Journal Of Nursing Practice
https://thejnp.org/
ISSN: 2614-3488 (print); 2614-3496 (online)
Vol. 10 No.1 October. Page 282-298
https://doi.org/10.30994/jnp.v10i1.1090

Physical and Mental Components of Quality of Life in Older Adult with Hypertension, comparing the roles of Physical Activity and Self-Management

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ABSTRACT

Background: Managing hypertension in later life requires balancing cardiovascular stability against the daily demands of illness care. Although physical activity and self-management are standard recommendations, aggregate quality of life scores often conceal opposing trends between physical functional gains and psychological treatment burden.

Purpose: We examined how physical activity and specific self-management behaviors relate to the physical and mental components of quality of life in hypertensive older adults.

Methods: In this cross-sectional study of 62 hypertensive older adults at Caringin Primary Health Centre, Bandung, we administered the Physical Activities Scale for the Elderly (PASE), Hypertension Self-Management Behavior Questionnaire (HSMBQ), and RAND SF-36. Hierarchical linear regression evaluated continuous scores, controlling for age, sex, and hypertension stage.

Results: Physical activity independently predicted higher PCS (B = 0.054, p = 0.005), driven by physical functioning (B = 0.116, p < 0.001) and role fulfillment (B = 0.092, p = 0.002). Overall self-management did not predict PCS (p = 0.354), though it was associated with reduced bodily pain (B = 0.397, p = 0.041). However, self-integration was negatively associated with MCS (B = -0.765, p = 0.019) and vitality (B = -1.599, p < 0.001). A significant positive interaction was found between physical activity and self-management on PCS (B = 0.0045, p = 0.0009).

Conclusion: Routine physical activity sustains functional mobility, whereas rigid self-management introduces emotional strain. Primary care nurses should promote manageable physical movement while offering practical coping support to ease self-care burden.

Keywords **:** Aged; Exercise; Hypertension; Quality of life; Self-management

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Received: October 5, 2026; Revised: October 27, 2026; Accepted: October 28, 2026; Available Online: October 30, 2026
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BACKGROUND

In Indonesian primary care clinics, essential hypertension remains the most frequent chronic diagnosis among older adults, currently affecting more than a third of the geriatric population (Directorate of Non-Communicable Disease Prevention and Control RI, 2021; World Health Organization, 2024). In dense urban centers such as Bandung, city health records show high rates of cardiovascular complications and related long-term disability (Bandung Health Department RI, 2024). In daily nursing practice, clinical management tends to focus heavily on pharmacological and meeting systolic blood pressure targets below 140 mmHg. For older patients themselves, however, health is rarely defined by blood pressure alone. What matters most to them is whether they can walk to the market, perform household chores, maintain social roles, and enjoy daily life without disabling symptoms or overwhelming distress (Egan et al., 2024; Rakugi & Kawai, 2017).

Health-related quality of life (HRQoL) captures these subjective dimensions of living with chronic illness (Ware & Sherbourne, 1992). In older adults with hypertension, HRQoL is split across two distinct, often conflicting areas: physical health and mental health. The Physical component reflects mobility, bodily comfort, and the capacity to complete everyday tasks. The Mental component, on the other hand, encompasses emotional vitality, psychological resilience, and social engagement. Balancing both components is difficult because managing hypertension demands continuous behavioral adjustments restricting dietary sodium, adhering to daily prescriptions, attending clinic appointments, and maintaining regular exercise (Du et al., 2022; Mansouri et al., 2024).

Routine physical movement is widely recognized as central to geriatric cardiovascular care. Regular aerobic and light to moderate physical activities preserve peripheral vascular elasticity, stimulate endothelial nitric oxide release, reduce arterial stiffness, and protect skeletal muscle mass against age-related sarcopenia (Islam et al., 2023; Lee & Heo, 2021; Oliveira-Silva et al., 2020; Wingood et al., 2022). In community settings, staying active also provides important psychological stimulation and opportunities to connect with neighbors during morning walks or neighborhood exercises (Esmail et al., 2020; Jamshidpour et al., 2020). As a result, older adults who maintain active routines generally report better functional independence.

The picture for disease self-management, however, is far more contradictory. Clinical guidelines strongly urge patients to take an active role in their care: tracking blood pressure at home, avoiding salty foods, taking tablets faithfully, and consulting healthcare providers when symptoms appear (Muliyadi et al., 2024; Safitri et al., 2024; Stupplebeen et al., 2020; Villar et al., 2023). Several studies have linked higher self-management to better perceived health (Safitri et al., 2024). But an equally substantial body of observational research finds no significant link, and some studies even observe an inverse relationship where rigorous self-care correlates with poorer perceived well-being (Budhiana et al., 2022; Meldy Tursina et al., 2022; Prastika & Siyam, 2021; Zhang et al., 2020).

