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Predicting Health Behavior Using the Theory of Planned Behavior: Lessons Learned from the COVID-19 Pandemic

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Abstract

Clean and healthy living behavior (CHLB) is one of the fundamental aspects of life. However, public awareness of health behaviors in Indonesia is still relatively low. This research aimed to predict health behaviors using the Theory of Planned Behavior (TPB) framework, which has the components of attitude, subjective norms, behavioral control, behavioral intention, and behavior, in the context of the COVID-19 pandemic. An incidental sampling technique was used to select 118 participants aged 20-40. Data were collected online using 17 questions about TPB. Path analysis showed that attitude and behavioral control predict health behavior indirectly through behavioral intention (partial mediation). On the other hand, subjective norms do not significantly predict intention but are directly related to health behavior. The implications of this study for policy and public health are discussed further.

Clean and Healthy Living Behavior (CHLB), hereinafter referred to as health behavior, is one of the fundamentals of human life. However, public awareness of health behavior in Indonesia remains relatively low (Arlinta, 2024; Utami & Sani, 2021; Wati & Ridlo, 2020). Data shows that only around 20% of the total Indonesian population understands health behavior, while the trend of diseases and health threats continues to increase (Arlinta, 2019). The Indonesian Health Survey in 2023 showed that only 51.1% of Indonesians regularly wash their hands properly, 27% were active smokers, and 37.4% were described as lacking physical activity (Ministry of Health, 2023). A recent study on public attitudes toward air pollution in Jakarta also showed a surprising result. Most Jakartans are aware of the pollution and air quality in their region, but they do not independently demonstrate healthy living and preventive behaviors (Hamasy, 2023). This phenomenon proves that public knowledge about health threats does not necessarily guarantee the emergence of health behaviors.

Poor health behavior in the community was also shown during the COVID-19 pandemic. While health officials recommended key behaviors, such as wearing masks, maintaining physical distance, and regular handwashing, public compliance was low. Indonesian Central Statistics Agency (2020) conducted a survey to assess the compliance of the Indonesian people with health protocols in various public places during the pandemic, finding that compliance with maintaining a safe distance was low, especially in traditional markets and malls, or plazas (47.16% - 66.97%). The COVID-19 Task Force also found that one year after the COVID-19 pandemic began, there were still 95 out of 394 districts or cities across Indonesia that had a mask compliance rate of less than 75% (Kholisdinuka, 2021).

The rise of unhealthy lifestyles that prioritize practicality and lack of awareness of healthy living behaviors has increased the risk of illness in today's society (Arlinta, 2024). It shows that the condition of Indonesian society is still far from ideal. Meanwhile, health is so important that health behavior is one of the 17 sustainable development goals (SDGs) that must be achieved by 2030 (United Nation, 2023).

Health behavior, both physical and environmental, is key to a quality and prosperous society. Therefore, various stakeholders need to pay great attention to public health behavior. Studies on factors that can significantly encourage

healthy living behavior are important to better understand behavior patterns and determine the best mitigation strategy.

The theory of planned behavior (TPB) can be a model for studying and predicting individual behavior, especially health behavior (Sarafino & Smith, 2017). TPB is also one of the robust and widely used theoretical frameworks because it integrates three main behavioral factors that reflect psychological and social aspects relevant in the public health context, i.e., attitude, subjective norms, and perceived behavioral control. TPB also focuses on intention as a key predictor of behavior, reflecting a person's motivation and serving as a bridge between thoughts and actual actions.

Previous studies have shown that TPB can be used to explain smoking (Tapera et al., 2020), exercise (Norman & Conner, 2005), condom use (Asare, 2015), healthy consumption (Brouwer & Mosack, 2015), and hygiene (Afzal et al., 2022). Chan et al. (2021) used the TPB to analyze why people do not comply with health protocols in preventing COVID-19 transmission. Prasetyo et al. (2020) used the extended TPB to predict perceived effectiveness of COVID-19 prevention in the Philippines.

There are five components in TPB: health behavior, behavioral intention, attitude toward behavior, subjective norm, and behavioral control (Ajzen, 1991, 2020). Among these components, behavioral intention is the mediator and central factor, or often referred to as the determinant of a behavior (Ajzen, 1991; Conner & Sparks, 2005; Sarafino & Smith, 2017). Behavioral intentions represent individual motivation in planned actions. Given the challenges in performing health behaviors, behavioral intentions can be an increasingly accurate predictor of health behavior if the level of behavioral control is high enough (Ajzen, 1991, 2020).

