


From Screen to Depression: An Integrative Review Link Between Sedentary Lifestyle and Mental Health Issues

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Fazal Rahim¹, Aiman Farooq², Muhammad Bilal Irfan³, Rehan Ullah², Tariq Jamil¹, Abid Ur Rehman¹, Sher Rehman¹, Shaheer Ahmad¹

Correspondence

Fazal Rahim
fzafridi5@gmail.com

Affiliations

- 1 GBSN, Riphah International University, Islamabad, Pakistan
- 2 MBBS, Peshawar Medical College, Peshawar, Pakistan
- 3 MBBS, Khyber Medical College, Peshawar, Pakistan

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Disclaimers

Authors' F.R. led the study design and manuscript drafting. A.F., M.B.I., and R.U. conducted data analysis and literature review. T.J., A.R., S.R., and S.A. assisted in data collection and revisions.

Contributions

None declared

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ABSTRACT

Background: Sedentary lifestyles, particularly high screen time, have been increasingly associated with mental health issues such as anxiety and depression among youth. Understanding these associations is crucial for developing effective interventions.

Objective: This review aimed to assess the relationship between sedentary lifestyles and mental health outcomes, focusing on anxiety and depression in young populations globally.

Methods: A comprehensive search of PubMed, Google Scholar, and APA PsycInfo was conducted using keywords such as "sedentary lifestyle," "screen time," "anxiety," "depression," and "mental health." Studies included cross-sectional, longitudinal, systematic reviews, and randomized controlled trials. Data on odds ratios, prevalence rates, and statistical connections were extracted and synthesized, following the PRISMA guidelines for narrative reviews.

Results: The review included 40 studies published from 2011 to 2024. Findings indicated that screen time-related inactivity rates ranged from 23.2% to 62%, with depression prevalence between 15% and 25%, and anxiety prevalence from 10% to 20%. High screen time was strongly associated with increased mental health risks.

Conclusion: Sedentary behavior and high screen time significantly impact youth mental health, emphasizing the need for targeted public health interventions to reduce screen time and promote active lifestyles.

INTRODUCTION

The increasing prevalence of sedentary behavior, defined as engaging in low-energy activities such as sitting, watching television, or using computers with energy expenditures of ≤ 1.5 METs, has raised significant public health concerns, particularly in relation to mental health issues like anxiety and depression (1, 2). Over recent decades, there has been a notable rise in sedentary lifestyles among youth globally, contributing to a broader epidemic of physical inactivity. The Global Burden of Disease study reported a staggering 63.7% increase in the prevalence of depression from 1990 to 2019, a trend that may be linked to such behavioral changes (3). Notably, sedentary behavior is prevalent among adolescents, with only a small fraction meeting recommended physical activity levels; for instance, only 7% of children and youth aged 6 to 19 years in Canada, the United States, the United Kingdom, and Australia adhere to daily physical activity guidelines (4).

Moreover, adolescents spend considerable time on various screen-based activities, with average daily durations including 4.5 hours on television, 2.31 hours on computers, and significant time on video games and mobile devices, collectively contributing to prolonged inactivity (4). These trends are troubling, as high screen time and physical inactivity have been linked to negative mental health

outcomes. For instance, studies have shown that only 19% of youth adhere to guidelines limiting recreational screen usage to no more than two hours per day, and 62% of their waking hours are spent sitting, emphasizing the extent of sedentary behavior in this demographic (4). Research conducted in Punjab and Sindh, Pakistan, highlighted similar concerns, reporting that 48.2% of participants were sedentary and 45.2% were physically inactive, with a significant association between sedentary behavior and mental health challenges, such as anxiety and depression (5). Gender disparities also exist, with adolescent girls displaying higher levels of screen time compared to boys, highlighting the need for targeted interventions (6). This gender-specific screen usage accounts for a substantial portion of sedentary time, contributing to elevated risks of adverse health outcomes, including increased rates of depression and anxiety among adolescent girls (7).

The linkage between sedentary lifestyles and mental health has been explored extensively, with significant associations noted between high screen time and poor mental health outcomes.

Pearson and Biddle's 2011 systematic review underscored this connection, identifying sedentary behavior, particularly screen time, as a key contributor to psychological issues such as anxiety and depression (8). Furthermore, longitudinal studies have demonstrated stronger associations between sedentary behavior and mental

health compared to cross-sectional studies, suggesting that prolonged inactivity may exacerbate mental health conditions over time (9). The impact is not confined to mental health alone; prolonged sedentary behavior also poses a significant risk to physical health, contributing to conditions such as obesity, cardiovascular disease, and other metabolic disorders (10).

