Scientific Publications

Journal of Artificial Intelligence and Big Data, 2025, 5, 1265
www.scipublications.com/journal/index.php/jaibd
DOI: 10.31586/jaibd.2025.1265

Review Article

The Future of Longevity Medicine from the Lens of Digital Therapeutics

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Abstract: Digital therapeutics (DTx) are emerging as a pivotal tool in promoting longevity by addressing non-communicable diseases (NCDs) such as diabetes, cardiovascular diseases, and mental health disorders. These software-driven interventions offer personalized, evidence-based treatments that can be accessed via digital devices, making healthcare more accessible and scalable. One of the key advancements in DTx is the integration of artificial intelligence (AI) and machine learning (ML) to tailor interventions based on individual health data. This personalization enhances the effectiveness of treatments and supports preventive care by identifying risk factors early. The need for digital therapeutics is underscored by the rising prevalence of NCDs, which are responsible for a significant portion of global mortality and healthcare costs. Traditional healthcare systems often struggle to provide timely and personalized care, especially in low-resource settings. DTx can bridge this gap by offering cost-effective solutions that are easily scalable. Moreover, digital therapeutics can address health inequities by providing low-cost interventions to underserved populations, thereby reducing the burden of NCDs and improving overall health outcomes. As technology continues to evolve, the potential for DTx to enhance longevity and quality of life becomes increasingly promising. Recent advancements in longevity medicine and technology have focused on extending both lifespan and healthspan, ensuring that people not only live longer but also maintain good health throughout their extended years. This review article highlights these advancements that are contributing to this compelling subject of Longevity.

Keywords: Longevity, Aging, Anti-Aging Therapies, Regenerative Medicine, Genomics, Senescence, Wearable Technology, Nutritional Interventions, AI in Longevity, Personalized Medicine

How to cite this paper:
Ramakrishnan, A., Rhee, R., Lath, G., & Ramakrishnan, R. (2025). The Future of Longevity Medicine from the Lens of Digital Therapeutics. *Journal of Artificial Intelligence and Big Data, 5*(1), 1265. Retrieved from https://www.scipublications.com/journal/index.php/jaibd/article/view/1265

Received: December 16, 2024
Revised: January 28, 2025
Accepted: February 7, 2025
Published: February 9, 2025

1. Introduction

In recent years, the field of longevity has witnessed remarkable advancements, driven by cutting-edge technologies and innovative digital therapeutics. These developments are transforming our understanding of aging and extending the human healthspan. Key breakthroughs in genomics, regenerative medicine, and artificial intelligence are paving the way for personalized interventions that target the underlying mechanisms of aging [1]. Additionally, wearable technology and digital health platforms are empowering individuals to monitor and optimize their health in real-time [2]. This review article explores the latest trends and technological innovations that are shaping the future of longevity, offering new hope for a healthier, longer life.

2. Method and Methodology

2.1. Literature Search Strategy

To ensure a comprehensive review of recent trends and technological advancements in the field of longevity, a systematic literature search was conducted. The search focused on peer-reviewed articles, conference papers, and relevant reviews published between January 2015 and December 2024. The following databases were utilized: **PubMed, Google Scholar and Scopus**.

2.2. Search Keywords

The search strategy incorporated a combination of keywords and phrases to capture the breadth of research in longevity. The primary keywords included:

- Longevity
- Aging
- Anti-Aging Therapies
- Regenerative Medicine
- Genomics
- Senescence
- Wearable Technology
- Nutritional Interventions
- AI in Longevity
- Personalized Medicine

2.3. Inclusion and Exclusion Criteria

Inclusion Criteria:

- Articles published in English.
- Studies focusing on technological advancements and trends in longevity.
- Research published between January 2015 and December 2024.
- Peer-reviewed journal articles, conference papers, and reviews.

Exclusion Criteria:

- Articles not available in full text.
- Studies not directly related to longevity or aging.
- Publications prior to January 2015.

Only high-quality studies that met the inclusion criteria were included in the final review.

3. Understanding the underlying mechanisms of ageing

Aging is a complex biological process characterized by the gradual decline in physiological functions and increased vulnerability to diseases. The causes and consequences of ageing have been well illustrated in the Figure 1 [3]. Solutions for age reversal target the underlying mechanisms of aging.

