

Persuasive Technologies Driving Adoption of Fitness and Wellness Applications

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Abstract:

In contemporary society, obesity and sedentary behaviour are quickly becoming health concerns. The subject of persuasive and behaviour change technology is constantly evolving, and it increasingly aims to affect people's attitudes and behaviours in the area of health and wellness. The field of health and wellness is seeing an increase in the use of persuasive technology (PT) to encourage and support users with various lifestyles and behavioural health issues to alter their attitudes and/or behaviours. In several areas of health and wellness, including boosting physical activity (PA) and mental wellness, there is mounting evidence that PT can be successful.

Recently, the focus of personal technology development has switched from creating products that strive to grab users' attention to creating products that enhance user wellbeing. Digital wellness technologies encourage users to engage in behaviours that are personally and socially beneficial, including health and wellbeing, by leveraging the same alluring properties of other persuasive apps. Mobile applications can employ persuasive technology to sway user behaviour. The primary shift is from devices that want to grab users' attention to those that want to enhance user wellbeing. The growing use of smartphones offers a tremendous deal of promise to help people change their behaviour in a positive way. As a result, this article assesses the efficacy of

PTs used to promote PA and identifies trends in the results, including the persuasive techniques utilized and how they were implemented, behavioural theories, and the technology tools that were used.

This study focuses on the possibility that persuasive technologies, particularly those created in accordance with ethical guidelines for digital wellness, can improve users' wellbeing.

Keywords: Persuasive Technologies, Fitness, Wellness, Application

Introduction:

Interactive systems called persuasive technology (PT) are made to encourage people to adopt positive behaviours for themselves and their community while avoiding negative ones. The application of PT with the goal of influencing and reinforcing desired behaviour and/or attitude is expanding in almost every aspect of health and wellness. Several PT have been developed in the last decade with the aim of influencing one or more areas of health and wellness[23].

It is obvious that our lives have become increasingly sedentary when we contrast them with those of earlier generations. Some people, for instance, are spending more time in settings that discourage physical activity (PA) and necessitate extended sitting. Sedentary behaviour is linked to a number of health issues, including obesity, diabetes, cancer, and cardiovascular illnesses[1].

These "persuasive technologies" were created in order to "develop new digital experiences that influence people". In this context, the term "persuasion" refers simply to the fact that these technologies can, when utilized effectively, affect users' behaviour. As numerous writers have emphasized, whether persuasive technology is ethically acceptable relies not just on the method of persuasion itself but also on the context and purpose of its employment[25].

The rise in mental health problems, particularly among younger individuals, is not a recent trend. Stress, anxiety, and depression (SAD) appear to be the most prevalent mental health conditions, with numbers for SAD symptoms in some groups reaching 74% for incapacitating stress, 28% for anxiety disorder, and 48% for depression[18].

With the help of big data and AI, numerous societal initiatives have been made to develop technologies that will aid, inspire, direct, and influence individuals to improve their lives and the world around them in a variety of ways, particularly those related to the SDGs. The technology is

known as persuasive technology (PT), and it is made to try and "change attitudes or behaviours or both." It is mostly used for behaviour change, which is defined as a temporary or permanent change in a person's behaviour, attitude, or other mental states from their previous states [18].

It is well established that making healthier lifestyle choices in respect to diet, exercise, dental care, stress management, and upholding social connections will improve overall quality of life and long-term health. The development of medical issues like obesity could be postponed or even prevented with the help of technologies that can effectively encourage long-term healthy decision-making, relieving financial strain on the conventional medical system[11].

Persuading change in the world of wearable computers can take the shape of health monitoring data, such blood sugar levels, and sensory input via visual and haptic output. Technology may promote change by rewarding beneficial behaviour in a variety of ways, including through the use of inspiring messages, eye-catching images, or points in a gaming system. Any solution intended to help users change their health behaviour must have motivation as a crucial component. While some users maintain active lifestyles, there is a significant requirement for external incentives and motives among the majority of inactive people[2].