This contradiction becomes understandable when viewed through the concepts of treatment burden and illness intrusion (Hudon et al., 2012; Lawless et al., 2021; Tao et al.,

2024). Managing a long term condition requires continuous mental effort. Older adults must monitor what they eat, remember complex medication schedules, worry about unexpected spikes in blood pressure, and manage the persistent fear of stroke or kidney damage (Alosaimi et al., 2020; Surikova et al., 2020). In Sundanese and broader Indonesian communities, where family mealtimes and collective social dining are central cultural practices, strict dietary rules can lead to feelings of isolation and friction. When managing hypertension turns into an all-encompassing daily obligation, the psychological vigilance drains personal energy, resulting in emotional fatigue and lower vitality even while medication successfully reduces headaches and physical discomfort.

Much of this complexity has been resulted in previous studies by methodological habits. Researchers frequently combine all eight SF-36 subscales into a single total score, or split continuous scores into crude categories like good and poor quality of life. Dichotomizing continuous scores discards meaningful variation and weakens statistical power, producing unstable estimates in small clinical samples. More importantly, using a single composite score creates an analytical blind spot: physical benefits, such as pain relief; and psychological costs, such as vitality loss cancel each other out, giving the false impression that self-management has no effect.

To address these limitations, we investigated the independent associations of physical activity and specific self-management dimensions with continuous Physical Component and Mental Component scores. We also profiled participants across all eight SF-36 domains, evaluated behavioral interactions, and examined potential confounding by demographic and clinical factors. Our aim was to give primary care nurses a clearer, clinically grounded understanding of how lifestyle behaviors actually operate in community dwelling older adults.

METHODS

Design and Setting

We conducted an analytic cross-sectional study in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines. The study took place at the Caringin Primary Health Centre (PHC), a public primary care facility in the Babakan Ciparay subdistrict of Bandung, West Java, Indonesia. Caringin PHC serves a densely populated urban area and runs a dedicated chronic disease and geriatric clinic. Data were gathered during routine clinic visits in September 2024, allowing us to record behavioral exposures, clinical measurements, and quality-of-life outcomes concurrently.

Participants and Sampling

To keep recruitment transparent, the sampling frame and participant flow were systematically documented. Within the administrative jurisdiction of Caringin PHC, 437 older adults are registered in the city registry. The geriatric chronic clinic sees roughly 35 to 40 patient visits each month. During September 2024, we screened 72 consecutive older adults who attended the clinic with a documented diagnosis of essential hypertension.

Eligibility was judged against predefined criteria. Inclusion criteria were: (1) aged 60 years or older; (2) medically confirmed essential hypertension documented in PHC records; (3)

resident within the Caringin PHC working area; (4) able to communicate verbally in Indonesian or Sundanese; and (5) willing to give written informed consent. Exclusion criteria were: (1) severe cognitive impairment or dementia preventing reliable questionnaire responses; (2) acute cardiovascular emergencies or hypertensive crises in the preceding 3 months; and (3) bedridden status, end-stage renal disease on dialysis, or severe decompensated diabetic complications (Francis et al., 2024; Jacob & McCafferty, 2023).

Of the 72 screened patients, 10 did not enter the study: 6 met clinical exclusion criteria (3 had acute hypertensive crises or unstable cardiovascular symptoms requiring immediate referral, 2 had documented moderate-to-severe cognitive impairment, and 1 was undergoing hemodialysis for end-stage kidney failure), while 4 declined to participate due to fatigue or scheduling conflicts. The remaining 62 participants completed the face-to-face interviews under the guidance of trained nursing researchers, yielding an 86.1% participation rate.

Sample Size and Statistical Power Justification

In initial exploratory analyses, binary logistic regression was evaluated using a dichotomized quality-of-life cutoff. However, because only 10 participants fell into the poor category, the events-per-variable ratio dropped below 3.5, resulting in wide confidence intervals and unstable regression estimates. Rather than discarding continuous variance through artificial dichotomization, we used continuous multiple linear regression on SF-36 summary scores (PCS and MCS). A post-hoc power calculation was carried out using G*Power 3.1.9.7. For a linear regression model with five primary predictors (age, sex, hypertension severity, physical activity, and self-management), a two-tailed alpha of 0.05, and N = 62, the achieved statistical power (1 - β) exceeds 0.82 for medium-to-large effect sizes (f^2 between 0.15 and 0.22). This confirms that our sample size is adequate for continuous multivariable modeling without risking small sample coefficient instability.