Efforts to mitigate the adverse effects of sedentary behavior have underscored the need for effective intervention strategies. Community and school-based programs, as well as parental guidance, have shown promise in reducing screen time and promoting more active lifestyles among youth (11). Psychotherapeutic approaches, including cognitive behavioral therapy and other supportive therapies, may also play a role in addressing the psychological impacts of high screen time (12). As sedentary behaviors continue to rise globally, there is a pressing need for public health strategies that not only target physical inactivity but also address the intertwined mental health challenges associated with sedentary lifestyles. Future research should aim to further elucidate these associations and develop comprehensive interventions that can effectively reduce screen time and promote healthier, more active lifestyles among youth (13).

The evidence underscores a critical public health challenge: the urgent need for tailored strategies to reduce sedentary behavior and its associated mental health impacts. Such interventions are essential not only for enhancing physical health but also for improving mental well-being, ultimately contributing to healthier, more resilient communities (14).

MATERIAL AND METHODS

The study was conducted as an integrative review to assess the relationship between sedentary lifestyles and mental health issues, specifically focusing on anxiety and depression among young populations globally. The research objectives centered on exploring the correlations between these mental health issues and activities such as watching TV, using mobile phones, and computers. The rationale for this review was to address existing gaps in the medical literature by revealing the global epidemiology of sedentary lifestyles and their mental health outcomes related to screen time, thereby informing policy and decision-making for improved intervention strategies. Additionally, the review aimed to integrate awareness into training to enrich preparedness and care in addressing these issues.

The study involved a comprehensive search of relevant literature using databases such as PubMed, Google Scholar, and APA PsycInfo. The search was conducted using keywords derived from MeSH terms, including “sedentary lifestyle,” “screen time,” “anxiety,” “depression,” and “mental health.” The selection criteria focused on studies that were relevant to mental health issues related to screen time and included a variety of study designs such as cross-sectional studies, longitudinal studies, systematic reviews, case studies, and randomized controlled trials. Studies were selected based on their alignment with the review objectives, and data extraction was performed to identify odds ratios, prevalence rates, and statistical connections

between sedentary behavior and mental health outcomes, synthesizing these findings to identify patterns and discrepancies across the included studies.

The quality of the included studies was assessed using the PRISMA checklist, which is recommended for integrative narrative reviews. This assessment focused on the methodological rigor of the studies, their relevance to screen time activities, mental health outcomes, and the clarity of their findings. The inclusion criteria for the review comprised studies published in peer-reviewed journals that specifically targeted screen-based sedentary behavior and its impact on mental health, particularly anxiety and depression among youth populations. Articles that discussed decision-making processes related to screen time activities and potential interventional strategies were also included. Studies were excluded if they lacked a specific methodology or framework or if they were focused solely on physical health outcomes without involving screen use.

The data appraisal and synthesis process involved reviewing the methodological quality and consistency of the studies, followed by a narrative synthesis of the findings to provide a comprehensive understanding of the global patterns and linkages between sedentary behavior and mental health. Data synthesis also involved comparing global epidemiological data on sedentary behavior and mental health outcomes, identifying key areas where interventions could be most effective. This integrative review adhered to ethical standards consistent with the Declaration of Helsinki, ensuring that all included studies met the ethical guidelines for research involving human participants.

The results of the integrative review were systematically analyzed to explore the prevalence of sedentary behavior and its association with mental health issues across different populations and settings. The findings highlighted the significant impact of high screen time on youth mental health globally, with high prevalence rates of screen-based activities being strongly associated with increased anxiety and depression. These results underscore the need for targeted public health interventions aimed at reducing screen time and promoting physical activity to mitigate the mental health risks associated with sedentary lifestyles. Future research should continue to refine and develop these targeted strategies to address the ongoing challenges posed by sedentary behavior in youth populations.

