International Journal of Health Science and Technology e-ISSN 2685-8673
Vol. 7, No. 2 (2025), pp. (109-119)
https://doi.org/10.31101/ijhst.v7i2.4413

Original Research Paper

Health belief model-based analysis of Prolanis Exercise

Astika Cahyarani[1,2*], Joko Murdiyanto[1], Annisa Latifa[1], Hendrian Dyatmiko[1], Sekarlangit Sekarlangit[1], Novi Husmarini[2], Huda Salsabila[1], Annisasufitri Bryan Illahi[1], Rico Firman Rasyid[1]
[1]Faculty of Medicine Universitas Aisyiyah Yogyakarta, Yogyakarta, Indonesia
[2]Poltekkes Kemenkes Yogyakarta Primary Clinic, Yogyakarta, Indonesia
astika.cahyarani@unisayogya.ac.id

Submitted: September 9, 2025 Revised: October 13, 2025 Accepted: October 17, 2025

Abstract
Managing non-communicable diseases, particularly diabetes and hypertension, requires a blend of pharmacological and non-pharmacological interventions, including enhanced physical activity. The Prolanis exercise program, created by BPJS, is a promotive-preventive initiative aimed at fostering healthy lifestyle modifications through consistent physical activity and health education. The Poltekkes Kemenkes Yogyakarta Primary Clinic has implemented this program for individuals with hypertension and diabetes; however, the participation rate requires enhancement. This study seeks to examine the determinants affecting participant engagement in Prolanis Exercise through the Health Belief Model (HBM) framework. This research is a cross-sectional qualitative research with a sample of 40 participants which was then analyzed using the linear regression method. Results show that most HBM constructsperceived susceptibility, severity, benefits, barriers, and cues to actiondo not significantly influence participation. Only self-efficacy demonstrated a positive but marginally significant effect while the promotive-preventive approach showed a significant negative relationship with participation. The research results indicate that the majority of HBM constructs such as perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and cues to action do not have a significant relationship with the level of participation in the Prolanis exercise activities at the clinic. However, there are serious drawbacks to the existing promotive-preventive strategy, which highlights the need to enhance health communication approaches to be more participative, interactive, and in line with patients' needs and sociocultural context. This study highlights the importance of redesigning promotive-preventive strategies toward more participatory, context-sensitive, and empowerment-oriented health communication models, providing valuable insights for policymakers and primary healthcare providers in developing more effective community-based interventions for non-communicable disease management.

Keywords: health belief model; health promotion; prolanis exercise; non-communicable diseases; self-efficacy

1. Introduction

Non-communicable diseases (NCDs) are among the primary causes of mortality globally, including in Indonesia. In 2016, non-communicable diseases accounted for 72% of worldwide mortality. This amount is about fourfold greater than the fatalities associated with infectious diseases, maternal issues, neonatal complications, and nutritional deficiencies (Ministry of Health of the Republic of Indonesia, 2024). The findings of the 2018 Basic Health Research (Riskesdas) indicate an increased in the prevalence of NCDs compared to the 2013 Riskesdas results. The non-communicable diseases that have escalated include cancer (from 1.4% to 1.8%), stroke (from 7% to 10.9%), chronic renal disease (from 2% to 3.8%), diabetes mellitus (from 6.9% to 8.5%), and hypertension (from 25.8% to 34.1%). The rise

in non-communicable disease prevalence correlates with lifestyle factors such as tobacco use, inadequate physical activity, and insufficient intake of fruits and vegetables (Mboi et al., 2022). Since 2013, the prevalence of smoking among adolescents aged 10-18 years has consistently risen, with rates of 7.2% (Kemenkes RI, 2019). The prevalence of insufficient physical exercise has risen from 26.1% to 33.5%. Furthermore, it is recognized that 0.8% engage in excessive alcohol use. This trend is also accompanied by a rising prevalence of overweight and obese individuals in Indonesia annually. The incidence of overweight individuals rose from 8.6% in 2007 to 13.6% in 2018, but the incidence of obesity escalated from 10.5% in 2007 to 21.8% in 2018. Furthermore, research indicates that 95.5% of Indonesians aged over 5 consume fewer than five servings of fruits and vegetables daily (Kementerian Kesehatan Republik Indonesia, 2023).

Diabetes mellitus (DM) and hypertension are two types of NCDs with the highest prevalence. Both conditions have become more common in recent years and frequently appear in the same high-risk individuals. According to data, 8.5% of Indonesians aged 18 and older have diabetes mellitus, and 34.1% have hypertension (Kemenkes RI, 2019). Since it can result in long-term concerns like heart attacks, sight problems, strokes, and even early death, it requires immediate attention.

