AI BASED HEALTHY LIFESTYLE PROMOTION AND BEHAVIOURAL CHANGE THEORIES

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Abstract

Artificial Intelligence (AI) has emerged as a transformative tool in health promotion, facilitating behaviour change through the application of behavioural change theories. This paper examines AI based healthy lifestyles promotion and behavioural change theories. It focuses on the concept of AI, healthy lifestyle, behaviour change, behaviour change theories, artificial intelligence in promoting healthy lifestyles, application of the health belief model in AI-based health promotion, integration of the theory of planned behaviour in AI-mediated interventions, use of social cognitive theory in AI-supported habit formation and AI application in health behaviour modification. The paper concludes that through real-time data analytics, predictive modelling, and adaptive feedback systems, AI enables the precise translation of behavioural constructs into actionable interventions tailored to individuals' unique needs and motivations. It was recommended amongst others that programme designers, AI engineers, and public health educators should incorporate gamification, virtual reality, and emotionally responsive AI into health initiatives to enhance user engagement, motivation, and self-efficacy.

Keywords: AI, Healthy lifestyles, Behavioural change theories

Introduction

Artificial intelligence (AI) has emerged as one of the most transformative technologies of the twenty-first century, redefining how societies think, learn, and interact. It encompasses the development of computer systems capable of performing cognitive functions such as reasoning, perception, problem-solving, and decision-making that traditionally requires human intelligence (Russell & Norvig, 2022). Chen et al. (2022) regard AI as an integrated field of computer science that enables systems to analyse data, draw inferences, and act intelligently in response to changing situations. AI is not merely about automation but about equipping systems with the ability to think, learn, and adapt in complex human contexts. With the growing sophistication of algorithms and data analytics, AI now operates as a transformative driver of innovation in multiple domains including education, agriculture, business, and health. As AI continues to evolve, its integration into human-centred domains underscores its capacity to simulate adaptive learning and support decision processes in real-time contexts (Aggarwal et al., 2023).

The expanding influence of Artificial Intelligence has increasingly transcended industrial innovation to engage with the complexities of human health and wellbeing. By harnessing data analytics, machine learning, and intelligent monitoring systems, AI now supports individuals in making informed lifestyle decisions that enhance physical, mental, and social health (Zhang et al., 2023, Okanlawon et al, 2025).Artificial Intelligence has now evolved from a passive analytical tool into an active partner in the cultivation of healthy lifestyles among individuals. In this sense, AI functions as a digital ally empowering individuals to adopt preventive health practices, make informed lifestyle choices, and maintain long-term behavioural consistency. This evolving partnership between human agency and artificial intelligence underscores a transformative shift in modern health promotion, where technology supports and strengthens individual commitment to healthier lifestyles.

Healthy lifestyle occupies a central position in global health promotion and behavioural science literature. The World Health Organization (WHO, 2021) considers a healthy lifestyle as a way of living that lowers the risk of being seriously ill or dying early by maintaining habits consistent with physical, mental, and social wellbeing. In a related sense, Koulouvari et al. (2023) describe a healthy lifestyle as a sustained behavioural pattern in which individuals actively engage in actions such as balanced nutrition, physical activity, rest, and stress management to maintain optimal health. This emphasizes both preventive and self-regulatory dimensions of health behaviour, highlighting that healthy living is a continuous commitment rather than an occasional choice. As technological interventions increasingly shape daily life, AI systems have been integrated into platforms that encourage physical activity, track nutrition, monitor sleep, and even provide mental wellness coaching (Adebowale & Olatunji, 2022). Such integration demonstrates that technology can not only disseminate health information but also reinforce habits conducive to a healthy lifestyle.

The effectiveness of AI-driven interventions on health depends not only on technological sophistication but also on their alignment with established psychological and behavioural frameworks that explain why individuals adopt or resist certain health practices (Michie et al., 2020). Behavioural change theories therefore provide the scientific basis for interpreting human motivation, intention, and action elements that AI systems must integrate to achieve meaningful and sustained impact (Ajzen, 2021). It offers conceptual tools that explain why and how people modify their actions in response to internal motivations or external interventions. Michie et al. (2020) assert that behavioural change theory is a structured framework for understanding the psychological, social, and environmental factors that influence human actions. Ajzen (2021) explains it as a theoretical system describing the determinants of behaviour, including attitudes, intentions, perceived control, and social norms. These frameworks underpin the design of public health programmes by clarifying the mechanisms that motivate individuals to adopt or maintain desirable behaviours.