Instruments and Data Collection

Data were collected during structured, direct interviews by trained nursing researchers. Sociodemographic variables included chronological age (years) and biological sex (female or male). Blood pressure was measured using calibrated Omron HEM-7120 digital monitors alongside calibrated aneroid sphygmomanometers. Participants rested in a seated position for at least 5 to 10 minutes prior to measurement, with their arm supported at heart level and an appropriately sized cuff placed on the bare upper arm. Two readings taken two minutes apart were averaged. Hypertension was categorized according to JNC-7 / WHO criteria as Stage 1 (systolic 140–159 mmHg or diastolic 90–99 mmHg) or Stage 2 (systolic ≥ 160 mmHg or diastolic ≥ 100 mmHg), noting participants whose readings were pharmacologically controlled on the day of assessment.

Physical activity was measured using the Physical Activities Scale for the Elderly (PASE) (Washburn et al., 1993), an established instrument designed to capture movement habits in older adults over a 7-day recall period (Glynn et al., 2021). The scale evaluates the frequency and daily duration of 10 activities across leisure pursuits (walking, light exercise, moderate exercise, strenuous sport, and strength training), household tasks (light housework,

heavy chores, home repair, gardening, and caregiving), and volunteer or paid work. Responses are weighted by metabolic factors and summed to give a continuous total score from 0 to over 400, where higher scores reflect greater movement and energy expenditure. The Indonesian PASE demonstrated good internal consistency in our sample (Cronbach's $\alpha = 0.76$).

Hypertension self-management was assessed using the 40-item Hypertension Self-Management Behavior Questionnaire (HSMBQ) (Safitri et al., 2024). The instrument covers five behavioral areas: (1) Self-Integration (13 items on dietary adjustments, low-salt cooking, and making self-care part of daily life); (2) Self-Regulation (9 items on symptom tracking, stress management, and emotional coping); (3) Interaction with Healthcare Providers (9 items on doctor/nurse communication and asking questions); (4) Blood Pressure Monitoring (4 items on checking and recording blood pressure); and (5) Regimen Adherence (5 items on taking medications on time). Items are rated on a 4-point scale (1 = Never/Rarely to 4 = Routinely/Always), yielding a continuous total score between 40 and 160. Higher scores indicate stronger self-management. The Indonesian version demonstrated high internal consistency (Cronbach's $\alpha = 0.88$).

Health-related quality of life was evaluated using the Indonesian validated RAND 36-Item Health Survey (SF-36) (Ware & Sherbourne, 1992). The SF-36 covers eight health domains: Physical Functioning (PF, 10 items), Role Limitations due to Physical Health (RP, 4 items), Bodily Pain (BP, 2 items), General Health (GH, 5 items), Vitality (VT, 4 items), Social Functioning (SF, 2 items), Role Limitations due to Emotional Problems (RE, 3 items), and Mental Health (MH, 5 items). Items were recoded and transformed to a standard 0–100 scale according to RAND guidelines, with higher scores reflecting better health status. Two summary scores were calculated: the Physical Component, computed as the mean of PF, RP, BP, and GH; and the Mental Component, computed as the mean of VT, SF, RE, and MH. Because surveys were completed through nursing interviews, all 62 participants completed every item (zero missing data). Internal consistency across subscales was high (Cronbach's $\alpha = 0.82$ to 0.91).

Data Analysis

Data were entered, verified, and analyzed using Python statistical libraries (statsmodels v0.14 and scipy v1.11). Continuous variables were summarized using means, standard deviations (SD), medians, and interquartile ranges (IQR). Categorical data were tabulated as counts and percentages. Bivariate relationships were assessed using Pearson correlation coefficients (r) with exact two-tailed p-values. Standard regression assumptions were checked: standardized residuals followed a normal distribution (Shapiro-Wilk $p > 0.05$), residuals were independent (Durbin-Watson $d \approx 1.9$), multicollinearity was absent (variance inflation factors < 1.65; tolerance > 0.60), and residual variances were homoscedastic by Breusch-Pagan testing.

We used hierarchical multiple linear regression to examine predictors of Physical Component and Mental Component. In Step 1, baseline covariates (chronological age, sex [0 = female, 1 = male], and hypertension stage [0 = Stage 1, 1 = Stage 2]) were entered. In Step 2, physical activity (PASE continuous score) and hypertension self-management (HSMBQ continuous score) were added. Confounding was evaluated by checking whether the addition

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of covariates altered the unadjusted PASE regression coefficient by 10% or more. In Step 3, we tested the interaction between mean-centered PASE and mean-centered HSMBQ (PASE_c × HSMBQ_c). In secondary models, we regressed individual SF-36 domain scores (PF, RP, BP, VT, and RE) onto specific behavioral dimensions to unpack domain-specific mechanisms. All models report unstandardized coefficients (B), standard errors (SE), standardized coefficients (β), t-values, 95% confidence intervals (CI), and exact p-values. Statistical significance was set at $p < 0.05$.

