research also underscores the importance of therapist mediation and contextual adaptation in maximizing the effectiveness of AI-based interventions (Chang et al., 2013).

AI's role in dementia management provides a compelling example of its capabilities. Ranade et al. (2018) and Mody and Mody (2019) explain how machine learning and natural language processing technologies assist in the early detection, diagnosis, and treatment of dementia. These tools not only monitor behavioral changes but also evaluate cognitive and emotional functioning, supporting the refinement of care plans over time. Mody and Mody (2019) also note the potential of socially assistive robots and robotic pets to enhance emotional health, reduce social isolation, and improve the caregiving experience.

In addition to its significant role in dementia care, AI has broader applications across various aspects of mental health. Luxton (2014) discusses how AI enhances psychological assessment, treatment planning, and clinical decision-making. Moreover, AI-powered tools, including mental health chatbots and virtual counseling platforms, deliver personalized support and psychoeducation. Chatbots offer stigma-free psychological care, addressing anxiety, depression, and stress with high user satisfaction (Abd-Alrazaq et al., 2020; Abd-Alrazaq et al., 2021; Saadati & Saadati, 2023). Virtual reality therapies create immersive environments that alleviate symptoms of anxiety and depression, fostering coping skills and enhancing emotional well-being. Booth et al. (2022) emphasize the importance of refining these tools based on user feedback to ensure

reliability and emotional sensitivity (Hemalatha et al., 2024). Similarly, D'Alfonso (2020) highlights the use of AI-enhanced digital interventions through web and smartphone applications for personalized mental health care. Predictive modeling tools, which analyze digital data such as social media interactions, are increasingly being developed and assessed for their potential to identify mental health conditions at an early stage (D'Alfonso, 2020). However, as Irshad et al. (2022) and Luxton (2014) caution, the implementation of AI in mental health care raises concerns about job displacement and ethical issues, such as data privacy and algorithmic transparency. In geriatric mental health, AI is proving valuable for the early detection and management of cognitive decline. Lee et al. (2022) and Wei et al. (2023) describe how AI technologies, such as machine learning, natural language processing, and deep learning, analyze diverse data sources like electronic health records to predict and diagnose mental health conditions in older adults. For example, Lee et al. (2022) note that AI can detect Alzheimer's disease years before its onset and monitor agitation in dementia patients, thereby facilitating earlier and more effective interventions. However, Graham, Depp, et al. (2019) caution that while AI shows promise in predicting cognitive decline with high accuracy, further validation is required to ensure its reliability. Ethical concerns, including algorithmic bias, data privacy, and transparency, also need to be addressed before widespread implementation (Wei et al., 2023). Finally, dementia care illustrates the multifaceted applications of AI in psychological care. Guzzi and Veltri (2023) describe how AI-driven frameworks are used to create memory-related videos for non-pharmacological interventions, while Savoia et al. (2021) highlight its role in reducing caregiver burden through personalized assistive services. However, as Tsoi et al. (2022) and Andargoli et al. (2024) note, challenges such as data limitations, high implementation costs, and variability in algorithm performance remain significant barriers. Researchers are exploring innovative approaches, such as digital twin-based patient journey models, to expand the scope of AI applications in dementia care (Andargoli et al., 2024). While AI has demonstrated potential in psychological care, Luxton (2014) and Gual-Montolio et al. (2022) emphasize that more research is needed to evaluate its long-term efficacy. For example, computer-aided tools informed by psychological insights are advancing psychotherapy by analyzing affective domains and cognitive interaction patterns (de Mello & de Souza, 2019). However, ethical considerations, particularly regarding transparency and bias, remain pressing issues.

AI in Psychological Treatment for Older Adults

AI is revolutionizing psychological treatment for

older adults by introducing innovative, scalable, and personalized approaches tailored to their unique mental health needs. Technologies such as machine learning, natural language processing (NLP), and wearable sensors enable early detection of cognitive decline and psychological distress. Wei et al. (2023) demonstrate how AI algorithms analyze clinical and behavioral data to diagnose conditions such as anxiety, depression, and dementia with remarkable precision. These capabilities enable more accurate diagnoses and targeted interventions, fundamentally enhancing care delivery for older adults. Digital health applications, such as the Altoida ADPS app, employ gamified exercises to detect early signs of cognitive decline and provide sensitive monitoring (Rai et al., 2020).

One of the most transformative contributions of AI is its capacity for continuous psychological monitoring. Smartphones and wearable devices equipped with AI algorithms collect real-time data to predict emotional states, detect cognitive changes, and assess risks for psychological distress (Mittal et al., 2023). This initiative-taking approach ensures timely interventions, particularly for older adults who may face barriers to accessing traditional healthcare services. Darzi (2023) underscores the role of AI-powered virtual assistants and chatbots, which provide psychoeducation, emotional support, and preliminary assessments. These tools are especially beneficial for individuals with mobility challenges or those residing in remote areas, bridging critical gaps in accessibility without replacing human care. Furthermore, wearable devices facilitate proactive interventions by enabling sensitive and continuous monitoring of emotional and cognitive states (Mittal et al., 2023).

