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DEVELOPING A PREDICTIVE MODEL OF SOCIAL COGNITIVE INFLUENCES ON PHYSICAL ACTIVITY IN MIDDLE-AGED AND OLDER ADULTS: A CROSS-SECTIONAL STUDY

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ABSTRACT

Introduction: Increasing physical activity levels in middle-aged and older adults is a critical public health agenda, as regular physical activity reduces morbidity, healthcare costs, and chronic disease risks by up to 90%. Developing effective physical activity programs, however, requires comprehension of factors influencing physical activity behavior. **Aims:** This research aimed to develop a predictive model of social cognitive influences on moderate and vigorous physical activity (MVPA) in this demographic. **Method:** A cross-sectional study was conducted in 118 participants, 76% of whom were female. Social cognitive factors, which included self-efficacy, outcome expectations (physical, social, and self-evaluation), self-regulation (goal setting and planning), and social support (from family and friends) regarding physical activity, were assessed using validated self-reported questionnaires. A 7-day Physical Activity Recall interview was conducted to measure MVPA. Data were analyzed using bivariate correlations and stepwise multiple linear regressions, adjusted for sex and age. **Results:** All social cognitive measures showed moderate to strong correlations with MVPA (r = 0.43-0.79). The regression model, which included self-efficacy, physical outcome expectations, planning, and social support, explained 77% of the variance in MVPA. **Conclusion:** These results highlight the importance of strengthening these social cognitive factors to encourage more physically activity among middle-aged and older adults in Indonesia.

Keywords: Physical Activity, Regression, Social Cognitive, Health Behavior

INTRODUCTION

Global populations are aging, with those aged 65 or older increasing from 6.9% in 2000 to 9.3% in 2020, projected to reach 15.9% by 2050 and 22.4% by 2100 (Gu et al., 2021; Indonesia Central Bureau of Statistics, 2021). This trend is particularly evident in developing countries (World Health Organization, 2015). In Indonesia, the world's fourth most populous country, the proportion of elderly people is projected to increase from 5% in 2010 to 11% by 2035 (Basrowi et al., 2021a). Additionally, the middle-aged population is also growing in Indonesia, presenting further challenges as this group transitions into older age, which potentially increases incidences of degenerative diseases and demand for healthcare (Stambler, 2017). Therefore, preparing for these demographic shifts and their implications on health systems is a significant public health agenda (Indonesia Central Bureau of Statistics, 2021; United Nations Population Fund, 2014).

Participating in regular moderate to vigorous physical activity (MVPA) is crucial for reducing the impact of degenerative diseases by preserving metabolic function, cardiovascular health, and muscle integrity (Eckstrom et al., 2020). Engaging in low-to-moderate-intensity physical activity once a week reduces the odds of Parkinson's disease by 68%, hip/femoral fractures in men by 55%, and chronic lung disease in women by 39% (Marques et al., 2018). Engaging in MVPA lowers the mortality risk for adults over 60 by 22%, reduces the risk of cancer by 33%, type 2 diabetes by 90%, cardiovascular disease by 80% and cardiac-related

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mortality by 26% (Anderson et al., 2019). Physical activity lowers the onset of chronic diseases by 25%, diabetes by 39%, and hypertension by 41% (Zhou et al., 2018). Moreover, physical activity also improves the quality of life (Marquez et al., 2020). Physical activity also mitigates the impact of medical comorbidities on psychological distress, thereby improving the quality of life for individuals with mental illness (Moon et al., 2020). As the significant benefits of regular physical activity have been confirmed, its potential for reducing the global burden of chronic diseases and improving public health outcomes is suggested.

However, there is a tendency for physical activity to decline with advancing age (Buchman et al., 2014). The most recent national survey reveals that 52% of Indonesians aged over 65 fail to adhere to the recommended physical activity guidelines (Indonesia Ministry of Health, 2023). This dearth of physical activity can potentially exacerbate the health complications associated with aging (Cunningham et al., 2020). Therefore, it is essential to implement targeted interventions to encourage physical activity among older adults in this demographic. Developing such interventions requires an understanding of factors affecting physical activity behavior in a specific population, ensuring the programs are tailored to promote active lifestyles within the target group.