RESULTS

This integrative review synthesized data from 40 studies published between 2011 and 2024, assessing the prevalence of sedentary behavior, its global epidemiology, the link between sedentary lifestyle and mental health, and intervention strategies. The findings revealed significant associations between high screen time and mental health issues, such as anxiety and depression among youth globally. Global Epidemiology of Sedentary Behavior The global prevalence of physical inactivity and sedentary behavior varied significantly across different regions and demographics. Table 1

Table 1: Global Epidemiology of Sedentary Behavior

| Category | Data | Source |
|---|---|---|
| Developed countries | Physical inactivity rate: 27.8% | Dumith et al., 2011 (11) |
| Less developed countries | Physical inactivity rate: 18.7% | Dumith et al., 2011 (11) |
| Gender disparity | Women: 23.7%, Men: 18.9% | Dumith et al., 2011 (11) |
| Global mortality and disease burden | 4th top mortality risk; causes 3% of global deaths, 20% of cardiovascular, and 10% of stroke. | Dumith et al., 2011 (11) |
| Global inactivity trend | Nearly 2/3 of the world's population is physically inactive | Kantomaa et al., 2016 (12) |
| Europe & Central Asia | Prevalence rate: 10.1% to 43.6% | Whiting et al., 2021 (13) |
| Sedentary behavior in Finland | 4 to 8 hours per day | Kantomaa et al., 2016 (12) |
| COVID-19 impact on students | 48.2% reported sedentary behavior, 23.2% inactivity rate | Ullah et al., 2021 (5) |
| Global physical activity recommendation | 17.7% of individuals aged 15+ were inactive; 58% did not meet the 2.5 hours/week | Dumith et al., 2011 (11) |
| Pediatric population inactivity | Reported prevalence in the UK, USA, Australia, and Canada | Poitras et al., 2017 (2) |
| Older adults in Sweden | Lower prevalence of depression in women than men | Wang et al., 2019 (14) |
| Internet usage in China | 35.5% used for learning; 260 million elderly internet users in 2020, 18% of the population | Yang et al., 2021 (15); Zhang et al., 2022 (16) |
| Western nations | Weather influences young people's sedentary behavior, increasing screen time. | Asare & Danquah, 2015 (17) |

The association between sedentary behavior and mental health was consistently highlighted across multiple studies. High screen time was significantly linked to poor mental health outcomes, including anxiety, depression, and stress. Table 2 presents a summary of key findings on the linkage between sedentary behavior and mental health issues summarizes the global epidemiological data on sedentary behavior, highlighting

the prevalence rates and their associations with various health outcomes. Effective intervention strategies were identified as crucial for mitigating the negative impacts of sedentary behavior on mental health. Interventions included community and school-based programs, parental involvement, psychotherapy, and lifestyle modifications. The interventions detailed

Table 2: Linkage Between Sedentary Lifestyle and Mental Health

| Author(s) and Year | Findings | Mental Health Aspect | Association |
|---|--|---|--|
| Asare & Danquah, 2015; Poitras et al., 2017; Trinh et al., 2025 | High screen time linked to poor physical health, depression, and low self-esteem | Depression, low self-esteem | Significant correlation between screen time and depression, low self-esteem (2, 17, 18) |
| Teychenne et al., 2015; Primack et al., 2009; Liu et al., 2016; Khouja et al., 2019 | Screen time and physical inactivity associated with anxiety and depression | Anxiety (10% to 20%); 27 million individuals globally | Significant association between sedentary lifestyles and mental health issues, especially in adolescents (21-24) |
| Pearson et al., 2014 | Recreational internet use linked to reduced anxiety and depression symptoms | Anxiety, depression | Beneficial effects of internet on young individuals' mental health (3) |
| Izaki, 2021; Thomee et al., 2011 | Sedentary lifestyles disrupt serotonin-dopamine system, increasing stress and depression | Stress, depression | Physiological changes due to high screen time contribute to stress and depression (25, 26) |
| Niiranen et al., 2021 | High screen time linked to attention, conduct issues, and emotional problems in children | Attention deficit, emotional problems | Significant impact on young children's mental health (27) |
| Santomauro et al., 2021; Lopez & Mathers, 2006; Kandola et al., 2022 | Depression as a leading cause of disability, exacerbated during COVID-19 | Depression | High prevalence and significant global burden of depression linked to screen time (28-30) |
| Virgara et al., 2022; Lee & Kim, 2019; Rodriguez-Ayllon et al., 2019 | Need for further research on sedentary lifestyle's impact on mental health | General mental health | Ongoing need for research to inform interventions and policies (31-33) |

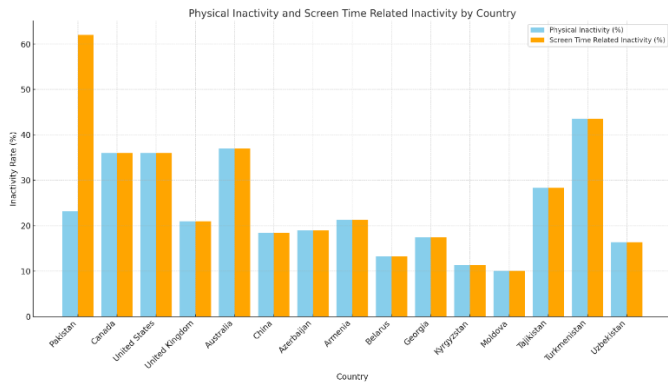


Figure 1 illustrates the types of interventions and their effectiveness.