AI is also reshaping therapeutic interventions through technologies specifically designed for older adults. Socially assistive robots (SARs), such as Pepper and ELLIQ, play a pivotal role in addressing loneliness and promoting emotional well-being. Lee et al. (2022) emphasize how these robots engage older adults through personalized interactions, memory exercises, and cognitive games, improving both emotional and cognitive health. Chen et al. (2020) conducted a study with Paro robots in long-term care facilities, demonstrating significant reductions in depression and loneliness among participants. Thematic analyses revealed that participants valued the robot's humanizing features, which fostered social interactions and companionship. Chang et al. (2013) and Randall et al. (2019) emphasize the importance of understanding individual interpretations and broader social contexts in enhancing the therapeutic potential of such robots. Hemalatha et al. (2024) further explore virtual reality (VR) therapies, demonstrating how immersive environments can significantly reduce anxiety and depression

symptoms while fostering coping skills. Together, SARs and VR interventions provide interactive, engaging, and scalable solutions to common psychological challenges faced by older adults. AI-driven digital health applications are significantly expanding the possibilities of traditional therapies, merging cutting-edge technologies with time-tested practices to improve well-being. Among the most promising innovations are mobile health applications, especially mental health chatbots, which have shown great potential in supporting older adults by reducing depressive symptoms and enhancing their overall well-being (Chou et al., 2023). Riboni et al. (2020) highlight the potential of tools like VR, telemedicine, and smartphone applications in enhancing treatment accessibility and scalability. These innovations address key barriers such as stigma and logistical challenges, empowering older adults to engage with mental health resources in more discreet and user-friendly ways. Importantly, these technologies complement, rather than replace, human therapists, ensuring that care remains holistic and patient-centered. Despite its transformative potential, the integration of AI into psychological care for older adults poses ethical and practical challenges. While these advancements provide immense benefits, they also bring challenges that require careful consideration. Algorithmic bias, data privacy concerns, and equitable access are among the most significant issues requiring attention (Martinez-Martin, 2021; Olawade et al., 2024). To address this, it is essential that AI developers use inclusive, diverse data that reflects the varied experiences of older adults, ensuring that these technologies are equitable and fair. The need for privacy is another critical issue, as the personal nature of mental health data demands robust safeguards to protect users' confidentiality and build trust. Older adults must feel safe and confident when using these tools, knowing their sensitive information is secure. Algorithms trained on non-representative datasets risk perpetuating disparities in mental health care, underscoring the need for diverse and inclusive training data. Huang et al. (2024) call for the development of transparent, Explainable Artificial Intelligence (XAI) systems that allow users and clinicians to understand how decisions are made by AI, which will help build trust and reduce concerns about potential bias. At the same time, Cortellessa et al. (2021) stress the importance of involving older adults directly in the design of these technologies. Actively involving older adults in the development of these technologies ensures usability, comfort, and broader acceptance. In conclusion, AI holds immense potential to transform psychological treatment for older adults by offering early detection, continuous monitoring, and innovative therapeutic interventions. Tools such as socially assistive robots, VR therapies, and AI-powered chatbots provide scalable solutions to

address challenges like mobility limitations and social isolation. However, for these technologies to reach their full potential, ethical considerations, inclusive design, and equitable access must be prioritized. Future research should focus on advancing AI applications while addressing ethical challenges, ensuring that AI becomes a reliable and accessible resource for improving the mental health and overall well-being of older adults.

Challenges And Ethical Considerations

The integration of AI into psychological assessment and healthcare offers transformative potential in addressing the needs of older adults. However, alongside its promise, significant ethical and practical challenges demand attention. A primary concern is the protection of sensitive health information. AI systems, which process vast amounts of personal data, must adhere to stringent privacy and security standards to protect patient confidentiality. Giannouli (2023) emphasizes that safeguarding data is not merely a technical requirement but a cornerstone for building trust with older adults who may already harbor skepticism about these technologies. Solanki et al. (2022) further suggest operationalizing ethical principles throughout the AI lifecycle to address these concerns effectively. Addressing this skepticism requires proactive trust-building measures, such as transparent communication and demonstrable reliability, to ease concerns and encourage adoption.

Balancing the roles of AI and human caregivers is another critical aspect. While AI can revolutionize care through tools like predictive modeling and personalized interventions, it cannot replace the empathy and nuanced judgment of human clinicians. Cascella et al. (2023) describe how multimodal AI tools for pain assessment hold promise but stress the need for collaboration between healthcare providers and AI developers to create ethically robust solutions. Cascella et al. (2023) also highlight that AI should complement, not replace, human caregivers, ensuring that AI augments rather than diminishes the human element in care delivery. In complex scenarios requiring empathy and intuition, AI should serve as a supportive tool rather than a substitute, augmenting rather than replacing human expertise.

Algorithmic bias presents yet another pressing challenge. If training data is not representative, AI systems risk perpetuating existing inequities in healthcare, particularly for marginalized groups, including older adults. Timmons et al. (2022) point out that ensuring AI systems are "fair-aware" is crucial. This involves using diverse datasets that reflect variations in age, culture, and socioeconomic status. Yin and Bickmore (2018) advocate for culturally adaptive AI systems that align with diverse patient needs, reducing disparities and enhancing engagement. Developing inclusive datasets and transparent algorithms is essential for achieving

fairness and inclusivity in AI applications (Chen et al., 2023; Iloanusi & Chun, 2024). Researchers also propose adapting traditional research ethics to address the specific challenges posed by AI technologies, particularly in low- and middle-income countries (Ho & Malpani, 2022). Without such precautions, AI might reinforce disparities rather than bridge them. Furthermore, usability concerns, such as the need for intuitive interfaces and adaptive technologies, are vital to making these systems accessible and effective for older adults, especially those with sensory or cognitive impairments. Ethical considerations also extend to autonomy and informed consent. AI tools like smart assistants, which often make initiative-taking decisions, can inadvertently undermine user autonomy if not designed thoughtfully. London et al. (2023) warn that this could erode well-being by diminishing the sense of control older adults have over their care. To counteract this, multidisciplinary collaboration is essential. Healthcare providers, ethicists, and AI developers must work together to embed ethical principles into the design and implementation of AI technologies. Strategies such as explainable AI, which allows users to understand and trust AI-driven decisions, and inclusive design approaches can help ensure these tools empower older adults while preserving their dignity and agency. AI has immense potential to transform the landscape of psychological and healthcare support for older adults, but its integration must be guided by a commitment to ethical and humane practices. By addressing privacy concerns, minimizing bias, and fostering collaboration between humans and AI, we can build systems that truly support and uplift this vulnerable population.