Participants with diabetes mellitus and hypertension ought to get comprehensive chronic illness management, which includes both non-pharmacological and pharmaceutical treatments. Pharmacological drugs are used in drug therapy, while supportive therapy, which is a crucial adjunct to pharmacological treatment, is non-drug therapy. Making behavioral changes, increasing physical activity, controlling nutrition, and effectively managing stress are all ways to use non-pharmacological therapy (Raveendran, 2018).

Pharmacological therapy for diabetes includes both medicine and lifestyle changes. Diabetes patients should be advised and given instruction on lifestyle changes, such as increasing physical activity, managing diet, and managing stress (Yeh et al., 2023). High-intensity or moderate-intensity physical activity is beneficial for cardiovascular protection and will help diabetics better maintain their blood sugar levels. Both forms of exercise improved glycemic control in individuals with type 2 diabetes, despite the fact that a study comparing high-intensity interval training and moderate-intensity continuous training discovered that the former was more beneficial for cardiovascular protection than the latter (Costa-Arruda et al., 2025). Doctors can prescribe exercise to patients with diabetes because it is very good for increasing their quality of life and even for controlling their sleep quality (González-Devesa et al., 2025). For individuals with type 2 diabetes, optimal blood glucose control is influenced by interpersonal interactions, perceived advantages, and perceived severity at the individual level (Rajkumar et al., 2022).

Numerous studies have examined pharmacological and non-pharmacological management approaches for diabetes mellitus and hypertension, most have focused on clinical outcomes such as glycemic control, blood pressure regulation, and medication adherence. Limited research has explored the behavioral determinants that influence patients participation in Prolanis as component of Indonesia chronic disease management program. Few studies have applied the HBM framework to analyze how individuals perceptions of susceptibility, severity, benefits, and barriers affect their engagement in this preventive physical activity. This study seeks to fill this gap by examining the relationship between HBM constructs and participation in Prolanis among patients with diabetes mellitus and hypertension. Novelty of this research lies in its integration of a behavioral health model within a national chronic disease management context offering new insights into how cognitive and motivational factors shape participation in community-based exercise programs designed to improve non-communicable disease outcomes.

2. Research Method

This study has a cross-sectional, quantitative design, which means that data for all variables for research are gathered at one location in time. Primary data from questionnaires using the Health Belief Model (HBM) method and secondary data regarding the Prolanis Exercise program from the Poltekkes Kemenkes Yogyakarta Primary Clinic compose the research data. All Prolanis participants at the Poltekkes Kemenkes Yogyakarta Primary Clinic represent the study population. A sample size of 40 individuals who satisfy the following requirements are included in the study: they must be between the ages of 40 and 70, willing to participate, and free from severe physical or cognitive impairments that could impair their ability to communicate or perform the exercise.

A Likert scale questionnaire was used as the research tool, with participation in the Prolanis Exercise serving as the dependent variable and evaluations of vulnerability, severity, benefits, barriers, and cues to action as independent variables. Two assistants who had received training to guarantee a consistent comprehension of the questionnaire's objectives, substance, and completion procedures helped the researcher gather the data. Before taking part, each respondent completed an informed consent form and received an explanation of the study's goals.

The sampling technique employed in this study was purposive sampling in which participants were selected based on the aforementioned inclusion criteria. The total sample of 40 respondents corresponded to the number of Prolanis participants who attended the exercise sessions during the data collection period at the Poltekkes Kemenkes Yogyakarta Primary Clinic. The questionnaire was offered directly to participants during Prolanis exercise sessions and those who agreed to participate filled out the questionnaire after receiving appropriate information about the study. For data analysis univariate analysis was performed to describe the frequency distribution of each variable. Bivariate analysis using the t-test was conducted to examine the relationship between the independent variables (perceived susceptibility, severity, benefits, barriers, and cues to action) and the dependent variable (participation in the Prolanis Exercise). Multiple linear regression analysis was used to evaluate the simultaneous and partial effects of all independent variables on participation, while simple linear regression was applied to assess the influence of individual predictor variables. Ethical approval was obtained from the Health Research Ethics Committee of Universitas Aisyiyah Yogyakarta with the number EC 4383/KEP-UNISA/IV/2025.