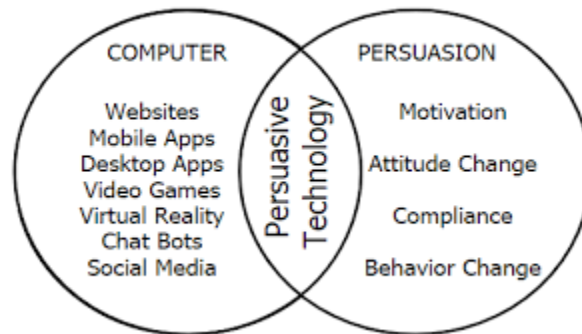


Figure 1: Persuasive Features Driving Fitness Applications

A threat to the whole populace, unhealthy lifestyles can result in a variety of diseases and health problems (such as poor diets and inactivity). Technology that is well-designed can intervene against unhealthy habits; a good user interface and information architecture can affect how people behave. Technologies that promote healthy living can change a user's mindset and behaviour, and this field is gaining more attention in both theory and practice[29].

It is important to recognize the expanding power of mobile health applications to inform, educate, and influence customers. Due to the nature of these systems, they may significantly affect individuals and communities that might not otherwise have access to adequate health education materials. We must make every effort to thoroughly comprehend how the resources currently available for mobile technology can be used to enhance people's welfare in order to guarantee that this developing field is developed to its fullest potential. Understanding the design

principles that affect the efficacy of persuasive technology is crucial for government 2 initiatives in particular[19].

The platforms that are most likely to change users' behaviour are those that deploy persuasive technology. A positive effect can be defined as any advantageous action the ultimate user makes as a result of the technology. Platforms for leading a fit and healthy lifestyle serve as prime instances of useful persuasive technology[26].

Literature Review:

In order to create successful fitness applications used social cognitive theory (SCT) persuasive technology. This is because the success of fitness apps depends on inspiring and encouraging users to engage in physical activity [3][10].

According to SCT, the interaction of cognitive, personal, and environmental variables is triadic, dynamic, and reciprocal in determining an individual's conduct. The theory holds that the individual's behaviour is predicted by self-efficacy, result expectations, sociostructural influences, and self-regulatory systems[3].

Therefore, effective fitness treatments should be able to stimulate the surroundings, support cognitive functions (self-efficacy, result expectations, and goals), and ultimately improve the behaviour of engaging in physical exercise. Design ideas from persuasive technology were used to successfully integrate these social and cognitive motivating tactics into fitness apps[10].

According to Fogg, persuasive technology is an interactive strategy intended to alter attitudes or behaviours or both. Forgg's approach offers a way to comprehend the persuasive technology design. In order to promote mobile app technology they adopted and adapted persuasive technology design concepts [10][30].

PT is used to encourage people to act in their best interests and in accordance with their personal goals (for example, to eat healthier). The scope of this work is expressly limited to situations

when individuals are not convinced by PT to behave in their own best interests (for example, to spend money on items they do not need).

The study focuses on situations in which a user would reasonably consent to both the PT's intended objectives (i.e., the target conduct) and the PT's intended means (i.e., the persuasive tools used to persuade the user to do the intended behaviour)[15].

The integration of a wellness intervention with social software that participants already use, such as Facebook, and shared their activity in the application with their existing contacts (their Facebook social network), as opposed to other intervention participants who they might not know in real life[21].

In a study on physical activity, they made participants' step counts available to other participants. They discovered that participants' motivation was affected by this sharing through both social pressure and social support. One advantage of the application was how it integrated behaviour tracking with social interactions[5].

Fitness applications can be used to boost a user's motivation, self-confidence, and physical activity while also providing a way for them to measure their progress toward certain goals.

Wellness Applications, or WAs, are software programs that encourage users to exercise more and control their weight in order to maintain a healthy lifestyle. Persuasive technology, a form of computer system intended to alter users' attitudes and behaviours, aims to influence people's thoughts and actions[22].

Result and Discussion : Apps and Persuasive Technologies

Wellness Applications in Mobile Phone

HAPIfork: It keeps track of the user's eating patterns and tries to get them to eat more slowly;

MyFitnessPal: A diet tracker and calorie counter app that encourages users to eat healthier and exercise more;

Sobriety Counter: This is an app that encourages users to give up drinking by showing them the money they will save by abstaining from alcohol or by presenting them with data on their body's health and how it will improve without alcohol.