CONCLUSION

AI is revolutionizing mental health care, offering transformative potential in psychological assessment and treatment for older adults. Techniques such as supervised learning (AI systems trained with labeled datasets) and deep learning (algorithms that mimic human neural networks) enable early detection and diagnosis of conditions like anxiety, depression, and dementia (Wei et al., 2023). AI-powered tools—like chatbots, virtual assistants, and AI-driven virtual therapists—not only improve diagnostic accuracy but also tailor treatment plans to the individual and provide ongoing support, ensuring that help is always within reach (Balasubramanian, 2023; Shimada, 2023). These advancements are crucial in meeting the growing psychological needs of older adults by making care more accessible, efficient, and timely, all while promoting greater independence through community-based care models (Czaja & Ceruso, 2022; Yousefi et al., 2023). For example, AI applications have been successfully implemented

in early dementia screening, improving diagnostic efficiency (Shiwani et al., 2023). Additionally, tools like socially assistive robots and chatbots provide scalable solutions to address loneliness, depression, and cognitive decline, offering new ways to support mental health care for older adults. Despite these benefits, integrating AI into mental health care poses significant challenges. Ethical concerns, such as data privacy, algorithmic biases, and transparency issues, remain critical barriers to adoption (Olawade et al., 2024; Shimada, 2023). Biases in training datasets, for instance, can exacerbate health disparities, particularly among underserved populations (Shiwani et al., 2023). While AI holds immense potential, addressing challenges related to privacy, bias, and human-AI collaboration is crucial to ensure that technological advancements enhance, rather than hinder, the quality of care for older adults. Furthermore, the absence of standardized regulatory frameworks complicates the safe and effective deployment of AI technologies in clinical practice. Addressing these issues requires a multidisciplinary approach that includes perspectives from older adults, caregivers, healthcare professionals, and AI developers. This collaboration can ensure that AI systems are user-friendly, culturally sensitive, and adaptable to the diverse needs of older adults (Yousefi et al., 2023). Older adults' interactions with AI technologies reveal both opportunities and barriers. For example, older adults often value autonomy and social connection, which AI tools like Hyodol conversational agents can enhance by providing personalized, home-based therapy (Mhlanga, 2024). However, successful adoption also depends on education and training initiatives to increase trust in AI and facilitate its use among older adults and healthcare providers (Shiwani et al., 2023). Ensuring ethical practices, transparency, and inclusivity in the design and implementation of these tools is key to fostering their adoption and maximizing their impact on mental health care for older adults.

FUTURE DIRECTIONS

To maximize AI's potential, key priorities must guide its development and integration into mental health care: ***(1) Advancing Algorithmic Capabilities:*** Developing robust algorithms capable of processing multidimensional data, combining behavioral, neurophysiological, and contextual inputs, can enhance the accuracy and applicability of AI tools (Wei et al., 2023). ***(2) Enhancing Usability:*** To ensure meaningful engagement, it is vital to design interfaces that are user-friendly and intuitive and that also take into account the preferences and capabilities of older persons (Yousefi et al., 2023). ***(3) Scaling Validation Studies:*** Scaling validation studies are necessary to understand AI's true impact. Long-term,

large-scale studies will validate AI's effectiveness and ensure its ability to work across diverse populations and real-world environments (Shiwani et al., 2023). Ongoing research is needed to validate AI's long-term efficacy and explore its applications in diverse populations. Collaborative efforts among developers, clinicians, and policymakers can address ethical and practical challenges, ensuring that AI benefits all aging populations. Nasir and colleagues (2024) emphasize the need for frameworks that prioritize transparency, equity, and accountability in order to ensure that AI development and deployment are ethical and just. (4) Establishing Ethical Frameworks: Clear guidelines are needed to address privacy, transparency, and fairness in AI systems. According to Olawade et al. (2024), these frameworks should do their best to emphasize the rights and dignity of older persons while simultaneously avoiding prejudices and injustices. Integrating AI into community-based care models holds profound promise, not only by supporting aging in place but also by empowering older adults to maintain their independence and reduce reliance on institutional care. With the help of AI, the concept of personalized care delivered in the comfort of one's home can help enhance the level of independence and quality of life of older adults. Remote monitoring systems, as pointed out by Czaja and Ceruso (2022) and Mhlanga (2024), can identify the signs of cognitive decline as early as possible, thus enabling intervention. Additionally, conversational AI tools are always available to provide emotional support, reducing feelings of isolation and strengthening relationship bonds. Technologies such as digital twins and predictive analytics have the potential to radically change the approach to mental health care, making treatment more personalized and preventive (Spitzer et al., 2023; Vallée, 2023). As argued by Park and colleagues (2023), human digital twins can enhance the care of patients by using the data generated from the patients. These developments are not only enhancing the quality of health care but are also changing the face of aging, making it more integrated, sensitive, and caring. It is therefore important that education and training of clinicians and patients will play a big role in the integration of AI and in the achievement of the right utilization of the technologies. In the same way, policymakers and healthcare providers must also work on developing equitable access frameworks for the digital divide since AI-driven care solutions must be available to all older adults, irrespective of their economic background (Shiwani et al., 2023). In conclusion, here, the author discusses the ways in which AI can transform the delivery of mental health services for older adults in a positive manner. However, its successful implementation is not without its challenges; ethical issues have to be addressed, algorithmic transparency needs

to be enhanced, and all the stakeholders need to come together. Thus, focusing on person-based strategies and involving several disciplines, AI has the potential to improve the quality of mental health care for people of high age. According to Luxton (2014), the integration of psychologists in the formation, assessment, and management of AI technologies is crucial for their appropriate and right use. In this context, the role of psychologists is crucial in translating the technological potential into the needs of the older adult population. This means that they can contribute to the advancement and implementation of AI so that these tools would not only achieve the clinical objectives but also preserve the fundamental principles of dignity, empathy, and non-discrimination in the field of mental health.