3. Result and Discussion

3.1.Result

3.1.1.Demographic Profile of Participants

The demographic profile of the respondents (Tabel 1.) indicates that the predominant age group was 60–70 years (55%), followed by 49–59 years (32.5%), with a small representation of individuals aged 71–81 (12.5%). The responders were primarily female (77.5%) compared to male (22.5%). The majority of individuals are married (77.5%), followed by 20% who are widowed, and only 2.5% who are unmarried. The respondents' educational attainment varied, with the majority being high school graduates (42.5%), followed by bachelor's degree holders (22.5%), and only a small percentage possessing postgraduate degrees (5%) or unstated degrees (10%). The predominant occupations are housewives (30%) and pensioners (27.5%), with 17.5% unemployed, and the remaining individuals classified as self-employed (12.5%) and civil servants (12.5%). The major chronic condition is hypertension (45%), followed by a combination of hypertension and diabetes (30%), diabetes alone (12.5%), and other ailments (12.5%). From a behavioural standpoint, participant frequency for physical activity Prolanis programmes remains comparatively low, with the majority attending bi-monthly (45%) or irregularly (15%), while 35% participate consistently on a weekly basis. Over 75 percent of

respondents have participated in the programme for over six months, whereas just fifteen percent have participated for less than one month.

Table 1. Participant characteristics

Characteristics		n	%
Age	49-59	13	32.5
	60-70	22	55
	71-81	5	12.5
Gender	Men	9	
	Woman	31	
Marital Status	Married	31	77.5
	Not yet married	1	2.5
	Widow/Widower	8	20
Highest Education	Not mentioned	4	10
	Elementary School	2	5
	Junior High School	3	7.5
	Senior High School	17	42.5
	Diploma	3	7.5
	Bachelor's degree	9	22.5
	Postgraduate	2	5
Job	Not Working	7	17.5
	Entrepreneur	5	12.5
	Housewife	12	30
	Civil Servant	5	12.5
	Retirement	11	27.5
Diseases Suffered	Hypertension	18	45
	Diabetes	5	12.5
	Both	12	30
	Other	5	12.5
Exercise Frequency	Never	2	5
	Rarely	6	15
	Twice a month	18	45
	Once a week	14	35
Long Time Doing Prolanis Exercise	<1 Month	6	15
	1-3 Month	2	5
	4-6 Month	2	5
	>6 Month	30	75

3.1.2. Perception Analysis

The multiple regression analysis results (Table 2) indicate an F-statistic of 1.696, with a significance level of 0.145. The significance value goes above the conventional threshold of 0.05, indicating that the independent variables within the Health Belief Model framework (perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy) do not significantly affect patient participation in Prolanis exercise activities. This condition suggests that elements outside the HBM framework, including intrinsic motivation, familial support, physical health, and the quality of interactions with healthcare professionals, likely exert a more substantial influence on patient participation in the exercise programme (Ma et al., 2024; Thielen et al., 2023; Werner et al., 2024).

The research findings showed that the vast majority of participants were elderly and experienced a substantial number of chronic diseases; nonetheless, their regular engagement in exercise remained constrained. The study indicates that the majority of components of the HBM did not exhibit a

significant correlation with the level of participation in Prolanis exercise activities. Perceived vulnerability (Table 3) to chronic diseases exhibits a positive correlation (B = 0.070; β = 0.078) but lacks statistical significance (p = 0.667), suggesting that participants' understanding of potential disease risks did not enough affect their decision to engage. This parallels a study conducted in Indonesia, which revealed that individuals frequently underestimate ailments, particularly those resulting from detrimental lifestyle choices such as diabetes and hypertension. This discovery underscores the necessity of enhancing health literacy and communication techniques (Setianti et al., 2025). The perceived severity of the illness exhibited a positive connection (B = 0.091; β = 0.116), while it was not statistically significant (p = 0.665). This suggests that despite participants seeing their condition as significantly severe, this component did not immediately enhance their engagement in exercise activity.

Table 2. Results of multiple linear regression test (F-test)

Model	f-statistic	Sig	Coefficients Interval
Regression	1.696	0.145	95%

Table 3. Results of multiple linear regression test, t-test (significant individual parameter test)

Independent Variable	t-statistic	B	Beta	Sig
Perceived Susceptibility	0.434	0.07	0.78	0.667
Perceived Severity	0.436	0.091	0.116	0.665
Perceived Benefits	0.149	0.028	0.037	0.882
Perceived Barriers	-1.384	-0.084	-0.239	0.172
Cue to Action	0.266	0.059	0.064	0.792
Self-Efficacy	1.728	0.271	0.362	0.094
Promotive and Preventive Approach	-2311	-0.348	-0.509	0.027

The regression analysis (Table 3) indicates that most HBM constructs were not significantly associated with participation in Prolanis exercise activities. Although perceived benefits, barriers, and cues to action showed expected directional trends, their effects were weak and statistically insignificant. In contrast, self-efficacy demonstrated the strongest positive influence on participation, suggesting that individuals confidence in their ability to overcome obstacles plays a crucial role in sustaining regular exercise. Promotive and preventive approach revealed a significant negative association indicating that current strategies may not effectively motivate participants and could even reduce enthusiasm for participation. These findings underscore the central role of self-efficacy as a behavioral driver within the HBM framework while highlighting the need to reassess existing promotive-preventive efforts to better encourage active involvement in Prolanis exercises.