Ethical Considerations

The study followed the ethical principles of the Declaration of Helsinki and WHO 2011 standards for human research. Formal ethical approval was granted by the Health Research Ethics Committee (Komite Etik Penelitian Kesehatan / KEPK) of Institut Kesehatan Immanuel (Certificate No. 035/KEPK/IKI/V/2024, issued May 2024). Research permits were obtained from the National Unity and Political Agency of Bandung City (Bakesbangpol Kota Bandung, Permit No. PK.03.04.05/1649-BKBP/VII/2024) and the Bandung City Health Department (Dinas Kesehatan Kota Bandung, Permit No. B/KS.12.01/3512-Dinkes/VIII/2024). All participants gave written informed consent after the study purpose, voluntary nature, and confidentiality safeguards were explained. Data were anonymized and stored on password-protected storage accessible only to the investigators.

RESULTS

Of the 62 participants enrolled, more than four-fifths were women (82.3%, n = 51), with a mean age of 69.34 ± 5.00 years (range: 60–79 years; median: 72.0 years; Table 1). In terms of clinical blood pressure recorded during the clinic visit, 59.7% of participants (n = 37) presented with Stage 1 hypertension, 29.0% (n = 18) had Stage 2 hypertension, and the remaining 11.3% (n = 7) had controlled readings on current antihypertensive medication.

Table 1. Sociodemographic and Clinical Characteristics of Participants (N = 62)

Characteristic	Category / Metric	n / Mean ± SD	% / Median (Range)
Age (years)	Continuous	69.34 ± 5.00	72.0 (60–79)
	Young-old (60–69 years)	27	43.5%
	Middle-old (70–79 years)	35	56.5%
Sex	Female	51	82.3%
	Male	11	17.7%
Hypertension Stage	Stage 1 (SBP 140–159 / DBP 90–99 mmHg)	37	59.7%
	Stage 2 (SBP ≥ 160 / DBP ≥ 100 mmHg)	18	29.0%

Note. N = 62. SBP = systolic blood pressure; DBP = diastolic blood pressure; SD = standard deviation. An additional 7 participants (11.3%) demonstrated pharmacologically controlled/borderline blood pressure readings at the time of examination.

Table 2 summarizes the behavioral exposures and quality of life scores. Physical activity scores showed wide variation, ranging from 20.0 to 554.0 (mean: 242.19 ± 128.70; median: 264.50), reflecting a mix of sedentary individuals and active seniors. Total self-management scores averaged 122.03 ± 19.14 (median: 124.0), indicating generally moderate-to-high adherence across the five subscales: Self-Integration (37.23 ± 7.45), Self-Regulation

(28.23 ± 7.76), Provider Interaction (24.26 ± 7.76), Blood Pressure Monitoring (13.90 ± 2.45), and Regimen Adherence (18.42 ± 3.45).

In the SF-36 profile, mean summary scores were fairly balanced: 69.12 ± 18.57 for Physical Component and 67.86 ± 16.51 for Mental Component. Looking at individual subscales, participants scored highest in Social Functioning (78.19 ± 17.30) and Role Physical (77.82 ± 30.90), followed by Physical Functioning (70.65 ± 24.35) and Vitality (70.16 ± 53.43). In contrast, Mental Health (56.97 ± 20.17) and Bodily Pain (60.60 ± 24.25) received the lowest ratings, suggesting that emotional strain and physical aches remain common concerns in this cohort.

Table 2. Descriptive Profiles of Physical Activity, Self-Management Dimensions, and SF-36 Domains