Social Cognitive Theory (SCT), is one of the most prominent behavioral change theories that provide a solid framework for understanding the link between social cognitive factors and health behaviors (Bandura, 2013), including physical activity behavior (Jeng et al., 2022; Joseph et al., 2017). SCT focuses on its key constructs. The primary construct of SCT is self-efficacy (Bandura, 2013), which refers to the belief in one's ability to initiate and maintain regular physical activity. Another key construct is outcome expectations, which involve the anticipated health improvement results from exercising (Schunk et al., 2020). The other SCT important construct, self-regulation refers to the ability to set personal goals, track progress, and adapt physical activity behaviors (Bandura, 2013; Schunk et al., 2020). Furthermore, social support (Bandura, 2013; Schunk et al., 2020), in the forms of encouragement and companionship from others when engaging in exercise, is important. These key SCT constructs have consistently been associated with higher levels of physical activity and have also been shown to affect adherence to regular physical activity (Jeng et al., 2022; Joseph et al., 2017) and improvement in health outcomes (Arovah et al., 2018, 2019).

While the SCT framework has been validated for understanding and enhancing physical activity behaviors in various contexts, there have been few studies investigating the social-cognitive correlates of physical activity behavior in Indonesia. This study aims to develop a predictive model on MVPA based on the SCT constructs in middle-aged and older adults in Indonesia. It is expected that the findings from this study can be used to design effective interventions to promote physical activity in the target population.

METHODS

Study Design and Setting

This study was a cross-sectional study conducted in April 2019 in Yogyakarta, Indonesia.

Participants

The participants were 118 participants recruited from the membership of a community center in Yogyakarta, Indonesia, which offers health services to local middle-aged and older residents. Participants were invited to join the study when they accessed the services. The inclusion criteria required participants to be over 45 years of age and literate in the Indonesian language. Exclusion criteria

included any members who did not provide complete responses.

Ethical Considerations

Participants received written informed consent. The procedure of this study has been approved by the Human Ethics Committee of Gadjah Mada University with the approval number KE/0142/02/2019.

Measures

Physical Activity

Physical activity was evaluated using the Stanford 7-day Physical Activity Recall Scale (PAR) which assessed both occupational and non-occupational0related activities (Sallis et al., 1985). Participants reported the number of hours spent sleeping and engaging in different levels of physical activity over the past week (Sallis et al., 1985). The PAR includes a variety of activities, from household chores to exercise and sports, with separate reporting for weekday and weekend activities. Each activity was assigned a metabolic equivalent (MET) value: sleep at 1 MET, light physical activity at 1.5 METs, moderate physical activity at 4 METs, vigorous physical activity at 6 METs, and very hard physical activity at 10 METs (Sallis et al., 1985). The total time spent in each physical activity over the past week in hours was multiplied by its corresponding MET value and summed (Sallis et al., 1985). For MVPA, only the moderate, hard, and very hard activities were calculated as METs per week (Sallis et al., 1985).

Social Cognitive Measures

Self-efficacy was assessed using the Self-Efficacy for Exercise Scale (SEE) to evaluate individuals' confidence in their ability to engage in regular physical activity (Resnick et al., 2000). The scale consists of nine items, with options ranging from 0 to 10, with higher scores indicating greater confidence, resulting in a total score of 0 to 90 (Resnick et al., 2004). This instrument has been validated in Indonesian adults and has demonstrated high reliability (Cronbach's alpha=0.88) and consistent measurements over time (ICC=0.75) (Arovah et al., 2022). The scale also showed strong correlations with physical activity levels (r=0.72), confirming its validity and effectiveness in distinguishing between different activity levels (Arovah et al., 2022).