ALIGNING AI WITH THE VISION OF THE JALTC

For those working in this field, AI integration goes beyond being a technological solution. In line with the goals and objectives of the Journal of Aging and Long-Term Care (JALTC), AI has the potential of assisting in issues that are of concern to the well-being of older adults, including accessibility, independence, and quality of care. Indeed, in the near future, care models for older adults will not only be smarter but also more compassionate. Furthermore, psychologists, gerontologists, and other healthcare providers will work together to ensure that older adults receive care that is both human-centered and innovative. In addition, this mentioned integration will not only address mental health issues but also contribute to the development of culturally sensitive and evidence-based public policies that reflect the needs of the aging population. This is both a necessity and an inevitable situation. The entire scientific community, as well as policymakers and practitioners, should know that technology should not be used as a mere tool to enhance the quality of life in this process but as a force that meaningfully improves individuals' lives—and it will be used as such. As technological advancements continue at full speed worldwide, it is extremely important for scientists and professionals in the fields of aging and long-term care to be excited and knowledgeable about progress in AI and the effective and comprehensive application of technological developments. In this way, we can create a future where older adults not only receive compassionate and dignified care but also feel supported and uplifted by the incredible potential of technological advancements, all while collaborating with every stakeholder who shares this vision. These efforts are substantial and align closely with JALTC's objective, which is committed to strengthening care sectors, enhancing quality of life, and affirming that dignified living is a basic right. Together, we shall create a future defined by dignity and satisfaction!

REFERENCES

Abd-Alrazaq, A. A., Alajlani, M., Ali, N., Denecke, K., Bewick, B. M., & Househ, M. (2021). Perceptions and Opinions of Patients About Mental Health Chatbots: Scoping Review. *Journal of Medical Internet Research, 23*(1), e17828. https://doi.org/10.2196/17828

Abd-Alrazaq, A. A., Safi, Z., Alajlani, M., Warren, J., Househ, M., & Denecke, K. (2020). Technical Metrics Used to Evaluate Health Care Chatbots: Scoping Review. *Journal of Medical Internet Research, 22*(6), e18301. https://doi.org/10.2196/18301

American Psychological Association (2018, April 19). APA *Dictionary of Psychology.* Retrieved October 1, 2024, from https://dictionary.apa.org/psychological-assessment

Andargoli, A. E., Ulapane, N., Nguyen, T. A., Shuakat, N., Zelcer, J., & Wickramasinghe, N. (2024). Intelligent decision support systems for dementia care: A scoping review. *Artificial Intelligence in Medicine, 150*, 102815. https://doi.org/10.1016/j.artmed.2024.102815

Balasubramanian, E. A. S. (2023). AI-Enabled Mental Health Assessment and Intervention: Bridging Gaps in Access and Quality of Care. *Power System Technology, 47*(3). https://doi.org/10.52783/pst.159

Barra, P., Mnasri, Z., & Greco, D. (2023). Multimodal emotion recognition from voice and video signals. In *IEEE EUROCON 2023 - 20th International Conference on Smart Technologies* (pp. 169-174). https://doi.org/10.1109/eurocon56442.2023.10198928

Barua, P. D., Vicnesh, J., Lih, O. S., Palmer, E. E., Yamakawa, T., Kobayashi, M., & Acharya, U. R. (2022). Artificial intelligence assisted tools for the detection of anxiety and depression leading to suicidal ideation in adolescents: A review. *Cognitive Neurodynamics, 18*(1), 1–22. https://doi.org/10.1007/s11571-022-09904-0

Bogoslov, I. A., Corman, S., & Lungu, A. E. (2024). Perspectives on Artificial Intelligence Adoption for European Union Elderly in the Context of Digital Skills Development. *Sustainability, 16*(11), 4579. https://doi.org/10.3390/su16114579

Booth, F., Potts, C., Bond, R., Mulvenna, M. D., Ennis, E., & Mctear, M. F. (2022). Review mining to discover user experience issues in mental health and wellbeing chatbots. In *European Conference on Cognitive Ergonomics*. https://doi.org/10.1145/3552327.3552357

Cacioppo, J. T., & Cacioppo, S. (2018). The growing problem of loneliness. *The Lancet, 391*(10119), 426. https://doi.org/10.1016/s0140-6736(18)30142-9

Cascella, M., Schiavo, D., Cuomo, A., Ottaiano, A., Perri, F., Patrone, R., Migliarelli, S., Bignami, E. G., Vittori, A., & Cutugno, F. (2023). Artificial

Intelligence for Automatic Pain Assessment: Research Methods and Perspectives. *Pain Research and Management, 2023*, 1–13. https://doi.org/10.1155/2023/6018736

Chang, W., Šabanović, S., & Huber, L. (2013). *Situated Analysis of Interactions between Cognitively Impaired Older Adults and the Therapeutic Robot PARO.* In Lecture Notes in Computer Science (pp. 371–380). https://doi.org/10.1007/978-3-319-02675-6_37

Chen, S., Moyle, W., Jones, C., & Petsky, H. (2020). A social robot intervention on depression, loneliness, and quality of life for Taiwanese older adults in long-term care. *International Psychogeriatrics, 32*(8), 981–991. https://doi.org/10.1017/s1041610220000459