GlowCap: This is a convincing medication adherence tool that comprises of a smart pill bottle and cap that flashes an orange light to remind users to take their medications;

MySugar: A diabetes management software called MySugr tracks users' blood sugar levels and offers them individualized diabetes coaching.

Wellness Applications and Persuasive Technologies

In the study paper titled "Wellness applications: Design guidelines to encourage physical activity," [22] described four of these programs, UbiFit, MOPET, Houston, and TripleBeat, as well as the persuasive strategies they utilize to encourage physical activity.

Table 1: Wellness Applications and Persuasive Technologies

| Wellness Applications | Supported Activities | Evaluated Persuasive Technologies | Remark |
|------------------------------|--|--|---|
| UbiFit | Walking, cycling, elliptical trainer, running, stair machine | Glanceable display | The application encouraged users to prioritize scheduling and making time for exercise. |
| MOPET | Jogging, fitness | 3D embodied agent | A 3D embodied agent's advice can assist the user in performing the exercise correctly, lowering the risk of injury. |
| Houston | Walking, running | Social sharing, competition | Houston is a prototype smartphone app that allows users to share their step count with friends in order to promote physical activity. |
| TripleBeat | Running | Competition, | TripleBeat aids users in reaching their |

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| | | glanceable display | fitness objectives. The training became more efficient because to the glanceable design, and the social aspects of the competition element were thought to be the main source of fun. |
|--|--|--------------------|--|

Wellness Wear System and Implementation of the Persuasive Techniques

The wellness wear system seeks to track users' levels of physical activity and heart health. Signals are captured and sent to the terminal while the user is at rest or working out. Mobile devices, such as smartphones and tablets, can serve as both software platforms and terminals for receiving and transmitting data. The software program analyzes the signals and other body parameters (such as height, weight, etc.) and offers the user real-time signal monitoring, immediate parameter feedback, and wellness recommendations. They also demonstrated the implementation of the persuading features supported by the wellness wear[20].

Persuasive Features supported by Wellness Wear System

Goal Setting:The number of steps is used as an activity goal in wellness wear system and is intended to be established and attained on a weekly basis.

Social Influence:Fitness competitions are used in wellness wear system to encourage physical activity.

Personal Awareness:With Wellness Wear, immediate HR and gait metrics during exercise are used to express feedback on physical activity. When users finish a single exercise session, they may also view the cumulative results.

Rewards:Rewards in wellness waer are intended to be won by moving closer to or achieving the goals. Users can check their prizes in the workout calendar, where various trophy types stand in for various goal achievement milestones. The exercise group that one person has joined shares the benefits earned.

Reminders:The wellness wear is made to offer suggestions and reminders for exercising. When it's almost time for their scheduled workout, users receive a reminder to get ready. Users are also given suggested weights (based on personal data) and advice on a fitness regimen and weight loss.

Entertainment:Music is used into the wellness wear to promote enjoyment and physical activity. The interactive program will start playing tunes while users are working out once this feature is enabled.

Game-Based Methods and Persuasive Technologies

Persuasive technologies are those that use technology to influence behaviour. In [9], looked into the use of persuasion technologies to promote a balanced diet and active lifestyle.

National Mindless Eating Challenge (NMEC), an online, customized healthy eating and weight loss program, was reported in [16]. Participants in the program received a personalized list of advice on how to improve their habits. The study came to the conclusion that gradual weight loss brought on by small lifestyle adjustments has the potential to be permanent. "OrderUp!" a game made to promote good health as an example of designing for cultural relevancy. The player owns a restaurant and can make meal recommendations to patrons based on their medical history. The player gains points for recommendations that are healthy and loses points for ones that are unhealthy[12].



Gamification is the process of using game mechanics and design principles to address relevant problems. Games are powerful tools for changing behaviour in the desired way. In general, the intention to do a behaviour or particular habit should be impacted in order to change it [8].