The present study focused on physical distancing behavior, which is defined as behavior to limit or minimize physical contact with others. Another term used to refer to this behavior is "social distancing." In this study, both terms are used interchangeably. Experts recommended physical distancing to reduce the risk of COVID-19 transmission (World Health Organization, 2020). In this context, the action element in behavioral intentions and health behaviors studied is physical distancing, e.g., staying at home, avoiding marketplaces (malls or markets), avoiding crowds, and skipping gatherings at cafes or other hangout places.

While several health behaviors are recommended during the COVID-19 pandemic, this study only focused on physical distancing behavior because it is the most difficult one to implement and the most violated during the pandemic (Aditya & Krisiandi, 2020; Hasibuan, 2021). Unlike mask-wearing and handwashing behaviors, where one has considerable behavioral control, physical distancing has various challenges because they are related to social habits and manners. Gathering activities are important in social life, including for Indonesian society (Hasibuan, 2021). Therefore, the researchers reasoned that this phenomenon required further examination.

Based on TPB, behavioral intention is influenced by three other components, i.e., attitude toward behavior, subjective norms, and behavioral control. Attitude toward the behavior is an individual's subjective evaluation, either positive or negative, about certain behaviors (Ajzen, 1991, 2020). The attitude is formed based on beliefs about the planned behavior, which includes the impact of the behavior and the subjective evaluation of that impact (Conner & Sparks, 2005; Ogden, 2007; Ramdhani, 2011; Taylor, 2018). In the context of physical distancing, attitude is an individual's belief in the behavior of maintaining physical distance from others, whether the behavior brings positive results or not.

The next determinant of behavioral intention is subjective norm, which is defined as the social pressure one feels to perform or not perform a certain behavior (Ajzen, 1991, 2020). Subjective norm is a function of normative beliefs, which include belief in the opinions of others and the motivation to behave according to these opinions (Conner & Sparks, 2005; Ogden, 2007; Ramdhani, 2011; Taylor, 2018). Others refer to people who are important to the individual, e.g., parents, spouses, friends, or coworkers. In research on physical distancing, subjective norms include individuals' beliefs about the opinions of people who are important to them regarding physical distancing and the motivation to follow these opinions (Yu et al., 2021).

Perceived behavioral control is a distinctive component that distinguishes TPB from the previous theory underlying TPB, namely the theory of reasoned action. Behavioral control is "the perceived ease or difficulty of performing a certain behavior" (Ajzen, 1991). This perceived control reflects the individual's previous experience as well as the anticipation of obstacles that may be encountered in performing the behavior. According to Ajzen as cited in Conner and Sparks (2005) and Ogden (2007), behavioral control can predict both intention and the behavior itself. In the context of physical distancing, behavioral control refers to whether individuals perceive it as easy or difficult to carry out concrete actions of physical distancing.

Past studies have proven the success of TPB in explaining health behavior during a pandemic. Seong and Bae (2022) found that attitudes, subjective norms, and behavioral control significantly predict the intention of personal hygiene behavior among South Koreans during the pandemic. Aschwanden et al. (2021) also found that attitudes, subjective norms, and behavioral control significantly predicted various preventive behaviors during COVID-19. However, a study by Ahmad et al. (2020) showed that not all elements in the TPB are robust enough to predict health behavior. The study showed that moral norms were not related to COVID-19 prevention behavior.

Some studies conducted in Indonesia also showed that some elements of the TPB do not predict health intentions or behaviors. For example, Nadlifatin et al. (2020) found that only attitudes predict behavior, while subjective norms and behavioral control do not. Furthermore,

research by Fiandari and Andharini (2024) also found no relationship between intention and behavior.

The present study focused on the contexts of the pandemic to examine the relevance of the SDGs in predicting health behavior. Although the world is no longer in the COVID-19 pandemic, this research reflects future health crises that the Indonesians may experience, e.g., new disease outbreaks or other emergencies. Research on health behaviors and the factors that influence them can enrich our understanding of health behaviors. Ultimately, it can help stakeholders determine more effective public health persuasion strategies going forward. Thus, it is hoped that public health behaviors can improve, leading to improved health and quality of life.

