



## Patients' Perceptive on Sedentary Lifestyle: Impact of Lifestyle Modification in Hypertension Management

Shobana M<sup>1</sup>, Jenefa Melcy M<sup>2\*</sup>, Jagath M D<sup>3</sup>

1. Assistant Professor, Department of Pharmaceutics, Cherraaan's College of Pharmacy, 521 Siruvani Main Road, Telungupalayam Pirivu, Coimbatore-641039, Tamil Nadu, India.

2. Doctor of Pharmacy, Cherraaan's College of Pharmacy, 521 Siruvani Main Road, Telungupalayam Pirivu, Coimbatore-641039, Tamil Nadu, India.

3. Doctor of Pharmacy, Cherraaan's College of Pharmacy, 521 Siruvani Main Road, Telungupalayam Pirivu, Coimbatore-641039, Tamil Nadu, India.

\*Corresponding author's E-mail: [michaelsenefa02@gmail.com](mailto:michaelsenefa02@gmail.com)

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### ABSTRACT

**Background:** One of the main causes of the worldwide increase in chronic metabolic symptoms like hypertension is sedentary lifestyles. This study aims to investigate how patients view the effects of sedentary behavior and the role that lifestyle changes play in controlling hypertension. Patients' perceptions of a sedentary lifestyle are examined through questionnaires and qualitative interviews. This study compares the likelihood that sedentary and active individuals will be able to control their hypertension through lifestyle changes. Additionally, in individuals with recently diagnosed hypertension receiving medication therapy, the mean arterial pressure (MAP) is measured before and after implementing lifestyle changes.

**Methods:** 200 patients participated in a mixed cohort research conducted at Kumaran Medical Center in Coimbatore. We gave 200 hypertension patients a questionnaire to find out what they thought about leading a sedentary lifestyle. One hundred hypertension patients were divided into two groups: sedentary active and motile active. What was the likelihood of disease control in each group? To determine the impact on illness control, MAP values were measured in 100 patients with newly diagnosed hypertension males receiving medication therapy.

**Results:** Only 26 (13%) of the 200 hypertension patients polled for the patients' perspective study were completely aware of the idea and dangers of leading a sedentary lifestyle. The majority of patients, 128 (64%), had never heard of the term "sedentary lifestyle" or its possible effects on the management of hypertension, whereas 48 patients (24%) had a passing familiarity with the idea. Based on effectiveness, motile active individuals (n=63) have a higher chance of controlling hypertension than sedentary active patients (n=37) in a comparative study involving 100 hypertensive patients. 36 of the 100 newly diagnosed hypertension individuals who responded to medication therapy also showed an average drop in MAP of 9.4 mmHg following the introduction of lifestyle changes.

**Conclusion:** The results show that people are generally aware of the dangers of leading a sedentary lifestyle, but they also point out several obstacles to changing to more active behaviors, such as lack of motivation, time constraints, and false beliefs about physical activity. These results point to a serious knowledge gap, especially concerning the dangers of extended inactivity to one's health. Nonetheless, patients who implemented customized lifestyle changes, like more exercise and dietary adjustments, reported better blood pressure management and general well-being. These findings highlight the value of patient-centered strategies in encouraging lifestyle modifications and imply that focused therapies may hold the secret to improving the long-term management of hypertension.

**Keywords:** Lifestyle modification, sedentary lifestyle, Hypertension (HTN), Patient perspectives, comparative study, motile active, sedentary active, mean atrial pressure (MAP).

