ORIGINAL ARTICLE

Physical Therapy Journal of Indonesia (*PTJI*) 2026, Volume 7, Number 1: 70-78
E-ISSN : 2722-6034 ; P-ISSN : 2722-0125

# The role of physiotherapy in a health maintenance strategy for retirees in Indonesia to support total defense

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Received: 2025-09-10
Accepted: 2025-12-16
Published: 2026-03-05

## ABSTRACT

**Background:** Retirement represents a critical transitional phase for members of the Indonesian military and civil servants, often accompanied by post-power syndrome and retirement depression, which adversely affect psychological stability, musculoskeletal function, and social participation. This study aimed to empirically analyze the effectiveness of physiotherapy interventions based on physical activity combined with psychosocial support in mitigating post power syndrome and retirement depression, while also assessing their alignment with the job demands-resources model and the successful aging theory.

**Methods:** This study employed a quantitative analytical survey involving 200 retired Indonesian military personnel and civil servants (≥1 year post-retirement) selected through simple random sampling. Data were collected using structured Likert-scale questionnaires covering physiotherapy interventions, post-power syndrome symptoms, and mental health indicators. Validity and reliability were confirmed through pilot testing. Data were analyzed using structural equation modelling with partial least squares (SEM-PLS 4) to assess relationships and model fit through outer and inner model evaluations.

**Results:** The results indicate that all constructs met the criteria for validity and reliability (outer loading > 0.70; AVE > 0.50; CR > 0.80; HTMT < 0.85). Physiotherapy interventions demonstrated a significant effect in reducing PPS ($\beta = -0.62$; $t = 8.522$; $p < 0.001$) and retirement depression ($\beta = -0.67$; $t = 7.274$; $p < 0.001$), with musculoskeletal function and physical activity engagement acting as significant partial mediators ($t = 5.275$; $p < 0.001$). These findings affirmed that integrated physiotherapy interventions enhance retirees' physical resilience and psychosocial well-being, while also holding strategic relevance for national health policies and strengthening the role of retirees as supportive components within the national defense and security system.

**Conclusion:** This research contributes to advancing physical and mental well-being among the elderly through integrated physiotherapy interventions; however, its cross-sectional design presents a limitation, suggesting future studies adopt longitudinal approaches with broader contextual variables.

**Keywords:** elderly, health defense, musculoskeletal, physiotherapy, SEM PLS-4.
**Cite This Article:** Harefa, F., Harahap, Y., Dewi, D.A.R., Nurrobi, R.M.T., Sutanto., Harsono, C.F. . 2026. The role of physiotherapy in a health maintenance strategy for retirees in Indonesia to support total defense. *Physical Therapy Journal of Indonesia* 7(1): 70-78. DOI: 10.51559/ptji.v7i1.343

## INTRODUCTION

Retirement represents a crucial transitional phase in life, often accompanied by complex psychological and social challenges.[1] Among retired members of the Indonesian military and civil servants, this phase is frequently marked by phenomena such as post-power syndrome and retirement depression.[2] Post-power syndrome manifests as a psychological condition resulting from the loss of position, authority, and long-held social identity, leading to feelings of worthlessness, loss of direction, and even an existential crisis.[3] Meanwhile, retirement depression is often triggered by the loss of daily routines, reduced social interactions, and anxiety over financial and health uncertainties.[4] The combination of these factors not only undermines mental health but also negatively impacts physical function, limits social participation, and increases the risk of musculoskeletal disorders due to a sedentary lifestyle.[5]

According to data from the Ministry of Finance (2024), retirees from the civil servants, Indonesian military, and national police constitute approximately 2.3% of Indonesia's population of about 270 million people.[6] In the context of national defense, retired Indonesian military personnel and civil servants continue to hold a strategic position as supporting components of the total defense *(Sistem Pertahanan dan Keamanan Rakyat Semesta)/Sishankamrata)*.[7] They possess not only valuable experience and intellectual capacity but also the potential

to serve as role models, strengthen national values, and act as agents of civic education.[8] However, this potential may diminish without structured and targeted interventions addressing their mental and physical health.[9] Thus, an interdisciplinary approach that integrates psychosocial and rehabilitative dimensions is essential to maintaining the retirees' quality of life.[10]

The theoretical foundation of this study draws upon the job demands resources model, which posits that individual well-being both during and after employment is shaped by the interaction between job demands and available resources.[11] It also incorporates the successful aging theory, which asserts that successful aging is not merely the absence of disease, but also the maintenance of high physical and cognitive functioning and active engagement in social and productive life.[12] Supporting evidence emphasizing that older adults can remain active and contributive; that older individuals can maintain productivity through adaptive policies; that a balanced age structure contributes positively to organizational performance.[13] Similarly recent research affirm that older workers retain the capacity to learn, transfer knowledge, and collaborate productively.[14]