Variable / Scale	Possible Range	Mean ± SD	Median (IQR)	Min – Max
Physical Activity (PASE Total)	0 – 400+	242.19 ± 128.70	264.50 (209.75)	20.0 – 554.0
Hypertension Self-Management (HSMBQ)				
Total Score	40 – 160	122.03 ± 19.14	124.00 (26.25)	62.0 – 154.0
Self-Integration	13 – 52	37.23 ± 7.45	38.00 (10.00)	18.0 – 50.0
Self-Regulation	9 – 36	28.23 ± 7.76	29.00 (10.75)	10.0 – 36.0
Provider Interaction	9 – 36	24.26 ± 7.76	25.00 (11.00)	9.0 – 36.0
Blood Pressure Monitoring	4 – 16	13.90 ± 2.45	14.00 (3.75)	6.0 – 16.0
Regimen Adherence	5 – 20	18.42 ± 3.45	20.00 (2.00)	8.0 – 20.0
Quality of Life (SF-36)				
Physical Functioning (PF)	0 – 100	70.65 ± 24.35	80.00 (38.75)	5.0 – 100.0
Role Limitations - Physical (RP)	0 – 100	77.82 ± 30.90	100.00 (50.00)	12.5 – 100.0
Bodily Pain (BP)	0 – 100	60.60 ± 24.25	53.75 (36.25)	32.5 – 100.0
General Health (GH)	0 – 100	67.40 ± 36.16	65.00 (36.25)	15.0 – 191.0
Vitality (VT)	0 – 100	70.16 ± 53.43	55.00 (43.75)	20.0 – 260.0
Physical Component	0 – 100	69.12 ± 18.57	69.38 (24.69)	23.8 – 102.1

Note. N = 62. PASE = Physical Activities Scale for the Elderly; HSMBQ = Hypertension Self-Management Behavior Questionnaire; SF-36 = Short Form 36 Health Survey; IQR = interquartile range; SD = standard deviation. Scale metrics are scored such that higher scores indicate greater behavioral performance or better health status.

Table 3 presents the bivariate correlation matrix. Physical activity correlated positively with Physical Component (r = 0.391, p = 0.0017) but had virtually no relationship with Mental Component (r = 0.012, p = 0.9278). In contrast, hypertension self-management showed a positive trend with Physical Component (r = 0.209, p = 0.1034) but a statistically significant negative correlation with Mental Component (r = -0.252, p = 0.0484). Age had weak, negative

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https://doi.org/10.30994/jnp.v10i1.1090

correlations with both Physical Component (r = -0.153) and MCS (r = -0.055). Men reported lower self-management scores than women (r = -0.506, p < 0.0001), while stage 2 hypertension correlated positively with physical activity (r = 0.260, p = 0.0410).

Table 3. Bivariate Pearson Correlation Matrix of Study Variables (N = 62)

Variable	1. Age	2.Sex (M)	3. Stage 2	4. PASE	5. HSMBQ	6. PCS	7. MCS
1. Age (years)	1.000	0.215	0.128	-0.060	0.014	-0.153	-0.055
2. Sex (Male)		1.000	0.261*	-0.081	-0.506**	-0.165	0.189
3. Stage 2 Hypertension			1.000	0.260*	0.091	0.022	0.075
4. Physical Activity (PASE)				1.000	0.182	0.391**	0.012
5. Self-Management (HSMBQ)					1.000	0.209	-0.252*
6. Physical Component						1.000	0.212
7. Mental Component							1.000

Note. N = 62. Pearson correlation coefficients (r) reported. * p < 0.05; ** p < 0.01 (two-tailed). Exact p-values: PASE vs. PCS (p = 0.0017); HSMBQ vs. MCS (p = 0.0484); Sex vs. HSMBQ (p < 0.0001); Stage 2 vs. PASE (p = 0.0410).

Table 4 summarizes the hierarchical regression models predicting Physical Component. In Step 1, baseline covariates accounted for less than 5% of PCS variance ($R^2 = 0.0477$, $F(3, 58) = 0.9692$, $p = 0.4135$). In Step 2, adding physical activity and self-management improved model fit significantly ($R^2 = 0.1952$, $\Delta R^2 = 0.1474$, $\Delta F = 5.1283$, $p = 0.0090$).

Within the Step 2 model, physical activity emerged as a clear, independent positive predictor of Physical Component (B = 0.0539, SE = 0.0183, β = 0.3739, t = 2.950, p = 0.0046, 95% CI [0.0173, 0.0906]). In practical terms, each 50-point increase in PASE score was associated with a 2.7-point improvement in physical quality of life. Self-management, however, was not significantly related to overall PCS (B = 0.1327, p = 0.3535). Confounding was checked substantively: the unadjusted PASE coefficient (B = 0.05635) shifted by only -2.01% after adjusting for age (B = 0.05522), -2.79% after adjusting for sex (B = 0.05477), and -4.26% in the fully adjusted Step 2 model (B = 0.05394). Because these changes remained well below 10%, demographic factors were ruled out as operational confounders.

In Step 3, testing the interaction term between mean-centered PASE and mean-centered HSMBQ revealed a significant positive moderation effect (B = 0.0045, SE = 0.0013, t = 3.509, p = 0.0009, 95% CI [0.0019, 0.0070]). The explained variance expanded to 34.21% ($F(6, 55) = 4.772$, $p = 0.00056$; $\Delta R^2 = 0.1469$, $p = 0.0009$). This indicates that physical activity has a stronger positive association with physical quality of life among older adults who also maintain good self-management practices.

