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Effectiveness of walking in managing and lowering blood pressure in hypertensive patients: A Literature Review

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Abstract:

High blood pressure or hypertension is defined as a pathological chronic condition. One of the reasons is physical inactivity, Walking is considered "near-perfect exercise." for lowering and management of hypertension.

The study's aimed was to analyze some previous studies on walking therapy for hypertension patients. Articles from the Research Gate, PUPMAD, and Google Scholar databases between 2017 and 2020 are used to learn about the effectiveness of walking in lowering and managing high blood pressure; The analysis of 14 studies showed that walking was helpful in lowering blood pressure control in people with high blood pressure and certain physiological variables.

Conclusion: Walking can be prescribed as a stand-alone or supplementary therapy for hypertensive patients to control or reduce blood pressure.

Keywords: Hypertension; Walking; Effectiveness; High blood pressure.

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I- Introduction :

High blood pressure, often known as hypertension, is a major risk factor for cardiovascular diseases(Korsager Larsen & Matchkov, 2016; Lee et al., 2021). It hits elderly more commonly (Kazeminia et al., 2020). It is defined as a pathological chronic condition in which systolic blood pressure is more than 140 mm Hg and diastolic blood pressure is 90 mm Hg(Ningsih, 2020). Each year, there are more people with high blood pressure. By 2025, there may be 1.5 billion people with high blood pressure in the world, a rise of roughly 15 to 20%(Yu et al., 2020). The World Health Organization (WHO) stated in "Global NCD Target Reduce Hight Blood Pressure" that a rise in blood pressure was a major risk factor for death worldwide, as it resulted in the deaths of 9.4 million people(Ningsih, 2020). Its causes are associated to lifestyle, including inactivity, a high-salt and fat diet, and smoking(Lee et al., 2021).

Physical inactivity is known to cause many health problems globally each year(Zhu et al., 2019) According to the WHO, 2009, it is the fourth biggest cause of death globally and accounts for 6–10% of the major non-communicable diseases such as coronary heart disease, type 2 diabetes, breast and colon cancers(Murtagh et al., 2015).

Regular physical activity (PA) lowers cardiovascular events and decreases noncommunicable disease risk factors. By halting the progression of prehypertension, PA has been shown in numerous previous studies to lower the prevalence of cardiovascular diseases. and for greater health advantages, regular, sustained PA should be added to everyday activities and gradually increased(Zhu et al., 2019) All modern societies strive to include physical activity in people's the daily agenda of population(Khoram et al., 2019)

Walking is an easy form of physical activity and low-cost(Omura et al., 2021). aerobic exercise provides the same range of health advantages as physical activity while having no negative consequences(Longo et al., 2015) walking is the most popular and preferred form of moderate-intensity exercise among adults(Bonnini et al., 2020; Farren et al., 2015; Longo et al., 2015; Robertson et al., 2012). Walking is considered "near-perfect exercise." It can be used at any time of day and by anyone, regardless of their age(Scherder et al., 2014). Walking is the best type of intervention to promote population health(Oja et al., 2018). walking has become a cornerstone of physical activity promotion strategies and health(Murtagh et al., 2015).

According to a recent literature review by Wijaya et al., brisk walking can lower blood pressure in hypertension patients and help them become less dependent on anti-hypertension medications. By consistently performing this morning exercise three times a week for 30 to 45 minutes, for at least three months (regularly)(Wijaya et al., 2022). A recent systematic review of 17 articles conducted by Ningsih shown that daily walking exercises help lower SBP and DBP in hypertension patients. Health education might incorporate walking as an independent nursing intervention to help hypertensive individuals control their blood pressure(Ningsih, 2020).

This literature review of some few previous research was conducted in order to learn more about the significance of walking exercises for controlling and reducing blood pressure in hypertensive patients. accordingly, we raised the following general question: How effective is walking exercises for hypertension patients manage and lower blood pressure?

1.hypothese:

Walking exercises are effective in managing and lowering blood pressure for hypertensive patients**.**

2.Research objectives:

- Recognize the importance of walking as a blood pressure-lowering and blood pressure-management strategy.

- Identifying research gaps will assist researchers in identifying the subjects for their future studies.

- Recognize the methodologies utilized in such studies.

- Recognize The characteristics of the participants, the sample's design, and the selection procedure.