Behavioural change theories are built upon a range of foundational psychological and social theories that explain how human behaviour is formed, influenced, and sustained. These underlying theories such as the health belief model, theory of planned

behaviour, and social cognitive theory serve as the structural pillars upon which contemporary behavioural change frameworks are developed and applied in health promotion. When AI systems are aligned with these theories, they can deliver personalisedbehavioural feedback, simulate social reinforcement, and guide users through the stages of change. Thus, behavioural change theories serve as the intellectual foundation upon which AI-powered health interventions can be effectively built. By embedding these theories into algorithmic design and user interaction models, AI transcends mere automation to become a behaviorally intelligent system capable of guiding, reinforcing, and sustaining health-oriented decisions. Hence, behavioural change theories form the conceptual bridge through which AI applications can translate data-driven insights into enduring lifestyle transformation. Building on the foundational principles of behavioural change theories, it becomes essential to examine the significance of artificial intelligence in promoting healthy lifestyles which individuals adopt, sustain, or modify health-related behaviours.

Concept of Artificial Intelligence

Artificial intelligence (AI), a subfield of computer science, focuses on designing systems capable of performing functions traditionally associated with human intelligence. It encompasses abilities such as data analysis, pattern recognition, and decision-making (Luckin, 2022). Artificial Intelligence (AI) is seen as the simulation of human intelligence processes by machines, particularly computer systems, designed to think, learn, and make decisions independently (Russell & Norvig, 2021). In another perspective, Dwivedi et al. (2023) define AI as the integration of algorithms and computational models that enable systems to interpret data, acquire knowledge, and perform cognitive tasks such as reasoning, problem-solving, and prediction. AI's primary goal is to replicate or augment human cognitive capabilities through computational means.

The nature of AI is multifaceted, encompassing both its technological and functional dimensions. Technologically, AI operates through machine learning, natural language processing, neural networks, and deep learning frameworks that allow continuous adaptation based on data inputs (Zhou et al., 2022). Functionally, AI embodies the ability to mimic human reasoning, perceive complex patterns, and automate intelligent decision-making processes. Its adaptive learning nature enables systems to evolve and refine their performance over time, bridging the gap between human cognition and computational precision (Liu et al., 2020). Furthermore, AI's nature extends beyond automation to collaboration, where it complements human abilities in diverse sectors such as healthcare, education, and behavioural science. By processing vast datasets and identifying behavioural trends, AI offers insights that can guide individuals toward healthier lifestyle choices. This collaborative dynamic between human judgment and machine intelligence establishes AI as a critical tool in shaping modern interventions for promoting health and wellbeing.

Healthy Lifestyle

Health, in its broadest sense, represents a state of complete physical, mental, and social wellbeing rather than the mere absence of disease or infirmity (World Health Organization, 2021). It encompasses the capacity of individuals to adapt, self-manage, and maintain stability when faced with physical, emotional, or social challenges (Huber et al., 2020). From this standpoint, maintaining health involves adopting patterns of living that actively promote balance and prevent illness, thereby giving rise to a healthy lifestyle.

A healthy lifestyle is as a set of consistent behaviours and habits that enhance overall wellbeing and protect individuals from disease. Lee and Kim (2022), states that a healthy lifestyle encompasses proactive choices such as balanced nutrition, regular physical activity, and stress control that contribute to physical and psychological resilience. Santos et al. (2023) describe a healthy lifestyle as a multidimensional behavioural framework that integrates diet, exercise, sleep, emotional regulation, and social connectedness to ensure sustained health and quality of life. A healthy lifestyle is not accidental but intentional, requiring self-awareness, motivation, and environmental support to maintain long-term wellness.The dimensions of a healthy lifestyle can be categorised into physical, psychological, emotional, social, and spiritual domains.