Theoretical and empirical evidence increasingly underscores the vital role of physiotherapy interventions in preserving physical function and psychological well-being among retirees. Multicomponent interventions comprising structured physical exercise, health education, and social support significantly enhance the functional independence of older adults in daily living activities.[15] In the Indonesian context, sustained physical activity and life satisfaction among the elderly, highlighting the national relevance of such approaches. Integrative interventions combining physical, cognitive, and social dimensions yield the most effective outcomes for maintaining the overall quality of life in aging populations. Furthermore, participation in retiree support groups substantially improves all dimensions of post-retirement adjustment, reinforcing the importance of psychosocial empowerment in rehabilitation strategies. Conceptually, the activity theory of aging posits that sustained social and physical engagement enhances life satisfaction and preserves social identity among older adults. Despite the robustness of international evidence, empirical research linking physiotherapy-based interventions with the non-military dimensions of national defense in Indonesia remains scarce, signaling the need for an innovative scientific framework that positions retirees' health maintenance as an essential component of human resource resilience within the total defense.[16]

Physiotherapy plays a pivotal role within this framework. Through physical activity based interventions, physiotherapists can prevent and alleviate depressive symptoms, enhance musculoskeletal function, and improve sleep quality and functional capacity.[17] The integration of structured physical activity programs with community based psychosocial support yields dual benefits: reinforcing mental resilience while maintaining physical health.[18] Thus, physiotherapist involvement in mitigating post power syndrome and retirement depression is not only vital from a public health perspective but also aligns with national defense strategies by optimizing retirees' roles as supportive elements of *Sishankamrata*.[19]

The objective of this study was to empirically analyze the effectiveness of physiotherapy interventions integrating physical activity and psychosocial support in mitigating post power syndrome and retirement depression among retired Indonesian military and civil servant personnel, and to evaluate their alignment with the job demands-resources model and successful aging theory.[20] Specifically, the study aimed to determine the extent to which physiotherapy interventions enhanced musculoskeletal function, strengthened physical activity engagement, and restored psychological balance through an evidence-based biopsychosocial approach.[21] Furthermore, it seeks to provide a conceptual and empirical foundation for formulating national health and welfare policies for retirees, emphasizing that their physical and mental empowerment constitutes a strategic asset in sustaining the non-military dimensions of national defense.[22] Additionally, the research offers practical contributions by providing relevant and applicable health information for the elderly population to improve their quality of life, functional independence, and psychosocial resilience in aging with dignity and productivity.[23]

## METHODS

This study employed a quantitative approach with an analytical survey design. Population and Sample. The research population consisted of retired members of the Indonesian military and civil servants who had been in retirement for at least one year.[24] From this population, a total of 200 respondents were selected using a simple random sampling technique to ensure representativeness and minimize selection bias.[25] The sample size met the minimum requirements for structural equation modeling (SEM) analysis using the partial least squares (PLS) method, which generally necessitates a relatively large sample to achieve model stability.[26] The study was conducted with ethical approval from the Ethics Committee of the Ministry of Defense, under approval number 6/EC/Kemhan/IX/2025.

Data were collected through structured questionnaires developed based on indicators of mental health, symptoms of Post Power Syndrome, and physiotherapy intervention variables, which included structured physical activity, ergonomic education, and psychosocial support.[27] The instrument used Likert scale (1-5) to measure respondents' perception intensity.[28] The validity and reliability of the questionnaire were assessed through a pilot test conducted on a small group of retirees prior to the main study.[29] The data were analyzed used SEM PLS-4.

The analytical procedure comprised three main stages: testing the outer model and the inner model.[30] In the outer model stage, convergent validity was assessed through outer loading values (>0.70), average variance extracted (AVE >0.50), and construct reliability using composite reliability (CR >0.80) and cronbach's alpha (>0.70). Discriminant validity was evaluated using the heterotrait–monotrait ratio (HTMT <0.85) and Fornell-Larcker Criterion, confirming conceptual distinctions among latent variables.[31] In the inner model stage, causal relationships among variables were examined by

evaluating R-square ($R^2$) values to determine the explanatory power of the model, F-square ($f^2$) values to measure effect size, and t-statistics and p-values derived from bootstrapping to assess the significance of relationships among latent variables.[32] Model fit was further assessed using the standardized root mean square residual (SRMR) to evaluate model adequacy, while $Q^2$predict, root mean square error (RMSE), and mean absolute error (MAE) were employed to examine the model's predictive capability.[33] The cross-validated predictive ability test (CVPAT) was conducted to compare the performance of the SEM-PLS model with the Indicator Average Model, confirming that the SEM-PLS approach provides robust, valid, and efficient estimations in explaining the effects of physiotherapy interventions on post power syndrome and retirement depression among retired personnel of the Indonesian national armed forces and civil servants.[34]