- Recognize The kinds of programs used, their duration, weekly repetition count, and session length**.**

3. Terminology:

3-1-Hypertension:

According to the American Heart Association (AHA) hypertension is defined as a persistent or intermittent high of systolic blood pressure equal to or above 140 mm Hg and diastolic blood pressure equal to or above 90 mm Hg(Sommers, 2019, p. 574).

3-1-1-classification of hypertension:

Since 2003, the European Society of Hypertension and the European Society of Cardiology (ESH/ESC) have published joint guidelines, which most recently have been revised in 2007, 2009 and 2013 (78-80, 28). They further suggest dividing blood pressure in the normal range into the three categories(Eckner & Gothenburg university, 2014, p. 14)

Table (1): classification of hypertension

Category	SBP (mmHg)	And/or	DBP (mmHg)
Optimal	<120	and	<80
Normal	120-129	or	80-84
Prehypertension	130-139	or	85-89
Hypertension stage I	140-159	or	90-99
Hypertension stage II	160-179	or	100-109
Hypertension stage II	≥180	or	≥110
Isolated systolic hypertension	≥140	or	<90

DBP: Diastolic blood pressure. SBP: Systolic blood pressure. The source:(Eckner & Gothenburg university, 2014, p. 14)

2-2-Walking:

Walking is one of the simplest and most widespread forms of human movement(Themes, 2016) Normal human walking gait can be designated as a coordinated set of rotational movements of body parts in order to maintain the balance of the system throughout its forward movement(Guillaume, 2019, p. 1).

II– Methods:

This study analyzes a few earlier studies that looked at walking therapy for hypertension patients. The reviewers searched the Google Scholar, Pupmad, and Research Gate databases. using the terms "walking," "high blood pressure," and "hypertension." Independent screening was done on articles to ensure they met the criteria for inclusion. Both experimental and quasi-experimental

studies with separate walking exercise interventions or with other interventions were considered. The search was limited to content from publications between (2017 - 2021)

III- Results and discussion :

III-1 - Results

Table (2): results of studies

Authors	Participants	Intervention type	Protocol	results
(Ko et al., 2021)	40 men and women (61.6 y) with high–normal BP or hypertension stage 1 (130/85 – 159/99 mm Hg)	stretching versus brisk walking exercise	program (30 min/day, 5 d/week for 8 week). BP was assessed during sitting and supine positions and for 24 hours using a portable monitor before and after the training programs	The stretching program elicited greater reductions than the walking program for sitting systolic (146 [9] to 140 [12] vs 139 [9] to 142 [12] mm Hg), supine diastolic (85 [7] to 78 [8] vs 81 [7] to 82 [7] mm Hg), and nighttime diastolic (67 [8] to 65 [10] vs 68 [8] to 73 [12] mm Hg) BP. The stretching program elicited greater reductions than the walking for mean AP assessed in sitting (108 [7] to 103 [6] vs 105 [6] vs 105 [8] mm Hg), supine (102 [9] to 96 [9] vs 99 [6] to 99 [7] mm Hg), and at night (86 [9] to 83 [10] vs 88 [9] to 93 [12] .(mm Hg
(Mandini et al., 2021)	subjects 259 considered for the present study (145 women, 114 men, age 63.9 ± 8.3 years). 203 subjects (124 without and 79 with therapy) completed the program. SBP higher (144.6 ± 12.2 vs. 140.2 ± (10.7	guided walking	duration of program: 1 year During the 1-year program each subject walked ~220 h. walke 5–6 days a week. Walking speed and walking time increased progressively.	decrease of SBP was observed in both groups. The decrease was significantly higher in the subjects under therapy. The decrease of SBP was directly proportional to baseline values. DBP decreased significantly in both groups