This negative trend on perception of benefits fits with the existing research indicating increased perceived obstacles, such as time limitations, distance, physical ailments, or hesitance, result in diminished participation rates (Koh et al., 2022). Participants' self-efficacy in overcoming obstacles significantly influences their consistency in engaging with the exercise program (Cheng et al., 2023). Self-efficacy and perceived barriers are key variables that correlate most strongly with exercise behavior, while cues to action and perceived benefits show low or non-significant associations (Gong & Sheng, 2022). The results of this study highlight two important aspects in understanding participation behavior in the Prolanis exercise program: the counter-intuitive role of the promotive-preventive approach, and the importance of self-efficacy.

This counterintuitive finding aligns with previous evidence suggesting that top-down communication approaches are often ineffective; effective health communication must not only convey

accurate information but also build trust, relevance, and resonance with the audience's lived experiences, underscoring the importance of developing participatory, empowerment-oriented strategies that actively involve individuals and communities in designing and implementing health promotion initiatives (Kreps, 2023). Participation in structured peer-support programs significantly improved self-efficacy and self-management behaviors among individuals with type 2 diabetes, leading to better health-related outcomes and reduced healthcare burdens. Similarly the Chronic Disease Self-Management Program has been proven effective in empowering individuals to take greater control of their health, adopt healthier behaviors, and maintain consistent disease management through participatory learning and mutual support mechanisms. These findings suggest that integrating similar empowerment-based educational strategies into Prolanis could enhance participant engagement and sustainability more effectively than traditional top-down promotive-preventive communication approaches (Kerari et al., 2024).

3.2.Discussion

A promotional-preventive strategy in health programs does not always ensure increased participation, as the spread of didactic, top-down, and less relevant information to participants' daily experiences may result in resistance to health recommendations. Recent study reveals that, despite the extensive availability of evidence-based guidelines, their adoption is frequently minimal due to communication approaches that fail to resonate with the audience's needs and perceptions, resulting in rejection or indifference towards preventative initiatives (Kreps, 2023). Furthermore, literature on behavior change communication highlights the considerable limitations of one-way communication methods, underscoring the need for interactive and contextual strategies to facilitate more profound behavioral change (Nancy & Dongre, 2021). Research from community-based health initiatives indicates that commitment is greater when communications are customized to the socio-cultural environment and developed by active community participation, as opposed to hierarchical approaches that depend exclusively on normative education (Smith et al., 2015). The efficacy of promotive-preventive treatments significantly depends on employing a participatory, culturally relevant, and appropriate communication strategy that addresses the participants' wants and needs.

Despite a considerable understanding of risk factors for chronic diseases like hypertension and diabetes, this has not sufficiently compelled individuals to take preventive measures. Studies suggest that awareness of the dangers associated with obesity, hypertension, and diabetes corresponds with healthy behaviors; however, this correlation is rather weak and does not result in substantial changes in behavior (Rajkumar et al., 2022; Vornanen et al., 2020). In the context of diabetes, individuals possessing a heightened knowledge of problems frequently neglect to implement preventative strategies, such as achieving optimal weight or regulating blood pressure (Ang, 2019; Rose & Merz, 2020). This demonstrates the presence of an intention-behavior gap, which refers to the difference between risk knowledge and the necessary activities for illness prevention. This condition establishes that mere risk knowledge is insufficient for promoting health behaviors without further interventions, including motivation, social support, and ongoing, contextually relevant health education programs that are culturally appropriate (Fatimatuzahra & Wisnuwardani, 2023). This study clarifies why perceived susceptibility did not significantly affect participation in Prolanis exercise. Consequently, promotive and preventive interventions must be formulated to not only elevate risk awareness but also to bolster additional driving factors, including healthcare worker support, familial engagement, and community strategies that can improve participants' motivation and commitment to regular participation.