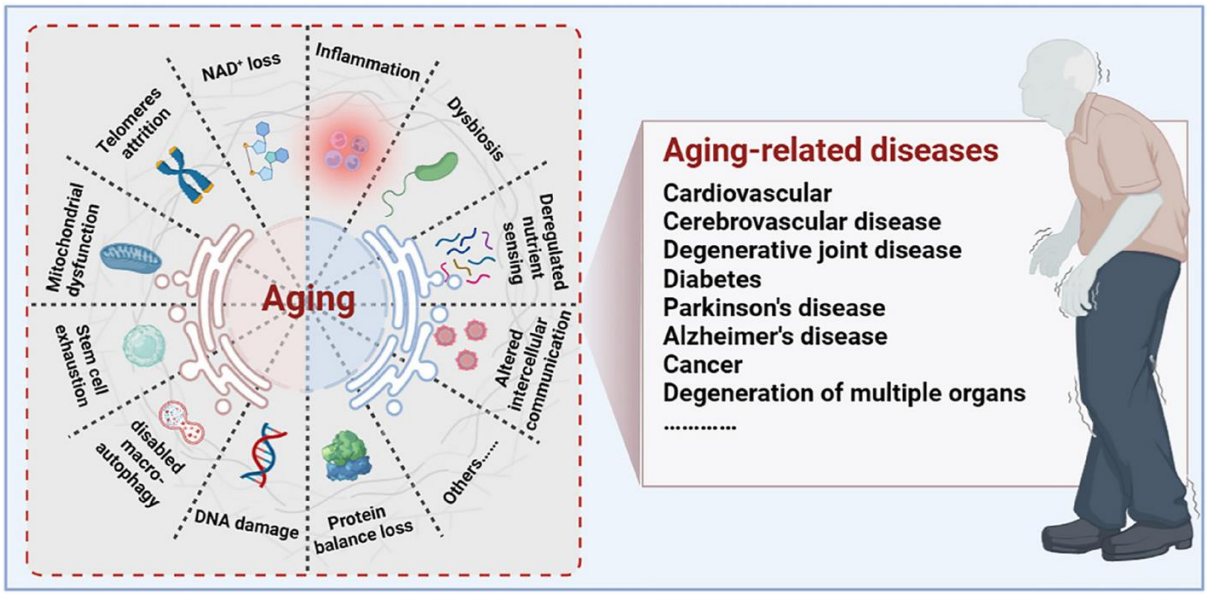

Figure 1. Causes and Consequences of Ageing

Aging drivers and age-related diseases. Major physiological features of aging include NAD+ loss, telomeres attrition, mitochondrial dysfunction, stem cell exhaustion, disabled macro-autophagy, DNA damage, protein balance loss, inflammation, dysbiosis, deregulated nutrient sensing, and altered cellular communication. These physiological characteristics of aging are primitive, antagonistic, and integrated, and their interaction promotes aging. When aging reaches a certain threshold, organ and tissue function continues to deteriorate, which increases the incidence and mortality of aging-related diseases, including cardiovascular, cerebrovascular, degenerative joint disease, diabetes, Parkinson's disease, Alzheimer's disease, and cancer [3].

4. Recent advancements in Aging Reversal

Recent advancements in aging reversal and longevity have shown promising results. These advancements represent a multi-faceted approach to longevity, combining cutting-edge technology with innovative therapies to improve both the quality and duration of life. Some of the noteworthy advancements are highlighted as follows:

Digital Advancements

1. **Artificial Intelligence (AI) and Machine Learning (ML)**
   - **AI-Driven Drug Discovery**: AI algorithms are being used to identify potential anti-aging compounds more efficiently. Companies like Insilico Medicine are leveraging AI to accelerate the discovery of drugs that target aging-related pathways [4].
   - **Biomarker Analysis**: AI and ML are used to analyze biomarkers that indicate biological age and predict health risks. This helps in early detection and personalized treatment plans [1].
2. **Wearable Technology**
   - **Health Monitoring Devices**: Wearables like the Apple Watch Series 10 and Fitbit track vital signs, sleep patterns, and physical activity, providing data that can be used to monitor aging and detect early signs of age-related diseases [2].
   - **Continuous Glucose Monitors (CGMs)**: Devices like the Dexcom G6 provide real-time glucose monitoring, which is crucial for

managing metabolic health and preventing age-related conditions like diabetes [5].