Chen, Y., Clayton, E. W., Novak, L. L., Anders, S., & Malin, B. (2023). Human-Centered Design to Address Biases in Artificial Intelligence. *Journal of Medical Internet Research, 25*, e43251. https://doi.org/10.2196/43251

Chou, Y., Lin, C., Lee, S., Chien, Y. C., & Cheng, L. (2023). Potential Mobile Health Applications for Improving the Mental Health of the Elderly: A Systematic Review. *Clinical Interventions in Aging, 18*, 1523–1534. https://doi.org/10.2147/cia.s410396

Cortellessa, G., De Benedictis, R., Fracasso, F., Orlandini, A., Umbrico, A., & Cesta, A. (2021). AI and robotics to help older adults: Revisiting projects in search of lessons learned. *Paladyn Journal of Behavioral Robotics, 12*(1), 356–378. https://doi.org/10.1515/pjbr-2021-0025

Czaja, S. J., & Ceruso, M. (2022). The Promise of Artificial Intelligence in Supporting an Aging Population. *Journal of Cognitive Engineering and Decision Making, 16*(4), 182–193. https://doi.org/10.1177/15553434221129914

D'Alfonso, S. (2020). AI in mental health. *Current Opinion in Psychology, 36*, 112–117. https://doi.org/10.1016/j.copsyc.2020.04.005

Darzi, P. (2023). Could Artificial Intelligence be a Therapeutic for Mental Issues? *Science Insights, 43*(5), 1111–1113. https://doi.org/10.15354/si.23.co132

Dashwood, M., Churchhouse, G., Young, M., & Kuruvilla, T. (2021). Artificial intelligence as an aid to diagnosing dementia: an overview. *Progress in Neurology and Psychiatry, 25*(3), 42–47. https://doi.org/10.1002/pnp.721

de Mello, F. L., & de Souza, S. A. (2019). Psychotherapy and Artificial Intelligence: A Proposal for Alignment. *Frontiers in Psychology, 10*. https://doi.org/10.3389/fpsyg.2019.00263

Ding, Z., Lee, T., & Chan, A. S. (2022). Digital Cognitive Biomarker for Mild Cognitive Impairments and Dementia: A Systematic Review. *Journal of Clinical Medicine, 11*(14), 4191. https://doi.org/10.3390/jcm11144191

Favaro, A., Motley, S., Samus, Q. M., Butala, A., Dehak, N., Oh, E. S., & Moro-Velazquez, L. (2022). Artificial Intelligence Tools to Evaluate Language and Speech Patterns in Alzheimer's Disease. *Alzheimer S & Dementia, 18*(S2). https://doi.org/10.1002/alz.064913

Fear, K., & Gleber, C. (2023). Shaping the Future of Older Adult Care: ChatGPT, Advanced AI, and the Transformation of Clinical Practice. *JMIR Aging, 6*, e51776. https://doi.org/10.2196/51776

Fisher, A. J. (2015). Toward a dynamic model of psychological assessment: Implications for personalized care. *Journal of Consulting and Clinical Psychology, 83*(4), 825–836. https://doi.org/10.1037/ccp0000026

Giannouli, V. (2023). Financial capacity assessments and AI: A Greek drama for geriatric psychiatry? *International Journal of Geriatric Psychiatry, 38*(9). https://doi.org/10.1002/gps.6008

Graham, S. A., Lee, E. E., Jeste, D. V., Van Patten, R., Twamley, E. W., Nebeker, C., Yamada, Y., Kim, H., & Depp, C. A. (2019). Artificial intelligence approaches to predicting and detecting cognitive decline in older adults: A conceptual review. *Psychiatry Research, 284*, 112732. https://doi.org/10.1016/j.psychres.2019.112732

Graham, S., Depp, C., Lee, E. E., Nebeker, C., Tu, X., Kim, H., & Jeste, D. V. (2019). Artificial Intelligence for Mental Health and Mental Illnesses: an Overview. *Current Psychiatry Reports, 21*(11). https://doi.org/10.1007/s11920-019-1094-0

Grimm, B., Talbot, B., & Larsen, L. (2022). PHQ-V/GAD-V: Assessments to Identify Signals of Depression and Anxiety from Patient Video Responses. *Applied Sciences, 12*(18), 9150. https://doi.org/10.3390/app12189150

Gual-Montolio, P., Jaén, I., Martínez-Borba, V., Castilla, D., & Suso-Ribera, C. (2022). Using Artificial Intelligence to Enhance Ongoing Psychological Interventions for Emotional Problems in Real- or Close to Real-Time: A Systematic Review. *International Journal of Environmental Research and Public Health, 19*(13), 7737. https://doi.org/10.3390/ijerph19137737

Guzzi, P. H., & Veltri, P. (2023). An Artificial Intelligence-Based Framework for Supporting Management of Patients Affected by Dementia. *2021 IEEE International Conference on Bioinformatics and Biomedicine (BIBM)*, 3891–3892. https://doi.org/10.1109/bibm58861.2023.10385707

Hemalatha, P., Princes, C. S., & Kumar, K. P. (2024). Enhancing Mental Health Treatment Through Virtual Reality and Artificial Intelligence: A Review and Future Directions. *International Journal for Multidisciplinary Research, 6*(4). https://doi.org/10.36948/ijfmr.2024.v06i04.24269

Hickey, B. A., Chalmers, T., Newton, P., Lin, C., Sibbritt, D., McLachlan, C. S., Clifton-Bligh, R., Morley, J.,

& Lal, S. (2021). Smart Devices and Wearable Technologies to Detect and Monitor Mental Health Conditions and Stress: A Systematic Review. *Sensors, 21*(10), 3461. https://doi.org/10.3390/s21103461

Ho, C. W., & Malpani, R. (2022). Scaling up the Research Ethics Framework for Healthcare Machine Learning as Global Health Ethics and Governance. *The American Journal of Bioethics, 22*(5), 36–38. https://doi.org/10.1080/15265161.2022.2055209

Holt-Lunstad, J., Layton, R., Barton, B., & Smith, T. B. (2020). Science into practice: effective solutions for social isolation and loneliness. *Generations Journal, 44*(3), 1–10.

