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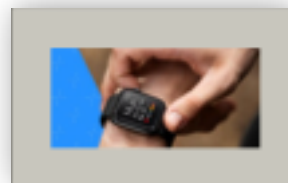
TASK 1- Blog 2 Entries

Blog 1: The Role of Wearable Devices in Promoting Physical Activity



The Growing Epidemic of Physical Inactivity

According to Adeloeye et al. (2022), physical inactivity is a growing public health issue that accounts for approximately 3.2 million deaths annually worldwide. Approximately 39% of adults in the UK do not participate in the recommended amount of physical activity, which raises the risk of cardiovascular diseases, diabetes, and certain cancers (Everest et al., 2022). Innovative approaches to promoting physical activity are required to combat the epidemic of sedentary living.



Fitbit Charge 5 as a Health Promotion Tool

The Fitbit Charge 5 has emerged as a popular health promotion tool. This advanced fitness tracker provides users with real-time feedback on their levels of physical activity by monitoring steps, heart rate, sleep patterns, and calories burned. The global market for wearable technology is expected to be worth \$118.16 billion by 2028, indicating widespread use (Jiang et al., 2024).

Effectiveness of Fitbit Charge 5 in Encouraging Physical Activity

Wearables like the Fitbit Charge 5 have been shown to effectively encourage physical activity. Silveira and Motl (2019) conducted a systematic review and found that wearable device users took an average of 1,800 more steps per day than non-users. Additionally,

Kitamura et al. (2024) found that participants who used fitness trackers, including the Fitbit Charge 5, increased their moderate-to-vigorous physical activity by 27% over six months.

Features and Benefits of Fitbit Charge 5

- ✚ **Real-Time Activity Tracking:** Monitors steps, heart rate, sleep patterns, and calories burned.
- ✚ **Daily Readiness Score:** Provides insights into when users should prioritize recovery or take on a more intense workout.
- ✚ **Stress Management:** Includes an EDA (electrodermal activity) sensor to monitor stress levels.
- ✚ **Built-In GPS:** Tracks outdoor activities like running or biking without needing a phone.
- ✚ **Health Metrics Dashboard:** Offers a detailed view of health metrics such as heart rate variability and skin temperature variation.

Challenges and Limitations of Wearable Devices

Despite its many benefits, there are concerns about the long-term impact of wearables like the Fitbit Charge 5 on behaviour change. While these devices provide immediate awareness and motivation, maintaining engagement remains challenging. According to a 2017 study by Kim and Lee, 30% of users abandon their devices within six months. Additionally, concerns about data privacy and the accuracy of some measurements persist (Hassandoust et al., 2021). Another issue is the accessibility of such devices; they are often out of reach for lower-income groups, which could exacerbate health disparities.



Addressing Health Disparities and Improving Long-term Engagement

A survey conducted by Lê and Trần found that wearable device ownership was 3.5 times higher in high-income groups than in low-income groups. To address these issues, developers should focus on enhancing long-term engagement through personalized goal-setting and social support features. Integrating devices like the Fitbit Charge 5 with healthcare systems could enhance their utility and credibility.

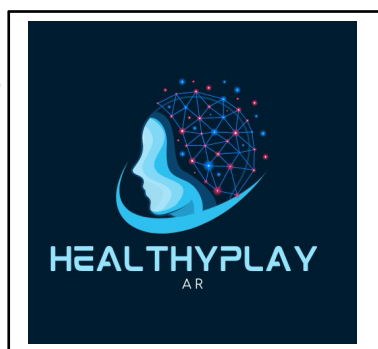
Ensuring Equitable Health Promotion

Efforts to make wearables more affordable and accessible to diverse populations are essential for equitable health promotion. In conclusion, while the full potential of devices like the Fitbit Charge 5 to promote physical activity has yet to be realized, these digital tools could significantly contribute to combating the global problem of physical inactivity by overcoming current limitations and becoming more widely available.