3. **Telemedicine and Digital Health Platforms**
    - **Remote Consultations**: Telemedicine platforms enable continuous monitoring and management of chronic conditions, reducing the need for frequent in-person visits and improving access to healthcare [6].
    - **Digital Therapeutics**: Apps and online programs offer personalized health coaching, cognitive behavioral therapy, and other interventions to promote healthy aging [6].

Therapeutic Advancements

1. **Gene Therapy and CRISPR**
    - **Gene Editing**: Technologies like CRISPR are being used to edit genes associated with aging and age-related diseases. This has the potential to prevent or reverse conditions like Alzheimer's and cardiovascular diseases [7].
    - **Gene Therapy**: Advances in gene therapy aim to repair or replace defective genes, offering new treatments for genetic disorders that contribute to aging [7].
2. **Regenerative Medicine**
    - **Stem Cell Therapy**: Stem cell treatments are being developed to regenerate damaged tissues and organs, potentially reversing the effects of aging [8].
    - **Tissue Engineering**: Bioprinting and other tissue engineering techniques are being used to create replacement tissues and organs, which can extend the functional lifespan of patients [8].
3. **Senolytics**
    - **Targeting Senescent Cells**: Senolytic drugs are designed to selectively eliminate senescent cells, which accumulate with age and contribute to chronic inflammation and tissue dysfunction. Metformin, acarbose, NSAIDs, 25-hydroxycholesterol, Cardiac steroids, PPRα agonists (Fenofibrate) and Antibiotics (Azithromycin, roxithromycin) are examples of such senolytic drugs [3].
    - **Clinical Trials**: Several senolytic compounds are currently in clinical trials, showing promise in improving healthspan and reducing age-related diseases [9].
4. **Nutraceuticals and Supplements**
    - **Anti-Aging Compounds**: Supplements like NAD+ boosters, hyaluronic acid, resveratrol, and taurine are being studied for their potential to enhance cellular health and longevity [3].
    - **Personalized Nutrition**: Advances in nutrigenomics allow for personalized dietary recommendations based on an individual's genetic profile, optimizing health and longevity [10].

Digital and therapeutic advancements are revolutionizing healthcare, offering innovative solutions to improve patient outcomes and engagement. One of the most significant developments is the rise of digital therapeutics (DTx), which leverage technology to deliver evidence-based therapeutic interventions through software programs. Improving patient engagement in digital therapeutics (DTx) involves several strategies:

1. Personalization: Tailoring interventions to individual needs and preferences can significantly enhance engagement. Using AI and machine

learning to analyze patient data allows for more personalized treatment plans [11].

2. User-Friendly Design: Ensuring that the DTx interface is intuitive and easy to navigate is crucial. A well-designed app can make it easier for patients to use the therapeutic tools consistently [12].
3. Gamification: Incorporating game-like elements such as rewards, challenges, and progress tracking can make the therapeutic process more engaging and motivating for patients [12].
4. Continuous Feedback and Support: Providing real-time feedback and support through notifications, reminders, and virtual coaching can help maintain patient engagement. This continuous interaction can encourage patients to stick with their treatment plans [12].
5. Education and Empowerment: Educating patients about their condition and the benefits of DTx can empower them to take an active role in their health management. This can be achieved through informative content and interactive features within the app [12].
6. Integration with Daily Life: Making DTx a seamless part of patients' daily routines can improve adherence. This can include integrating the app with other health devices and platforms they already use [12].
7. Social Support: Creating a community or support network within the app where patients can share experiences and encourage each other can foster a sense of belonging and motivation [12].