(Yu et al., 2020)	688 participants. The inclusion criteria were as follows: 1) full-time employees 2) aged 18–65 y 3) a sedentary lifestyle (sitting for more than 6 hours per day). divided into 5 levels 4000-<6000 (L 1), 6000-<8000 (L 2), 8000-<10000 (L 3), 10000-12000 (L 4), and >12000 (level 5) steps/day. and divided into 3 aged groups: 18–35 (group 1), 36–50 (group 2), and 51–65 (group 3)	Brisk walking	duration of program: 3 months; it involves , brisk walking, exercise intensity (moderate), exercise duration (at least 10 mins/session, 30–80 min/day), and 5–7 days/week), exercise execution time period (6: 00–23: 00), All participants' exercise program was a 30-day cycle with a gradual increase in the exercise intensity (walking speed) and/or exercise duration (walking length) walking speed of 80–90 m/min for females (4.0-4.5 METER) and 90–100 m/min for males (4.5-5.0 MET). use the pedometer every day throughout the intervention period	SBP and DBP decreased by 1.9 and 2.0 mmHg, respectively. Taking level 5 (>12000 steps/day) as reference, SBP can be better controlled at levels 1-4: level 1 had the best effect (-6.05 mmHg), followed by level 2 (-3.54 mmHg). Showing a significate dose-effect relationship between exercise and SBP. Furthermore, the effective step count of 6000<8000 steps/day was better in controlling SBP in males (-4.26 mmHg), while 4000-<6000 steps/day had a better effect on females (-6.86 mmHg). The significate dose-effect relationship was only observed in the 36-50 age group. However, no significate dose-effect relationship between exercise and DBP.
(Mandini et al., 2020)	192 Participants were sedentary and had a systolic pressure ≥ 140 mmHg. divided in a group of GW (n= 93) and of SW (n = 99). 70 subjects GW group and 88 SW group completed the program	guided walking GW=300m suggested walking SW=120m	duration of Program: 6 months GW group = 300 min SW group = 120 min	70 subjects of the GW group and 88 of the SW group completed the program. Significantly decrease in weight, BMI and WC was observed in both groups. SBP and DBP decreased by 7.5 and 1.9 mmHg in the GW group and by 4.1 and 2.1 mmHg in the WS. The decrease in SBP was significantly higher in the subjects of GW group. 16months after the end of the study, 54 subjects of the WG and 30 of the SG declared to maintain a walking habit
(Bakar et al., 2020)	54 Participants divided into two groups. aged 60-74 years. They have the ability to walk and have no physical weaknesses. Older people with HBP should not have complications	walking	duration of program: 4 weeks. 5 session per week 30 min (5 min warm up, 20 min walking, 5 min cool-down).	The results showed that most respondents experienced a lessening of their SBP and DBP. This matter is supported by the results of the Mann Whitney test expressing that there is a significant difference between the IG and the CG. The result of the Wilcoxon signed-rank test also showed a difference between the pre- and post-test IG values

(Chalida et al., 2019)	40 respondents with BP higher than 140/90 mmHg, consume drugs and treatment in the clinic, aged (46-65 y). divided into 2 groups	cucumber juice and brisk walking	brisk walking: 20-30minutes for 8 times the intervention in 2 weeks (4 days 2 days of continued intervention intervene again during 4 consecutive days). cucumber juice: 7 days (1 week) respectively at a dose of 150 ml (200gr / 150ml)	brisk walking exercise interventions can lower SBP of 4 mmHg and DBP 3.5 mmHg. cucumber juice can lower SBP of 10.2 mm Hg and DBP of 8.9 mmHg
(Rachmawati et al., 2019)	116 patients with essential hypertension. IG patients taking antihypertensive medication. CG patients hypertension who just take drugs	brisk walking	brisk walking exercise 30 minutes for 8 sessions in 2 weeks.	Results showed a mean decrease in blood pressure, systolic pressure and diastolic pressure
(Lu et al., 2019)	42prehypertensive and 43 hypertensive subjects	low-intensity walking (2.5, METs)	Duration of program: 2 months regular low-intensity walking -exercise volume of 500–1000 MET· min /week. 50–60 m/day and 5–7 times/week	the results showed mild but significant BP-lowering and HR-reducing effects in 7 hypertensives
(Yulisa, 2018)	10 respondents were taken then divided into two groups: 5 respondents with hypertension and obesity and 5 respondents with normal nutritional status. aged 64-67			IG: SBP and DBP decreased of 4.6 mmHg, 2.2 mmHg respectively. As for in CG the SBP decreased by 1 and the DBP only increased by 0.4
(He et al., 2018)	46 Patients with essential hypertensions	brisk walking	brisk walking training (60-min of brisk walking, three times a week for a total of 12 weeks). 3-minute step tests of low and high intensity were conducted preand post-intervention	SBP of IG during resting, low and high-intensity exercise was significantly reduced by 8.3mmHg, 15.6mmHg, and 22.6mmHg, respectively. while HR of IG's reduced by 3.6 beats /minute, 8.7 beats/ minute and 11.3beats/minute, respectively. IG's steps per day, vo2max, moderate physical activity time and physical activity energy expenditure significantly increased by 6000 steps, 2.4 ml/kg/m, 40 minutes and 113 kcal, respectively. At the same time, IG's BFR and sedentary time significantly reduced by 2% and 60 min/day