### INTRODUCTION

Is a sedentary lifestyle a silent hazard? Globally, the COVID-19 pandemic has had a major effect on people's lifestyles, causing many to adopt more sedentary behaviors. Physical activity declined as a result of lockdowns, work-from-home policies, and restricted access to gyms and outdoor areas. Even if these alterations have returned to normal, their effects are still felt by the current population. Many people remained inactive even after COVID-19 terminated. People became less active and less communicative as the pandemic normalized working from home.<sup>1</sup> Furthermore, there is still an increase in behavioral patterns like spending more time indoors and on screens. This led to health outcomes like Weight gain and obesity, mental health challenges, Musculoskeletal

Problems, Cardiovascular health, and Weakened Immunity.<sup>2</sup>

#### Definition:

Sedentary behavior is defined as any waking behavior such as sitting or leaning with an energy expenditure of 1.5 metabolic equivalent tasks (MET) or less.<sup>3</sup> It was proposed by the Sedentary Behaviour Research Network in 2012. The most widely used definition currently is simply defined as any waking activity characterized by low energy expenditure.<sup>4</sup>

#### Key elements of a sedentary lifestyle:

Extended sitting<sup>5</sup>: Sitting for an extended amount of time without moving throughout the allotted time, Very little exercise: inadequate use of energy during the day,



Regularly resting: Resting on a couch or bed instead of engaging in any kind of physical exercise.<sup>6</sup>

### Is exercise: A Partial Solution to A Sedentary Lifestyle?

To lower the hazards linked with a sedentary lifestyle, regular movement must be incorporated into everyday routines. Walking, stretching, and even brief breaks can have a big impact on total energy expenditure and enhance general health. Frequent exercise is good for you, but going to the gym once a week for a few hours isn't enough. When compared to being sedentary for more than 8 to 10 hours a day, the idea that exercising for 1 to 2 hours a day may eliminate the dangers and impacts of a sedentary lifestyle is not helpful.<sup>7</sup>

Consider two distinct lifestyle categories:

- Sedentary active
- Motile active

#### Sedentary active

It refers to those who work out at the gym, do yoga, jog, swim, and so on, but who nevertheless spend the majority of their days sitting down. An example might be someone who works 8 to 10 hours a day at a desk job at a software business and spends an hour or two working out at the gym. Long periods of sitting have detrimental effects even if the person is physically active for a portion of the day.<sup>8</sup>

#### Motile active:

An individual is referred to as motile active if they are constantly moving throughout the day. It entails being active all day long in addition to participating in organized physical activities like jogging, the gym, etc.<sup>9</sup> A motile individual might, for instance, walk or ride a bicycle to work or use a standing desk. When compared to a sedentary lifestyle, frequent movement and exercise offer the greatest health benefits.<sup>10</sup>

#### The key difference between the two lifestyles:

The primary distinction between the two lifestyles is in the distribution of physical activity throughout the day. This includes how often you move, how active you are, and how much time you spend sitting down.<sup>11</sup>

#### Effect of sedentary lifestyle on blood pressure<sup>12</sup>

- Higher risk of hypertension: The heart works less efficiently while you're sedentary.
- Weight gain: The body stores fat as a result of poor energy expenditure, which puts more strain on the heart muscles.
- Poor circulation: Prolonged sitting reduces blood flow throughout the body, particularly in the legs and other lower extremities.
- Increased strain on the heart muscles: Over time, sedentary lifestyles cause the heart muscles to deteriorate.

### WHO guidelines on physical activity (adults)

For significant health benefits, adults (18–65 years old) should engage in moderate-intensity aerobic physical activity for at least 150–300 minutes per week, vigorous-intensity aerobic physical activity for at least 75–150 minutes per week, or an equivalent mix of both. To reap the additional health benefits, adults should engage in moderate-to-intense muscle-strengthening exercises that work for all major muscle groups two or more days a week.<sup>13</sup>

#### DASH eating plan<sup>14</sup>

- Eating vegetables, fruits, and whole grains
- Including fat-free or low-fat dairy products
- Fish, poultry, beans, nuts, and vegetable oils
- Limiting foods that are high in saturated fat, such as fatty meats
- Avoid full-fat dairy products, tropical oils such as coconut, palm kernel, palm oils
- Limiting sugar-sweetened beverages and sweets

**Mean atrial pressure<sup>15</sup>** - The mean arterial pressure (MAP) is an average calculated blood pressure in an individual during a single cardiac cycle.<sup>16</sup> Although methods of estimating MAP vary, a common calculation is,

$$\text{MAP} = \text{diastolic blood pressure} + (\text{systemic blood pressure} - \text{diastolic blood pressure})/3$$