Hypotheses; H1: musculoskeletal function and physical activity engagement (M) have a significant effect on reducing retirement depression (Y2) among retired personnel of the Indonesian national armed forces and civil servants. H2: physiotherapy interventions (X) have a significant effect on improving musculoskeletal function and physical activity engagement (M) among retired personnel of the Indonesian national armed forces and civil servants. H3: Physiotherapy interventions (X) have a significant effect on reducing post power syndrome (Y1) among retired personnel of the Indonesian national armed forces and civil servants. H4: Physiotherapy interventions (X) have a significant effect on reducing retirement depression (Y2) among retired personnel of the Indonesian national armed forces and civil servants.

## RESULTS

### Respondent Characteristics

A total of 200 retired personnel from the Indonesian military and civil servants participated in this study. The majority of respondents were between 59 and 65 years old (62%), with an average retirement duration of two years. The sample was predominantly male (71%), while female respondents accounted for 29%, reflecting the gender distribution within their respective institutions. Educational backgrounds varied, with most participants having completed higher education. From a health perspective, 54% of respondents reported chronic musculoskeletal complaints such as lower back pain and neck pain, while 46% exhibited psychological symptoms, including mild to moderate anxiety. The collected data further revealed that to prevent the onset of post power syndrome and retirement-related depression, many retirees engaged in regular physical and social activities, such as walking, outdoor tennis, table tennis, and various forms of community involvement. These activities not only contributed to maintaining their physical fitness but also served as adaptive coping mechanisms to sustain psychological stability and social connectedness during the post-retirement period.[35]

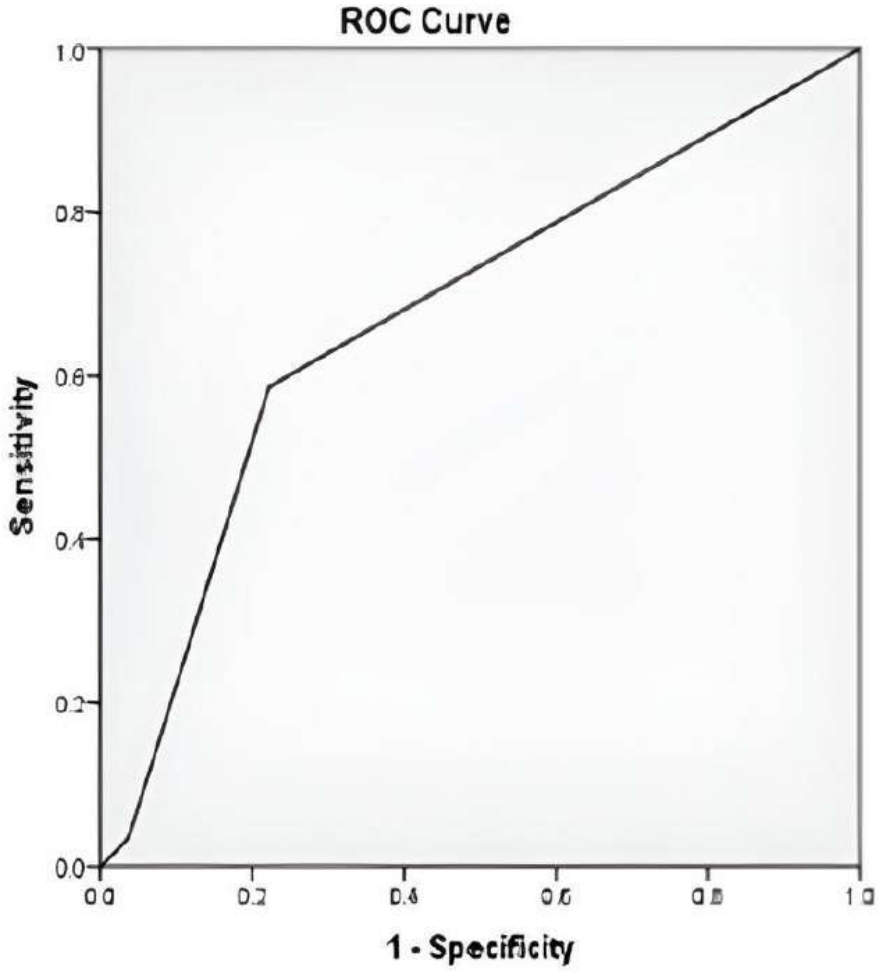


**Figure 1.** Outer loading structural equation modeling – partial least squares version 4 (SEM PLS-4)

### Outer Model

Figure 1 demonstrates that all outer loading values exceed 0.70, indicating strong indicator reliability and that each observed variable effectively represents its corresponding latent construct. This confirms excellent convergent validity within the model, showing that the measurement indicators are consistent, stable, and statistically robust in explaining their respective variables. For the Physiotherapist Intervention variable (X), all four indicators made significant contributions to the main construct, with the highest loading observed in the structured physical activity indicator (0.880). This finding illustrates that retirees' participation in functional exercises, breathing routines, and group activities constitutes the most dominant component in strengthening the effect of physiotherapeutic interventions. Other