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https://thejnp.org/
ISSN: 2614-3488 (print); 2614-3496 (online)
Vol. 10 No.1 October. Page 282-298
https://doi.org/10.30994/jnp.v10i1.1090

Table 4. Hierarchical Multiple Linear Regression Models Predicting Physical Component

Model / Predictor	B	SE	β	t	p-value	95% CI
Step 1: Baseline Covariates (R^2 = 0.048, Adj R^2 = -0.002, F = 0.969, p = 0.414)						
Age (years)	-0.4787	0.4885	-0.1289	-0.980	0.3311	[-1.4566, 0.4991]
Sex (Male)	-7.6484	6.5171	-0.1585	-1.174	0.2454	[-20.6938, 5.3971]
Stage 2 Hypertension	3.2503	5.4012	0.0801	0.602	0.5497	[-7.5614, 14.0619]
Step 2: Behavioral Main Effects (R^2 = 0.195, Adj R^2 = 0.123, F = 2.716, p = 0.029; ΔR^2 = 0.147, ΔF = 5.128, p = 0.009)						
Physical Activity (PASE)	0.0539	0.0183	0.3739	2.950	0.0046	[0.0173, 0.0906]
Self-Management (HSMBQ)	0.1327	0.1418	0.1368	0.936	0.3535	[-0.1514, 0.4168]
Step 3: Interaction Model (R^2 = 0.342, Adj R^2 = 0.271, F = 4.772, p = 0.0006; ΔR^2 = 0.147, ΔF = 12.31, p = 0.0009)						
PASE_c (centered)	0.0593	0.0167	0.4114	3.541	0.0008	[0.0257, 0.0928]
PASE_c × HSMBQ_c (Interaction)	0.0045	0.0013	0.3852	3.509	0.0009	[0.0019, 0.0070]

Note. N = 62. Dependent variable: SF-36 Physical Component Summary (PCS). B = unstandardized regression coefficient; SE = standard error; β = standardized regression coefficient; CI = confidence interval. Diagnostics: Shapiro-Wilk p = 0.066; Durbin-Watson d = 1.879 (Step 2) and 1.707 (Step 3); Maximum VIF = 1.63.

Table 5 shows the regression models for Mental Component. Covariates alone explained very little variance (R^2 = 0.0464, p = 0.4275). Adding total PASE and total HSMBQ in Step 2 did not result in a significant model (R^2 = 0.0812, p = 0.4321). Physical activity showed no link to mental quality of life (B = 0.0044, p = 0.8019), while overall self-management displayed a negative, non-significant slope (B = -0.1960, p = 0.1514).

Decomposing self-management into its subscales in Step 3, however, clarified the source of this negative slope. Self-Integration emerged as a statistically significant negative predictor of MCS (B = -0.7654, SE = 0.3167, β = -0.3453, t = -2.417, p = 0.0189, 95% CI [-1.400, -0.131]; Model R^2 = 0.1852, p = 0.0381). Older adults who were intensely preoccupied

with integrating dietary restrictions and daily self-monitoring reported lower emotional well-being and greater psychological fatigue.

Table 5. Hierarchical Multiple Linear Regression Models Predicting Mental Component

Model / Predictor	B	SE	β	t	p-value	95% CI
Step 1: Baseline Covariates (R^2 = 0.046, Adj R^2 = -0.003, F = 0.940, p = 0.428)						
Age (years)	-0.2647	0.4347	-0.0802	-0.609	0.5449	[-1.1348, 0.6055]
Sex (Male)	0.9579	5.7994	0.0223	0.165	0.8693	[-10.6510, 12.5668]
Stage 2 Hypertension	-0.3204	4.8064	-0.0089	-0.067	0.9471	[-9.9414, 9.3006]
Step 2: Aggregate Behavioral Model (R^2 = 0.081, Adj R^2 = -0.001, F = 0.990, p = 0.432)						
Physical Activity (PASE)	0.0044	0.0174	0.0341	0.252	0.8019	[-0.0304, 0.0392]
Self-Management Total (HSMBQ)	-0.1960	0.1348	-0.2272	-1.454	0.1514	[-0.4659, 0.0740]
Step 3: Subscale Deconstruction Model (R^2 = 0.185, Adj R^2 = 0.112, F = 2.545, p = 0.038)						
HSMBQ: Self-Integration	-0.7654	0.3167	-0.3453	-2.417	0.0189	[-1.4001, -0.1307]
HSMBQ: Regimen Adherence	-1.0137	0.6841	-0.2116	-1.482	0.1440	[-2.3842, 0.3568]

Note. N = 62. Dependent variable: SF-36 Mental Component Summary (MCS). B = unstandardized regression coefficient; SE = standard error; β = standardized regression coefficient; CI = confidence interval. Step 3 model adjusted for age, sex, and PASE. Durbin-Watson d = 1.891; Maximum VIF = 1.48.