i. Physical dimension: This involves maintaining the body through regular physical activity, balanced nutrition, adequate rest, and avoidance of harmful habits such as smoking or excessive alcohol intake. Physical wellness enhances energy levels and resistance to disease (Patel & Sharma, 2021).
ii. Psychological dimension: It focuses on cognitive functioning, mindset, and intellectual growth. This dimension includes maintaining mental clarity, positive thinking, and motivation toward personal goals, all of which influence an individual's ability to manage challenges effectively (Martinez et al., 2022).
iii. Emotional dimension: Emotional wellness concerns recognising, understanding, and managing one's feelings constructively. It promotes resilience, self-awareness, and empathy, allowing individuals to handle stress and maintain stability during adversity (Santos et al., 2023).
iv. Social dimension: The social component of a healthy lifestyle involves building and maintaining supportive interpersonal relationships, community involvement, and social responsibility. Social connections contribute to emotional fulfilment and psychological balance (Dwivedi et al., 2023).
v. Spiritual dimension: This dimension relates to purpose, values, inner peace, and moral grounding. It involves aligning one's life with personal beliefs or ethical principles, fostering meaning and harmony in daily living (Lee & Kim, 2022).

Behavioural Change

Behavioural change is the process through which individuals modify or replace existing behaviours with new patterns that contribute to improved health and wellbeing. According to Michie et al. (2020), behavioural change involves the systematic alteration of actions influenced by personal motivation, environmental factors, and cognitive processes. Young

et al. (2022) describe behavioural change as the dynamic adaptation of human actions through learning, self-regulation, and reinforcement that leads to the maintenance of healthier habits over time. These definitions collectively emphasize that behavioural change is not an isolated event but a gradual and deliberate process shaped by internal beliefs and external influences.

Behavioural change is rooted in the understanding that human behaviour is influenced by cognition, emotion, and social context. It acknowledges that individuals often face barriers such as low motivation, environmental stressors, or limited awareness that hinder health-promoting actions (West et al., 2021). To address these barriers, structured psychological frameworks known as behavioural change theories have been developed to explain why people adopt, maintain, or abandon particular health behaviours. These theories offer predictive and explanatory models that guide the design of interventions aimed at encouraging sustainable lifestyle transformation.

Behavioural Change Theories

Behavioural change theories are systematic psychological frameworks designed to explain how individuals' thoughts, emotions, and social influences contribute to adopting, maintaining, or changing health-related behaviours. Michie et al. (2020), describe these theories as essential for understanding the mechanisms that underlie decision-making processes and for developing interventions that effectively encourage positive health behaviours. Noar and Zimmerman (2022) view behavioural change theories as structured models that identify determinants such as beliefs, attitudes, intentions, and perceived control that shape an individual's likelihood of changing or sustaining behaviour. In essence, behavioural change theories provide a roadmap for predicting health-related actions and for designing evidence-based interventions.

Among the numerous behavioural change frameworks, three theories stand out as particularly influential in understanding health-related behaviour: the Health Belief Model (HBM), the Theory of Planned Behaviour (TPB), and the Social Cognitive Theory (SCT). Each of these models provides a unique yet complementary perspective on how individuals perceive, decide, and act to improve their health outcomes.

i. Health Belief Model - Rosenstock (1950)

The health belief model was originally developed in the 1950s by Irwin M. Rosenstock and later refined by Becker and Maiman (1975). It remains one of the most enduring frameworks for explaining health behaviours, particularly in preventive health contexts. The HBM was formulated to understand why individuals failed to adopt disease prevention strategies or screening tests for early disease detection (Rosenstock, 1974). The model is based on the assumption that health-related behaviour is determined by an individual's beliefs about health conditions and their appraisal of the benefits and barriers to taking action. It comprises six key constructs: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy (Glanz et al., 2021). These components collectively determine whether a person is likely to engage in a health-promoting behaviour.

ii. Theory of Planned Behaviour -Ajzen (1985)

The theory of planned behaviour (TPB) was proposed by Icek Ajzen in 1985 as an extension of the earlier theory of reasoned action (TRA) developed by Fishbein and Ajzen (1975). The TPB introduced an additional construct perceived behavioural control to explain behaviours that are not entirely under volitional control (Ajzen, 1991). The theory posits that behavioural performance is primarily determined by behavioural intention, which itself is shaped by three core factors: attitude toward the behaviour, subjective norms, and perceived behavioural control. Attitude represents the individual's evaluation of the behaviour (positive or negative), subjectivenorms reflect perceived social pressures to perform or not perform the behaviour, and perceivedcontrol denotes the individual's confidence in their ability to execute the behaviour (Ajzen & Schmidt, 2022). In the context of healthy lifestyle promotion, TPB suggests that individuals will engage in healthy actions such as regular exercise, balanced diet, or avoiding harmful habits when they believe these actions are beneficial, socially supported, and within their capability.