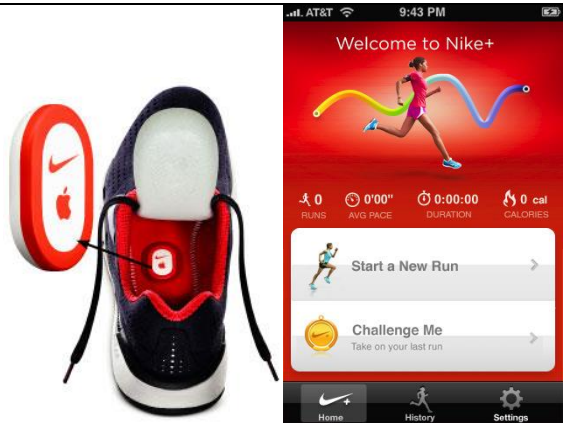
In this regard, [4] investigated how games can alter behaviour. According to the study, a game's success is based on how much enjoyment it can be played for. In a thorough mapping of gamification strategies for motivating students, [7] discovered that sociability, better learning, and challenge are the most prevalent strategies. For the Cure4Kids challenge, the game "Yummy Tricks" promoted a healthy diet [13]. The user gains experience through the game's goal-setting, challenges, problem-solving, and rules through an interactive process. With goal-based techniques, it reinforces good eating habits.

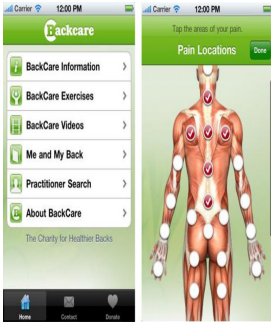

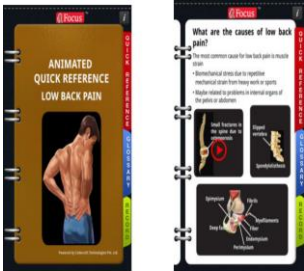
[31] concentrated on the topic of encouraging people with back pain to exercise in order to recover. Exercise has been shown to be superior to simple rest in a patient's recovery strategy, as well as to highlight the difference.

Table 2: Mobile Applications and Persuasive Technology Approach

| Name | Description | Persuasive Technology | Human Interface to Motivate the Users |
|------|-------------|-----------------------|---------------------------------------|
|------|-------------|-----------------------|---------------------------------------|

| | | Approach | |
|---|--|---------------------------------------|--|
| Molarcropolis (Soler, Zacarias, & Lucero, 2009) | A Mobile Persuasive Game to Promote Dental and Oral Health. In this scrolling platform puzzle game, the player must defend the oral environment from outside forces that seek to heal the mouth. three persuasive techniques are used to influence the target behaviour of improving oral health: 1) cause- and effect-simulation, 2) suggestion and 3) attractiveness | Mobile game for adolescence |  <p>Figure 1. The Molarcropolis interface. The interface illustrates</p> |
| Movipill (Oliveira, Cherubini, & Oliver, 2010) | Movipill is a mobile game that targets seniors and uses social competition to convince patients to take their medication as prescribed. | - Mobile Game - Social Competition |  |
| Persuasive Technology | Initille conducted research in 2004 | -Sensors | |

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| <p>on Healthy Aging (Initille, 2004)</p> | <p>on how to convey data from sensors linked to older people, such as posture, physical activity, and ambulation using an accelerometer, by utilizing the benefits of Just-In-Time messaging and behaviour change incentive. The cell phone is then used to run this information.</p> | <ul style="list-style-type: none"> - Just in time messaging - Behavior Change motivation | |
| <p>Nike + iPod</p> | <p>A sensor that is employed in the insole of the shoes and a mobile application that resides on the user's iPod or iPhone combine to make the Nike + iPod system. The application allows users to share their accomplishments with other users across the world and keep track of their running activity.</p> | <ul style="list-style-type: none"> - Sensors -Real time information - Social features |  |