Huang, X., Zhang, Z., Guo, F., Wang, X., Chi, K., & Wu, K. (2024). *Research on Older Adults' Interaction with E-Health Interface Based on Explainable Artificial Intelligence*. ArXiv (Cornell University). https://doi.org/10.48550/arxiv.2402.07915

Iloanusi, N., & Chun, S. A. (2024). AI Impact on Health Equity for Marginalized, Racial, and Ethnic Minorities. *Digital Government Research*, 841–848. https://doi.org/10.1145/3657054.3657152

Irshad, S., Azmi, S., & Begum, N. (2022). Uses of Artificial Intelligence in Psychology. *Journal of Health and Medical Sciences, 5*(4). https://doi.org/10.31014/aior.1994.05.04.242

Kalafatis, C., Modarres, M. H., Marefat, H., Khanbagi, M., Karimi, H., Vahabi, Z., & Razavi, S. K. (2019). P4-207: Employing Artificial Intelligence in the Development of a Self-Administered, Computerised Cognitive Assessment for the Assessment of Neurodegeneration. *Alzheimer S & Dementia, 15*(7S_Part_26). https://doi.org/10.1016/j.jalz.2019.06.3870

Kale, M. B., Wankhede, N. L., Pawar, R. S., Ballal, S., Kumawat, R., Goswami, M., Khalid, M., Taksande, B. G., Upaganlawar, A. B., Umekar, M. J., Kopalli, S. R., & Koppula, S. (2024). AI-Driven Innovations in Alzheimer's Disease: Integrating Early Diagnosis, Personalized Treatment, and Prognostic Modelling. *Ageing Research Reviews*, 102497. https://doi.org/10.1016/j.arr.2024.102497

Khoo, E., Small, R., Cheng, W., Hatchard, T., Glynn, B., Rice, D. B., Skidmore, B., Kenny, S., Hutton, B., & Poulin, P. A. (2019). Comparative evaluation of group-based mindfulness-based stress reduction and cognitive behavioural therapy for the treatment and management of chronic pain: A systematic review and network meta-analysis. *Evidence-Based Mental Health, 22*(1), 26–35. https://doi.org/10.1136/ebmental-2018-300062

Koc, M. (2023). Artificial intelligence in geriatrics. *The Turkish Journal of Geriatrics, 26*(4), 352–360. https://doi.org/10.29400/tjgeri.2023.362

Kwon, J., Ha, J., Kim, D., Choi, J. W., & Kim, L. (2021). Emotion Recognition Using a Glasses-Type Wearable Device via Multi-Channel Facial Responses. *IEEE Access, 9*, 146392–146403. https://doi.org/10.1109/access.2021.3121543

Lee, E., Karim, H., Iaboni, A., & Sekhon, H. (2022). Artificial Intelligence in Geriatric Mental Health: Recent Advances in Clinical Research. *American Journal of Geriatric Psychiatry, 30*(4), S15–S16. https://doi.org/10.1016/j.jagp.2022.01.275

Leong, F. T. L., Lui, P. P., & Kalibatseva, Z. (2019). Multicultural Issues in Clinical Psychological Assessment. In *Cambridge University Press eBooks* (pp. 25–37). https://doi.org/10.1017/9781108235433.003

Li, R., Wang, X., Lawler, K., Garg, S., Bai, Q., & Alty, J. (2022). Applications of artificial intelligence to aid early detection of dementia: A scoping review on current capabilities and future directions. *Journal of Biomedical Informatics, 127*, 104030. https://doi.org/10.1016/j.jbi.2022.104030

Li, Y., Buys, N., Ferguson, S., Li, Z., Shi, Y., Li, L., & Sun, J. (2023). The evaluation of cognitive-behavioral therapy-based intervention on type 2 diabetes patients with comorbid metabolic syndrome: a randomized controlled trial. *Diabetology & Metabolic Syndrome, 15*(1). https://doi.org/10.1186/s13098-023-01100-2

London, A. J., Razin, Y. S., Borenstein, J., Eslami, M., Perkins, R., & Robinette, P. (2023). Ethical Issues in Near-Future Socially Supportive Smart Assistants for Older Adults. *IEEE Transactions on Technology and Society, 4*(4), 291–301. https://doi.org/10.1109/tts.2023.3237124

Luxton, D. D. (2014). Artificial intelligence in psychological practice: Current and future applications and implications. *Professional Psychology Research and Practice, 45*(5), 332–339. https://doi.org/10.1037/a0034559

Marais, C., Song, Y., Ferreira, R., Aounti, S., Duflos, C., Baptista, G., & Pers, Y. (2022). Evaluation of mindfulness based stress reduction in symptomatic knee or hip osteoarthritis patients: a pilot randomized controlled trial. *BMC Rheumatology, 6*(1). https://doi.org/10.1186/s41927-022-00277-9

Martinez-Martin, N. (2021). Minding the AI: Ethical Challenges and Practice for AI Mental Health Care Tools. In *Advances in Neuroethics* (pp. 111–125). https://doi.org/10.1007/978-3-030-74188-4_8

Meyer, G. J., Finn, S. E., Eyde, L. D., Kay, G. G., Moreland, K. L., Dies, R. R., Eisman, E. J., Kubiszyn, T. W., & Reed, G. M. (2001). Psychological testing and psychological assessment: A review of evidence and issues. *American Psychologist,*