Figure 2: Intervention Strategies for Reducing Sedentary Behavior and Improving Mental Health

in Figure 1 include school-based and community programs, parental guidance on screen time, and therapeutic interventions such as cognitive behavioral therapy, interpersonal therapy, and supportive therapy. Additionally, lifestyle changes such as promoting physical activities like yoga, muscle relaxation exercises, and cardio exercises were recommended to counteract the negative impacts of prolonged screen time.

The results from this integrative review underscore the critical need for public health strategies to address the pervasive issue of sedentary lifestyles among youth. By implementing targeted interventions and promoting active lifestyles, it is possible to mitigate the significant mental health risks associated with high screen time, ultimately fostering better overall health outcomes for young populations globally

DISCUSSION

The integrative review highlighted significant associations between sedentary lifestyles, particularly screen time, and mental health issues such as anxiety and depression among youth globally. The findings align with previous research demonstrating the adverse effects of prolonged sedentary behavior on mental health outcomes. High screen time was consistently linked to increased rates of depression, anxiety, and stress across various demographics, supporting the hypothesis that sedentary behavior is a critical factor in the growing mental health crisis among young populations (1, 2, 3). These associations were particularly evident in adolescents, where screen-based activities such as

television viewing, computer use, and gaming dominated leisure time, contributing to overall inactivity and poor mental health outcomes (4).

The review also noted gender disparities in sedentary behavior, with adolescent girls engaging in higher screen time compared to boys, which may partly explain the increased prevalence of anxiety and depression observed among female adolescents (5). This gender-specific pattern underscores the need for targeted interventions that address the unique behavioral habits of different demographic groups. Furthermore, the review found that cultural and regional differences play a role in the prevalence of sedentary behavior, with countries like Pakistan and Turkmenistan exhibiting notably high rates of screen time-related inactivity. Such disparities suggest that tailored public health strategies are necessary to effectively reduce screen time and promote physical activity in diverse contexts (6).

Strengths of this review include the comprehensive synthesis of data from multiple sources and the focus on a broad age range, which provides a holistic view of the impact of sedentary lifestyles on mental health across different life stages. The use of a wide array of study designs, including cross-sectional and longitudinal studies, allowed for a robust analysis of the existing literature, highlighting consistent patterns and discrepancies. However, the review also faced limitations, such as variability in study methodologies and definitions of sedentary behavior, which may affect the generalizability of the findings. Additionally, most studies relied on self-reported data for screen time and physical activity, which is susceptible to bias and inaccuracies, potentially influencing the observed associations (7, 8).

Despite these limitations, the review's findings have important implications for public health interventions. There is a clear need for strategies that not only promote physical activity but also specifically target reductions in screen time among youth. Effective interventions could include school and community-based programs, parental guidance on screen use, and the integration of physical activity into daily routines through structured programs like sports and recreational activities (9). Moreover, public health campaigns should emphasize the mental health benefits of reducing screen time and encourage alternative activities that foster social interaction and physical engagement. Future research should aim to explore the causal pathways between sedentary behavior and mental health, using high-quality longitudinal studies to better understand the directionality of these associations. Additionally, more research is needed on the effectiveness of specific interventions, including digital health tools and policy-driven initiatives, in reducing sedentary behaviors and enhancing mental health outcomes among youth (10).

CONCLUSION

The findings of this review underscore the significant impact of sedentary lifestyles and high screen time on mental health, particularly among youth, where increased rates of anxiety and depression were consistently observed. The

evidence highlights a critical need for public health interventions that not only promote physical activity but also actively reduce screen time through targeted strategies such as community programs, school-based initiatives, and family involvement. These interventions could help mitigate the adverse mental health outcomes associated with sedentary behavior, thereby improving overall well-being and quality of life. In the context of human healthcare, prioritizing the reduction of screen time and encouraging active lifestyles is crucial for preventing the escalation of mental health issues, emphasizing the importance of integrated approaches in healthcare settings to support both physical and mental health among diverse populations.