To look more closely at individual health areas, Table 6 presents regressions predicting specific SF-36 subscales. Physical activity strongly predicted Physical Functioning (B = 0.1160, β = 0.6133, $p < 0.0001$; Model R^2 = 0.432) and Role Physical limitations (B = 0.0924, β = 0.3848, p = 0.0024; Model R^2 = 0.266).

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https://thejnp.org/
ISSN: 2614-3488 (print); 2614-3496 (online)
Vol. 10 No.1 October. Page 282-298
https://doi.org/10.30994/jnp.v10i1.1090

By contrast, self-management showed opposite effects depending on the domain. For Bodily Pain, higher self-management was associated with less pain interference (B = 0.3967, β = 0.3130, p = 0.0410). But for Vitality, higher self-management was associated with substantially lower energy levels (B = -1.5992, β = -0.5731, p = 0.0001; Model R^2 = 0.302). Thus, while self-care behaviors help protect against somatic discomfort, rigid compliance routines appear to deplete psychological reserves.

Table 6. Multiple Linear Regression Models of Specific Behavioral Predictors on Key SF-36 Domains

SF-36 Dependent Domain	Model R^2	Model F (p)	Key Predictor	B	SE	β	p-value
Physical Functioning (PF)	0.432	8.528 (<0.001)	Physical Activity (PASE)	0.1160	0.0230	0.6133	<0.001
Role Physical (RP)	0.266	4.053 (0.003)	Physical Activity (PASE)	0.0924	0.0290	0.3848	0.002
Bodily Pain (BP)	0.156	2.064 (0.082)	Self-Management (HSMBQ)	0.3967	0.1900	0.3130	0.041
Vitality (VT)	0.302	4.851 (<0.001)	Self-Management (HSMBQ)	-1.5992	0.3879	-0.5731	<0.001
Mental Component	0.185	2.545 (0.038)	HSMBQ: Self-Integration	-0.7654	0.3167	-0.3453	0.019

Note. N = 62. All models adjusted for participant age, biological sex, and hypertension severity. SF-36 domains are scored 0–100, where higher scores reflect superior functioning, less bodily pain, higher energy/vitality, and better mental health summary scores.

DISCUSSION

Our findings highlight a fundamental divergence in how lifestyle habits relate to quality of life in older adults with hypertension. Routine physical movement showed a strong, positive link with physical capacity and daily role functioning. Disease self-management, however, showed two contrasting sides: while adhering to self-care was linked to reduced bodily pain, an intensive focus on self-integration was associated with diminished vitality and lower emotional well-being. By separating physical from mental domains, these results offer a practical explanation for the mixed and contradictory findings frequently seen in the geriatric literature.

The positive link between physical activity and physical health (β = 0.3739 on Physical Component; β = 0.6133 on Physical Functioning) aligns with known physiology (Islam et al., 2023; Lee & Heo, 2021; Wingood et al., 2022). In older adults, staying mobile through walking, light gardening, household tasks, and community senior gymnastics preserves lower extremity strength, maintains balance, and prevents muscle loss (Jamshidpour et al., 2020; Oliveira-Silva et al., 2020). These physical gains translate directly into maintaining independence in basic daily activities. Furthermore, physical activity and self-management interacted synergistically in our models: participants who were physically active and also attentive to their health habits

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experienced the highest physical quality of life. Importantly, the activities reported by our participants were not strenuous athletic workouts, but routine daily tasks. This suggests that community nursing programs should emphasize accessible, regular walking and group activities rather than demanding exercise regimens.

In contrast, the findings for hypertension self-management revealed an unexpected result. On one hand, participants with higher self-management reported significantly less bodily pain ($\beta = 0.3130$, $p = 0.0410$). This makes clinical sense: taking antihypertensive medications regularly and monitoring health indicators helps prevent blood pressure spikes, thereby reducing headaches, neck stiffness, and general vascular discomfort (Martínez-Ibáñez et al., 2023; Stupplebeen et al., 2020).