iii. Social Cognitive Theory - Bandura (1986)

The social cognitive theory was developed by Albert Bandura in 1986 as an evolution of his earlier work on social learning theory (1977). The SCT emphasizes that behaviour change occurs through a dynamic interaction between personal factors, environmental influences, and behavioural actions, a process Bandura termed reciprocal determinism (Bandura, 1986). Central to the SCT are the constructs of observational learning, self-efficacy, outcome expectations, reinforcement, and behavioural capability (Li et al., 2022). Bandura (1997) argued that self-efficacy, an individual's belief in their capability to perform a behaviour successfully is the most critical determinant of behavioural change. People learn by observing others, modelling their actions, and receiving feedback that reinforces their motivation to continue the behaviour.

Artificial Intelligence in Promoting Healthy Lifestyles

In the health domain, AI's analytical and predictive capabilities have revolutionised approaches to health promotion by enabling personalised, data-driven interventions that motivate individuals to adopt and maintain healthy lifestyles. AI's role in promoting healthy lifestyles is anchored in its ability to translate data into actionable behavioural insights. Modern AI applications in health promotion include intelligent mobile apps, wearable sensors, virtual health assistants, and predictive algorithms that monitor, interpret, and respond to users' behavioural patterns (Jiang et al., 2021). These systems track physical activities, nutritional intake, sleep patterns, and emotional wellbeing, providing real-time feedback that fosters self-awareness and behavioural accountability. This integration of AI into everyday routines enables individuals to actively participate in their own health management, shifting the emphasis from treatment to prevention.

The application of AI in lifestyle management extends beyond data collection, it introduces adaptive learning mechanisms that continually adjust recommendations based on user progress and contextual factors. As noted by Topol (2019), AI systems in healthcare evolve dynamically, learning from user data to offer more accurate and

relevant interventions over time. For example, an AI-based wellness app may recommend a specific exercise regimen or mindfulness routine tailored to an individual's physical condition and psychological needs. This adaptability enhances user engagement and efficacy, allowing individuals to sustain health-promoting behaviours more consistently. Hence, AI acts not merely as a monitoring tool but as an intelligent companion that supports continuous behavioural improvement.

In addition to personal wellness applications, AI contributes to population-level health promotion by analysing aggregated data from diverse users to identify lifestyle trends and health disparities. This big-data-driven approach enables policymakers, public health organisations, and health educators to design targeted interventions that address community-specific health challenges (Dwivedi et al., 2023). For example, AI-driven health surveillance systems can predict outbreaks of lifestyle-related diseases such as obesity or hypertension and propose preventive strategies that combine behavioural modification with social and environmental interventions. Such evidence-based decision-making underscores AI's role not only as a technological innovation but also as a strategic partner in public health advancement.

Application of the Health Belief Model in AI-Based Health Promotion

The health belief model remains one of the most widely applied psychological frameworks in health behaviour research. It posits that individuals' engagement in health-related behaviours is primarily determined by their perceptions of susceptibility to illness, the severity of potential health outcomes, the benefits of taking preventive action, and the barriers that might hinder such actions (Glanz et al., 2021). In addition, cues to action and self-efficacy were later integrated into the model to account for triggers and confidence levels that influence behavioural initiation and maintenance (Carpenter, 2019). In contemporary digital health promotion, Artificial Intelligence (AI) has emerged as a powerful tool for operationalising the constructs of the HBM. Through predictive analytics, personalised feedback, and adaptive learning algorithms, AI systems enhance users' awareness, motivation, and commitment to adopting healthy lifestyles. AI-powered platforms collect and interpret real-time data such as physical activity, dietary habits, and biometric indicators to create a personalised health profile that aligns with the cognitive components of the HBM (Dwivedi et al., 2023). This fusion of behavioural theory and intelligent technology transforms health promotion from a generalized approach into a highly individualized and dynamic process.There are six interconnected components that represent the core of the health belief modeland are effectivelyoperationalised through AI technologies.