This study aims to create awareness about the health risks associated with a sedentary lifestyle and to understand the impact of lifestyle modification, particularly in the management of hypertension.<sup>17</sup> Specifically to evaluate the level of awareness among patients about the concept of a sedentary lifestyle, this thereby helps in identifying knowledge gaps and areas for health education interventions, Assessing the Probability of Effectiveness of being Motile Active in comparison with Sedentary Active in Controlling Disease Progression of hypertension, concerning age, To measure the impact of incorporating lifestyle changes, on blood pressure control in hypertensive patients, by observing change in MAP, who are also receiving drug therapy, assessing whether such changes improve the effectiveness of their treatment. Overall, the objective is to understand the role of awareness and lifestyle modifications in improving the disease management of hypertension.

### MATERIALS AND METHODS

The Mixed cohort study design focuses on three main components: a patient survey, disease control comparison, and changes in Mean Arterial Pressure (MAP). The patient survey evaluates knowledge and awareness of sedentary lifestyles through a questionnaire. The second phase compares disease control probability between two groups of hypertensive patients: those who are motile active and sedentary active. The final phase examines changes in MAP



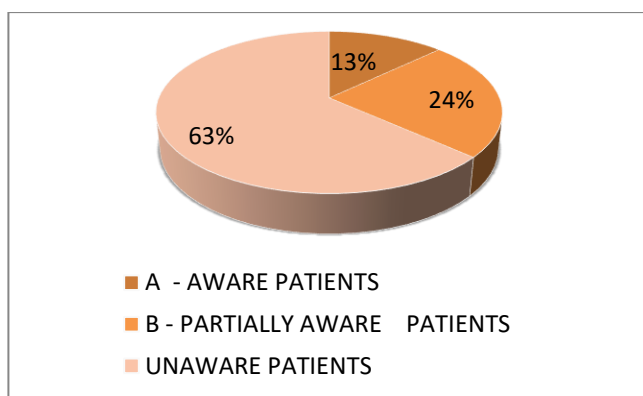
before and after lifestyle modifications in hypertensive patients undergoing mono-drug therapy. The sample includes 200 hypertensive patients for Part 1, 100 for Part 2 (lifestyle modifications), and 100 for Part 3 (pharmacological therapy). Inclusion criteria involve hypertensive male and non-pregnant female patients aged 20-60, with no significant biochemical issues beyond hypertension. Exclusion criteria include recent surgery, significant medical conditions, recent drug intake, and study participation. Data collection is performed via patient interviews and electronic medical records at Kumaran Medical Centre, Coimbatore, maintaining strict confidentiality.<sup>18</sup> Ethical approval for the study was obtained from the Institutional Ethical Committee (IEC) before data collection.<sup>19</sup> For Part 3, patients are followed through two visits—after mono-drug therapy and after lifestyle modification. Blood pressure, HBA1C, and cholesterol levels are key clinical data points collected throughout the study.

**RESULTS AND DISCUSSION**

The findings of this project offer significant insights into the role of lifestyle modification in managing hypertension and particularly controlling elevated Mean Arterial Pressure (MAP). The results highlight several key factors influencing physical activity levels, disease control potential<sup>20</sup>, and the impact of lifestyle modification when combined with drug therapy and by itself.

**Patients’ awareness of a sedentary lifestyle**

To assess the level of awareness among patients regarding the health risks associated with a sedentary lifestyle, patients were grouped into three categories based on their knowledge and understanding fully aware (n = 26, 13%), partially aware (n 48, 24%), and unaware (n= 128, 63%)