56(2), 128–165. https://doi.org/10.1037/0003-066x.56.2.128

Mhlanga, D. (2024). Artificial Intelligence in Elderly Care: Navigating Ethical and Responsible AI Adoption for Seniors. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.4675564

Mittal, A., Dumka, L., & Mohan, L. (2023). A Comprehensive Review on the Use of Artificial Intelligence in Mental Health Care. *2022 13th International Conference on Computing Communication and Networking Technologies (ICCCNT), 15*, 1–5. https://doi.org/10.1109/icccnt56998.2023.10308255

Modarres, M. H., Khazaie, V. R., Ghorbani, M., Ghoreyshi, A. M., AkhavanPour, A., Ebrahimpour, R., Vahabi, Z., Kalafatis, C., & Razavi, S. K. (2021). Early diagnosis of Alzheimer's dementia with the artificial intelligence-based Integrated Cognitive Assessment. *Alzheimer S & Dementia, 16*(S6). https://doi.org/10.1002/alz.042863

Mody, V., & Mody, V. (2019). Mental Health Monitoring System using Artificial Intelligence: A Review. *2022 IEEE 7th International Conference for Convergence in Technology (I2CT)*, 1–6. https://doi.org/10.1109/i2ct45611.2019.9033652

Moskowitz, D. S., & Young, S. N. (2006). Ecological momentary assessment: what it is and why it is a method of the future in clinical psychopharmacology. *Journal of Psychiatry & Neuroscience, 31*(1), 13–20.

Naglieri, J. A., & Graham, J. R. (2012). Current Status and Future Directions of Assessment Psychology. *Handbook of Psychology*, Second Edition. https://doi.org/10.1002/9781118133880.hop210025

Nandanwar, A., & Dutt, V. (2023). Assessing stress, anxiety, and depression with social robots via conversational AI. In *Proceedings of the 16th International Conference on PErvasive Technologies Related to Assistive Environments*. https://doi.org/10.1145/3594806.3596589

Nasir, S., Khan, R. A., & Bai, S. (2024). Ethical Framework for Harnessing the Power of AI in Healthcare and Beyond. *IEEE Access, 12*, 31014–31035. https://doi.org/10.1109/access.2024.3369912

Nelson, B., McGorry, P. D., Wichers, M., Wigman, J. T. W., & Hartmann, J. A. (2017). Moving From Static to Dynamic Models of the Onset of Mental Disorder. *JAMA Psychiatry, 74*(5), 528. https://doi.org/10.1001/jamapsychiatry.2017.0001

Olawade, D. B., Wada, O. Z., Odetayo, A., David-Olawade, A. C., Asaolu, F., & Eberhardt, J. (2024). Enhancing mental health with Artificial Intelligence: Current trends and future prospects. *Journal of Medicine Surgery and Public Health, 3*, 100099. https://doi.org/10.1016/j.glmedi.2024.100099

Park, J., Choi, W., Jeong, T., & Seo, J. (2023). Digital twins and land management in South Korea. *Land Use Policy, 124*, 106442. https://doi.org/10.1016/j.landusepol.2022.106442

Pollack, M. E. (2005). Intelligent Technology for an Aging Population: The Use of AI to Assist Elders with Cognitive Impairment. *AI Magazine, 26*(2), 9–24. https://doi.org/10.1609/aimag.v26i2.1810

Rai, L., Boyle, R., Brosnan, L., Rice, H., Farina, F., Tarnanas, I., & Whelan, R. (2020). Digital Biomarkers Based Individualized Prognosis for People at Risk of Dementia: the AltoidaML Multisite External Validation Study. *Advances in Experimental Medicine and Biology*, 157–171. https://doi.org/10.1007/978-3-030-32622-7_14

Ranade, A. G., Patel, M., & Magare, A. (2018). Emotion model for artificial intelligence and their applications. In *2018 Fifth International Conference on Parallel, Distributed and Grid Computing (PDGC)*. https://doi.org/10.1109/pdgc.2018.8745840

Randall, N., Bennett, C. C., Šabanović, S., Nagata, S., Eldridge, L., Collins, S., & Piatt, J. A. (2019). More than just friends: In-home use and design recommendations for sensing socially assistive robots (SARs) by older adults with depression. *Paladyn Journal of Behavioral Robotics, 10*(1), 237–255. https://doi.org/10.1515/pjbr-2019-0020

Ray, A., Bhardwaj, A., Malik, Y. K., Singh, S., & Gupta, R. (2022). Artificial intelligence and Psychiatry: An overview. *Asian Journal of Psychiatry, 70*, 103021. https://doi.org/10.1016/j.ajp.2022.103021

Renn, B. N., Schurr, M., Zaslavsky, O., & Pratap, A. (2021). Artificial Intelligence: An Interprofessional Perspective on Implications for Geriatric Mental Health Research and Care. *Frontiers in Psychiatry, 12*. https://doi.org/10.3389/fpsyt.2021.734909

Riboni, F. V., Comazzi, B., Bercovitz, K., Castelnuovo, G., Molinari, E., & Pagnini, F. (2020). Technologically-enhanced psychological interventions for older adults: a scoping review. *BMC Geriatrics, 20*(1). https://doi.org/10.1186/s12877-020-01594-9

Saadati, S. A., & Saadati, S. M. (2023). The role of chatbots in Mental Health Interventions: User experiences. *AI And Tech in Behavioral and Social Sciences, 1*(2), 19–25. https://doi.org/10.61838/kman.aitech.1.2.4

Sapci, A. H., & Sapci, H. A. (2019). Innovative Assisted Living Tools, Remote Monitoring Technologies, Artificial Intelligence-Driven Solutions, and Robotic Systems for Aging Societies: Systematic Review. *JMIR Aging, 2*(2), e15429. https://doi.org/10.2196/15429

Savoia, S. E., Stern, E. H., Salardini, A., & Dorai, C. (2021). Usability and functional validation of artificial intelligence-enabled technology

services in dementia care using a controlled trial in clinical practice. *Alzheimer S & Dementia, 17*(S7). https://doi.org/10.1002/alz.056547

Sharif, F., Masoudi, M., Ghanizadeh, A., Dabbaghmanesh, M. H., Ghaem, H., & Masoumi, S. (2014). The effect of cognitive-behavioral group therapy on depressive symptoms in people with type 2 diabetes: A randomized controlled clinical trial. *Iran J Nurs Midwifery Res, 19*(5), 529–536.