indicators, such as ergonomic education (0.792) and community based psychosocial support (0.861), also played critical roles in maintaining the equilibrium between physical and mental health, while rehabilitative social engagement (0.850) emphasized the importance of the social dimension as an integral part of recovery.

For the mediating variable (M), representing musculoskeletal function and engagement in physical activity, all indicators exhibited strong contributions, with outer loading values ranging from 0.701 to 0.864. The indicator representing increased participation in routine physical activity (0.864) emerged as the strongest reflection of the intervention's success in enhancing physical function and reducing musculoskeletal complaints. This underscores that higher engagement in physical activity among retirees results in greater improvements in both physical and psychological well being.

Regarding the post power syndrome variable (Y1), the two principal indicators showed high outer loading values, namely 0.842 for the feeling of loss of self-identity and reduced self-confidence, and 0.806 for loss of purpose and motivation. These findings indicate that emotional and existential symptoms are dominant aspects of this syndrome. Similarly, the retirement depression variable (Y2) demonstrated even higher outer loading values 0.909 for affective and cognitive symptoms, and 0.848 for physical and social symptoms showing that emotional and social dimensions reinforce one another in explaining depressive conditions during retirement.[36]

Overall, these results confirm that all constructs in the model are both valid and reliable, effectively capturing the conceptual relationships among variables. The high outer loading values across all indicators substantiate that physiotherapy interventions based on physical activity and psychosocial support exert a significant impact on improving musculoskeletal function, which in turn plays a crucial role in mitigating post power syndrome and retirement related depression among retired members of the Indonesian military and civil servants.[37]

## Construct Validity and Reliability

**Table 1** presents the results of the construct validity and reliability analysis, confirming that all constructs in the research model meet the measurement feasibility criteria based on Cronbach's Alpha, composite reliability (rho_a and rho_c), and average variance extracted (AVE) values.

For the X, the *Cronbach's Alpha* value of 0.870 and composite reliability (rho_c) of 0.910 indicate a very high level of internal consistency, signifying that all indicators structured physical activity, ergonomic education, psychosocial support, and rehabilitative social engagement homogeneously measure the same dimension. The AVE value of 0.716, which exceeds the minimum threshold of 0.50, implies that this construct explains more than 71% of the variance of its indicators, demonstrating that physiotherapist intervention possesses high reliability and strong representational power as an exogenous variable within the model.

The construct of M obtained a Cronbach's Alpha of 0.811 and a Composite Reliability of 0.873, indicating excellent reliability. The AVE value of 0.634 shows that the construct explains more than half of the variance of its indicators, signifying strong convergent validity. This suggests that improvements in physical function, muscle strength, functional capacity, and engagement in physical activities collectively represent a stable and reliable construct.

Meanwhile, for the Y1, although the Cronbach's Alpha value is relatively lower (0.529), it remains acceptable due to the limited number of indicators (two main items), which typically yield smaller internal consistency values. Nonetheless, the Composite Reliability (rho_c) of 0.809 and AVE of 0.679 demonstrate that this construct maintains good reliability and adequate convergent validity. Accordingly, indicators such as loss of self-identity and life purpose have proven consistent in capturing the psychological phenomena of post-retirement adjustment that characterize post power syndrome.

Furthermore, the Y2 exhibits strong measurement performance, with *Cronbach's Alpha* of 0.709, composite reliability of 0.871, and AVE of 0.772. The high AVE value indicates that most of the variance in the depression indicators is well explained by the construct, confirming that affective, cognitive, physical, and social symptoms serve as valid representations of post-retirement depression.