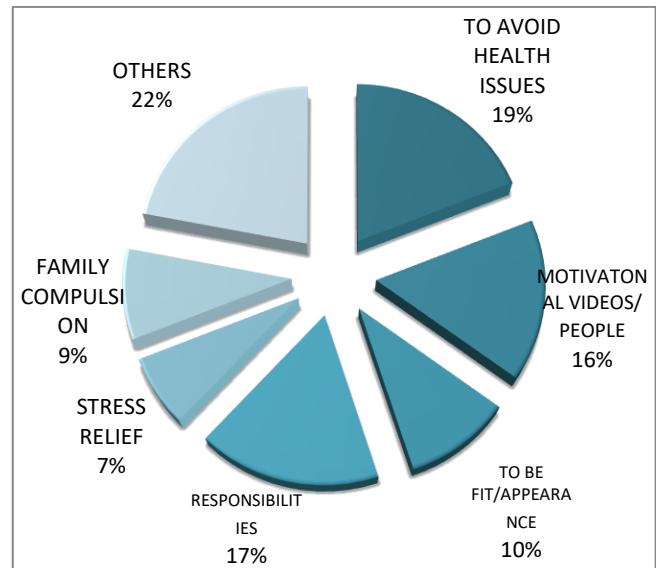
**Figure 1:** Distribution of patients’ awareness regarding sedentary lifestyle

**Factors that drive and prevent patients from being physically active (patients’ insight)**

From the survey, the thought of avoiding health issues (19%) emerged as a strong motivator for becoming physically active. This suggests that when patients are better informed about the health risks of inactivity—particularly in the context of chronic diseases like

hypertension—they may be more likely to adopt and sustain physical activity habits.

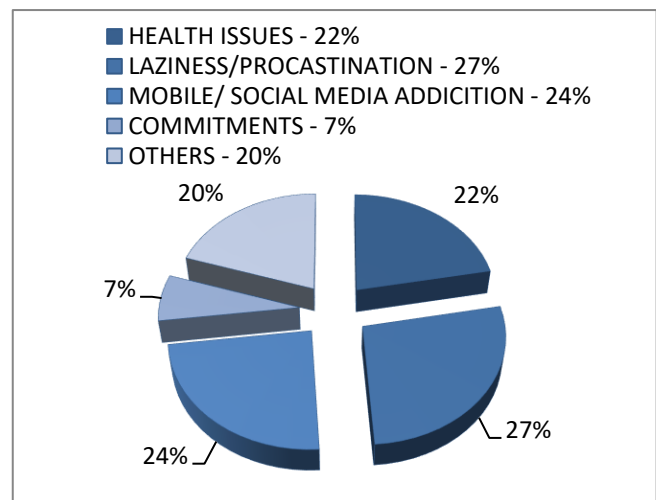
**Patient's perspective on what makes them physically active**



**Figure 2:** Factors that promote physical activity among patients

It is revealed that patients' lack of awareness (63%) about the dangers of a sedentary lifestyle, combined with laziness and procrastination (27%), serves as a major barrier to engaging in physical activity. This is a common issue in public health, as individuals often underestimate the long-term risks of inactivity.

**Factors limiting physical activity in the patient population**



**Figure 3:** Barriers to physical activity among patients

This suggests that when patients are better informed about the health risks of inactivity—particularly in the context of chronic diseases like hypertension—they may be more likely to adopt and sustain physical activity habits. Therefore, educational interventions emphasizing the health risks of sedentary behavior could help shift patients' mindsets and increase their physical activity levels.

**Comparative study on disease control population: Distribution of activity levels in a sample population**

It is focused on data from patients under lifestyle modification after the cessation of drug therapy by the physician. The results showed that motile active individuals had higher rates of disease control compared to sedentary active individuals, who may only engage in minimal movement during daily activities. This underscores the importance of regular, intentional physical activity in achieving better disease control outcomes.