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| <p>BackCare</p> | <p>BackCare is a free iOS mobile application that informs customers in the UK about Back Care. The information covers topics including general back care advice, back-care exercises, and how to find a doctor nearby.</p> | <p>-Mobile application - Informational -Videos on exercise -Location tracker</p> |   |
| <p>Animated Quick Reference for Low Back Pain</p> | <p>The Focus Animated Quick Reference series is a well-organized source of knowledge stuffed with data and facts that outline various conditions that influence the human body.</p> | <p>-Mobile application - Informational -Animated contents</p> |  |

Conclusions:

The mobile apps for health and wellness that affect behaviour are examined in this research. The goal of the study is to comprehend trends in these apps, the most popular behaviour modification tactics employed, and the degree to which such strategies are implemented in these apps. This study covers the literature on persuasive technology and m-healthcare at its conclusion.

This study has shown how a widespread public health problem may be solved and made more attractive to the public by using straightforward, generic persuasive techniques employed through a mobile application created to aid in their recovery.

This paper outlines the issues caused by physical inactivity and encourages the possible positive effects that so-called wellness applications for mobile phones may have on people's wellbeing. In order to provide insight into how computers can be used to modify people's attitudes and behaviours, persuasive technologies designed to alter people's behavior are described.

References:

- [1] AlSlaity, A., Suruliraj, B., Oyebode, O., Fowles, J., steeves, D., & Orji, R. (2022). Mobile Applications for Health and Wellness: A Systematic Review. *Proceedings of the ACM on Human-Computer Interaction*, 6(EICS), 1-29.
- [2] Ananthanarayan, S., & Siek, K. A. (2012, May). Persuasive wearable technology design for health and wellness. In *2012 6th International Conference on Pervasive Computing Technologies for Healthcare (PervasiveHealth) and Workshops* (pp. 236-240). IEEE.
- [3] Bandura, A. (1986) Social foundations of thought and action: A social cognitive theory. Prentice-Hall, Inc
- [4] Baranowski, T., Buday, R., Thompson, D., Lyons, E. J., Lu, A. S., & Baranowski, J. (2013). Developing games for health behavior change: Getting started. *GAMES FOR HEALTH: Research, Development, and Clinical Applications*, 2(4), 183-190.
- [5] Consolvo, S., Klasnja, P., McDonald, D. W., & Landay, J. A. (2009, April). Goal-setting considerations for persuasive technologies that encourage physical activity. In *Proceedings of the 4th international Conference on Persuasive Technology* (pp. 1-8).
- [6] De Oliveira, R., Cherubini, M., & Oliver, N. (2010, September). MoviPill: improving medication compliance for elders using a mobile persuasive social game. In *Proceedings of the 12th ACM international conference on Ubiquitous computing* (pp. 251-260).

- [7] De Sousa Borges, S., Durelli, V. H., Reis, H. M., & Isotani, S. (2014, March). A systematic mapping on gamification applied to education. In *Proceedings of the 29th annual ACM symposium on applied computing* (pp. 216-222).
- [8] Deterding, S., Sicart, M., Nacke, L., O'Hara, K., & Dixon, D. (2011). Gamification. using game-design elements in non-gaming contexts. In *CHI'11 extended abstracts on human factors in computing systems* (pp. 2425-2428).
- [9] Fadhil, A., Matteotti, C., Armellin, G., Villafiorita, A., & Betti, D. (2016, September). CoachMe: a platform for promoting healthy lifestyle. In *Proceedings of the 18th International Conference on Human-Computer Interaction with Mobile Devices and Services Adjunct* (pp. 1077-1080).
- [10] Fogg, B.J. (2002) Persuasive technology: using computers to change what we think and do. *Ubiquity*, 2002, 5
- [11] Fritz, T., Huang, E. M., Murphy, G. C., & Zimmermann, T. (2014, April). Persuasive technology in the real world: a study of long-term use of activity sensing devices for fitness. In *Proceedings of the SIGCHI conference on human factors in computing systems* (pp. 487-496).
- [12] Grimes, A., & Grinter, R. E. (2007). Designing persuasion: Health technology for low-income African American communities. In *Persuasive Technology: Second International Conference on Persuasive Technology, PERSUASIVE 2007, Palo Alto, CA, USA, April 26-27, 2007, Revised Selected Papers 2* (pp. 24-35). Springer Berlin Heidelberg.
- [13] Inglés-Camats, G., Presno-Rivas, M. M., Antonijoan, M., Garcia-Panella, O., & Forrest, T. (2012). Yummy tricks: a serious game for learning healthy eating habits. In *Advancing Cancer Education and Healthy Living in Our Communities* (pp. 185-190). IOS Press.
- [14] Intille, S. S. (2004). A new research challenge: persuasive technology to motivate healthy aging. *IEEE Transactions on information technology in Biomedicine*, 8(3), 235-237.
- [15] Jacobs, N. (2020). Two ethical concerns about the use of persuasive technology for vulnerable people. *Bioethics*, 34(5), 519-526.
- [16] Kaipainen, K., Payne, C. R., & Wansink, B. (2012). Mindless eating challenge: retention, weight outcomes, and barriers for changes in a public web-based healthy eating and weight loss program. *Journal of medical Internet research*, 14(6), e2218.
- [17] King, P., & Tester, J. (1999). The landscape of persuasive technologies. *Communications of the ACM*, 42(5), 31-38.