While awareness of chronic disease concerns, such as hypertension and diabetes, is considerable, it does not always result in meaningful changes in health behavior. Research shows that awareness of chronic disease risk factors is correlated with healthy behavior; however, this association is generally

weak and does not directly encourage preventative measures (Gözüm & Dağıstan Akgöz, 2023; Hassen et al., 2022) . Individuals experiencing increased rates of diabetic complications frequently neglect preventive measures, including weight management and blood pressure regulation (Jalilian et al., 2023). This event exemplifies the awareness-behavior gap, the difference between risk awareness and necessary health actions. Culturally tailored, community-based health education interventions have demonstrated greater efficacy in enhancing knowledge, risk perception, and behavioral changes for prevention. A quasi-experimental study published in Nigeria shown that a behavior change communication program effectively enhanced knowledge and healthy living practices about hypertension and diabetes (Akuiyibo et al., 2022). Culturally contextualized community education programs effectively enhance health outcomes, including health literacy, physical activity, and physiological control, in minority populations (Singh et al., 2022). In Prolanis exercise activity, sustainable, enjoyable, and community-oriented educational initiatives are essential to connect risk knowledge with actual participation, hence enhancing participants' motivation to engage in activities frequently as part of chronic illness management.

Self-efficacy plays an important role in explaining health behavior, as highlighted in the Health Belief Model and Bandura's Social Cognitive Theory. Individuals with the self-assurance to surmount obstacles and sustain healthy practices demonstrate greater consistency in adhering to interventions, such as frequent physical activity. Studies indicate that self-efficacy is a significant predictor of the adoption of health preventive practices, since it enhances individuals' confidence in combating the threat of illness (Blom et al., 2021; Egele et al., 2025; Nooijen et al., 2019). Support from group members can significantly enhance self-efficacy and develop confidence in one's capacity to overcome diverse challenges (Wang et al., 2023). The comprehensive review confirmed that the efficacy of lifestyle changes, including nutritious dietary habits and physical exercise, is improved by increased self-efficacy, matching with the principles of social cognitive theory (Guillaumie et al., 2010). Moreover, treatments that prioritize setting objectives, peer support, and structured self-efficacy instruction have demonstrated efficacy of improving participants' adherence to the management of chronic diseases, including type 2 diabetes (Jiang et al., 2021). Consequently, increasing self-efficacy is a more sustainable approach for augmenting involvement in the Prolanis program than exclusively depending on promotive-preventive teaching.

The non-significant influence of HBM constructs such as perceived susceptibility, perceived severity, perceived benefits, and cues to action on participation in the health program is likely due to the homogeneity of risk perception among Prolanis participants. Most participants had already been diagnosed with chronic diseases and received regular health education, so their awareness of the risks and benefits of prevention was relatively high and uniform. Studies on participants with chronic diseases show that after a diagnosis is made, health threat perceptions tend to increase evenly, making HBM variables less able to explain further behavioral variations (Tarkang & Zotor, 2015). Another finding in the diabetic participant population also showed that perceived susceptibility and severity were often not significantly related to self-care behaviors, as risk awareness was already strongly ingrained from the beginning (Alatawi et al., 2016). Healthcare services often face significant challenges such as inadequate resources, labor shortages, and difficulty accessing essential medications and equipment, which hinder healthcare providers. Integrating diabetes care into a primary healthcare system that is minimal and exacerbated by cultural beliefs and a fatalistic attitude toward the disease. Professional healthcare workers recommend group-based support to assist community members, as well as home visits for personalized care (Chowdhury et al., 2025). Increased literacy through telemedicine combined with health education can provide significant benefits to older adults with type 2 diabetes living in the community and is a new approach to chronic disease prevention and management (Rajashekhar et al., 2025). Education to improve literacy using health promotion models and implementing it through

multimedia can change beliefs about the importance of physical activity and increase participation among participants with diabetes (Lari et al., 2018).

This study provides new evidence on the behavioral determinants of participation in the Prolanis exercise program by applying the Health Belief Model within the Indonesian primary healthcare context. While international research has widely examined the role of psychological and social constructs in promoting physical activity, few studies have specifically explored how these factors influence engagement in community-based chronic disease management programs such as Prolanis. The findings highlight that self-efficacy is the strongest behavioral predictor of consistent participation, suggesting that empowerment-based interventions—such as peer support, motivational counseling, and goal-setting—may enhance the effectiveness of Prolanis implementation. Furthermore, the negative association between promotive-preventive strategies and participation underscores the need for more contextual, participatory, and culturally sensitive communication approaches that resonate with participants' lived experiences. These insights extend the global literature by demonstrating how behavioral health theories can inform chronic disease prevention programs in Indonesia's community health system.

Several limitations should be noted. The study involved a small sample size (n = 40) drawn from a single Prolanis site which may limit generalizability. Data collection relied on self-reported questionnaires which are subject to recall and social desirability bias. Cross-sectional design prevents causal inference between Health Belief Model constructs and participation behavior. Future research should consider larger, multi-site longitudinal studies using mixed-method approaches to validate and expand these findings. Despite these limitations the study contributes valuable preliminary evidence for developing behaviorally informed strategies to strengthen chronic disease management through Prolanis in Indonesia.