Overall, the analysis confirms that all constructs within the model possess high reliability and sufficient convergent validity, establishing the measurement model as appropriate for further structural analysis. The robustness of the instrument reinforces the conclusion that physiotherapy interventions and the enhancement of musculoskeletal function play a significant role in reducing post power syndrome and retirement depression, thereby supporting the theoretical relationships proposed in the framework of the job demands resources model and the successful aging theory.[38]

## Heterotrait-monotrait ratio of correlations (HTMT)

**Table 2** shows the results of HTMT analysis, which was conducted to assess the discriminant validity among the constructs within the research model. All HTMT correlation values are below the

**Table 1. Construct validity and reliability**

| Variable | Cronbach's alpha | Rho_a | Rho_c | AVE |
|---|---|---|---|---|
| M | 0.811 | 0.810 | 0.873 | 0.634 |
| X | 0.870 | 0.906 | 0.910 | 0.716 |
| Y1 | 0.529 | 0.531 | 0.809 | 0.679 |
| Y2 | 0.709 | 0.737 | 0.871 | 0.772 |

AVE, average variance extracted; M, musculoskeletal function and involvement of physical activity; Rho_a, composite reliability; Rho_c, composite reliability; X, physiotherapist intervention; Y1, post power syndrome; Y2, Retirement depression.

critical threshold of 0.85, indicating that each construct demonstrates adequate conceptual differentiation and that no significant overlap occurs among the latent variables. The highest correlation value is observed between X and Y1 at 0.668, suggesting a moderately strong association that remains within acceptable discriminant validity limits. This implies that, although these constructs are theoretically related through psychosocial and physical intervention mechanisms, they are empirically distinct.

Meanwhile, the HTMT value between M and Y2 of 0.594 reflects a moderate relationship, reinforcing the mediating role of M in bridging the influence of physiotherapy interventions on the reduction of depressive symptoms. Therefore, the HTMT findings confirm that the measurement model satisfies the discriminant validity criteria, ensuring that each construct possesses a distinct conceptual identity and can be interpreted independently within the structural analysis framework.

**Table 2. Heterotrait–monotrait ratio of correlations (HTMT)**

| Variable | M | X | Y1 | Y2 |
|---|---|---|---|---|
| M | | | | |
| X | 0.245 | | | |
| Y1 | 0.490 | 0.668 | | |
| Y2 | 0.594 | 0.593 | 0.444 | |

M, musculoskeletal function and involvement of physical activity; X, physiotherapist intervention; Y1, post power syndrome; Y2, retirement depression.

**Table 3. Fornell–Larcker criterion0**

| Variable | M | X | Y1 | Y2 |
|---|---|---|---|---|
| M | 0.796 | | | |
| X | 0.239 | 0.846 | | |
| Y1 | -0.325 | -0.479 | 0.824 | |
| Y2 | 0.461 | 0.504 | -0.278 | 0.879 |

M; musculoskeletal function and involvement of physical activity; X, physiotherapist intervention; Y1, post power syndrome; Y2, retirement depression.

**Table 4. Hypothesis testing**

| Hypothesis | T statistics | P-value |
|---|---|---|
| M to Y2 | 5.275 | 0.000 |
| X to M | 3.666 | 0.000 |
| X to Y1 | 8.522 | 0.000 |
| X to Y2 | 7.274 | 0.000 |

M, musculoskeletal function and involvement of physical activity; X, physiotherapist intervention; Y1, post power syndrome; Y2, retirement depression.

**Table 5. R-square**

| Variable | R-square | R-square adjusted |
|---|---|---|
| M | 0.057 | 0.052 |
| Y1 | 0.229 | 0.225 |
| Y2 | 0.377 | 0.371 |

M, musculoskeletal function and involvement of physical activity; Y1, post power syndrome; Y2, retirement depression.

## Fornell-larcker criterion

Table 3 results of the fornell-larcker criterion analysis presented in the table indicate that each construct satisfies the requirements for discriminant validity, as the square root values of the AVE on the diagonal (0.796 for M, 0.846 for X, 0.824 for Y1, and 0.879 for Y2) are higher than the correlations between constructs in the corresponding rows and columns. This finding signifies that the latent variables physiotherapist intervention, musculoskeletal function and physical activity involvement, post power syndrome, and retirement depression exhibit sufficient conceptual distinction and do not significantly overlap. Accordingly, the model demonstrates a strong level of construct discrimination, confirming that each variable represents its theoretical dimension specifically and independently, thereby strengthening the causal interpretability of the relationships tested within the structural model.

## Inner model

### Hypothesis testing

Table 4 shows the relationship between musculoskeletal function and involvement in M and Y2 yielded a t-statistic value of 5.275 with a p-value of 0.000 (<0.05), indicating a significant relationship between the mediating variable and retirement depression. Empirically, this finding affirms that improvements in musculoskeletal function and engagement in physical activities make a substantial contribution to reducing post-retirement depressive symptoms. Physiologically, enhanced muscle strength, joint mobility, and consistent functional activity promote endorphin release and lower cortisol levels, which directly improve mood stability and reduce psychological stress. Psychosocially, participation in group-based physical activities fosters social connectedness and mitigates isolation two major determinants in preventing depression among the elderly population.