This study aimed to examine the effectiveness of various factors that can encourage healthy living behavior using the TPB framework to better understand behavior patterns and the best treatment strategies. In this study, the researchers wanted to see the relationship between attitudes toward behavior, subjective norms, and behavioral control with physical distancing intentions and behavior. This study is expected to provide an empirical basis for preparing effective strategies to deal with future health threats, e.g., new disease outbreaks or other emergency situations.

The hypotheses proposed in this study were as follows: 1) H1: Attitude toward behavior predicts intention to do physical distancing; 2) H2: Behavioral control predicts intention to do physical distancing; 3) H3: Subjective norm predicts intention to do physical distancing; 4) H4: Behavioral intention predicts physical distancing behavior; 5) H5: Behavioral control predicts physical distancing behavior.

Methods

This study used a correlational quantitative method. There were five variables involved in this study. Attitude toward behavior, subjective norms, and behavioral control were predictors, behavioral intention was a mediator, and health behavior was the dependent variable.

Participants and Data Collection

The researcher used incidental sampling. In total, 118 participants (72 women, 29 men) aged 20 to 40 (Mage = 26.6 years old; SD = 5.20) in Semarang City and its surrounding area were picked for the study. All participants passed the screening process, and all of their responses were used in this study. This age group was chosen with the consideration that millennials and Generation Z would dominate Indonesia's demographic structure in the future. Participants were not restricted by gender, educational level, employment status, or marital status. Demographic data can be seen in Table 1.

Information about the study was shared through the principal researcher's social media accounts, such as Instagram, WhatsApp, and Line. Data collection was carried out online using Google Forms after obtaining approval from the Research Ethics Commission of the Faculty of Psychology, Soegijapranata Catholic University (No. 009/B.7.5/FP.KEP/V/2021), dated May 3, 2021.

Table 1
Demographics of Research Participants (N = 118)

Variable	*N*	Percentage
Age		
20–25 years	72	61%
26–30 years	15	13%
More than 30 years	11	9%
Education		
High School	25	21%
Diploma	9	8%
Bachelor's Degree	68	66%
Master's Degree	6	5%
Marital Status		
Married	89	75%
Not Married	26	22%
No Answer	3	3%
Occupation		
Student	42	36%
Employee	57	48%
No Answer	19	16%
Exposure to COVID-19		
Yes	11	9%
No	107	91%

Research Instruments

The questionnaire consists of questions about demographic data and scales containing components of the TPB, i.e., attitudes (three items), subjective norms (four items), behavioral control (four items), behavioral intentions (three items), and health behaviors (three items). The questions were prepared by adapting the measuring instrument used by Das et al. (2021). The adaptation process was carried out by the researcher by asking for input from several experts. Some of the questions used in this study include "Maintaining physical distance is good and safe." (attitude); "My friends want me to maintain physical distance from them." (subjective norm); "I have the control to maintain physical distance from my friends." (behavioral control); "I will physically distance myself from my friends if they ask me to." (intention); and "I have been maintaining physical distance with my colleagues." (health behavior).

Then, the corrected item-total correlation method was used to test the discrimination power of instrument items, while reliability was assessed using the Cronbach's α formula. The minimum criteria used are 0.300 for the corrected item-total correlation calculation (r) and 0.700 for the Cronbach's α (Nunnally & Bernstein, 1994). Three items measuring attitude (r=0.78-0.84; α=0.902), four items measuring subjective norm (r=0.37-0.60; α=0.714), three of four items measuring behavioral control (r=0.48-0.52; α=0.687), three items measuring behavior intention (r=0.31-0.36; α=0.520), and three items measuring

health behavior (r=0.43-0.72; α=0.720) fulfilled the criteria. Only one item measuring the behavioral control variable did not meet the established standards.

Data Analysis

The analysis began with confirmatory factor analysis (CFA) to ensure the validity of the items, followed by path analysis using maximum likelihood estimation. The model is considered fit if it meets several fit indices criteria (p$\chi^2 > 0.05$; TLI ≥ 0.95; CFI ≥ 0.95; RMSEA ≤ 0.05; and SRMR ≤ 0.08) (Hu & Bentler, 1999). The χ^2 coefficient was reported, but not used as the primary goodness-of-fit criterion, as this value tends to reject models based on large sample sizes (Bentler & Bonett, 1980). Data were analyzed using correlation techniques and mediation analysis with JAMOVI software.