**Table 1:** Effectiveness of type of lifestyle modification on hypertensive patients

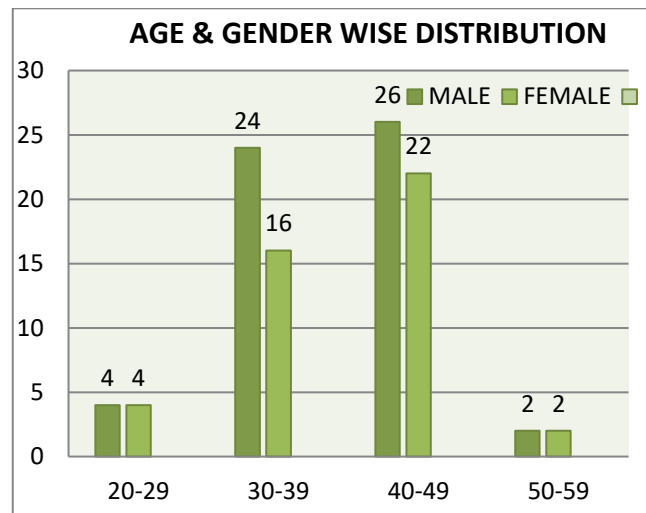
S.NO	Type of lifestyle modification	Number of patients	Percentage
1	Sedentary active	37	37
2	Motile active	63	63

**Age-wise distribution in the sample population**

In our study, about 56 patients were male (56%) and 44 (44%) patients were female. The subjects were classified based on their age as 20-29, 30-39, 40-49, and 50-59. As per the result, 4% were male and 4% were female in the age group of 20-29 years. 24% of males and 16% of females were in the age group of 30-39 years. 26% were male and 22% were female in the age group of 40-49 years. 2% were male and 2% were female in the age group of 50-59 years.

The male population is higher than the female in all aspects of age groups. The middle-aged population dominated this

study. People with hypertension under lifestyle modification alone are very low in the age group of 50 to 60. Onset of hypertension is prevalent in ages above 30.



**Figure 4:** Age and gender-wise distribution of the sample population

**Distribution of motility and sedentary active behavior by age**

Additionally, age-based analysis revealed that individuals above the age of 40 experience more effective health improvements through lifestyle modifications only if they maintain a motile active lifestyle. This finding suggests that lifestyle changes have a stronger impact on disease control in older populations when they are accompanied by consistent physical activity, which might be due to the increased prevalence of metabolic and cardiovascular risks in this age group.

**Table 2:** Distribution of sedentary active and motile active patients

S.NO	Age in years	Sedentary active	Percentage (%)	Motile active	Percentage (%)
1	20-29(n=8)	6	75	2	25
2	30-39(n=40)	20	50	20	50
3	40-49(n=48)	9	18.75	39	81.25
4	50-59(n=4)	0	0	4	100

**Impact of LSM on mean arterial pressure**

Primarily, baseline MAP and MAP after mono-drug therapy during the first follow-up were calculated. N=66 patients had a decrease in MAP from that of the baseline value (66%). Other n=34, patients include,

- Increase in MAP – 22 patients
- No change in MAP – 4 patients
- No follow-up – 8 patients

Reasons for the increase in MAP include non-adherence to medication, incorrect administration, Drug interaction, Lifestyle factors, biological factors, and inappropriate

medication/dose. After educating the 66 patients who had a decrease in MAP on lifestyle modification, their MAP on the second follow-up visit was noted. For the 66 patients, after including LSM, in their 2<sup>nd</sup> follow-up,

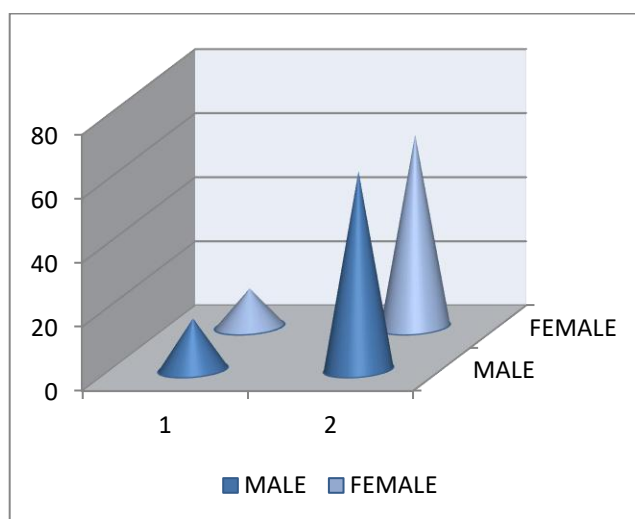
- n= 45 (68%) had decreased in MAP
- n= 19 (28%) had an increase in MAP
- n= 1 (1.5%) had no change in MAP
- n= 1 (1.5%) no follow up

The increase in MAP of these patients might be due to, Inconsistent adherence, insufficient duration, inadequate intensity, underlying medical condition, Psychological



factors, Poor support system, Genetic factors, and Environmental factors.