4. Conclusion

This study found that most constructs of the Health Belief Model including perceived susceptibility, severity, benefits, barriers, and cues to action did not show a significant relationship with participation in the Prolanis exercise program. Only self-efficacy demonstrated a relatively strong positive influence, suggesting that confidence in one's ability to overcome obstacles is a key factor in sustaining regular participation. In contrast, the promotive-preventive approach showed a significant negative effect implying that existing communication and engagement strategies may not yet be effective or culturally responsive. The findings emphasize the importance of enhancing self-efficacy through supportive group activities, motivational reinforcement, and structured health education tailored to participants' needs. However, this study is limited by its small sample size, single-site setting, and reliance on self-reported data, which may affect generalizability. Future research should involve larger and more diverse samples, as well as longitudinal or mixed-method designs, to strengthen the evidence base for behavioral interventions within the Prolanis framework.

The findings contribute to the refinement of community-based health promotion strategies and the development of more person-centered interventions. The study also establishes a foundation for future longitudinal and intervention-based research aimed at enhancing patient empowerment and self-management.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Acknowledgment

The authors gratefully acknowledge the support of Universitas 'Aisyiyah Yogyakarta for facilitating this research. Appreciation is also extended to the Poltekkes Kemenkes Yogyakarta Primary Clinic for its collaboration and to all Prolanis participants for their invaluable contribution and participation in this study.

References

Akuiyibo, S., Anyanti, J., Amoo, B., Aizobu, D., & Idogho, O. (2022). Effects of behaviour change communication on hypertension and diabetes related knowledge, attitude and practices in Imo and Kaduna States: A quasi-experimental study. BMC Public Health, 22(1). https://doi.org/10.1186/s12889-022-13139-3

Alatawi, Y. M., Kavookjian, J., Ekong, G., & Alrayees, M. M. (2016). The association between health beliefs and medication adherence among patients with type 2 diabetes. Research in Social and Administrative Pharmacy, 12(6), 914–925. https://doi.org/10.1016/j.sapharm.2015.11.006

Ang. (2019). Impact of Knowledge and Attitudes on Lifestyle Practices in Preventing Type 2 Diabetes Mellitus. Annals of the Academy of Medicine, Singapore, 48(8). https://pubmed.ncbi.nlm.nih.gov/31628744/

Blom, V., Drake, E., Kallings, L. V., & Ekblom, M. M. (2021). The effects on self-efficacy, motivation and perceived barriers of an intervention targeting physical activity and sedentary behaviours in office workers: A cluster randomized control trial. BMC Public Health, 21(1). https://doi.org/10.1186/s12889-021-11083-2

Cheng, H.-I., Hsu, W.-T., Wang, W.-H., Li, R.-H., Tang, F.-C., & Huang, S.-L. (2023). Health Behavior Models and Regular Exercise Levels Among Workers in Taiwan. Journal of Multidisciplinary Healthcare, Volume 16, 4149–4159. https://doi.org/10.2147/JMDH.S435774

Chowdhury, H. A., Billah, B., Alam, Z., Dipa, S. A., Fazlur Rahman, A. K. M., Ali, L., Joham, A. E., & Harrison, C. L. (2025). A qualitative study of healthcare provider perspectives on challenges and opportunities to improve diabetes self-management practices in rural Bangladesh. Diabetes Research and Clinical Practice, 227, 112412. https://doi.org/10.1016/j.diabres.2025.112412

Costa-Arruda, R. M. D., Padovani, C., Correia, M., Consolim-Colombo, F., Phillips, S., Ritti-Dias, R., & Sampaio, L. M. M. (2025). The impact of two different aerobic exercise intensities on cardiometabolic parameters in type 2 diabetic patients: A randomized trial. Journal of Bodywork and Movement Therapies, 42, 153–161. Scopus. https://doi.org/10.1016/j.jbmt.2024.12.013

Egele, V. S., Klopp, E., & Stark, R. (2025). How Valid Is Bandura's Social Cognitive Theory to Explain Physical Activity Behavior? European Journal of Investigation in Health Psychology and Education, 15(2), 20–20. https://doi.org/10.3390/ejihpe15020020

Fatimatuzahra, T., & Wisnuwardani, R. W. (2023). Analysis of Risk Factors of Non Communicable Disease in The Prapatan Urban Village Balikpapan City, East Kalimantan on 2023: Analysis of Risk Factors of Non Communicable Disease in The Prapatan Urban Village Balikpapan City, East Kalimantan on 2023. Mulawarman International Conference on Tropical Public Health, 3(3). https://scholar.google.com/citations?view_op=view_citation&hl=en&user=b3VUWWkAAAAJ&cstart=20&pagesize=80&citation_for_view=b3VUWWkAAAAJ:5mL_tC_eHSoC