Blog 2: Innovative AR Technology to Combat Childhood Obesity

Rates of childhood obesity have tripled since the 1970s, making it a pressing public health issue. According to Skae, nearly a third of children aged 2 to 15 in the UK are overweight or obese. According to Gupta and Chen (2023), this epidemic raises the risk of a wide range of health issues, including mental health issues, heart disease, and type 2 diabetes. It could cost the NHS £9.7 billion annually by 2050.

App



"HealthyPlay AR," an innovative Augmented Reality (AR) mobile application, was designed by me to meet this challenge. Through engaging, gamified experiences, this app aims to promote nutrition education and physical activity among children aged 6 to 12 (Gkintoni et al., 2024).

Features



-  **Interactive Health Promotion:** HealthyPlay AR overlays interactive, health-promoting elements in the real world using smartphone cameras.

- 🧩 **Nutrition Quests:** In supermarkets, children can participate in "nutrition quests" to collect virtual fruits and vegetables, learning about healthy food choices.
- 🧩 **Outdoor Play Encouragement:** The app creates augmented reality obstacle courses in backyards or parks, promoting outdoor play and exercise.

Integration with Wearable Devices

The app works with wearable devices to track physical activity and gives achievements in the game to help you progress. It also has a dashboard for parents to monitor their children's activity and food choices, encouraging family participation in health promotion.



HealthyPlay AR has the potential to have a significant impact on health promotion. It could increase children's involvement in health-related activities by combining education and entertainment. The augmented reality (AR) technology makes nutrition education engaging and memorable, possibly leading to better food choices. To combat sedentary behaviour, the gamification of physical activity could encourage children to be more active.

Shortcomings

- 🧩 **Accessibility Issues:** Requires smartphones with augmented reality capabilities, potentially excluding lower-income families and increasing health disparities.
- 🧩 **Over-Reliance on Technology:** Risk of excessive reliance on technology for physical activity, potentially reducing non-tech-based outdoor play (Lyons, 2022).



Recommendations

To address these issues, access to AR-capable devices could be made available through partnerships with community centres and schools. The app could also include features that encourage social interaction in real life and activities that do not involve technology.

Conclusion

Even though HealthyPlay AR shows promise for innovative engagement in the fight against childhood obesity, careful implementation and ongoing evaluation will be necessary to guarantee its efficacy and accessibility to a variety of populations (White et al., 2023). We have the potential to make significant progress in promoting healthier lifestyles among children by harnessing the power of augmented reality technology.