The relationship between X and M yielded a t-statistic of 3.666 with a p-value of 0.000, signifying a significant positive influence. This result confirms the effectiveness of physiotherapy-based interventions in facilitating both physiological and psychological adaptation during the post-retirement transition. Through structured programs such as functional exercise, breathing techniques, and ergonomic education, physiotherapists play a critical role in optimizing musculoskeletal performance, enhancing mobility, and cultivating sustainable active lifestyle habits. Theoretically, this relationship aligns with the job demand resources model, in which physiotherapy serves as a vital resource to counterbalance the psychological strain caused by role loss and diminished daily activity following retirement.

The relationship between X and Y1 revealed a t-statistic value of 8.522 with a p-value of 0.000, demonstrating a highly significant effect. This finding indicates that physiotherapy engagement directly alleviates symptoms associated with loss of identity, reduced self esteem, and existential crisis commonly experienced by retirees. The integrative physiotherapy approach combining physical activity, psychosocial support, and health

education proves effective in enhancing psychological resilience through improved self-perception, personal meaning, and competence. Consequently, physiotherapy functions not only as a form of physical rehabilitation but also as an effective psychological recovery mechanism in addressing post-retirement loss of authority and social role(39).

The relationship between X and Y2 produced a t-statistic value of 7.274 with a p-value of 0.000, confirming a significant influence. Theoretically, this result demonstrates that structured physical activities and psychosocial support facilitated by physiotherapists effectively restore emotional balance and enhance overall quality of life in retired individuals. Such interventions influence both physiological domains improving cardiovascular function, blood circulation, and stress hormone regulation and emotional domains through therapeutic interaction and community engagement. Therefore, physiotherapy serves a dual function as both a medical and social intervention that strengthens the psychological and social well-being of retirees in navigating post-career transitions and life role adjustments.[40]

**Table 6. F-square**

| Variable | M | X | Y1 | Y2 |
|---|---|---|---|---|
| M | | | | 0.197 |
| X | 0.060 | | 0.298 | 0.265 |
| Y1 | | | | |
| Y2 | | | | |

M, musculoskeletal function and involvement of physical activity; X, physiotherapist intervention; Y1, post power syndrome; Y2, retirement depression.

**Table 7. Standardized root mean square residual (SRMR)**

| | Saturated model | Estimated model |
|---|---|---|
| Standardized root mean square residual | 0.116 | 0.124 |

**Table 8. Latent variable (LV) prediction summary**

| Variable | $Q^2$predict | RMSE | MAE |
|---|---|---|---|
| M | 0.042 | 0.987 | 0.887 |
| Y1 | 0.209 | 0.899 | 0.783 |
| Y2 | 0.242 | 0.880 | 0.718 |

M, musculoskeletal function and involvement of physical activity; Y1, post power syndrome; Y2, retirement depression.

**Table 9. Cross-validated predictive ability test (CVPAT) partial least squares structural equation modelling (PLS SEM) vs indicator average (IA)**

| Variable | PLS loss | IA loss | Average loss difference | t value | P-value |
|---|---|---|---|---|---|
| M | 0.294 | 0.301 | -0.007 | 1.116 | 0.266 |
| Y1 | 0.225 | 0.263 | -0.038 | 3.516 | 0.001 |
| Y2 | 0.262 | 0.312 | -0.050 | 3.428 | 0.001 |
| Overall | 0.268 | 0.294 | -0.026 | 3.837 | 0.000 |

M, musculoskeletal function and involvement of physical activity; Y1, post power syndrome; Y2, retirement depression.

## R-square

Table 5 shows the R-square values indicate that the model explains 5.7% of the variance in musculoskeletal function and M, 22.9% of the variance in Y1, and 37.7% of the variance in Y2, suggesting that the model possesses a low to moderate predictive capacity, yet remains adequate for explaining the causal relationships among latent variables within the context of physiotherapy intervention and post-retirement well-being.[41]

## F-square

Table 6 shows the F-square analysis that the effect size of physiotherapy intervention on the mediating variable of musculoskeletal function and M is 0.060, on Y1 is 0.298, and on Y2 is 0.265. Meanwhile, the effect of musculoskeletal function and physical activity involvement on retirement depression shows an F-square value of 0.197. According to Cohen's (1988) criteria, an F-square value between 0.02-0.15 is classified as small, 0.15-0.35 as medium, and above 0.35 as large. Thus, it can be interpreted that physiotherapy interventions exert a moderate effect on reducing post power syndrome and retirement depression, and a small effect on improving musculoskeletal function and physical activity. Furthermore, the mediating variable M demonstrates a moderate effect on reducing retirement depression.[42] These findings affirm that physiotherapy programs not only have a direct impact on post retirement mental health but also contribute substantially by enhancing physical capacity and activity engagement, which collectively strengthen emotional well-being and overall quality of life among retirees.[43]

## Model fit test

Table 7 presents the standardized root mean square residual (SRMR) value of 0.116 for the saturated model and 0.124 for the estimated model indicates an acceptable level of goodness of fit, demonstrating that the discrepancy between the empirical covariance and the model covariance remains within tolerable limits; thus, the structural model is deemed suitable for further analysis.