Outcome expectation was evaluated using the Multidimensional Outcome Expectations for Exercise Scale (MOEES), to gauge older adults' expectations regarding exercise outcomes (Wojcicki et al., 2009). The outcome expectations scale encompasses three domains: physical, social, and self-evaluative, comprising 15 items with a 5-point Likert scale (Wojcicki et al., 2009). The validation of this scale in Indonesian adults indicated good reliability of this instrument (Cronbach's alpha=0.76-0.83) and consistency (ICC=0.72-0.84) (Arovah et al., 2022). These scales also correlated moderately with physical activity (r=0.42-0.50), thus validating their use in identifying variations in physical activity engagement (Arovah et al., 2022).

Self-regulation was assessed using the Exercise Goal-Setting and Exercise Planning and Scheduling (Rovniak et al., 2002). Each instrument comprises ten items assessing goal-setting or planning activities, with participants with a 5-point Likert scale. In the Indonesian context, self-regulation scales exhibited excellent reliability (Cronbach's alpha=0.83-0.94) and strong measurement consistency (ICC=0.77-0.85) (Arovah et al., 2022). Their strong correlations with physical activity (r=0.64-0.65) confirm their discriminative power (Arovah et al., 2022).

Social support was assessed using the Social Support for Exercise Behaviour (SSEB) (Sallis et al., 1987). Each scale consists of eight items with a 5-point Likert scale. Validated among Indonesian adults, these social support scales showed good internal consistency reliability (Cronbach's alpha=0.80-0.93) and reliability

(ICC=0.73-0.79) (Arovah et al., 2022). Moderate correlations with physical activity (r=0.49-0.64) supported their validity in assessing the influence of social factors on exercise behavior (Arovah et al., 2022).

Secondary measures include age, sex, marital status, education level, and employment status. Body mass index (BMI) was calculated by measuring height and weight by using a standardized protocol.

Statistical Analysis

Descriptive statistics were computed for social demographics and BMI. Age and BMI were compared between sexes using Mann Whitney while the distribution of social demographic and BMI status were compared between sexes using chi square. Spearman correlation analyses examined the relationships among social cognitive factors and MVPA. Multiple linear regression models were constructed, with MVPA as independent variables and social cognitive factors as primary predictors. All social cognitive predictors were included in the initial model, while the final model was developed using stepwise regression adjusted with age and sex. The adjusted multiple coefficients of determination (adjusted R^2) and the standard error of estimation (SEE) in the final model were calculated to assess the data fit. Statistical analyses were performed using SPSS® version 29.0 (IBM, Chicago, IL, US), with statistical significance set at a p-value < 0.05.

RESULTS

Participants' Characteristics

The study involved 118 participants, mainly middle-aged to older women. Key demographic trends were observed. Age distribution was similar between genders, but women had a significantly higher average BMI compared to men (p<0.001). Marital status trends showed more men than women were married, with a borderline significance (p=0.085). Men were more likely to have tertiary education than women (p=0.006), indicating potential gender disparities in education. Employment status did not significantly differ between sexes. Table 1 summarizes the complete participant characteristics by gender**.**

Table 1. Participant characteristics

	Total N=118	**Women N=85**	**Men N=33**	**p**
Age (year, M(SD))	61.7 (8.3)	61.7(8.1)	61.5 (8.8)	0.883
Body Mass Index (kg/m2, N (%))	33.4 (6.6)	36.2(4.2)	26.1 (5.9)	<0.001
Marital status (N (%))				0.085
Married	89 (75)	60 (71)	29 (88)	
Not married/widowed	29 (25)	25 (29)	4 (12)	
Education levels (N (%))				0.006
Primary	19 (16)	17 (20)	2 (6)	
Secondary	71 (60)	54 (65)	17 (42)	
Tertiary	28 (24)	14 (15)	14 (52)	
Employment status (N (%))				0.341
Employed	27 (23)	17 (20)	10 (30)	
Unemployed/retired	81 (67)	68 (80)	23 (70)	

N= Number, M=mean, SD= standard deviation

Social Cognitive Factors and Moderate Vigorous Physical Activity Correlations

Table 2 summarizes the participants' MVPA and social cognitive factors. Physical activity levels also varied broadly, with typical daily activity extending into moderate durations. Self-efficacy and different types of outcome expectations encompassing physical, social, and self-evaluative spanned from low to high, with means indicating generally positive perceptions and beliefs. Exercise goal-setting and planning activities showed diverse engagement levels, illustrating participants' varying commitments to structured exercise routines. Similarly, social support metrics related to family and friend involvement varied, reflecting diverse levels of perceived support across the study group.