- [18] Kolenik, T., & Gams, M. (2021). Persuasive technology for mental health: One step closer to (Mental health care) equality?. *IEEE Technology and Society Magazine*, 40(1), 80-86.
- [19] Matthews, J., Win, K. T., Oinas-Kukkonen, H., & Freeman, M. (2016). Persuasive technology in mobile applications promoting physical activity: a systematic review. *Journal of medical systems*, 40, 1-13.
- [20] Meng, Y., Yi, S. H., & Kim, H. C. (2019). Health and wellness monitoring using intelligent sensing technique. *Journal of Information Processing Systems*, 15(3), 478-491.
- [21] Munson, S. A., Lauterbach, D., Newman, M. W., & Resnick, P. (2010). Happier together: integrating a wellness application into a social network site. In *Persuasive Technology: 5th International Conference, PERSUASIVE 2010, Copenhagen, Denmark, June 7-10, 2010. Proceedings 5* (pp. 27-39). Springer Berlin Heidelberg.
- [22] Olofsson, E. (2010). Wellness applications: Design guidelines to encourage physical activity. *USCCS 2010*, 111.
- [23] Orji, R., & Moffatt, K. (2018). Persuasive technology for health and wellness: State-of-the-art and emerging trends. *Health informatics journal*, 24(1), 66-91.
- [24] Qasim, M. M., Ahmad, M., Omar, M., Zulkifli, A. N., & Abu Bakar, J. A. (2018). Persuasive technology and mobile healthcare: A critical review. *Journal of Advanced Research in Dynamical & Control Systems*, 10(10), 1501-1513.
- [25] Specker Sullivan, L., & Reiner, P. (2021). Digital wellness and persuasive technologies. *Philosophy & Technology*, 34, 413-424.
- [26] Salutari, A. (2021). Persuasive technologies and digital wellness: Positive effects on end users' time management skills and overall productivity.
- [27] Soler, C., Zacarías, A., & Lucero, A. (2009, October). Molarcropolis: a mobile persuasive game to raise oral health and dental hygiene awareness. In *Proceedings of the international conference on advances in computer entertainment technology* (pp. 388-391).
- [28] Wang, Y., Wu, L., Lange, J. P., Fadhil, A., & Reiterer, H. (2018). Persuasive technology in reducing prolonged sedentary behavior at work: A systematic review. *Smart Health*, 7, 19-30.

- [29] Xu, J., Chen, P. Y., Uglow, S., Scott, A., & Montague, E. (2012). Design challenges and guidelines for persuasive technologies that facilitate healthy lifestyles. *Computer technology and application*, 3(2), 140.
- [30] Yoganathan, D., & Kajanan, S. (2013, June). Persuasive Technology for Smartphone Fitness Apps. In *PACIS* (p. 185).
- [31] Zeffree Kan, Z. K. (2012). Development of a mobile wellness application for back pain patients using persuasive technology.