Despite these strategies to improve patient engagement, there are several challenges in implementing digital therapeutics (DTx) for longevity:

1. **Regulatory Hurdles**: DTx must comply with stringent regulatory standards, such as those set by the FDA, HIPAA, and other regional bodies. Navigating these regulations can be complex and time-consuming [13].
2. **Data Privacy and Security**: Ensuring the privacy and security of patient data is paramount. DTx solutions must implement robust cybersecurity measures to protect sensitive health information from breaches [13].
3. **Integration with Healthcare Systems**: Seamlessly integrating DTx into existing healthcare infrastructures can be difficult. This includes ensuring interoperability with electronic health records (EHRs) and other digital health tools [14].
4. **Reimbursement and Funding**: Securing reimbursement from insurers and funding for development can be challenging. Many healthcare payers are still hesitant to cover DTx, which can limit their adoption [14].
5. **Patient Engagement and Adherence**: Ensuring that patients consistently use DTx as prescribed is crucial for their effectiveness. This requires designing user-friendly interfaces and providing ongoing support to maintain engagement [13].
6. **Clinical Validation**: Demonstrating the clinical efficacy of DTx through rigorous trials is essential. This process can be costly and time-consuming, but it is necessary to gain trust from healthcare providers and patients [15].

Addressing these challenges requires collaboration between developers, healthcare providers, regulators, and payers to create a supportive ecosystem for DTx. Overcoming these obstacles will be key to realizing the full potential of digital therapeutics in enhancing longevity and improving health outcomes.

There are a significant number of companies that are exploring the opportunities in the longevity space with various solutions to offer. Some of the notable ones are listed below in Table 1.

Table 1. Details of digital therapeutics in Longevity currently available in the market

Sl No	Company Name & Country of Origin	Indication	Features
1	AGEX THERAPEUTICS [16] United States	Regenerative Medicine	Specializes in regenerative medicine using pluripotent stem cells. Focused on tissue engineering and cell-based therapies.
2	ALTOS LABS [17] UK	Cellular Rejuvenation	Focuses on cellular rejuvenation programming to reverse age-related decline. High-profile team includes leading scientists and significant funding from Jeff Bezos.
3	AMAZENTIS (TIMELINE) [18] Switzerland	Mitophagy & Muscle Health	Pioneers in research on mitophagy and mitochondrial health. Offers Urolithin A-based products for improving muscle and cell performance.
4	APOLLO HEALTH VENTURES[19] Germany	Aging Research Investment	Venture capital firm targeting companies with potential breakthroughs in aging. Supports translational research to bridge science and application.
5	BIOAGE LABS [20] United States	Aging Biomarker Discovery	Leverages human aging data to identify biomarkers and drug targets to combat aging-related diseases.
6	BioXtek[21] United States	Regenerative Technology	Cutting-edge platform leverages the regenerative properties of amniotic membrane and other birth-derived tissues to address various age-related conditions.
7	CALICO LABS[22] United States	Aging-related Therapies	Backed by Google's Alphabet, focused on understanding the biology of aging. Develops therapies targeting age-related diseases through collaboration with AbbVie.
8	Caristo Diagnostics[23] Oxford, England	Cardiovascular aging	AI-based tool capable of predicting heart attacks up to a decade in advance by assessing coronary inflammation. This technology provides clinicians with a powerful tool to identify at-risk individuals and implement preventive measures.
9	CHARACTER BIOSCIENCES [24] USA	Disease Progression	Integrates genomics, longitudinal clinical and imaging data, machine learning, and novel experimental approaches to identify the molecular drivers of disease progression and develop innovative targeted medicines.
10	CHROMADEX (TRU NIAGEN) [25] United States	NAD+ Mitochondrial Health	Specializes in NAD+precursors to improve mitochondrial health. Products aimed at boosting energy and cellular repair.
11	DEEP LONGEVITY[26] Hong Kong	AI for Biological Age	Builds AI-driven models to measure biological age and predict longevity based on health and lifestyle factors.
12	DORIAN THERAPEUTICS [27] USA	Senescence Therapies	They are developing senoblockers, a new class of therapeutics with a double function: blocking senescence while reactivating the regeneration capacity of a tissue.
13	ELYSIUM HEALTH[28] United States	NAD+ Boosters & Aging	Offers consumer-facing products like NAD+ boosters and health supplements. Develops and 12commercializes epigenetic biomarkers for aging.
14	GLYCAN AGE[29] UK	Biological Age Testing	Glycan Age is a simple, test that analyses glycobiology. Taking a GlycanAge® test is a vital step to determine once biological age.