Table 2. Moderate vigorous physical activity and social cognitive factors

	Min	Max	M	SD
Moderate and Vigorous Physical Activity**	0	60	16.50	14.13
Self-Efficacy	1.0	10.0	5.73	2.20
Outcome Expectation- physical	1.0	5.0	4.14	0.59
Outcome Expectation- social	1.5	5.0	3.92	0.64
Outcome Expectation-self-evaluative	1.0	5.0	4.04	0.62
Exercise Goal Setting	1.0	5.0	2.47	1.03
Exercise Planning and Schedule	1.0	4.3	2.47	0.80
Social Support Family Participation and Encouragement	1.0	4.5	2.45	0.88
Social Support Reward and Punishment	1.0	5.0	1.80	0.88
Social Support Friend Participation	1.0	5.0	2.59	0.88

Note: *= in calories per day, **= METs/week, Min=Minimum, Max= Maximum, M=Mean, SD= Standard deviation

Figure 1 illustrates the correlations between MVPA and various social-cognitive factors, providing a detailed understanding of the influences on physical activity among individuals. The figure reveals a strong positive correlation between self-efficacy and MVPA. This suggests that individuals with higher confidence in their ability to exercise are significantly more likely to engage in physical activity. This highlights the importance of fostering self-belief and confidence in one's physical abilities to encourage regular participation in physical activities.

Outcome expectations were categorized into three aspects: physical, social, and self-evaluation. Each of these categories demonstrated positive correlations with MVPA. The positive correlations indicate that individuals who anticipate favorable outcomes in these areas are more likely to participate in MVPA. This underscores the motivational power of positive expectations in promoting physical activity, suggesting that highlighting these benefits can be an effective strategy in encouraging exercise.

Goal setting and planning exhibited a moderate relationship with MVPA, indicating that setting clear goals and planning exercise schedules can moderately enhance physical activity levels. Individuals who set specific objectives and organize their exercise routines were more likely to maintain a consistent and structured approach to physical activity. This finding emphasizes the importance of encouraging goal setting and strategic planning as part of interventions aimed at sustaining an active lifestyle.

Social support included various forms of encouragement and participation from family and friends. This factor encompassed family participation and

encouragement, family reward and punishment, and friend participation and encouragement. While social support was significantly correlated with MVPA, the correlation coefficients were lower compared to self-efficacy and outcome expectations.

This suggests that, although encouragement and participation from family and friends play a role in promoting physical activity, their influence is not as strong as other factors. Social support remains important as it provides emotional encouragement, companionship, and accountability, but its impact on physical activity is relatively weaker. Nonetheless, creating a supportive social environment can still be beneficial in promoting an active lifestyle.