Gong, L., & Sheng, J. (2022). The Current Health Belief of Exercise Conditions of Chinese College Students and Ways of Improvements: An Analysis Based on the Health Belief Model. Frontiers in Psychology, 13, 906297. https://doi.org/10.3389/fpsyg.2022.906297

González-Devesa, D., Sanchez-Lastra, M. A., Pérez-Fernández, P., Diz-Gómez, J. C., & Ayán-Pérez, C. (2025). The effect of physical activity on sleep quality in people with diabetes: Systematic review and meta-analysis. Sleep and Breathing, 29(1). Scopus. https://doi.org/10.1007/s11325-024-03176-0

Gözüm, S., & Dağıstan Akgöz, A. (2023). Community-Dwelling Adults' Perceived Versus Actual Risk of Cardiovascular Disease, Body Mass Index, and Physical Activity Levels and Related Factors. Journal of Public Health Management & Practice, 29(6), E263–E272. https://doi.org/10.1097/PHH.0000000000001790

Guillaumie, L., Godin, G., & Vezina-Im, L.-A. (2010). Psychosocial determinants of fruit and vegetable intake in adult population: A systematic review. International Journal of Behavioral Nutrition and Physical Activity, 7(1), 12. https://doi.org/10.1186/1479-5868-7-12

Hassen, H. Y., Bowyer, M., Gibson, L., Abrams, S., & Bastiaens, H. (2022). Level of cardiovascular disease knowledge, risk perception and intention towards healthy lifestyle and socioeconomic disparities among adults in vulnerable communities of Belgium and England. BMC Public Health, 22(1), 197. https://doi.org/10.1186/s12889-022-12608-z

Jalilian, H., Javanshir, E., Torkzadeh, L., Fehresti, S., Mir, N., Heidari-Jamebozorgi, M., & Heydari, S. (2023). Prevalence of type 2 diabetes complications and its association with diet knowledge and skills and self-care barriers in Tabriz, Iran: A cross-sectional study. Health Science Reports, 6(2), e1096. https://doi.org/10.1002/hsr2.1096

Jiang, X.-J., Jiang, H., Chen, Y., Wu, X.-A., Yu, X.-L., Liu, L., & Li, M.-Z. (2021). The Effectiveness of a Self-Efficacy-Focused Structured Education Program (SSEP) in Improving Metabolic Control and Psychological Outcomes of Type 2 Diabetes Patients: A 12-Month Follow-Up of a Multicenter Randomized Controlled Trial. Diabetes Metabolic Syndrome and Obesity, Volume 14, 305–313. https://doi.org/10.2147/dmso.s290029

Kemenkes RI. (2019). Laporan Nasional Riskesdas 2018. Balitbangkes.

Kementerian Kesehatan Republik Indonesia. (2023). Buku Kinerja Kementerian Kesehatan Republik Indonesia Tahun 2022—2023 Transformasi Kesehatan Mewujudkan Masyarakat Indonesia sehat dan Unggul. Kementerian Kesehatan RI.

Kerari, A., Bahari, G., Alharbi, K., & Alenazi, L. (2024). The Effectiveness of the Chronic Disease Self-Management Program in Improving Patients' Self-Efficacy and Health-Related Behaviors: A Quasi-Experimental Study. Healthcare, 12(7), 778. https://doi.org/10.3390/healthcare12070778

Koh, Y. S., Asharani, P. V., Devi, F., Roystonn, K., Wang, P., Vaingankar, J. A., Abdin, E., Sum, C. F., Lee, E. S., Müller-Riemenschneider, F., Chong, S. A., & Subramaniam, M. (2022). A cross-sectional study on the perceived barriers to physical activity and their associations with domain-specific physical activity and sedentary behaviour. BMC Public Health, 22(1), 1051. https://doi.org/10.1186/s12889-022-13431-2

Kreps, G. L. (2023). Addressing resistance to adopting relevant health promotion recommendations with strategic health communication. Information Services and Use, 43(2), 131–142. https://doi.org/10.3233/ISU-230187

Lari, H., Tahmasebi, R., & Noroozi, A. (2018). Effect of electronic education based on health promotion model on physical activity in diabetic patients. Diabetes & Metabolic Syndrome: Clinical Research & Reviews, 12(1), 45–50. https://doi.org/10.1016/j.dsx.2017.08.013