***Perceived susceptibility*:** Perceived susceptibility refers to an individual's belief about the likelihood of experiencing a health problem or condition (Rosenstock, 1974). AI systems, particularly those integrated with wearable sensors and health-monitoring applications, can increase awareness of personal health risks by continuously collecting and analysing physiological data. For example, AI-driven fitness trackers can alert users

about elevated heart rates or sedentary behaviours, thereby reinforcing perceived vulnerability and motivating lifestyle adjustments (Topol, 2019).

Perceived severity: Perceived severity denotes how serious an individual believes the consequences of a health condition would be (Becker, 1974). AI applications in health communication can enhance the perception of severity by providing personalised and data-driven insights. For instance, predictive analytics models can forecast the long-term consequences of unhealthy eating or lack of exercise, offering evidence-based visualizations of potential outcomes (Esteva et al., 2019). Such real-time feedback encourages individuals to recognize the potential gravity of neglecting healthy habits.

Perceived benefits: This construct focuses on an individual's belief in the effectiveness of taking a recommended action to reduce health risk or improve wellness (Rosenstock et al., 1988). AI systems can demonstrate the benefits of behavioural change by simulating expected improvements in fitness, sleep quality, or cardiovascular health through interactive dashboards and predictive simulations. For example, AI-powered mobile health applications can illustrate the positive impact of regular exercise on body weight and heart function, thereby reinforcing motivation to adopt and sustain healthy behaviours (Stern, 2020).

Perceived barriers: Perceived barriers represent the individual's evaluation of the obstacles or costs of adopting new health behaviours (Champion & Skinner, 2008). Artificial Intelligence mitigates these barriers by offering personalised support and simplifying access to health information. AI-driven virtual health assistants and chatbots, such as those integrated into wellness apps, provide round-the-clock counselling, reminders, and problem-solving suggestions that help users overcome motivational and informational challenges (Bickmore et al., 2018). By reducing perceived difficulty, AI promotes consistency in health-related actions.

Cues to action: Cues to action refer to triggers that stimulate the decision-making process and prompt individuals to engage in health behaviors (Rosenstock, 1974). AI technologies enhance cues to action through automated notifications, health alerts, and adaptive reminders based on user activity patterns. For instance, AI algorithms embedded in smartwatches or fitness apps can detect inactivity and send motivational prompts encouraging the user to move or hydrate (Feng et al., 2021). Such intelligent reminders foster timely engagement in healthy practices.

Integration of the Theory of Planned Behaviour in AI-Mediated Interventions

In contemporary health promotion, Artificial Intelligence (AI) has become a powerful instrument for applying the TPB through digital interventions that personalise learning, influence motivation, and monitor behaviour change (Feng et al., 2021). By leveraging data analytics and behavioural algorithms, AI systems can target the major components of the TPB, thereby guiding individuals from intention formation to sustained behavioural

performance. These components include attitude toward the behaviour, subjective norms, perceived behavioural control, behavioural intention, and actual behaviour serve as the foundation for how AI technologies are designed and implemented in promoting healthy lifestyles.

i. ***Attitude toward the behaviour:*** Attitude refers to the individual's positive or negative evaluation of performing a specific behaviour (Ajzen, 1991). AI-based systems influence attitudes by presenting personalised information that shapes users' beliefs and outcome expectations. For instance, AI-driven health applications can visualise the benefits of exercise or balanced diet plans through predictive data modelling, helping individuals perceive health-promoting behaviours as rewarding and attainable (Bennett & Glasgow, 2020). Machine learning algorithms can also identify motivational triggers and customise feedback, reinforcing positive attitudes toward healthy lifestyles.

ii. Subjective norms: Subjective norms involve the perceived social pressure to perform or not perform a particular behaviour (Fishbein & Ajzen, 1975). In AI-mediated interventions, this component is amplified through digital social networks and collaborative platforms. AI tools can analyse peer behaviours and facilitate community-based health challenges, where users receive encouragement or recognition for their achievements. For example, AI-enhanced fitness applications can integrate social features that display progress comparisons, promoting a sense of accountability and social reinforcement (Zhou et al., 2021). Thus, AI supports social modelling by creating virtual communities that influence individual behaviour through collective participation.