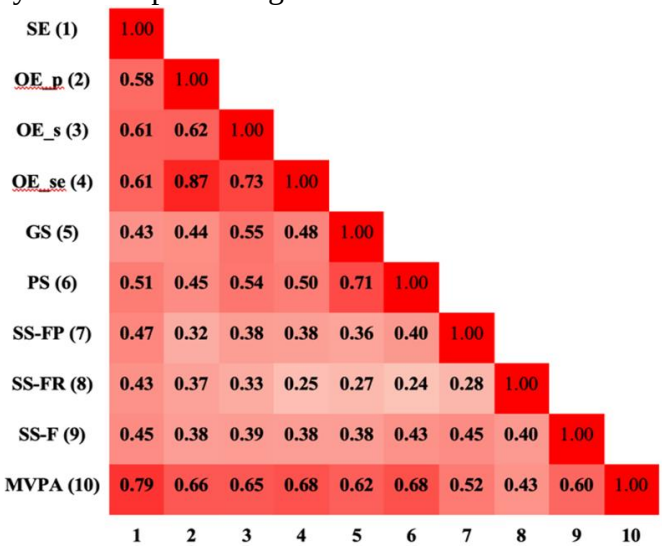

Figure 1. Correlations between MVPA and Social Cognitive Fact

Note: Bold=significant ($p<0.05$), the darker shades signify higher correlation coefficients, SE= Self-efficacy, OE-p= Outcome expectation physical, OE-s= Outcome expectation social, OEE-se=Outcome expectation self-evaluation, GS= Goal setting, PS= Planning and schedule, SS-FP= Social support family participation and encouragement, SS-FR= Social support family reward and punishment, SS-F= Social support friend participation and encouragement

The Regression Equation for Predicting Moderate and Vigorous Physical Activity

Table 3 summarizes the intercepts, coefficients (β), the adjusted R^2, and the Standard Estimating Error (SEE) of the multiple regression equations predicting MVPA. The summary of the regression analysis reveals distinct models used to predict MVPA, showing both initial and final models' effectiveness. In the initial model, several predictors were included to predict MVPA, such as self-efficacy, various outcome expectations (physical, social, and self-evaluation), goal setting, planning schedules, social support from family and friends, sex, and age. This model achieved an adjusted R^2 of 0.81, indicating a strong predictive power. Notably, the coefficients for self-efficacy ($\beta = 0.32$, $p < .001$), planning schedules ($\beta = 0.16$, $p = .01$), and social support from family ($\beta = 0.20$, $p < .001$) were significant predictors. Other predictors like goal setting and social support from family reward and punishment also showed significance but to a lesser extent.

The final model identified through stepwise regression included self-efficacy, physical outcome expectations, planning schedules, and social support from family and friends. The coefficients for the predictors in the final model are notably higher than in the initial model, particularly self-efficacy ($\beta = 0.38$, $p < .001$), physical

outcome expectations (β = 0.13, p = .018), planning schedules (β = 0.25, p < .001), and social support from friends (β = 0.22, p < .001). The final regression equation model for predicting MVPA=34.49+(2.45*self-efficacy) + (3.22*outcome expectation physical) + (4.46*planning schedule) + (3.01*family reward) + (3.53*social support from friends). The final model provides a robust prediction of MVPA, with an adjusted R^2 of 0.77 with an SEE of 6.8 Mets/week .

Both models demonstrated strong predictive success, but the final model, which focuses on the most impactful variables, provides a more robust and precise prediction of MVPA. This refined model underscores the importance of self-efficacy, physical outcome expectations, planning schedules, and social support in promoting higher levels of physical activity.

Table 3. The regression equation for predicting moderate and vigorous physical activity

	Initial Model			**Final Model**		
	Coefficient	**β**	**p**	**Coefficient**	**β**	**p**
Intercept	-8173		<.001	-34.49		<0.001
Self-efficacy	0.42	0.32	<.001	2.45	0.38	<0.001
OE physical	0.39	0.08	0.409	3.22	0.13	0.018
OE social	0.25	0.06	0.446			
OE self-evaluation	0.06	0.01	0.906			
Goal setting	0.42	0.15	0.018			
Planning schedule	0.59	0.16	0.01	4.46	0.25	<0.001
Social support FP	0.32	0.10	0.047			
Social support FR	0.64	0.19	<.001	3.01	0.19	0.001
Social support F	0.65	0.20	<.001	3.53	0.22	<0.001
Sex	0.13	0.02	0.652	0.014	0.019	0.993
Age	0.00	0.01	0.857	-0.033	0.00	0.678
Adjusted R^2	0,81			0.77		
SEE	1.27			6.8		