15	GERO[30] Singapore	Aging Biomarker Models	Develops AI-driven solutions to study biomarkers of aging and resilience. Known for predictive models of healthspan.
16	INSILICO MEDICINE [31] Hong Kong	Aging Research	Combines AI with genomics to identify therapeutic targets for age-related diseases. Leader in using deep learning for drug discovery and aging research.
17	JUVENESCENCE [32] United Kingdom	Aging-related Diseases	A biotech company investing in and developing drugs to target aging and age-related conditions. Broad portfolio includes senolytics and metabolic regulators.
18	LIBELLA GENE THERAPEUTICS [33] United States	Telomere Lengthening	Focused on telomere lengthening through gene therapy. Clinical trials for aging-related diseases are underway.
19	LIFE BIOSCIENCES [34] United States	Cellular Health Aging	Aims to combat aging through research in epigenetics, mitochondrial health, and senescence. Focuses on restoring cellular health to extend lifespan.
20	LONGEVITY VISION FUND [35] United States	Aging & Longevity Investment	Focuses on funding startups in aging and longevity science. Invests in innovations targeting healthspan and lifespan extension.
21	MICREGEN [36] UK	Stem Cell Therapies	Innovative approach in developing the Secretomix® platform to produce various secretome formulations from its first clinical grade master and working cell banks, could change how multiple critical and chronic problems are managed- not just the symptoms, but the root causes of diseases. They are primarily working on stem cells.
22	ONE SKIN [37] USA	Skin Aging Reversal	Their products focus on skin longevity. One Skin's proprietary peptide, OS-01, is an ingredient designed to reduce skin's biological age by improving skin barrier, supporting DNA damage repair, and preventing the accumulation of aged cells.
23	OISÍN BIOTECHNOLOGIES [38] USA	Aging-related diseases	Longevity therapeutics platform company focused on creating genetic medicines to combat a variety of age related diseases. Oisín Biotechnologies is developing a highly precise, DNA-targeted intervention to clear the senescent cells. As a recent study has shown, clearing senescent cells both reduces negative effects of aging pathologies and also extends median lifespan and survival.
24	PULSE SIGHT [39] France	Age-related Macular Degeneration	Ophthalmology drug development company developing disruptive non-viral gene therapies with minimally invasive delivery technology to treat AMD.
25	REJUVENATE BIO [40] United States	Gene Therapy Aging	Utilizes gene therapy to reverse age-related conditions in animals and humans. Targeting cardiovascular and metabolic diseases.
26	SUZHOU RUIMING[41] China	Age-related Macular Degeneration	The company has developed an eye-drop drug delivery technology for fundus diseases which include age-related wet macular degeneration (AMD), retinal vein occlusion, and diabetic macular edema.
27	S-BIOMEDIC [42] Belgium	Skin Health Solutions	Focused on skin health by pioneering the development of Pro- and Post-biotic ingredients from true skin commensals.

28	SEABELIFE BIOTECH [43] France	Neurodegenerative diseases	Focuses on the development of molecules designed to block regulated necrosis – also known as regulated cell death.
29	SIRONA BIOCHEM CORP [44] Canada	Skin Health Solutions	Developed a novel anti-aging compound designed to reverse the effects of aging on facial skin.
30	THORNE HEALTHTECH [45] United States	Personalized Longevity	Provides personalized health insights through testing kits. Focuses on nutritional solutions and longevity interventions.
31	TURN BIOTECHNOLOGIES [46] United States	Epigenetic Reprogramming	Uses epigenetic reprogramming to restore youthful cell function. Targets applications in skin and muscle rejuvenation.
32	UNITY BIOTECHNOLOGY [47] United States	Senolytic Therapies	Focuses on eliminating senescent cells to address diseases like osteoarthritis, fibrosis, and neurodegenerative conditions.