iii. Perceived behavioural control: Perceived behavioural control refers to the degree to which individuals feel capable of performing the desired behaviour, based on access to resources and opportunities (Ajzen, 1991). AI applications enhance perceived control by providing real-time feedback, adaptive goal setting, and intelligent coaching. For example, AI-powered health assistants can break complex health goals into manageable tasks, monitor adherence, and adjust recommendations according to user performance levels (Naslund et al., 2020). Through continuous learning, these systems empower individuals to believe in their ability to sustain behavioural changes, thereby strengthening self-management in health practices.

iv. Behavioural intention: Behavioural intention represents the motivational factor that indicates an individual's readiness to perform a specific health behaviour. AI systems influence behavioural intention through data-driven nudging and personalised communication strategies. Predictive analytics can determine when users are most receptive to behavioural cues and deliver targeted messages encouraging commitment to health goals (Feng et al., 2021). For example, AI wellness platforms can use sentiment analysis to gauge emotional states and adapt messages to promote stronger intention formation toward healthy living (Sun et al., 2022).

v. Actual behaviour: Actual behaviour reflects the execution of the intended action, influenced by prior constructs of attitude, subjective norms, and perceived control. AI technologies bridge the gap between intention and behaviour by ensuring constant engagement and monitoring. Wearable devices and mobile AI systems can record physical activities, dietary intake, and physiological responses, providing feedback loops that reinforce adherence to healthy routines (Topol, 2019). Through this interactive process, AI supports sustained behavioural execution and fosters long-term lifestyle transformation.

Use of Social Cognitive Theory in AI-Supported Habit Formation

In recent years, Artificial Intelligence (AI) has emerged as a strategic tool for operationalising these principles by creating adaptive environments that promote consistent behaviour repetition and habit formation. Through personalised feedback, goal setting, and behavioural modelling, AI systems replicate the learning mechanisms of SCT to encourage sustainable health habits such as regular exercise, balanced nutrition, and stress regulation. The first major construct of SCT includes:

i.Observational learning: This holds that individuals can acquire new behaviours by observing others' actions and the resulting outcomes (Bandura, 1986). AI platforms enhance this mechanism through interactive simulations, virtual avatars, and digital communities that model desired health behaviours. For example, AI-driven wellness applications can visualise lifestyle improvements through digital representations of users' potential progress, allowing them to witness the benefits of positive routines (Zhou et al., 2021). Furthermore, social AI platforms enable users to observe peers' success stories and health journeys, reinforcing vicarious motivation. This process of digitally mediated observation not only increases behavioural awareness but also bridges the gap between learning and actual performance.

ii. Self-efficacy: refers to an individual's belief in their capacity to perform specific behaviours successfully (Bandura, 1997). AI systems play a crucial role in strengthening self-efficacy through continuous performance monitoring, adaptive goal recommendations, and reinforcement learning. Intelligent coaching applications, for instance, use progress tracking to identify areas of improvement and deliver encouraging feedback that reinforces the user's sense of competence (Sun et al., 2022). Machine learning algorithms can also detect behavioural lapses and generate supportive prompts, helping users overcome psychological barriers such as low motivation or self-doubt. By promoting self-efficacy, AI fosters persistence and resilience qualities essential for sustained habit formation and behavioural maintenance.

***iii. Reinforcement*:** Another vital SCT construct, involves the use of rewards or feedback to strengthen desired behaviors (Bandura, 1991). AI-supported systems employ reinforcement strategies through digital rewards, achievement badges, and real-time feedback loops. For example, wearable devices and health applications provide instant

notifications when users meet fitness targets or dietary goals, reinforcing consistency and satisfaction (Bennett & Glasgow, 2020). Through reinforcement learning, AI systems adapt to user preferences, adjusting stimuli to maximize engagement and long-term adherence. Such responsive feedback mechanisms make behaviour repetition more rewarding, transforming intentional actions into habitual routines.

iv. Reciprocal determinism: This serves as interdependence between personal factors, behaviour, and the environment is embodied within AI-supported ecosystems. AI technologies function as both an environment and a behavioural mirror, continuously adapting to users' choices and influencing future decision-making patterns (Ajzen, 2020). For example, predictive analytics can anticipate behavioural lapses and introduce supportive interventions such as reminders or motivational messages. This dynamic feedback process exemplifies how AI sustains reciprocal interaction, fostering continuous learning and behaviour adaptation.