References

- Adeloye, D., Ige-Elegbede, J.O., Auta, A., Ale, B.M., Ezeigwe, N., Omoyele, C., Dewan, M.T., Mpazanje, R.G., Agogo, E., Alemu, W. and Gadanya, M.A., 2022. Epidemiology of physical inactivity in Nigeria: a systematic review and meta-analysis. *Journal of Public Health*, 44(3), pp.595-605. Available at <https://academic.oup.com/jpubhealth/article-abstract/44/3/595/6274877>
- Everest, G., Marshall, L., Fraser, C. and Briggs, A., 2022. Addressing the leading risk factors for ill health. *The Health Foundation*. Accessed, 1. [https://www.drugsandalcohol.ie/36140/1/Risk%20factors Ill health.pdf](https://www.drugsandalcohol.ie/36140/1/Risk%20factors%20Ill%20health.pdf)
- Gkintoni, E., Vantaraki, F., Skoulidi, C., Anastassopoulos, P. and Vantarakis, A., 2024. Promoting physical and mental health among children and adolescents via gamification—A conceptual systematic review. *Behavioral Sciences*, 14(2), p.102. Available at <https://www.mdpi.com/2076-328X/14/2/102>
- Gupta, S. and Chen, M., 2023. Medical management of obesity. *Clinical Medicine*, 23(4), pp.323-329. Available at <https://www.sciencedirect.com/science/article/pii/S1470211824045780>
- Hassandoust, F., Akhlaghpour, S. and Johnston, A.C., 2021. Individuals' privacy concerns and adoption of contact tracing mobile applications in a pandemic: A situational privacy calculus perspective. *Journal of the American Medical Informatics Association*, 28(3), pp.463-471. Available at <https://academic.oup.com/jamia/article-abstract/28/3/463/5961440>
- Jiang, K., Liu, Y., Yu, Z. and Huang, Z., 2024. Effects of smartwatch usage on Children's street-crossing behaviour and visual attention allocation: An experimental study on street crossing in a real road environment. *Accident Analysis & Prevention*, 194, p.107364. Available at <https://www.sciencedirect.com/science/article/pii/S0001457523004116>
- Kim, B.Y. and Lee, J., 2017. Smart devices for older adults managing chronic disease: a scoping review. *JMIR mHealth and uHealth*, 5(5), p.e7141. Available at <https://mhealth.jmir.org/2017/5/e69/>
- Kitamura, M., Izawa, K.P., Nagasaki, T., Yoshizawa, T., Okamura, S., Fujioka, K., Yamaguchi, W. and Matsuda, H., 2024. Effects of self-monitoring using an accelerometer on physical activity of older people with long-term care insurance in Japan: a randomized controlled trial. *European Geriatric Medicine*, 15(2), pp.371-380. Available at <https://link.springer.com/article/10.1007/s41999-024-00935-w>

Lê, S.M. and Trần, Q.H., DIGITAL JOURNEY IN PRIMARY HEALTH CARE: EMPOWERING PATIENTS WITH NONCOMMUNICABLE DISEASES IN VIETNAM. Available at <https://documents1.worldbank.org/curated/en/099017103132412996/pdf/IDU1495e4a1f1e00c14c8d181a41127785dc9dfa.pdf>

Lyons, S., 2022. *Cooperative games in education: Building community without competition, Pre-K–12*. Teachers College Press. Available at <https://books.google.com/books?hl=en&lr=&id=ds9cEAAAQBAJ&oi=fnd&pg=PT11&dq=Health+play+app+requires+smartphones+with+AR+capabilities,+which+might+exclude+lower-income+families,+potentially+exacerbating+health+inequalities.+&ots=CXYK8bed&sig=bCm70Gomq-CgubzoaTwMIGwV6ok>

Silveira, S.L. and Motl, R.W., 2019. Activity monitor use among persons with multiple sclerosis: Report on rate, pattern, and association with physical activity levels. *Multiple Sclerosis Journal–Experimental, Translational and Clinical*, 5(4), p.2055217319887986. Available at <https://journals.sagepub.com/doi/abs/10.1177/2055217319887986>

Skae, M.S., STEMMING THE RISE IN CHILDHOOD OBESITY–RECOGNISING AND ADDRESSING THE CHALLENGES. Available at https://media.churchillfellowship.org/documents/Skae_M_Report_2019_Final.pdf

White, D.A., Layton, A.M., Curran, T., Gauthier, N., Orr, W.B., Ward, K., Vernon, M., Martinez, M.N., Rice, M.C., Hansen, K. and Prusi, M., 2023. EHealth technology in cardiac exercise therapeutics for pediatric patients with congenital and acquired heart conditions: a summary of evidence and future directions. *Frontiers in Cardiovascular Medicine*, 10, p.1155861. Available at <https://www.frontiersin.org/articles/10.3389/fcvm.2023.1155861/full>