5. Holistic approach to Longevity

Social life and lifestyle play crucial roles in promoting longevity and overall well-being. Social factors related to aging are interconnected. For example, regular exercise can reduce stress, promote better sleep, and enhance social engagement. Likewise, a well-balanced diet can provide the necessary nutrients for physical activity and support mental well-being. Avoiding harmful habits and stress is another important factor for longevity [48].

6. Conclusion

The field of longevity has experienced significant advancements over the past decade, driven by technological innovations and digital therapeutics. Breakthroughs in genomics, regenerative medicine, and artificial intelligence are revolutionizing our approach to aging, offering personalized and effective interventions. Wearable technology and digital health platforms are empowering individuals to take proactive steps towards healthier aging. These advancements not only extend the human healthspan but also improve the quality of life. As research continues to evolve, the integration of these technologies holds great promise for a future where aging can be managed and potentially reversed, paving the way for healthier, longer lives.

References

[1] Lyu Y, Fu Q, Wilczok D, Ying K, King A, Antebi A, Vojta A, Stolzing A, Moskalev A, Georgievskaya A, Maier AB, Olsen A, Groth A, et al. Longevity biotechnology: bridging AI, biomarkers, geroscience and clinical applications for healthy longevity. Aging (Albany NY). 2024 Oct 16; 16:12955-12976 . https://doi.org/10.18632/aging.206135

[2] Shajari S, Kuruvinashetti K, Komeili A, Sundararaj U. The Emergence of AI-Based Wearable Sensors for Digital Health Technology: A Review. Sensors (Basel). 2023 Nov 29;23(23):9498. doi: 10.3390/s23239498. PMID: 38067871; PMCID: PMC10708748.

[3] Li, Y., Tian, X., Luo, J. *et al.* Molecular mechanisms of aging and anti-aging strategies. *Cell Commun Signal* **22**, 285 (2024). https://doi.org/10.1186/s12964-024-01663-1

[4] Paul D, Sanap G, Shenoy S, Kalyane D, Kalia K, Tekade RK. Artificial intelligence in drug discovery and development. Drug Discov Today. 2021 Jan;26(1):80-93. doi: 10.1016/j.drudis.2020.10.010. Epub 2020 Oct 21. PMID: 33099022; PMCID: PMC7577280.

[5] Mohammad Mansour, M. Saeed Darweesh, Ahmed Soltan, Wearable devices for glucose monitoring: A review of state-of-the-art technologies and emerging trends, Alexandria Engineering Journal, Volume 89, 2024, Pages 224-243, ISSN 1110-0168, https://doi.org/10.1016/j.aej.2024.01.021.

[6] Leistner, Tim; Kowatsch, Tobias (2023). Digital Therapeutics for Healthy Longevity: A Roadmap. In: Workshop on Best Practices for Scaling-Up Digital Innovations in Healthcare, Lisbon, Portugal, 16 February 2023 - 18 February 2023. SciTePress, 616-622. DOI: https://doi.org/10.5220/0011778500003414