Ma, G., Zhou, C., Han, Z., Mu, T., & Ma, X. (2024). Social support and physical literacy in young and middle-aged patients with hypertension: The mediating effects of sense of coherence and self-efficacy. BMC Psychiatry, 24(1), 494. https://doi.org/10.1186/s12888-024-05935-5

Nancy, S., & Dongre, A. R. (2021). Behavior Change Communication: Past, Present, and Future. DOAJ (DOAJ: Directory of Open Access Journals), 46(2), 186–190.

https://doi.org/10.4103/ijcm.ijcm_441_20

Nooijen, C., Blom, V., Ekblom, O., Ekblom, M. M., & Kallings, L. V. (2019). Improving office workers' mental health and cognition: A 3-arm cluster randomized controlled trial targeting physical activity and sedentary behavior in multi-component interventions. BMC Public Health, 19(1). https://doi.org/10.1186/s12889-019-6589-4

Rajashekhar, M., Joshi, M., Mundra, A., Kolhe, R., Kirubakaran, R., Raut, A. V., & Nazli Khatib, M. (2025). Community-based health promotion interventions to reduce risk factors of non-communicable diseases among adolescent and young adults in low- and middle-income countries: A systematic review and meta-analysis. Public Health, 105714. https://doi.org/10.1016/j.puhe.2025.03.026

Rajkumar, E., Kruthika, G., Angiel Ruth, P., Lakshmi, R., Monica, D., Romate, J., & John, A. (2022). Factors Influencing Optimal Glucose Control among Type II Diabetes Patients: From the Health Behaviour Models' Perspective. The Open Public Health Journal, 15(1), e187494452209020. https://doi.org/10.2174/18749445-v15-e2209020

Raveendran, A. V. (2018). Non-pharmacological Treatment Options in the Management of Diabetes Mellitus. European Endocrinology, 14(2), 31. https://doi.org/10.17925/EE.2018.14.2.31

Rose, E., & Merz, E. L. (2020). Diabetes knowledge, fatalism and type 2 diabetes-preventive behavior in an ethnically diverse sample of college students. Journal of American College Health, 70(2), 385–394. https://doi.org/10.1080/07448481.2020.1751175

Singh, H., Fulton, J., Mirzazada, S., Saragosa, M., Uleryk, E. M., & Nelson, M. L. A. (2022). Community-Based culturally tailored education programs for black communities with cardiovascular disease, diabetes, hypertension, and stroke: Systematic review findings. Journal of Racial and Ethnic Health Disparities, 10(6), 2986–3006. https://doi.org/10.1007/s40615-022-01474-5

Smith, M., Mateo, K. F., Morita, H., Hutchinson, C., & Cohall, A. T. (2015). Effectiveness of a Multifaceted Community-Based Promotion Strategy on Use of GetHealthyHarlem.org, a Local Community Health Education Website. Health Promotion Practice, 16(4), 480–491. https://doi.org/10.1177/1524839915571632

Tarkang, E. E., & Zotor, F. B. (2015). Application of the Health Belief Model (HBM) in HIV Prevention: A Literature Review. Central African Journal of Public Health, 1(1), 1. https://doi.org/10.11648/j.cajph.20150101.11

Thielen, S. C., Reusch, J. E. B., & Regensteiner, J. G. (2023). A narrative review of exercise participation among adults with prediabetes or type 2 diabetes: Barriers and solutions. Frontiers in Clinical Diabetes and Healthcare, 4, 1218692. https://doi.org/10.3389/fcdhc.2023.1218692

Vornanen, M., Konttinen, H., Peltonen, M., & Haukkala, A. (2020). Diabetes and Cardiovascular Disease Risk Perception and Risk Indicators: A 5-Year Follow-up. International Journal of Behavioral Medicine, 28(3), 337–348. https://doi.org/10.1007/s12529-020-09924-2

Wang, X., Tian, B., Zhang, S., Li, J., Yang, W., Gu, L., & Zhang, W. (2023). Underlying mechanisms of diabetes knowledge influencing diabetes self-management behaviors among patients with type II diabetes in rural China: Based on health belief model. Patient Education and Counseling, 117, 107986. https://doi.org/10.1016/j.pec.2023.107986

Werner, J. J., Ufholz, K., & Yamajala, P. (2024). Recent Findings on the Effectiveness of Peer Support for Patients with Type 2 Diabetes. Current Cardiovascular Risk Reports, 18(5), 65–79. https://doi.org/10.1007/s12170-024-00737-6

Yeh, Y. K., Yen, F., & Hwu, C. (2023). Diet and exercise are a fundamental part of comprehensive care for type 2 diabetes. Journal of Diabetes Investigation, 14(8), 936–939. https://doi.org/10.1111/jdi.14043