Note. OE = outcome expectation FP= family participation and encouragement, FR= family reward and punishment, F= friend participation and encouragement, SEE= Standard Estimating Equation

DISCUSSION

While several studies have explored the application of health behavioral change therapy in elucidating physical activity behaviors among Indonesian adolescents (Siagian et al., 2023), and young adults (Arovah, 2022) this study extends this inquiry to the middle and older adult demographic in Indonesia, focusing on examining the impact of comprehensive Social Cognitive Theory constructs on MVPA. The findings of the study underscore a significant positive association between various social cognitive constructs and levels of MVPA when analyzed using bivariate models. Specifically, individuals who exhibited higher levels of social cognitive factors were found to engage more frequently in MVPA. In the final model predicting MVPA, several key constructs emerged as particularly influential. This comprehensive model, which incorporates self-efficacy, physical outcome expectations, planning schedules, and social support, provides the most robust explanation for variations in physical activity levels among participants. These findings highlight the importance of these social cognitive factors in promoting greater engagement in physical activity and

suggest that interventions aimed at enhancing these constructs may be particularly effective in increasing MVPA levels.

Self-efficacy is a fundamental predictor of physical activity engagement, as corroborated by a range of studies targeting diverse populations, such as older adults in Spain (Alonso, 2020) and Indonesia (Juwita et al., 2022) overweight adults (Robertson et al., 2020) and adolescents (Schroeder et al., 2020). This suggests that self-efficacy is universally important across life stages and diverse populations. Strategies must, thus, account for the evolving nature of self-efficacy across the human lifespan and within the context of individual health challenges to cultivate long-lasting engagement in physical activity. Future research needs to delve into how the effects of self-efficacy evolve and influence behavior change over time. Such investigations could inform the creation of more detailed interventions tailored to sustain and enhance self-efficacy, promoting physically active lifestyles.

Outcome expectations are identified as significant correlates of engaging in engaging in MVPA. These findings align with broader research demonstrating that the perception of achieving outcome expectations is crucial for sustaining physical activity, as shown in studies targeting older women (Wilcox et al., 2006) and a general older population (Garland et al., 2021). Similarly, research shows that outcome expectations correlate with activity engagement in older women and broader cohorts, including individuals with longstanding multiple sclerosis (Morrison et al., 2014). The importance of the timing of outcomes has been particularly noted in Chinese adults, suggesting that immediate outcomes may enhance physical activity engagement (Li, 2013). Additionally, affective outcome expectancies might impact older adults' intentions and behaviors more significantly than health-related expectancies (Gellert et al., 2012). These insights underscore that promoting physical activity effectively in older adults requires understanding the complex interactions between outcome expectations, their realization, and self-regulation.

Self-regulation is found to be associated with the MVPA in this study. Similarly, an intervention study reported that self-regulation served as a mediating factor between health literacy and physical activity engagement (Harada, 2022). In support of the importance of self-regulation, self-monitoring and planning are highlighted as critical strategies for promoting physical activity, albeit with noted limitations due to age-related changes in cognition and motivation (Gellert et al., 2012). Self-regulation strategies like goal setting and self-monitoring are also reported to potentially enhance physical activity in structured health programs (Ylitalo et al., 2023). Adding to the dimensionality of self-regulation, self-regulatory imagery has been shown to positively impact self-efficacy, outcome expectations, and physical activity levels by enhancing enjoyment and reducing perceived barriers (Kosteli et al., 2018). Further exploring the structure of self-regulation, various indices such as executive function improve both psychological and physical health outcomes (Reed et al., 2020). Additionally, a positive correlation between self-regulation and daily sports activities underscores the role of self-regulation in supporting regular exercise behavior (Hajek et al., 2018; Lindsay Smith et al., 2017). These studies collectively emphasize the multifaceted nature of self-regulation in promoting physical activity, suggesting that interventions must effectively address cognitive and emotional aspects to support active lifestyles among older adults.