(Mandini et al., 2018)	529 subjects have SBP >120 mmHg. 56% completed the study (182 women 59.6 ± 9.0 years, and 114 men, 65.4 ± 8.6 years) 27 had a baseline SBP >160 mm Hg, 35 between 150–159, 70 between 140–149, 89 between 130–139 and 75 between 120–129 mmHg)	guided walking	Duration = 6 months 300 min/week reached in the second month. Measurement of BP, BW, BMI, WC and walking speed at enrollment and after six months	SBP decreased in all subgroups, with the largest decrease (−21.3 mmHg) in people with SBP >160. The smallest decrease (−2.6 mmHg) in people with SBP from 120 to 129 mmHg. DBP, BW, BMI and WC also declined. The decrease was nearly identical within all group
(Kucio et al., 2017)	30 overweight or obese men aged 47 to 66 with hypertension 139/89 mm Hg. undergoing pharmacological treatment. completed the program 15 patients from IG. 4 patients from the CG resigned	Nordic walking (NW)	IG performed NW training for 4 weeks. CG underwent pharmacological treatment only. The value of BP measured with a 24-hour AMBP monitoring device	Did not cause significant changes as far as the value of BP. However, the training led to increased exercise tolerance, a reduced BM and BMI value, as well as lowered triglyceride and total cholesterol levels
(Mei et al., 2017)	36 respondents divided into two groups (IG = 18, CG = 18). Sufferers of high blood pressure of the first, second and third grade, and their ages ranged between 20-59 years	brisk walking exercise	3 days consecutive. the brisk walking exercise intervention using the same instrument after the respondent was rested for 30 minutes.	the BP before and after exercise in the IG was p = 0.038 on SBP and p = 0.020 on DBP. The BP before and after exercise in the CG was p = 0.083 on SBP, and p = 0.362 on DBP. Differences in BP after exercise in the IG and CG were p = 0.678 on SBP and p = 0.285 on DBP
(Patil et al., 2017)	60 Elderly patients aged> 60 years with PP> 60 mmHg were. Yoga (IG n = 30) was assigned for yoga training and walking group (n = 30)	Yoga & walking	The yoga program included loosening practices, Asanas, Pranayama and cyclic meditation. protocol for walking-exercise consisted warmup, and walking (40–50 min) followed by rest (10 min). duration of two programs: 12 weeks,1 h/day and 6 days / week in the morning from 06:00 h to 07:00 h	yoga group: the changes: RHR (bpm)= 4.41, PD (ms)= 50.29, DT (ms): 49.04, ED%: 2.107, ES (mmHg/ms): 14.62, ET (ms): 0.66, UT (ms): 2.54, PEP (ms) : 1.25, %MAP: 2.08. Walking group: the changes: HR (bpm) = 0.35), PD (ms)= 11.15, DT (ms)= 11, ED%: 0.101, ES (mmHg/ms)= 0.75, ET(ms)= 2.2, UT (ms)= 4.7, PEP (ms)= 2.1, % MAP= 0.65

Key word: HBP=high blood pressure BP: blood pressure, SBP: systolic blood pressure, DBP: diastolic blood pressure, AP=arterial pressure, IG: intervention group, CG: control group, DT=Diastolic time; UT= Upstroke time; PEP=Pre-ejection period; HR=Heart RHR = Resting heart rate; ED% = ejection duration index; P LVEF = left ;rate; %MAP = percentage of Mean Arterial Pressure ventricular ejection time; ES = Ejection slope; RPP = Rate pressure product, AMBP: Ambulatory monitoring of blood pressure, BM= body mass BMI=body mass index, BW=body weight, WC= waist circumference, BFR=body fat rate, WG=guided walking, SG=suggested walking.

III -2- Discussion:

All studies aimed to identify the effect of walking on lowering blood pressure in patients with high blood pressure.