Results

Before testing the model in path analysis, the researcher conducted CFA on all items of the variables (i.e., attitude, subjective norm, perceived behavioral control, behavioral intention, and health behavior) simultaneously. However, the first model did not meet the specified fit indices. According to Hair et al. (2010), an item in CFA can be considered good if it has a factor loading greater than 0.400. Therefore, the researcher removed several items with low factor loadings (<0.400). As a result, the model showed good fit, meeting several fit indices criteria (p$\chi^2 > 0.05$; TLI = 0.991; CFI = 0.994; RMSEA = 0.024; SRMR = 0.048; and AIC = 3775). Based on the CFA results, three items were removed: one from subjective norm, one from perceived behavioral control, and another from intention. The CFA results are presented in Table 2.

Correlation testing was conducted on all variables tested in this study. The correlation indicated significant positive correlations between attitude and intention ($r = 0.56$; $p < 0.01$) and behavior ($r = 0.46$; $p < 0.01$). Subjective norm was also found to be related to intention ($r = 0.34$; $p < 0.05$) and behavior ($r = 0.50$; $p < 0.01$). Perceived behavioral control was also found to be correlated with intention ($r = 0.45$; $p < 0.01$) and behavior ($r = 0.43$; $p < 0.01$). The complete correlation between the variables can be seen in Table 3.

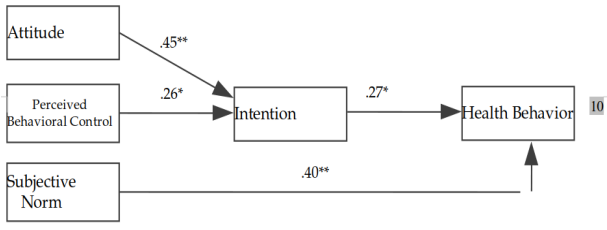
The researchers tested several models to obtain the most appropriate model (fit). The first model tested was path analysis in accordance with the TPB model, which included attitude, subjective norm, and behavioral control as predictors, behavioral intention as a mediator, and health behavior as output. The first model did not meet all the eligibility criteria (pχ^2<0.05; TLI=0.43; CFI=0.84; RMSEA=0.29; SRMR=0.07, and AIC=861). In this first model, the relationship between subjective norms and intention was also very weak and insignificant (β=-0.02; p=n.s). However, the mediating relationship between attitude and behavioral control with health behavior through behavioral intention was significant. Meanwhile, the mediating relationship between subjective norm and health behavior through behavioral intention was not significant.

Considering the very weak relationship between subjective norms and intention, as well as the absence of a mediating relationship between subjective norms, intention, and health behavior in the first model, the second model was tested by adding a direct effect between subjective norms and health behavior. The second model met all the eligibility criteria (pχ^2>30.05; TLI=0.99; CFI=0.99; RMSEA=0.02; SRMR=0.01, and AIC=848), but all mediating relationships in this model became insignificant. In the second model, the relationship between subjective norm and intention also remained weak and insignificant (β=-0.01; p=n.s), thus not addressing the weakness in the first model. On the other hand, there was a significant direct relationship between subjective norm and health behavior (β=0.35; p<0.01). See Table 5

To obtain a better model, we tested the third model by removing the weak relationship between subjective norm and behavioral intention, and removing the direct relationship between behavioral control and health behavior. The third model met all the eligibility criteria (pχ^2>0.05; TLI=0.91; CFI=0.96; RMSEA=0.03; SRMR=0.04, and AIC=849), and all mediating relationships in this model were found to be significant. See Table 6

Although the second and third models both meet the eligibility criteria, the researchers chose to use the third model because it does not deviate significantly from the TPB principle compared to the second model. In the third model, the mediation relationship remains significant and strengthens the role of the intention variable, which is the basis of TPB. The complete results of the third model path analysis can be seen in Table 6 and Figure 1. This third model also represents 31% of the variance in health behavior (R2 = 0.31) and 37% of the variance in intention (R2 = 0.37). The study accepted H1, H2, and H4 proposed and rejected the other two hypotheses (H3 and H5).