On the other hand, higher self-management was associated with a marked drop in vitality ($\beta = -0.5731$, $p = 0.0001$), and the Self-Integration subscale was specifically linked to lower mental summary scores ($\beta = -0.3453$, $p = 0.0189$). This pattern fits the concepts of treatment burden and illness intrusion described by Hudson and colleagues (Lawless et al., 2021; Tao et al., 2024). In everyday life, strict disease management requires constant vigilance: checking food ingredients, skipping traditional salty condiments, scheduling medications, tracking blood pressure readings, and worrying about stroke or heart failure (Alosaimi et al., 2020; Surikova et al., 2020). In Sundanese culture, sharing meals and traditional dishes is central to family life and neighborhood hospitality. When an older person is repeatedly warned to eat separately or decline shared foods, it can cause emotional distress and a feeling of being apart from family rituals. Over time, this constant self-monitoring drains personal vitality, creating mental fatigue that offsets the somatic relief of blood pressure control.

These opposing effects explain why previous research has often reported ambiguous or non-significant links between self-management and quality of life (Budhiana et al., 2022; Prastika & Siyam, 2021; Zhang et al., 2020). When researchers combine physical and psychosocial domains into an overall aggregate score, the physical gains (such as pain relief) and the psychological costs (such as reduced vitality) neutralize one another. In statistical terms, the net coefficient shrinks toward zero. By separating Physical Component from Mental Component and looking directly at subscales, our analysis shows that self-management cannot simply be assumed to improve all aspects of life. Without adequate emotional and family support, rigid adherence can impose a heavy psychological toll.

Limitations

This study has several limitations. First, the cross-sectional design means we can only report associations, not causal relationships. Longitudinal research is needed to determine whether initiating physical activity or changing self-management behaviors directly alters quality-of-life trajectories over time. Second, data relied on self-reported questionnaires (PASE, HSMBQ, and SF-36), which are subject to recall and social desirability biases, although this was minimized by having trained nurses conduct all interviews. Third, our sample was recruited from a single urban community health center in Bandung and consisted mostly of women (82.3%), matching typical clinic attendance patterns in Indonesian primary care but limiting how well findings apply to men or rural seniors. Finally, we were unable to capture

certain clinical details in our models, such as the exact duration of hypertension, specific drug classes and dosages, polypharmacy regimens, or laboratory biomarkers. Future multi-site studies with more detailed clinical tracking would help address these gaps.

Implications for Nursing Practice

Our findings offer practical guidance for primary care and community nurses working with older adults. First, nurses should move away from didactic, compliance-focused health education and toward supportive, patient-centered care partnerships (Muliyadi et al., 2024). Pushing strict behavioral rules without acknowledging patient burden can increase emotional distress. Routine clinic visits should include quick checks for self-management fatigue and worry alongside standard blood pressure measurements.

Second, physical activity should be treated as a primary, enjoyable intervention rather than an afterthought. Group programs, such as community senior gymnastics (*Senam Prolanis)* and neighborhood walking clubs, combine mild physical exercise with valuable social interaction, supporting both physical mobility and psychological spirits (Ribeiro et al., 2023; Wu et al., 2022).

Third, self-management advice should involve family members. Because dietary restrictions can feel isolating in Indonesian households, educating caregivers on how to prepare low-sodium family meals can help older adults maintain healthy habits without feeling excluded. By pairing physical activity promotion with empathetic, family-oriented support, community nurses can help older adults protect their cardiovascular health without sacrificing their emotional vitality.

CONCLUSION

This study shows that physical activity and hypertension self-management have distinct and divergent relationships with quality of life in older adults. Daily physical movement directly supports physical functioning and role independence, and it interacts positively with self-management behaviors. At the same time, while self-management helps relieve bodily pain, intense self-integration carries an emotional burden that can deplete vitality and lower mental well-being. Community health nurses should look beyond simple compliance targets by encouraging regular, enjoyable physical movement and offering pragmatic, family-centered coping strategies to help older adults manage the psychological challenges of chronic illness.

ACKNOWLEDGMENTS

We thank the Institute of Research and Community Service (LPPM) of Institut Kesehatan Immanuel for providing fundamental and legal support. We are also grateful to the leadership, nursing staff, and healthcare workers at Caringin PHC Bandung, as well as the elderly participants who generously shared their time and experiences.

AUTHOR CONTRIBUTIONS

Treesia Sujana: Conceptualization, Methodology, Formal analysis, Investigation, Writing - original draft, Project administration, Funding acquisition. **Galuh Chandra Irawan:** Conceptualization, Methodology, Validation, Writing - review and editing. **Yunus Ady**

Prasetyo: Investigation, Data curation, Resources, Writing - review and editing. All authors reviewed and approved the final manuscript.

FUNDING

This research was funded by the Institute of Research and Community Service (LPPM), Institut Kesehatan Immanuel Bandung.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

DECLARATION OF AI USE

The authors used AI tool (paperpal) to paraphrase, in preparing this manuscript.

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