There was a variance in the style of walking that was used; some of them used brisk walking like in studies by Rachmawati et al., 2019 and Mei et al. 2017, Yu et al., 2020, He et al., 2018. Both brisk walking with stretching and cucumber juice were compared by Ko et al. in 2021 and Chalida et al. in 2019. Patil et al. 2017 compared yoga and walking in their study. "Mandini et al." In its three studies from 2021, 2020, and 2018, it examined the effects of suggested and guided walking as well as other studies that lacked specificity like Yulisa, 2018, Bakar et al., 2020. Low-intensity walking was used in the Lu et al., 2019 investigation. In Kucio et al2017 study's used Nordic walking.

Regarding the sample, all research agreed that it should consist of hypertensive patients, however they varied in the type of hypertension they were trying to study. For examples, they addressed all types of blood pressure in the studies conducted by Mandini et al. in 2018 and Mei et al. in 2017. In the study Bakar et al., 2020 , the target blood pressure class was not showed.

Regarding the applied program, its duration varied from one weeks to 12 months (1 year).

As for the results: Kucio et al 2017.'s study found no reduction in blood pressure. As for the rest of the studies, results showed the effect of walking in reducing blood pressure in both systolic and diastolic numbers, with variation in the values of the decrease. For example, in the study of He et al., 2018, the value of the decrease was significant, reaching 22.6 mm Hg. As for the other studies, the values were close, and there are studies that did not refer to the decrease values as a study. Mandini et al., 2018. As according to studies by He et al. (2018), Mandini et al. (2018), Patil et al. (2017), and Kucio et al. (2017), walking also played a role in reducing some physiological variables like heart rate, triglycerides, respiratory rate, pulse, as well as sugar level and body mass index. The interventions involving stretching, cucumber juice, and yoga were more effective than the interventions involving walking in the research by Ko et al., 2021, Chalida et al., 2019 and Patil et al., 2017.

IV- Conclusion:

For hypertension patients, walking is a non-pharmacological treatment that can help reduce and control blood pressure. Exercises walking can be prescribed either on their own or in addition to blood pressure drugs. It affects some physiological variables, as well. For hypertension patients, walking for 20 to 60 minutes three to five times per week for at least two months plays a vital role in managing, lowering, and preventing blood pressure.

V- recommendations

- Preparing more researchs on the role of walking in the prevention and treatment of hypertension in Algeria due to the scarcity of studies that dealt with the walking variable. And the different types of walking.

- Using new techniques in walking programs or using them in diverse environments, such as the desert, and changing up the surfaces used for walking, such as beach sand or desert sand.

- Diversification in the program's length, its sessions, its intensity, and its walking pace.

- Launching awareness programs to highlight the benefits of physical activity, like walking.

Referrals and references:

Bakar, A., Widyastuti, N., Hidayati, L., & Qomariah, S. N. (2020). *The Effect Of Physical Training in the Form of Walking on Blood Pressure Reduction and the Quality of Life of the Elderly Living With Hypertension*. *24*(7), 8.

Bonnini, S., Mazzoni, G., Borghesi, M., Chiaranda, G., Myers, J., Mandini, S., Raisi, A., Masotti, S., & Grazzi, G. (2020). Improving walking speed reduces hospitalization costs in outpatients with cardiovascular disease. An analysis based on a multistrata non-parametric test. *BMC Health Services Research*, *20*(1), 1048. https://doi.org/10.1186/s12913-020-05874-3

Chalida, N., Ziadatul, E., Melati, F., Dwi, M., & Sugiarto, A. (2019). Effect Of Cucumber Juice And Brisk Walking Exercise On Blood Pressure In Elderly Hypertension Patients. *Midwifery and Nursing Research*, *1*(1), 51. https://doi.org/10.31983/manr.v1i1.4066

Eckner, J., & Gothenburg university. (2014). *High blood pressure - determinants and risks: Implications for treatment and prevention in a primary care setting*. Department of Public Health and Community Medicine, Institute of Medicine, Sahlgrenska Academy at University of Gothenburg : [Jenny Eckner].