## Latent variable (LV) prediction summary

Table 8 presents the latent variable (LV) prediction summary, which assesses the model's predictive capability for the latent variables. The $Q^2$predict values of 0.042 for M, 0.209 for Y1, and 0.242 for Y2 indicate that the model possesses positive predictive relevance ($Q^2$predict > 0), signifying that it is not merely descriptive but demonstrates substantial predictive power regarding the phenomena examined. The relatively low root mean square error (RMSE) and mean absolute error (MAE) values both below 1.00 suggest that the model's prediction errors are within acceptable

and statistically reasonable limits. Substantively, these results affirm that the integrated physiotherapy intervention model, combining physical activity and psychosocial support, effectively predicts the reduction of post power syndrome and retirement depression symptoms through improvements in musculoskeletal function and physical activity participation among retired Indonesian military and civil servants.[44]

### Cross-validated predictive ability test (CVPAT) partial least squares structural equation modelling (PLS SEM) vs indicator average (IA)

Table 9 presents the results of the cross-validated predictive ability test (CVPAT), which compares the performance of the partial least squares structural equation modelling (PLS-SEM) approach with the indicator average (IA) model in assessing predictive capability for latent variables. The lower PLS loss values compared to IA loss across all constructs indicate that the PLS-SEM model demonstrates superior predictive power and efficiency. The negative average loss difference further reinforces this finding, suggesting that the PLS-SEM approach produces smaller prediction errors. Statistically, this difference is significant for the variables Y1 and Y2, with t-values of 3.516 and 3.428 ($p < 0.01$), and is also significant overall ($t = 3.837$; $p < 0.001$). These results indicate that the model is not only structurally valid but also possesses strong predictive superiority in explaining the effects of physiotherapy interventions on mitigating post retirement psychological disorders, particularly in the dimensions of loss of meaning and retirement depression.[45]

## DISCUSSION

The findings of this study emphasize the strong interrelationship between physical and psychosocial dimensions in maintaining post retirement quality of life, particularly among retired personnel of the Indonesian Military and Civil Servants. Empirically, the structural model demonstrates that physiotherapy interventions based on physical activity and psychosocial support have a significant effect in reducing post power syndrome and retirement depression. Structured physical activity, ergonomic education, and community based support were found to not only enhance musculoskeletal function but also restore psychological balance through improved self esteem, a sense of purpose, and social adaptability. This supports the biopsychosocial framework, which posits that the well-being of the elderly cannot be separated from the integration of physical health and emotional stability.

From a theoretical perspective, which asserts that individual well-being depends on the balance between demands and resources. In the context of retirement, the loss of position, social identity, and routine activities represents a form of psychological demand, while physiotherapy interventions serve as resources that mitigate these negative effects. Physical exercise and social support act as stress-regulating mechanisms that enhance endorphin and neurotrophic hormone regulation, thereby reducing depressive symptoms and improving cognitive functioning.[11]

Furthermore, which emphasizes the maintenance of physical, cognitive, and social engagement as key elements of healthy aging. Through physiotherapy interventions, retirees can maintain functional capacity and actively participate in social life, thereby supporting the concept of ageing well.[12] These empirical findings assert that older adults can remain productive when provided with meaningful physical activities and strong social support. Similarly, senior workers are capable of sustaining productivity and serving as sources of social stability and knowledge transfer. Further supports this argument by demonstrating that older populations retain learning capacity and continue to contribute actively within organizations and communities.[13,14]

Empirically, the analysis shows a significant relationship between physiotherapy interventions and the reduction of PPS ($t = 8.522$; $p < 0.001$) as well as retirement depression ($t = 7.274$; $p < 0.001$). The mediating effect of musculoskeletal function on retirement depression was also found to be significant ($t = 5.275$; $p < 0.001$), indicating that improved mobility, muscle strength, and physical activity involvement serve as key mechanisms in maintaining mental health. The R-square values of 0.229 for PPS and 0.377 for retirement depression indicate moderate to strong predictive capacity of the model. The F-square results, showing medium effect sizes (0.298 for PPS and 0.265 for retirement depression), further affirm that physiotherapy interventions contribute substantially to improving retirees' psychological well-being.