An average for the decrease in **Mean arterial pressure = 9.7 mmHg**. In a comparison of the decrease in Mean Arterial Pressure (MAP), the reduction was 9.7 mmHg greater after introducing lifestyle modification along with mono-drug therapy than with mono-drug therapy alone. Among the 45 patients who experienced a decrease in MAP after lifestyle modification, 25 were male and 20 were female. Of these, 16 male and 12 female patients showed a more significant reduction in elevated MAP after adding lifestyle changes to their treatment. This highlights the enhanced effect of combining lifestyle modifications with drug therapy in managing hypertension.



**Figure 5:** Percentage of male and female population with increase in impact of LSM

The percentage of patients with increased disease control between both genders due to lifestyle modification remains almost similar,

- Male – **62%**
- Female – **60%**

Overall, the study highlights the critical role of patient awareness, sustained physical activity, and the integration of lifestyle changes with drug therapy in controlling hypertension. It is clear that lifestyle modification, especially when it involves consistent physical activity, has a profound impact. These findings advocate for the promotion of active, motile lifestyles and comprehensive treatment plans that incorporate both medication and lifestyle changes to achieve optimal health outcomes.

#### LIMITATIONS <sup>21</sup>

1. Sample Size, Small populations may lack the statistical power to detect meaningful differences or effects, leading to inconclusive or unreliable results.
2. External factors that are not controlled for (such as diet other than what is recommended, smoking, or additional medications) may influence the outcomes of the study.

3. Short Study Duration, Studies Conducted over short periods, which may not be long enough to observe the true long-term effects.
4. Potential biases could have arisen from the retrospective design, including selection bias and reliance on medical records.
5. The study's reliance on a single medical center may limit the applicability of the results to other settings or populations.
6. The accuracy of the findings may be impacted by incomplete or missing data in the medical records.

#### CONCLUSION

This project highlights the critical role of lifestyle modifications in managing hypertension, especially when combined with mono-drug therapy. Key findings reveal that many patients face psychological barriers such as lack of awareness, laziness, and procrastination, hindering regular exercise—a key factor in controlling hypertension. However, the motivation to stay healthy emerged as a significant driver of behavior change, suggesting the need for increased awareness about the risks of a sedentary lifestyle. The study found that patients engaged in structured physical activity (motile active) had better disease control, particularly those over 40. Additionally, combining lifestyle changes with mono-drug therapy led to greater reductions in Mean Arterial Pressure (MAP) compared to medication alone. Notably, the benefits were consistent across genders. These results underscore the importance of integrating lifestyle modifications with pharmacological interventions, promoting a holistic approach to long-term hypertension management, and reducing cardiovascular risks.