Farren, L., Belza, B., Allen, P., Brolliar, S., Brown, D. R., Cormier, M. L., Janicek, S., Jones, D. L., King, D. K., Marquez, D. X., & Rosenberg, D. E. (2015). Mall Walking Program Environments, Features, and Participants: A Scoping Review. *Preventing Chronic Disease*, *12*, 150027. https://doi.org/10.5888/pcd12.150027

Guillaume, F. (2019). *Biomécanique du transport collectif de charges, vers une application clinique* [Doctorat, L'université de Toulouse]. https://www.univ-tlse3.fr

He, L., Wei, W. ren, & Can, Z. (2018). Effects of 12-week brisk walking training on exercise blood pressure in elderly patients with essential hypertension: A pilot study. *Clinical and Experimental Hypertension*, *40*(7), 673–679. https://doi.org/10.1080/10641963.2018.1425416

Kazeminia, M., Daneshkhah, A., Jalali, R., Vaisi-Raygani, A., Salari, N., & Mohammadi, M. (2020). The Effect of Exercise on the Older Adult's Blood Pressure Suffering Hypertension: Systematic Review and Meta-Analysis on Clinical Trial Studies. *International Journal of Hypertension*, *2020*, 1–19. https://doi.org/10.1155/2020/2786120

Khoram, S., Loripoor, M., Pirhadi, M., & Beigi, M. (2019). The effect of walking on pregnancy blood pressure disorders in women susceptible to pregnancy hypertension: A randomized clinical trial. *Journal of Education and Health Promotion*, *8*, 7.

Ko, J., Deprez, D., Shaw, K., Alcorn, J., Hadjistavropoulos, T., Tomczak, C., Foulds, H., & Chilibeck, P. D. (2021). Stretching is Superior to Brisk Walking for Reducing Blood Pressure in People With High–Normal Blood

Pressure or Stage I Hypertension. *Journal of Physical Activity and Health*, *18*(1), 21–28. https://doi.org/10.1123/jpah.2020-0365

Korsager Larsen, M., & Matchkov, V. V. (2016). Hypertension and physical exercise: The role of oxidative stress. *Medicina*, *52*(1), 19–27. https://doi.org/10.1016/j.medici.2016.01.005

Kucio, C., Narloch, D., Kucio, E., & Kurek, J. (2017). The application of Nordic walking in the treatment hypertension and obesity. *Family Medicine & Primary Care Review*, *2*, 144–148. https://doi.org/10.5114/fmpcr.2017.67870

Lee, L. L., Mulvaney, C. A., Wong, Y. K. Y., Chan, E. S., Watson, M. C., & Lin, H. H. (2021). Walking for hypertension. *Cochrane Database of Systematic Reviews*, *2021*(3). https://doi.org/10.1002/14651858.CD008823.pub2

Longo, A., Hutchinson, W. G., Hunter, R. F., Tully, M. A., & Kee, F. (2015). Demand response to improved walking infrastructure: A study into the economics of walking and health behaviour change. *Social Science & Medicine*, *143*, 107–116. https://doi.org/10.1016/j.socscimed.2015.08.033

Lu, Q., Wang, S., Liu, Y., Chen, H., Zhang, R., Zhang, W., Zou, Y., Zhou, J., Guo, X., Zhang, Y., Huang, T.-L., Liu, Y., Zhang, S., Yamanishi, K., Yamanishi, H., Higashino, H., & Okamura, H. (2019). Low-intensity walking as mild medication for pressure control in prehypertensive and hypertensive subjects: How far shall we wander? *Acta Pharmacologica Sinica*, *40*(8), 1119–1126. https://doi.org/10.1038/s41401-018-0202-8

Mandini, S., Conconi, F., Mori, E., Caruso, L., Grazzi, G., & Mazzoni, G. (2021). Guided walking reduces blood pressure in hypertensive sedentary subjects including those with resistant hypertension. *Journal of Human Hypertension*, *35*(3), 226–231. https://doi.org/10.1038/s41371-020-0324-6

Mandini, S., Conconi, F., Mori, E., Grazzi, G., & Mazzoni, G. (2020). Guided walking is more effective than suggested walking in reducing the blood pressure of hypertensive sedentary subjects and in modifying their lifestyle. *Sport Sciences for Health*, *16*(2), 375–381. https://doi.org/10.1007/s11332-020-00620-y

Mandini, S., Conconi, F., Mori, E., Myers, J., Grazzi, G., & Mazzoni, G. (2018). Walking and hypertension: Greater reductions in subjects with higher baseline systolic blood pressure following six months of guided walking. *PeerJ*, *6*, e5471. https://doi.org/10.7717/peerj.5471

Mei, C. H., Tafwidhah, Y., & Wulandari, D. (2017). *EFEKTIVITAS BRISK WALKING EXERCISE TERHADAP PERUBAHAN TEKANAN DARAH PADA KELOMPOK RESIKO HIPERTENSI DI WILAYAH KERJA PUSKESMAS KECAMATAN PONTIANAK KOTA*. 14.