Shimada, K. (2023). The Role of Artificial Intelligence in Mental Health: A Review. *Science Insights, 43*(5), 1119–1127. https://doi.org/10.15354/si.23.re820

Shiwani, T., Relton, S., Evans, R., Kale, A., Heaven, A., Clegg, A., Abuzour, A., Alderman, J., Anand, A., Bhanu, C., Bunn, J., Collins, J., Cutillo, L., Hall, M., Keevil, V., Mitchell, L., Ogliari, G., Penfold, R., Van Oppen, J., . . . Todd, O. (2023). New Horizons in artificial intelligence in the healthcare of older people. *Age And Ageing, 52*(12). https://doi.org/10.1093/ageing/afad219

Solanki, P., Grundy, J., & Hussain, W. (2022). Operationalising ethics in artificial intelligence for healthcare: a framework for AI developers. *AI And Ethics, 3*(1), 223–240. https://doi.org/10.1007/s43681-022-00195-z

Spitzer, M., Dattner, I., & Zilcha-Mano, S. (2023). Digital twins and the future of precision mental health. *Frontiers in Psychiatry, 14*. https://doi.org/10.3389/fpsyt.2023.1082598

Stuck, R. E., & Walker, B. N. (2018). Human-Robot trust: Understanding user perceptions. In *Companion of the 2018 ACM/IEEE International Conference on Human-Robot Interaction* (pp. 325–326). Association for Computing Machinery. https://doi.org/10.1145/3173386.3176920

Taylor, H. O. (2020). Social Isolation's Influence on Loneliness Among Older Adults. *Clinical Social Work Journal, 48*(1), 140–151. https://doi.org/10.1007/s10615-019-00737-9

Timmons, A. C., Duong, J. B., Fiallo, N. S., Lee, T., Vo, H. P. Q., Ahle, M. W., Comer, J. S., Brewer, L. C., Frazier, S. L., & Chaspari, T. (2022). A Call to Action on Assessing and Mitigating Bias in Artificial Intelligence Applications for Mental Health. *Perspectives on Psychological Science, 18*(5), 1062–1096. https://doi.org/10.1177/17456916221134490

Tsoi, K. K. F., Jia, P., Dowling, N. M., Titiner, J. R., Wagner, M., Capuano, A. W., & Donohue, M. C. (2022). Applications of artificial intelligence in dementia research. *Cambridge Prisms Precision Medicine, 1*. https://doi.org/10.1017/pcm.2022.10

Vallée, A. (2023). Digital twin for healthcare systems. *Frontiers in Digital Health, 5*. https://doi.org/10.3389/fdgth.2023.1253050

Wei, D. H., Hernandez, B., & Burdick, D. (2023). Artificial intelligence in mental health for the aging population: a scoping review. *Innovation in Aging, 7*(Supplement_1), 805. https://doi.org/10.1093/geroni/igad104.2598

Weiner, I. B. (2003). The Assessment Process. *Handbook of Psychology*, 1–25. https://doi.org/10.1002/0471264385.wei1001

Wright, A. G. C., & Hopwood, C. J. (2016). Advancing the Assessment of Dynamic Psychological Processes. *Assessment, 23*(4), 399–403. https://doi.org/10.1177/1073191116654760

Yan, Z., Wu, Y., Zhang, Y., & Chen, X. '. (2022). EmoGlass: An End-to-End AI-Enabled Wearable Platform for Enhancing Self-Awareness of Emotional Health. *CHI Conference on Human Factors in Computing Systems*, 1–19. https://doi.org/10.1145/3491102.3501925

Yin, L., & Bickmore, T. (2018). Culturally-aware healthcare systems. In *Intelligent Systems Reference Library* (pp. 97–110). https://doi.org/10.1007/978-3-319-67024-9_5

Youngstrom, E. A., Van Meter, A., Frazier, T. W., Hunsley, J., Prinstein, M. J., Ong, M., & Youngstrom, J. K. (2017). Evidence-based assessment as an integrative model for applying psychological science to guide the voyage of treatment. *Clinical Psychology Science and Practice, 24*(4), 331–363. https://doi.org/10.1111/cpsp.12207

Yousefi, Z., Saadati, N., & Saadati, S. A. (2023). AI in Elderly Care: Understanding the Implications for Independence and Social Interaction. *AI And Tech in Behavioral and Social Sciences, 1*(4), 26–32. https://doi.org/10.61838/kman.aitech.1.4.5

Zhang, H., Xu, Y., & Xu, Y. (2024). Association of diastolic and systolic blood pressure with depression: a cross-sectional study from NHANES 2005-2018. *Frontiers in Psychiatry*, 15. https://doi.org/10.3389/fpsyt.2024.1433990

Zhang, Y., Zheng, X. T., Zhang, X., Pan, J., & Thean, A. V. (2024). Hybrid Integration of Wearable Devices for Physiological Monitoring. *Chemical Reviews, 124*(18), 10386–10434. https://doi.org/10.1021/acs.chemrev.3c00471