AI Application in Health Behaviour Modification

Artificial Intelligence (AI) has become a transformative force in health behaviour modification by enabling data-driven, personalised, and adaptive interventions that address individual differences in motivation, cognition, and behavioural readiness. Through advanced analytics, machine learning, and natural language processing, AI systems can model human behaviour, identify barriers to change, and deliver tailored interventions that enhance adherence and long-term outcomes (Topol, 2019). One of the most significant applications of AI in health behaviour modification includes:

i. ***Personalised health coaching:*** where AI-driven systems use predictive analytics and real-time monitoring to provide individualised feedback and recommendations. Digital health assistants such as chatbots, mobile apps, and wearable devices can analyse users' physiological data and behavioural patterns to create adaptive plans for activities such as diet regulation, exercise adherence, and stress management (Nahum-Shani et al., 2021). These systems employ reinforcement learning to adjust recommendations based on user responses, making interventions both dynamic and user-specific.

ii. Predictive behaviour analysis: helping healthcare professionals anticipate non-adherence, relapse, or risk behaviours before they occur. Machine learning algorithms can process large datasets including biometric readings, social media activity, and lifestyle inputs to predict which individuals are most likely to disengage from healthy routines (Coley et al., 2022). For instance, AI models can detect early signs of sedentary behaviour or emotional distress and prompt timely interventions through notifications or virtual counselling. Such predictive precision ensures that health promotion strategies move from reactive to proactive care.

iii. Behavioural reinforcement and motivation through the integration of gamification, virtual reality (VR), and feedback mechanisms. Intelligent systems use these tools to

maintain engagement, reward progress, and strengthen self-efficacy (Bennett & Glasgow, 2020). For example, gamified AI platforms in smoking cessation or weight management programmes provide real-time encouragement and progress tracking, replicating the motivational reinforcement typically found in human coaching. The emotional recognition capabilities of AI-powered systems further allow them to respond empathetically, thus supporting users' psychological needs and resilience.

iv. AI-facilitated habit formation and behavioural monitoring: where smart wearables and mobile applications continuously track activity levels, sleep patterns, or nutritional intake. These systems employ behavioural modelling algorithms based on theories such as the Social Cognitive Theory and the Health Belief Model to identify stages of behavioural change and deliver context-sensitive prompts (Naslund et al., 2020). AI-supported habit formation not only builds self-awareness but also fosters long-term consistency, an essential aspect of sustained health improvement.

Conclusion

Artificial Intelligence (AI) has evolved beyond a technological innovation to become an indispensable catalyst in reshaping health promotion and lifestyle modification. Its integration with behavioural change theories particularly the health belief model, the theory of planned behaviour, and social cognitive theory has transformed the conventional understanding of health behaviour from a static psychological construct to a dynamic, data-driven process. Through real-time data analytics, predictive modelling, and adaptive feedback systems, AI enables the precise translation of behavioural constructs into actionable interventions tailored to individuals' unique needs and motivations.Artificial Intelligence (AI) can promote healthy lifestyles when integrated with behavioural change theories. To maximize this potential, the following recommendations are proposed:

i. Healthcare technology developers and digital health companies should create AI-driven personal health assistants that provide real-time monitoring, personalised guidance, and reinforcement of healthy habits to support sustained lifestyle changes.
ii. Health institutions, AI developers, and data scientists should integrate multimodal behavioural data from wearables, mobile applications, social media, and environmental sensors to deliver context-aware and tailored health interventions.
iii. Programme designers, AI engineers, and public health educators should incorporate gamification, virtual reality, and emotionally responsive AI into health initiatives to enhance user engagement, motivation, and self-efficacy.
iv. Healthcare providers, digital health teams, and policymakers should employ AI to predict potential behavioural lapses or health risks and deliver timely, personalised prompts that enable proactive lifestyle management.
v. Researchers, behavioural scientists, and AI developers should embed behavioural change theories into AI systems with adaptive algorithms that continuously refine interventions, ensuring maximum adherence and long-term behavioural transformation.

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