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## REFERENCES

- Baker BD, Castelli DM. The Impact of a Global Pandemic on Young Adult Sedentary Behavior and Physical Activity. *AJPM Focus*. 2024 Jun 1;3(3):1-9. DOI: [10.1016/j.focus.2024.100202](https://doi.org/10.1016/j.focus.2024.100202); PMID: 38596163.
- Chaudhary N, Jones M, Rice SPM, Zeigen L, Thosar SS. Transitioning to Working from Home Due to the COVID-19 Pandemic Significantly Increased Sedentary Behavior and Decreased Physical Activity: A Meta-Analysis. *Int J Environ Res Public Health*. 2024 Jul 1;21(7):1-13. DOI: [10.3390/ijerph21070851](https://doi.org/10.3390/ijerph21070851); PMID: 39063428.
- Dempsey PC, Biddle SJH, Buman MP, Chastin S, Ekelund U, Friedenreich CM, Katzmarzyk PT, Leitzmann MF, Stamatakis E, Ploeg HPVD, Willumsen J, Bull F. International Journal of Behavioral Nutrition and Physical Activity New global guidelines on sedentary behaviour and health for adults: broadening the behavioural targets, *International Journal of Behavioral Nutrition and Physical Activity*. 2020 Nov;17(151):1-12. DOI: <https://doi.org/10.1186/s12966-020-01044-0>
- Tremblay MS, Aubert S, Barnes JD, Saunders TJ, Carson V, Latimer-Cheung AE, Sebastien F.M. Chastin SFM, Teatske M. Altenburg TM, Mai J.M. Chinapaw MJM. International Journal of Behavioral Nutrition and Physical Activity Sedentary Behavior Research Network (SBRN)-Terminology Consensus Project process and outcome, *International Journal of Behavioral Nutrition and Physical Activity*. 2017 Jun;14(75):1-17. DOI: <https://doi.org/10.1186/s12966-017-0525-8>
- Owen N, Healy GN, Matthews CE, Dunstan DW. Too much sitting: The population health science of sedentary behavior. *Exerc Sport Sci Rev*. 2010 Jul;38(3):105–113. DOI:[10.1097/JES.0b013e3181e373a2](https://doi.org/10.1097/JES.0b013e3181e373a2) PMID: [20577058](https://pubmed.ncbi.nlm.nih.gov/20577058/)
- Panahi S, Tremblay A. Sedentariness and Health: Is Sedentary Behavior More Than Just Physical Inactivity? *Frontiers in Public Health*. Frontiers Media S.A.; 2018 Sep;6(258):1-7. DOI: [10.3389/fpubh.2018.00258](https://doi.org/10.3389/fpubh.2018.00258); PMID: 30250838.
- Ekelund U, Steene-Johannessen J, Brown WJ, Fagerland MW, Owen N, Powell KE, Bauman A, Lee M. Does physical activity attenuate, or even eliminate, the detrimental association of sitting time with mortality? A harmonised meta-analysis of data from more than 1 million men and women. *The Lancet*. 2016 Sep 24;388(10051):1302–1310. DOI: [10.1016/S0140-6736\(16\)30370-1](https://doi.org/10.1016/S0140-6736(16)30370-1); PMID: 27475271.
- Hamilton MT, Hamilton DG, Zderic TW. Role of low energy expenditure and sitting in obesity, metabolic syndrome, type 2 diabetes, and cardiovascular disease, *Diabetes*. 2007 Nov;56(11):2655–2667. DOI: <https://doi.org/10.2337/db07-0882>; PubMed:[17827399](https://pubmed.ncbi.nlm.nih.gov/17827399/)
- Healy GN, Dunstan DW, Salmon J, Cerin E, Shaw JE, Zimmet PZ, Owen N. Breaks in sedentary time. *Diabetes Care*. 2008 Apr;31(4):661–666. DOI: [10.2337/dc07-2046](https://doi.org/10.2337/dc07-2046); PMID: 18252901.
- Dunstan DW, Kingwell BA, Larsen R, Healy GN, Cerin E, Hamilton MT, Shaw JE, Bertovic DA, Zimmet PZ, Salmon J, Owen N. Breaking up prolonged sitting reduces postprandial glucose and insulin responses. *Diabetes Care*. 2012 May;35(5):976–983. DOI: [10.2337/dc11-1931](https://doi.org/10.2337/dc11-1931); PMID: 22374636.
- World Health Organization (WHO), [Physical activity](https://www.who.int/news-room/fact-sheets/detail/physical-activity) (2024)