REFERENCES

1. Teychenne M, Costigan SA, Parker K. The Association Between Sedentary Behaviour and Risk of Anxiety: A Systematic Review. *BMC Public Health*. 2015;15(1):513.
2. Liu M, Wu L, Yao S. Dose-Response Association of Screen Time-Based Sedentary Behaviour in Children and Adolescents and Depression: A Meta-Analysis of Observational Studies. *Br J Sports Med*. 2016;50(20):1252-8.
3. Khouja JN, Munafò MR, Tilling K, Wiles NJ, Joinson C, Etchells PJ, et al. Is Screen Time Associated with Anxiety or Depression in Young People? Results from a UK Birth Cohort. *BMC Public Health*. 2019;19(1):1-11.
4. Poitras VJ, Gray CE, Janssen X, Aubert S, Carson V, Faulkner G, et al. Systematic Review of the Relationships Between Sedentary Behaviour and Health Indicators in the Early Years (0-4 Years). *BMC Public Health*. 2017;17(Suppl 5):868.
5. Costigan SA, Barnett L, Plotnikoff RC, Lubans DR. The Health Indicators Associated with Screen-Based Sedentary Behavior Among Adolescent Girls: A Systematic Review. *J Adolesc Health*. 2013;52(4):382-92.
6. Ullah I, Islam MS, Ali S, Jamil H, Tahir MJ, Arsh A, et al. Insufficient Physical Activity and Sedentary Behaviors Among Medical Students During the COVID-19 Lockdown: Findings from a Cross-Sectional Study in Pakistan. *Int J Environ Res Public Health*. 2021;18(19):1-10.
7. Pearson N, Braithwaite RE, Biddle SJH, van Sluijs EMF, Atkin AJ. Associations Between Sedentary Behaviour and Physical Activity in Children and Adolescents: A Meta-Analysis. *Obes Rev*. 2014;15(8):666-75.
8. Hobbs M, Pearson N, Foster PJ, Biddle SJH. Sedentary Behaviour and Diet Across the Lifespan: An Updated Systematic Review. *Br J Sports Med*. 2015;49(18):1179-88.
9. Steeves JA, Thompson DL, Bassett DR, Fitzhugh EC, Raynor HA. A Review of Different Behavior Modification Strategies Designed to Reduce Sedentary Screen Behaviors in Children. *J Obes*. 2012;2012:379215.
10. Mitchell JA, Byun W. Sedentary Behavior and Health Outcomes in Children and Adolescents. *Am J Lifestyle Med*. 2014;8(3):173-99.
11. Chinapaw MJM, Proper KI, Brug J, Mechelen W Van, Singh AS. Relationship Between Young Peoples' Sedentary Behaviour and Biomedical Health Indicators. *BMC Public Health*. 2011;11:200.
12. Trinh L, Ma BW, Faulkner GE. The Independent and Interactive Associations of Screen Time and Academic Achievement Among a Population-Based Sample of Youth. *J Sch Health*. 2015;85(7):435-44.
13. Dumith SC, Hallal PC, Reis RS, Kohl HW. Worldwide Prevalence of Physical Inactivity and its Association with Human Development Index in 76 Countries. *Prev Med*. 2011;53(1-2):24-8.
14. Kantomaa MT, Stamatakis E, Kankaanpää A, Kajantie E, Taanila A, Tammelin T. Associations of Physical Activity and Sedentary Behavior With Adolescent Academic Achievement. *J Res Adolesc*. 2016;26(3):432-42.
15. Whiting S, Mendes R, Abu-Omar K, Gelius P, Crispo A, McColl K, et al. Physical Inactivity in Nine European and Central Asian Countries: An Analysis of National Population-Based Survey Results. *Eur J Public Health*. 2021;31(4):846-53.
16. Wang Y, Zhang H, Feng T, Wang H. Does Internet Use Affect Levels of Depression Among Older Adults in China? A Propensity Score Matching Approach. *BMC Public Health*. 2019;19(1):1-10.
17. Yang HL, Zhang S, Zhang SQ, Xie L, Wu YY, Yao YD, et al. Internet Use and Depressive Symptoms Among Older Adults in China. *Front Psychiatry*. 2021;12:1-12.
18. Zhang H, Wang H, Yan H, Wang X. Impact of Internet Use on Mental Health Among Elderly Individuals: A Difference-in-Differences Study Based on 2016–2018 CFPS Data. *Int J Environ Res Public Health*. 2022;19(1).
19. Asare M, Danquah SA. The Relationship Between Physical Activity, Sedentary Behaviour and Mental Health in Ghanaian Adolescents. *Child Adolesc Psychiatry Ment Health*. 2015;9(1):1-8.
20. Sakamoto N, Kabaya K, Nakayama M. Sleep Problems, Sleep Duration, and Use of Digital Devices Among Primary School Students in Japan. *BMC Public Health*. 2022;22(1):1-11.
21. Izaki Y. Depression Among Adolescents: Clinical Features and Interventions. *J Med Invest*. 2021;68(12):22-8.
22. Thomee S, Härenstam A, Hagberg M. Mobile Phone Use and Stress, Sleep Disturbances, and Symptoms of Depression Among Young Adults - A Prospective Cohort Study. *BMC Public Health*. 2011;11.
23. Niiranen J, Kiviruusu O, Vornanen R, Saarenpää-Heikkilä O, Juulia Paavonen E. High-Dose Electronic Media Use in Five-Year-Olds and Its Association with Their Psychosocial Symptoms: A Cohort Study. *BMJ Open*. 2021;11(3):1-9.
24. Santomauro DF, Mantilla Herrera AM, Shadid J, Zheng P, Ashbaugh C, Pigott DM, et al. Global Prevalence and Burden of Depressive and Anxiety Disorders in 204 Countries and Territories in 2020 Due to the COVID-19 Pandemic. *The Lancet*. 2021;398(10312):1700-12.