At the national level, these findings have strategic implications for defense policy. Retired Indonesian military and Civil Servant personnel constitute an integral part of the total defense (*Sishankamrata*) as nir-military supporting components of national defense, both in wartime operations (*OMP*) and military operations other than war (*OMSP*). With sustained physical and mental health, retirees can actively contribute to youth character development, national defense education, and community-level social cohesion. Conversely, neglecting their health would weaken the potential of human resources vital to non-military defense components.

Therefore, physiotherapy interventions grounded in physical activity and psychosocial support should be institutionalized as part of the national retirement health policy. The government can integrate these interventions into military hospitals, *BPJS* health services, and civil servant community clinics. Cross-ministerial collaboration among the ministry of defense, ministry of health, and ministry of social affairs is essential for ensuring resource and funding continuity. Furthermore, veteran organizations and retiree associations should be empowered as community-based implementation hubs for functional exercise programs and psychosocial support forums. Hence, physiotherapy interventions should be recognized not merely as medical rehabilitation tools but as strategic instruments for strengthening social resilience and national defense through the optimization of retirees' roles as active and productive national assets.

### Health maintenance strategy for retirees in Indonesia as a supporting component of total defense

Health maintenance for retirees in Indonesia plays a crucial role in

strengthening national defense, as it directly contributes to human resource readiness and national social stability. Retirees, both from military and civilian sectors, remain an essential component of the national defense system due to their extensive experience, professional competence, and resilient social networks, all of which can be mobilized to support national development and resilience. A well planned and continuous health maintenance strategy implemented through promotive and preventive approaches such as regular medical check-ups, structured physical activities, and mental health programs helps sustain their physical and psychological well-being, enabling them to remain productive and independent. This approach aligns with the total defense (*Sishankamrata*), which recognizes all citizens, including retirees, as integral elements of the nation's defense, whether directly or indirectly. Therefore, maintaining the health of retirees not only enhances their individual well-being but also holds strategic significance in reinforcing social resilience, community self-reliance, and national preparedness in confronting the multidimensional non-military threats of the current and future dynamic geopolitical environment.

**Main findings, implications for future practice, policy, and research.**

The main findings of this study demonstrate that physiotherapy interventions integrating structured physical activity and psychosocial support significantly reduce Post Power Syndrome and retirement depression among retired Indonesian military and civil servants, thereby reinforcing the biopsychosocial model of well being and the theoretical foundation of the Job Demands Resources and Successful Aging frameworks.[11] Empirically, the study confirms that improved musculoskeletal function serves as a mediating mechanism that enhances mental health stability and functional independence in later life. These results hold critical implications for practice and policy: physiotherapy-based health maintenance should be institutionalized within Indonesia's national retirement health system through collaborative governance among the ministry of defense, ministry of health, and ministry of social affairs, ensuring continuity of preventive care and psychosocial empowerment. At a broader level, these findings underscore the strategic relevance of retirees as non-military assets in the Total Defense framework, where maintaining their health translates into strengthened social resilience, intergenerational knowledge transfer, and sustained human resource readiness. For future research, longitudinal and policy-oriented studies are recommended to evaluate the long-term effectiveness of integrated physiotherapy models in enhancing both individual well-being and national defense capacity.

This study has several limitations. The cross-sectional design limits causal interpretation between physiotherapy interventions, musculoskeletal function, post power syndrome, and retirement depression. Data were collected using self-reported questionnaires, which may lead to response bias despite prior validity and reliability testing. The sample was limited to retired Indonesian military personnel and civil servants, so the findings may not be generalizable to other groups. Although SEM-PLS provided robust analysis, it may be affected by non-normal data and sample size limitations. In addition, factors such as socioeconomic status, health condition, and social support were not controlled, which may have influenced the results.

## CONCLUSION

The study can contribute to the promotion of the physical and mental health of older people through integrated physiotherapy interventions, including physical activities and psychosocial support. However, the cross-sectional study design has limitations in establishing causality and examining the effects of the interventions in the long term.

Therefore, it is recommended that future studies adopt a longitudinal approach that will enable the examination of the sustained effects, as well as the causal processes, while also examining the effects of contextual variables such as family, SES, and community environments, which will provide a more complete understanding of the effects and psychosocial hardiness of the aging population.

## CONFLICT OF INTEREST

The authors declare no conflict of interest.

## FUNDING

This research did not receive external funding.

## ETHICAL CONSIDERATION

The study was conducted with ethical approval from the Ethics Committee of the Ministry of Defense, under approval number 6/EC/Kemhan/IX/2025.

## AUTHORS CONTRIBUTIONS

FH led the conceptualization, methodology, and manuscript drafting. AK contributed to data analysis and interpretation. SA assisted in data collection and validation. AS supervised the research process and reviewed the manuscript. S provided critical revision and gave final approval of the manuscript.

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