- Padilla J, Wallace JP, Park S. Accumulation of physical activity reduces blood pressure in pre- and hypertension. *Med Sci Sports Exerc*. 2005 Aug;37(8):1264–1275. DOI: [10.1249/01.mss.0000175079.23850.95](https://doi.org/10.1249/01.mss.0000175079.23850.95); PMID: 16118571.
- Bull FC, Al-Ansari SS, Biddle S, Borodulin K, Buman MP, Cardon G, Carty C, Chaput JP, Chastin S, Chou R, Dempsey PC, DiPietro L, Ekelund U, Firth J, Friedenreich CM, Garcia L, Gichu M, Jago R, Katzmarzyk PT, Lambert E, Leitzmann M, Milton K, Ortega FB, Ransinghe C, Stamatakis E, Tiedemann A, Troiano RP, Ploeg HPVD, Wari V, Willumsen JF, World Health Organization 2020 guidelines on physical activity and sedentary behaviour, *British Journal of Sports Medicine*. BMJ Publishing Group; 2020 Nov;55(24):1451–1462. DOI: [10.1136/bjsports-2020-102955](https://doi.org/10.1136/bjsports-2020-102955); PMID: 33239350.
- Paula Bricarello L, Poltronieri F, Fernandes R, Retondario A, de Moraes Trindade EBS, de Vasconcelos F de AG. Effects of the Dietary Approach to Stop Hypertension (DASH) diet on blood pressure, overweight and obesity in adolescents: A systematic review, *Clinical Nutrition ESPEN*. Elsevier Ltd; 2018 Dec;28:1–11. DOI: [10.1016/j.clnesp.2018.09.003](https://doi.org/10.1016/j.clnesp.2018.09.003); PMID: 30390863.
- Kandil H, Soliman A, Alghamdi NS, Jennings JR, El-Baz A. Using Mean Arterial Pressure in Hypertension Diagnosis versus Using Either Systolic or Diastolic Blood Pressure Measurements. *Biomedicine*. 2023 Mar 1;11(3):1-14. DOI: [10.3390/biomedicine11030849](https://doi.org/10.3390/biomedicine11030849); PMID: [36979828](https://pubmed.ncbi.nlm.nih.gov/36979828/).
- DeMers D, Wachs D. Physiology, Mean Arterial Pressure. [Updated 2023 Apr 10]. Treasure Island (FL): StatPearls; 2024 Jan. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK538226/>; PMID: 30855814
- Valenzuela PL, Carrera-Bastos P, Gálvez BG, Ruiz-Hurtado G, Ordovas JM, Ruilope LM, Lucia A. Lifestyle interventions for the prevention and treatment of hypertension, *Nature Reviews Cardiology*. Nature Research; 2021 Apr;18: 251–275. DOI: [10.1038/s41569-020-00437-9](https://doi.org/10.1038/s41569-020-00437-9); PMID: 33037326.
- Dzidkowiec O, Durbin J, Jayaraman Muralidharan V, Novak M, Cornett B. Improving the Quality and Design of Retrospective Clinical Outcome Studies that Utilize Electronic Health Records. *HCA Healthcare Journal of Medicine*. 2020 Jul 1;1(3):131-138. DOI: [10.36518/2689-0216.1094](https://doi.org/10.36518/2689-0216.1094); PMID: 37424712.
- World Medical Association declaration of Helsinki: Ethical principles for medical research involving human subjects. Vol. 310, *JAMA*. American Medical Association; 2013 Nov;310(20):2191–2194. DOI: [10.1001/jama.2013.281053](https://doi.org/10.1001/jama.2013.281053); PMID: 24141714.
- Rao P, Belanger MJ, Robbins JM. Exercise, Physical Activity, and Cardiometabolic Health: Insights into the Prevention and Treatment of Cardiometabolic Diseases, *Cardiology in Review*. Lippincott Williams and Wilkins; 2022 Aug;30:167–178. DOI: [10.1097/CRD.0000000000000416](https://doi.org/10.1097/CRD.0000000000000416); PMID: [34560712](https://pubmed.ncbi.nlm.nih.gov/34560712/).
- Capili B, Anastasi JK. Cohort Studies. *American Journal of Nursing*. 2021 Dec 1;121(12):45–48. DOI: [10.1097/01.NAJ.0000803196.49507.08](https://doi.org/10.1097/01.NAJ.0000803196.49507.08); PMID: [34792504](https://pubmed.ncbi.nlm.nih.gov/34792504/).

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