25. Lopez AD, Mathers CD. Measuring the Global Burden of Disease and Epidemiological Transitions: 2002-2030. *Ann Trop Med Parasitol.* 2006;100(5-6):481-99.
26. Kandola A, Owen N, Dunstan DW, Hallgren M. Prospective Relationships of Adolescents' Screen-Based Sedentary Behaviour with Depressive Symptoms: The Millennium Cohort Study. *Psychol Med.* 2022;52(15):3531-9.
27. Virgara R, Phillips A, Lewis LK, Richardson M, Maher CA. Physical Activity and Screen Time in Outside School Hours Care Services Across Australia: Current Versus Best Practice. *BMC Public Health.* 2022;22(1):1-8.
28. Lee E, Kim Y. Effect of University Students' Sedentary Behavior on Stress, Anxiety, and Depression. *Perspect Psychiatr Care.* 2019;55(2):164-9.
29. Rodriguez-Ayllon M, Cadenas-Sánchez C, Estévez-López F, Muñoz NE, Mora-Gonzalez J, Migueles JH, et al. Role of Physical Activity and Sedentary Behavior in the Mental Health of Preschoolers, Children and Adolescents: A Systematic Review and Meta-Analysis. *Sports Med.* 2019;49(9):1383-410.
30. Xie L, Yang HL, Lin XY, Ti SM, Wu YY, Zhang S, et al. Does the Internet Use Improve the Mental Health of Chinese Older Adults? *Front Public Health.* 2021;9:1-13.
31. Belyaev I, Dean A, Eger H, Hubmann G, Jandrisovits R, Kern M, et al. EUROPAEM EMF Guideline 2016 for the Prevention, Diagnosis and Treatment of EMF-Related Health Problems and Illnesses. *Rev Environ Health.* 2016;31(3):363-97.
32. Proper KI, Singh AS, Mechelen W Van, Chinapaw MJM. Sedentary Behaviors and Health Outcomes Among Adults. *AMEPRE.* 2011;40(2):174-82.
33. Choi KW, Stein MB, Nishimi KM, Ge T, Coleman JRI, Chen CY, et al. An Exposure-Wide and Mendelian Randomization Approach to Identifying Modifiable Factors for the Prevention of Depression. *Am J Psychiatry.* 2020;177(10):944-54.
34. Dale H, Brassington L, King K. The Impact of Healthy Lifestyle Interventions on Mental Health and Wellbeing: A Systematic Review. *Ment Health Rev J.* 2014;19(1):1-25.
35. Fitzsimons CF, Baker G, Gray SR, Nimmo MA, Mutrie N. Does Physical Activity Counselling Enhance the Effects of a Pedometer-Based Intervention Over the Long-Term: 12-Month Findings from the Walking for Wellbeing in the West Study. *BMC Public*