Figure 1
Path Analysis of the Third Model



Discussion

The path analysis showed that some of the hypotheses of this study were accepted. Attitude and behavioral control were found to predict one's health behavior intention. The study also accepted hypothesis 4, in which behavioral intention predicts health behavior. Thus, behavioral intention mediates the relationship between attitude and

Table 2
CFA Results for All Variables in the Study (N = 118)

Variable	Item	Factor Loading	AVE	CR
Attitude	Att1	.851	.760	.904
	Att2	.932		
	Att3	.828		
Perceived Behavioral Control	Cont1	.716	.428	.691
	Cont2	.609		
	Cont3	.633		
Subjective Norm	Norm1	.737	.389	.650
	Norm2	.487		
	Norm3	.621		
Intention	Int1	.668	.244	.466
	Int3	.453		
Behavior	Beh1	.761	.569	.789
	Beh2	.931		
	Beh3	.510		

Table 3
Correlation Between Research Variables (N=118)

Variable	*M*	*SD*	1	2	3	4	5
1. Attitude	19.19	2.54	–				
2. Perceived Behavioral Control	18.56	2.82	.425***	–			
3. Subjective Norm	10.67	2.61	.574***	.378***	–		
4. Intention	11.73	2.13	.561***	.342***	.449**	–	
5. Behavior	11.71	2.26	.459***	.498***	.434***	.409**	–

Note. *p <.05, **p <.01, ***p <.001.

control of one's health behavior. The mediation is statistically significant and classified as partial mediation (Kenny, 2024). Based on the path analysis, attitude is the strongest predictor of intention.

Bivariate correlation analysis showed that the predictors (attitude, subjective norm, and behavioral control) are correlated with intention and health behavior, respectively. The correlation between intention and health behavior was also found to be significant. This result is consistent with the findings of Das et al. (2021), who also researched social distancing with the TPB framework. Iwaya et al. (2020) and Sturman et al. (2021) conducted research on attitudes, subjective norm, behavioral control, and intention, but they did not measure behavior. Both studies found that attitude, subjective norm, and behavioral control are correlated with physical distancing intentions. Slightly different results were found by Yu et al. (2021), whereas positive attitudes and behavioral control are correlated with physical distancing behavior, but negative attitudes and subjective norm are not. Yu et al. (2021)'s research did not measure people's intentions.

The present study also found a result that differs from the original framework of TPB. The analysis showed that subjective norm does not predict an individual's intention. It was also found that subjective norm directly predicts health behavior relatively strongly. Previous studies on TPB support these findings, showing that subjective norm does not predict an individual's intention. Liao et al. (2022)'s study on health behavior and exercise showed that subjective norm is not a significant predictor of intention. Based on that study, both attitude and perceived behavioral control predict intention, and intention predicts exercise behavior. In the context of education, Greisel et al. (2022) also found that subjective norm does not predict the use of scientific theory by novice teachers to address teaching issues. In terms of food consumption, Fiandari and Andharini (2024) also found that subjective norm does not predict an individual's behavioral intention.

In TPB, the subjective norm variable reflects the social pressure or influence that an individual perceives (Ajzen, 1991). Interestingly, in some social behaviors, the subjective norm may not be related to an individual's intention because such behaviors are not always aligned with one's attitudes and intentions but are driven by social pressure (Liao et al., 2022)). This argument is reinforced by Ryan and Deci (2001) research, which showed that perceived social pressure tends to be a barrier to an individual's autonomy and motivation. During the pandemic, the social pressure to engage in health behaviors was very strong, driving individuals to conform, even if they did not actually have the intention to behave in that manner. However, the researchers argue that the insignificant correlation between subjective norm and intention, along with its assumptions, still needs to be tested across different populations and health contexts to ensure the

Table 4
First Model Path Analysis Results

Relationship	β	Significance
Direct Relationship		
Attitude → Behavioral Intention	.46	Significant
Perceived Behavioral Control → Behavioral Intention	.26	Significant
Subjective Norm → Behavioral Intention	−.02	Not Significant
Behavioral Intention → Health Behavior	.27	Significant
Perceived Behavioral Control → Health Behavior	.31	Significant
Mediation Relationship		
Attitude → Intention → Health Behavior	.124	Significant
Perceived Behavioral Control → Intention → Health Behavior	.07	Significant
Subjective Norm → Intention → Health Behavior	−.01	Not Significant

Table 5
Second Model Path Analysis Results

Relationship	β	Significance
Direct Relationship		
Attitude → Behavioral Intention	.46	Significant
Perceived Behavioral Control → Behavioral Intention	.26	Significant
Subjective Norm → Behavioral Intention	−.02	Not Significant
Behavioral Intention → Health Behavior	.19	Significant
Perceived Behavioral Control → Health Behavior	.21	Significant
Subjective Norm → Health Behavior	.35	Significant
Mediation Relationship		
Attitude → Intention → Health Behavior	.09	Not Significant
Perceived Behavioral Control → Intention → Health Behavior	.05	Not Significant
Subjective Norm → Intention → Health Behavior	−.01	Not Significant

consistency of findings.