[7] Yu J, Li T, Zhu J. Gene Therapy Strategies Targeting Aging-Related Diseases. Aging Dis. 2023 Apr 1;14(2):398-417. doi: 10.14336/AD.2022.00725. PMID: 37008065; PMCID: PMC10017145.
[8] Beyret E, Martinez Redondo P, Platero Luengo A, Izpisua Belmonte JC. Elixir of Life: Thwarting Aging With Regenerative Reprogramming. Circ Res. 2018 Jan 5;122(1):128-141. doi: 10.1161/CIRCRESAHA.117.311866. PMID: 29301845; PMCID: PMC5823281.
[9] Lelarge, V., Capelle, R., Oger, F. *et al.* Senolytics: from pharmacological inhibitors to immunotherapies, a promising future for patients' treatment. *npj Aging* **10**, 12 (2024). https://doi.org/10.1038/s41514-024-00138-4
[10] Iftikhar Alam, Farhad Ali, Falak Zeb, Ali Almajwal, Sadia Fatima, Xiaoyue Wu, Relationship of nutrigenomics and aging: Involvement of DNA methylation, Journal of Nutrition & Intermediary Metabolism, Volume 16, 2019,100098, ISSN 2352-3859, https://doi.org/10.1016/j.jnim.2019.100098.
[11] Smits M, Ludden GDS, Verbeek PP, van Goor H. How Digital Therapeutics Are Urging the Need for a Paradigm Shift: From Evidence-Based Health Care to Evidence-Based Well-being. Interact J Med Res. 2022 Oct 20;11(2):e39323. doi: 10.2196/39323. PMID: 36264624; PMCID: PMC9634516.
[12] Kuwabara A, Su S, Krauss J. Utilizing Digital Health Technologies for Patient Education in Lifestyle Medicine. Am J Lifestyle Med. 2019 Dec 13;14(2):137-142. doi: 10.1177/1559827619892547. PMID: 32231478; PMCID: PMC7092400.
[13] 6 Digital Therapeutics Challenges & How to Overcome Them. Updated Dec 20, 2023. https://binariks.com/blog/digital-therapeutics-challenges/
[14] Mario Fäh, Dr. Silvano Perrotta. https://www.ey.com/en_ch/insights/life-sciences/digital-health-dilemmas-the-challenges-the-industry-is-facing-and-how-to-address-them
[15] Recchia, G., Gussoni, G. (2023). Digital Therapeutics: Scientific, Technological, and Regulatory Challenges. In: Cesario, A., D'Oria, M., Auffray, C., Scambia, G. (eds) Personalized Medicine Meets Artificial Intelligence. Springer, Cham. https://doi.org/10.1007/978-3-031-32614-1_4
[16] https://en.wikipedia.org/wiki/AgeX_Therapeutics. Accessed in Jan 2025
[17] https://www.altoslabs.com/ Accessed in Jan 2025
[18] https://geneviatechnologies.com/site-data/references-healthage/amazentis/ Accessed in Jan 2025
[19] https://www.apollo.vc/ Accessed in Jan 2025
[20] https://bioagelabs.com/ Accessed in Jan 2025
[21] https://bioxtek.com/ Accessed in Jan 2025
[22] https://www.calicolabs.com/ Accessed in Jan 2025
[23] https://www.caristo.com/ Accessed in Jan 2025
[24] https://www.characterbio.com/ Accessed in Jan 2025
[25] https://www.chromadex.com/ Accessed in Jan 2025
[26] https://deeplongevity.com/ Accessed in Jan 2025
[27] https://www.doriantherapeutics.com/ Accessed in Jan 2025
[28] https://www.elysiumhealth.com/ Accessed in Jan 2025
[29] https://glycanage.com/ Accessed in Jan 2025
[30] https://gero.ai/ Accessed in Jan 2025
[31] https://insilico.com/ Accessed in Jan 2025
[32] https://juvlabs.com/ Accessed in Jan 2025
[33] https://synapse.patsnap.com/organization/3f810a076d1d03813170852965848ec2 Accessed in Jan 2025
[34] https://www.lifebiosciences.com/ Accessed in Jan 2025
[35] https://longevity.vision/ Accessed in Jan 2025
[36] https://micregen.com/ Accessed in Jan 2025
[37] https://www.oneskin.co/ Accessed in Jan 2025
[38] https://www.oisinbio.com/ Accessed in Jan 2025
[39] https://pulsesight.com/ Accessed in Jan 2025
[40] https://rejuvenatebio.com/ Accessed in Jan 2025
[41] https://synapse.patsnap.com/organization/f767382c6c5e649fc5bb0eace7d8d563 Accessed in Jan 2025
[42] https://www.sbiomedic.com/ Accessed in Jan 2025
[43] https://www.seabelife.com/en/ Accessed in Jan 2025
[44] https://www.sironabiochem.com/ Accessed in Jan 2025
[45] https://www.thorne.com/ Accessed in Jan 2025
[46] https://www.turn.bio/ Accessed in Jan 2025
[47] https://unitybiotechnology.com/ Accessed in Jan 2025
[48] Folake Olubukola Asejeje, Olalekan Bukunmi Ogunro, Deciphering the mechanisms, biochemistry, physiology, and social habits in the process of aging, Archives of Gerontology and Geriatrics Plus, Volume 1, Issue 1, 2024, 100003, ISSN 2950-3078, https://doi.org/10.1016/j.aggp.2023.100003.