TASK 2- Poster

Innovative AR Technology to Combat Childhood Obesity

BACKGROUND	Childhood obesity is a critical public health issue, with rates tripling since the 1970s. In the UK, nearly a third of children aged 2-15 are overweight or obese, risking health issues and potentially costing the NHS £9.7 billion annually by 2050 (von Stuenkel, 2021). According to Chai et al. (2022), previous interventions include school-based nutrition programs, community fitness initiatives, and digital solutions like fitness tracking apps and online games. HealthyPlay AR, the chosen intervention, is an innovative mobile application using Augmented Reality to promote physical activity and nutrition education among children aged 6-12 (Hajbath and McCloskey, 2022). Features include- ✦ "Nutrition quests" in supermarkets ✦ AR obstacle courses in parks or backyards ✦ Integration with wearable devices ✦ In-game rewards ✦ Parent dashboard for monitoring This app combines education with entertainment, making nutrition learning interactive and gratifying physical activity to address sedentary behaviour. By overlaying health-promoting elements onto the real world, HealthyPlay AR aims to increase children's engagement with health-related activities and motivate active lifestyles.
HEALTH PROMOTION VALUES AND PRINCIPLES	Health promotion values and principles include- 1. Empowerment: Enabling individuals to take control of their health 2. Participation: Involving people in decision-making about their health 3. Holistic approach: Addressing physical, mental, and social well-being 4. Equity: Ensuring fair access to health resources and information 5. Sustainability: Creating lasting change in health behaviour 6. Intersectoral collaboration: Involving multiple sectors in health promotion efforts HealthyPlay AR aligns with these principles in several ways- Empowerment: The app provides children with knowledge about nutrition and physical activity, empowering them to make healthier choices (Holmberg et al., 2018). Participation: According to Aarthus and Akerjordet (2014) through interactive quests and challenges, children actively participate in their health education and decision-making Holistic approach: Schoeppe et al. (2016) state that by combining nutrition education with physical activity promotion, the app addresses multiple aspects of health. Equity: The use of widely available smartphone technology could potentially reach a broad audience. However, efforts must be made to ensure access for lower-income families to avoid exacerbating health inequalities (Haynes et al., 2021). Sustainability: The game-like nature of the app and its integration with real-world activities could promote long-term engagement and sustainable behaviour change. Intersectoral collaboration: The app could facilitate collaboration between health sectors, education, and technology industries. However, the app's reliance on technology may pose equity challenges and could potentially reduce non-tech-based outdoor play. To address these issues- - According to LeMoine (2022), partnerships with schools and community centres could be established to provide access to AR-capable devices. - The app could incorporate features that encourage non-tech activities and real-world social interaction. - Continuous evaluation and adaptation of the app based on user feedback and health outcomes would be necessary to ensure it meets health promotion principles effectively (Michie et al., 2017).
ENVIRONMENTAL CONTEXT/THEORY	The Social Cognitive Theory (SCT), developed by Albert Bandura, is well-suited for the HealthyPlay AR intervention. According to Schunk and DiBenedetto (2020), SCT posits that learning occurs through dynamic interaction between person, environment, and behaviour. Key constructs include self-efficacy, outcome expectations, goal setting, and observational learning. HealthyPlay AR applies SCT principles- Self-efficacy: Boosted through gradual difficulty increases, immediate feedback, and progress visualization. Critical to tailor challenges to individual abilities. Outcome expectations: Shaped by demonstrating immediate benefits through in-game rewards and visualizing long-term health benefits. The balance between intrinsic and extrinsic motivators is crucial. Goal setting: Facilitated by allowing personal health goals, breaking them into smaller tasks, and tracking progress. The app should