Social support is a significant correlate of MVPA in this study. It is also recognized as a crucial facilitator for physical activity, promoting both

engagement and the maintenance of physical activity behaviors across various populations. A systematic review emphasizes that family-oriented social support is strongly correlated to the increased in leisure-time physical activity. (Lindsay Smith et al., 2017). The role of peer support in group activities, which significantly enhances the social dynamics promoting physical activity, is further emphasized (Basrowi et al., 2021b). Additionally, mechanisms through which social support influences physical activity, particularly the mediating role of emotional responses, are explored, indicating a deeper layer of interaction (Newsom et al., 2018). Furthermore, studies demonstrate that peer-led interventions can significantly boost physical activity levels, offering a cost-effective and sustainable approach to fostering active lifestyles (van de Vijver et al., 2020). These studies, collectively, suggest that social support not only initiates but also crucially sustains physical activity across different demographics and settings.

The study has demonstrated that all the SCT constructs examined are significant correlates of MVPA. Consequently, it is essential to address these factors through personalized and adaptable interventions to encourage and maintain physical activity levels. Incorporating these elements into intervention designs is particularly effective for this target population.

The strength of these findings lies in their holistic approach, which addresses multiple psychosocial variables that significantly predict MVPA and transcend demographic boundaries. By focusing on factors such as self-efficacy, outcome expectations, goal setting, planning, and social support, the study provides a comprehensive framework for developing interventions that can effectively increase physical activity levels. This multifaceted approach ensures that different dimensions of an individual's motivation and social environment are considered, enhancing the likelihood of successful interventions.

However, the reliance on cross-sectional data limits the ability to determine causality and may introduce bias. This underscores the necessity for longitudinal and qualitative studies to better understand the causal relationships and contextual factors influencing physical activity. Longitudinal studies can track changes in physical activity over time, helping to establish cause-and-effect relationships, while qualitative studies can offer deeper insights into factors influencing individuals' engagement in physical activity.

Future research should also aim to broaden the demographic scope to include a wider range of socioeconomic and geographic populations, thereby improving the generalizability of the findings. By encompassing diverse populations, researchers can ensure that the developed interventions are applicable to various groups and can address the unique challenges faced by different segments of the population.

Investigating the long-term effectiveness and adaptability of interventions to changing health statuses in older adults could provide valuable insights for public health strategies tailored to meet complex, evolving needs. Understanding how interventions can be modified to remain effective as individuals age and their health conditions change will be crucial for developing sustainable public health initiatives. This approach can help ensure that older adults continue to benefit from physical activity interventions, leading to improved health outcomes and quality of life**.**

CONCLUSION

The study confirms the pivotal role of the SCT in understanding physical activity among this target population by successfully developing a significant predictive equation on MVPA from the SCT construct. The findings underscore the importance of intervention strategies that

address both psychological and social health behavior aspects. The findings suggest that, by targeting these areas, we can effectively enhance physical activity levels among older adults.

Specifically, the research highlights several key points. Effective strategies should focus on improving outcome expectations and self-efficacy. By improving these psychological factors, older adults are more likely to engage in and maintain regular physical activity. Additionally, structuring social support systems tailored to the unique needs of the elderly is essential. This can include creating community programs, fostering family involvement, and encouraging peer support networks to provide the necessary encouragement and assistance. To generalize the findings across the aging population of Indonesia, future research should include larger and more diverse cohorts to validate the current findings and provide a more comprehensive understanding of the factors influencing physical activity in this demographic. The insights from this study are valuable for informing public health interventions not only in Indonesia but also in similar settings. By understanding the critical factors that promote physical activity within aging populations, public health policies and programs can be more effectively designed and implemented. In conclusion, this study contributes significantly to the understanding of the factors that influence physical activity among the elderly in Indonesia. It provides a strong foundation for developing targeted intervention strategies that can improve the psychological and social aspects of health behavior, ultimately leading to higher participation rates in physical activity. The research also highlights the need for continued exploration with broader cohorts to extend these findings and enhance public health interventions aimed at promoting active aging.

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