Murtagh, E. M., Nichols, L., Mohammed, M. A., Holder, R., Nevill, A. M., & Murphy, M. H. (2015). The effect of walking on risk factors for cardiovascular disease: An updated systematic review and meta-analysis of randomised control trials. *Preventive Medicine*, *72*, 34–43. https://doi.org/10.1016/j.ypmed.2014.12.041

Ningsih, A. D. (2020). *WALKING EXERCISE AS A CHOICE IN LOWERING BLOOD PRESSURE IN HYPERTENSIVE PATIENTS: SYSTEMATIC REVIEW*. *4*, 17.

Oja, P., Kelly, P., Murtagh, E. M., Murphy, M. H., Foster, C., & Titze, S. (2018). Effects of frequency, intensity, duration and volume of walking interventions on CVD risk factors: A systematic review and meta-regression analysis of randomised controlled trials among inactive healthy adults. *British Journal of Sports Medicine*, *52*(12), 769–775. https://doi.org/10.1136/bjsports-2017-098558

Omura, J. D., Watson, K. B., Loustalot, F., Fulton, J. E., & Carlson, S. A. (2021). Types of Physical Activity Recommended by Primary Care Providers for Patients at Risk for Cardiovascular Disease. *Preventing Chronic Disease*, *18*, 200545. https://doi.org/10.5888/pcd18.200545

Patil, S. G., Patil, S. S., Aithala, M. R., & Das, K. K. (2017). Comparison of yoga and walking-exercise on cardiac time intervals as a measure of cardiac function in elderly with increased pulse pressure. *Indian Heart Journal*, *69*(4), 485–490. https://doi.org/10.1016/j.ihj.2017.02.006

Rachmawati, I. D., Sugiarto, A., & Hastuti, T. P. (2019). INFLUENCE OF BRISK WALKING EXERCISE ON BLOOD PRESSURE AMONG ESSENTIAL HYPERTENSION PATIENTS. *Midwifery and Nursing Research*, *1*(1), 10. https://doi.org/10.31983/manr.v1i1.4058

Robertson, L. B., Ward Thompson, C., Aspinall, P., Millington, C., McAdam, C., & Mutrie, N. (2012). The Influence of the Local Neighbourhood Environment on Walking Levels during the Walking for Wellbeing in the West Pedometer-Based Community Intervention. *Journal of Environmental and Public Health*, *2012*, 1–14. https://doi.org/10.1155/2012/974786

Scherder, E., Scherder, R., Verburgh, L., Königs, M., Blom, M., Kramer, A. F., & Eggermont, L. (2014). Executive Functions of Sedentary Elderly May Benefit from Walking: A Systematic Review and Meta-Analysis. *The American Journal of Geriatric Psychiatry*, *22*(8), 782–791. https://doi.org/10.1016/j.jagp.2012.12.026

Sommers, M. S. (2019). *Davis's diseases and disorders: A nursing therapeutics manual* (Sixth edition). F. A. Davis Company.

Themes, U. F. O. (2016, May 25). Human Walking. *Musculoskeletal Key*. https://musculoskeletalkey.com/human-walking/

Wijaya, I. K., Yusuf Tahir, M., Thabran Talib, M., Tasa, H., & Mulyani, S. (2022). The Effect of Brisk Walking on Blood Pressure in Hypertension Patients: A Literature Review. *KnE Life Sciences*. https://doi.org/10.18502/kls.v7i2.10326

Yu, Y., Chang, C., Wu, Y., Xie, L., & Guo, C. (2020). *Effects of brisk walking on blood pressure in the Chinese Han occupational population with a sedentary lifestyle: A baseline control trial* [Preprint]. In Review. https://doi.org/10.21203/rs.3.rs-23564/v1

Yulisa, D. K. (2018). *The Effect of Walking Exercise on Blood Pressure in The Elderly With Hypertension in Mulyoharjo Community Health Center Pemalang*. 9.

Zhu, Z., Feng, T., Huang, Y., Liu, X., Lei, H., Li, G., Deng, D., Zhang, N., & Huang, W. (2019). Excessive physical activity duration may be a risk factor for hypertension in young and middle-aged populations. *Medicine*, *98*(18), e15378. https://doi.org/10.1097/MD.0000000000015378