Some previous studies with Indonesian samples have shown that some variables in TPB do not significantly predict intention or behavior. For example, Nadlifatin et al. (2020) found that only attitude predicts behavior, while subjective norm and perceived behavioral control do not. Furthermore, Fiandari and Andharini (2024), who studied an Indonesian sample group, found no relationship between intention and behavior. The present study provides empirical evidence that the TPB framework can be used to predict health behaviors in the context of Indonesian society. This study highlights the uniqueness of the TPB framework, which may heavily depend on the type of behavior and the conditions being studied. In the context of physical distancing behavior, subjective norm does not predict intention but significantly predicts health behavior.

These findings support the researcher's hypothesis that physical distancing is closely related to social norms or social pressure. Therefore, enhancing personal knowledge and awareness (subjective norm) may not always be the right method to shape health behaviors, as collective awareness or social pressure that can drive conformity (Nivette et al., 2021; Webster et al., 2020) may perform such a function better. Of course, further research in the Indonesian context is needed to confirm which health behaviors align with this hypothesis. The researchers also speculated that the influence of group norms or pressure may become stronger if the individual has a strong sense of identification with their group (Packer et al., 2021; Terry & Hogg, 1996).

These findings have several implications. First, it is important for future research to explore the role of social identity or identification in examining the relationship between social norms and health behavior. Second, these findings provide valuable insights for stakeholders to leverage social norms or group influence in health promotion efforts to improve desired health behaviors.

This study had several limitations that can be addressed in future research. One limitation of this study is that intention and behavior were measured simultaneously (cross-sectional). The reported behavior might be past behavior, rather than behavior that occurs after the intention being measured (Frounfelker et al., 2021; Xia et al., 2021).

Theoretically, measuring past behavior in TPB research is not problematic. According to Beck and Ajzen (1991), individual behavior is stable over time as long as the factors influencing it remain unchanged. In other words, past behavior can be a good predictor of future behavior. However, this condition still presents a potential gap regarding the results, as well as TPB in general. Therefore, it is important to conduct longitudinal studies on health behavior using the TPB framework. Further-

Table 6
Third Model Path Analysis Results

Relationship	β	Significance
Direct Relationship		
Attitude → Behavioral Intention	.45	Significant
Perceived Behavioral Control → Behavioral Intention	.26	Significant
Behavioral Intention → Health Behavior	.27	Significant
Subjective Norm → Health Behavior	.40	Significant
Mediation Relationship		
Attitude → Intention → Health Behavior	.01	Significant
Perceived Behavioral Control → Intention → Health Behavior	.12	Significant

more, this study used a relatively small sample, which might have made it difficult for the research model to meet the fit criteria. According to Jackson (2003), the ideal sample size is 20 people per parameter. With 17 observed variables, this study ideally required 340 respondents.

Conclusion

This study demonstrated that an individual's attitude and perceived behavioral control indirectly predict health behavior through behavioral intention. Meanwhile, subjective norm directly predicts health behavior, but does not predict the individual's intention. In social-related behaviors (e.g., physical distancing), subjective norm may not be related to an individual's intention because such behaviors do not always align with attitudes and intentions, and instead are driven by social pressure. The researcher speculates that the influence of group norms tends to be stronger when an individual highly identifies themself with the group. Therefore, it is important for future research to explore the role of social identity or identification in the relationship between social norms and health behavior. Stakeholders can leverage social norms or group influence in health promotion efforts to improve health behaviors.

Recommendation

Several recommendations can be made for future research based on the study results. First, it is important for future research to explore the role of social identity or identification in examining the relationship between social norms and health behavior. Second, these findings provide valuable insights for stakeholders to leverage social norms or group influence in health promotion efforts to improve desired health behaviors. Third, it is important to conduct longitudinal studies on health behavior using the TPB framework.

Declaration

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Conflict of Interests

All authors certify that they have no affiliations with or involvement in any organization or entity with any financial or non-financial interest in the subject matter or materials discussed in this manuscript.

Author's Contribution

ARDW: Conceptualization; writing – original draft; funding acquisition; methodology; supervision. BYA: Conceptualization; data curation; formal analysis; project administration; writing – review and editing.

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