balance suggested goals with user autonomy. Observational learning: Promoted via virtual role models, social features for peer sharing, and parent involvement. Real-world social interactions should also be encouraged (Mazzucchelli, 2018). Environmental factors: Interacts with the environment through AR overlays in real settings and virtual obstacle courses. Should enhance, not replace, physical environment interaction. Behavioural capability: Amatozovska et al. (2018) state that enhanced by providing age-appropriate instructions and tutorials on healthy behaviours. Regular updates based on the latest guidelines are necessary. By leveraging these SCT constructs, HealthyPlay AR can create a comprehensive learning environment promoting sustained behaviour change. However, it should be part of a broader health promotion strategy involving families, schools, and communities. Continuous evaluation and refinement based on user feedback and health outcomes will optimize its effectiveness in promoting healthy behaviours among children.
EXPECTED OUTCOME	By applying Social Cognitive Theory through HealthyPlay AR, we anticipate several positive outcomes- 1. Increased health literacy: Children using the app are expected to demonstrate improved knowledge about nutrition and physical activity (Romeo et al., 2019). 2. Enhanced self-efficacy: Users should show increased confidence in their ability to make healthy food choices and engage in regular physical activity. 3. Behavior change: We anticipate seeing an increase in healthy food choices and physical activity levels among users, potentially leading to a reduction in BMI percentiles for overweight or obese children. 4. Sustained engagement: Kazianaki et al. (2016) state that the gamification elements and social features are expected to promote long-term use of the app, supporting sustained behaviour change. 5. Family involvement: Through the parent dashboard, we expect to see increased family engagement in health promotion activities. 6. Environmental awareness: Users may demonstrate increased awareness and utilization of local health-promoting resources like parks and healthy food options. However, it's crucial to note that outcomes may vary across different demographic groups. Factors such as socioeconomic status, cultural background, and initial health status could influence the app's effectiveness. Long-term studies will be necessary to confirm sustained behaviour change and health improvements. Additionally, potential negative outcomes, such as over-reliance on technology or reduced non-tech physical activity, should be monitored and addressed.
CONCLUSION	The HealthyPlay AR intervention has significant implications for child health promotion- Policy: Integrate digital health tools into obesity prevention strategies, develop ethical guidelines for AR use, and ensure equitable access across socioeconomic groups (Patalano et al., 2021). Education: Incorporate digital health literacy into school curricula, train healthcare providers and educators on AR tools, and launch public campaigns on balancing technology with traditional activities. Research: Conduct long-term studies on AR effectiveness, investigate unintended consequences, compare AR to traditional methods, and optimize design for diverse groups. In conclusion, HealthyPlay AR shows promise in combating childhood obesity through innovative engagement. Successful implementation requires collaboration across policy, education, and research domains. Ongoing evaluation and adaptation are crucial to harness this technology's potential while mitigating risks, ultimately improving children's health outcomes. The app's integration into broader health promotion strategies involving families, schools, and communities is essential for maximum impact.
REFERENCES	✦ von Stuenkel, S. 2021. Eye on Developments in Artificial Intelligence and Children's Rights: Artificial Intelligence in Education (AIEd), EdTech, Surveillance, and Harmful Content. <i>EdTech, Surveillance, and Harmful Content</i> (June 4, 2021). Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3882296 ✦ Chai, L.K., Toffetti, R., Fathi, E. and Littlewood, R. 2022. A rapid review of the impact of family-based digital interventions for obesity prevention and treatment on obesity-related outcomes in primary school-aged children. <i>Nutrients</i>, 14(22), p.4837. Available at https://www.mdpi.com/2072-6643/14/22/4837 ✦ Hajbath, L. and McCloskey, S. 2022. Play to promote mental health in children and youth. <i>Making play just right: Unleashing the power of play in occupational therapy</i>. Available at http://samples.blearning.com/9781284194654/9781284321319_CH12_MKT_Secured.pdf ✦ Holmberg, C., Larsson, C., Korp, P., Lindgren, E.C., Jonsson, L., Fröberg, A., Chaplin, J.E. and Berg, C. 2018. Empowering aspects for healthy food and physical activity habits: Adolescents' experiences of a school-based intervention in a disadvantaged urban community. <i>International Journal of Qualitative Studies on Health and Well-being</i>, 13(sup1), p.1487759. Available at https://www.tandfonline.com/doi/abs/10.1080/17482631.2018.1487759 ✦ Aarthus, A. and Akerjordet, K. 2014. Parent participation in decision making in health care services for children: an integrative review. <i>Journal of nursing management</i>, 22(2), pp.177-191. Available at https://onlinelibrary.wiley.com/doi/abs/10.1111/1365-2834.12102.01457.x ✦ Schoeppe, S., Alley, S., Van Loozevelde, W., Bray, N.A., Williams, S.L., Duncan, M.J. and Vandelande, C. 2016. Efficacy of interventions that use apps to improve diet, physical activity and sedentary behaviour: a systematic review. <i>International Journal of Behavioral Nutrition and Physical Activity</i>, 13, pp.1-26. Available at https://link.springer.com/article/10.1186/s12998-016-0454-4 ✦ Haynes, N., Entwistle, A., Nunes, K., Gurtis, E., Haynes, M. and Swain, J. 2021. "Can you see my screen?" Addressing racial and ethnic disparities in telehealth. <i>Current Cardiovascular Risk Reports</i>, 15, pp.1-9. Available at https://link.springer.com/article/10.1007/s12170-021-00885-5 ✦ Schunk, D.H. and DiBenedetto, M.K. 2020. Motivation and social cognitive theory. <i>Contemporary educational psychology</i>, 60, p.101832. Available at https://www.sciencedirect.com/science/article/pii/S0361476X19304370 ✦ Patalano, R., De Luca, V., Vogt, J., Blevy, S., Giovannelli, L., Camuga, G., Pivonello, C., Stresemann, V., Triassi, M., Colao, A. and Illario, M. 2021. An innovative approach to designing digital health solutions addressing the unmet needs of obese patients in Europe. <i>International Journal of Environmental Research and Public Health</i>, 18(2), p.579. Available at https://www.mdpi.com/1660-4601/18/2/579 ✦ Kazianaki, R., Marconi, A., Martini, A., Piore, M. and Valetto, G. 2016, September. A gamification framework for the long-term engagement of smart citizens. In <i>2016 IEEE International Smart Cities Conference (ISC2)</i> (pp. 1-7). IEEE. Available at https://ieeexplore.ieee.org/abstract/document/7580746/ ✦ Romeo, A., Edney, S., Plotnikoff, R., Curtis, R., Ryan, J., Sanders, I., Croxier, A. and Maher, C. 2016. Can smartphone apps increase physical activity? Systematic review and meta-analysis. <i>Journal of medical Internet research</i>, 21(3), p.e12053. Available at https://www.jmir.org/2019/3/e12053/ ✦ Annaboussou, U., O'CALLAGHAN, F.R.A.N.C.E.S. and Hamilton, K. 2018. Behaviour change techniques to facilitate physical activity in older adults: what and how. <i>Ageing & Society</i>, 38(12), pp.2590-2616. Available at https://www.cambridge.org/core/journals/ageing-and-society/article/behaviour-change-techniques-to-facilitate-physical-activity-in-older-adults/what-and-how/15CD9567E2B877C14612422D593667 ✦ Mazzucchelli, T.G. 2018. Social learning influences: Modelling, instructions, consequences. <i>Handbook of parenting and child development across the lifespan</i>, pp. 67-96. Available at https://link.springer.com/chapter/10.1007/978-3-319-94598-9_4 ✦ LeMoine, J. 2022. <i>XR in Health and Wellbeing: Establishing a New, Inclusive/Designed Participatory Practice using Augmented Reality Haptics to Support Teens and Young Adults with Autism Spectrum Disorder to Address Life Challenges</i> (Doctoral dissertation, University College Dublin. School of Mechanical and Materials Engineering). Available at https://researchrepository.ucd.ie/entities/publication/115056554636-4194-6734-638070145db7/details ✦ Michie, S., Yardley, L., West, R., Patrick, K. and Greaves, F. 2017. Developing and evaluating digital interventions to promote behaviour change in health and health care: recommendations resulting from an international workshop. <i>Journal of medical Internet research</i>, 19(6), p.e232. Available at https://www.jmir.org/2017/6/e232/

