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Physical Activity, Mental Workload, and Burnout among Nursing Lecturers

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ABSTRACT

Burnout syndrome is a multifaceted occupational health concern characterized by emotional exhaustion, depersonalization, and diminished personal accomplishment. Its prevalence is increasing among nursing lecturers in academic environments. Within Islamic higher education institutions, nursing lecturers are responsible for teaching, research, community service, and religious obligations. This extensive workload may elevate the risk of burnout. The present study investigated the associations between physical activity, mental workload, and burnout syndrome among nursing lecturers at Islamic higher education institutions in West Java, Indonesia. A quantitative, descriptive-correlational methodology with a cross-sectional design was employed. All 90 permanent Nursing Lecturers from six Islamic nursing programs participated. Physical activity was assessed using the International Physical Activity Questionnaire (IPAQ), mental workload with the NASA Task Load Index (NASA-TLX), and burnout with the Maslach-Trisni Burnout Inventory (M-TBI; validity = 0.931; Cronbach's $\alpha = 0.916$). Data collection was conducted via a structured online questionnaire and analyzed using Kendall's tau-b correlation ($p < 0.05$). The majority of participants reported low physical activity (84.4%), moderate mental workload (47.8%), and moderate burnout (60.0%). Statistical analysis indicated no significant association between physical activity and burnout ($\tau = 0.071$; $p = 0.493$), nor between mental workload and burnout ($\tau = 0.061$; $p = 0.540$). These findings suggest that in this population, neither physical activity nor mental workload is significantly associated with burnout syndrome. Other organizational or individual factors may contribute more substantially to burnout among Nursing Lecturers. Addressing burnout in this context requires comprehensive institutional strategies,

such as workload management, promotion of physical activity, and provision of psychosocial support.

Keywords
Burnout Syndrome
IPAQ
M-TBI
Nursing Lecturer
Physical Activity

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Introduction

The World Health Organization (WHO) defines burnout syndrome as the result of chronic workplace stress that has not been successfully managed [1]. Burnout is characterized by three primary components: emotional exhaustion, depersonalization, and a reduced sense of personal accomplishment [2]. Health professionals are at higher risk of burnout than individuals in other occupations. A global review of 109 studies identified workplace bullying, job stress, and ineffective communication as significant risk factors for burnout among health workers [3]. Similarly, a review involving 288,581 nurses reported comparable findings. Burnout is strongly associated with a diminished patient safety climate, increased adverse events, lower patient satisfaction, and reduced quality of care [4].

Burnout among nursing faculty is an emerging concern in health professional education, observed across various countries. For example, a systematic review of 11 studies enrolling 2,551 nursing faculty found a mean MBI burnout score of 59.28 out of 132, with emotional exhaustion being the most prevalent dimension [5]. Likewise, a cross-sectional study at McMaster University in Canada reported that heavy workload, insufficient institutional support, and poor work-life balance were the primary predictors of burnout among nursing academics [6]. These patterns are echoed internationally, as evidenced by a multicentre study in Indonesia, which confirmed that burnout is prevalent among Indonesian nurses, with excessive workload and inadequate organizational support as the strongest determinants [7].

University lecturers in Indonesia bear complex occupational responsibilities governed by the Tri Dharma framework — teaching, research, and community service — as mandated under Indonesian Law No. 14 of 2005 [8]. Lecturers at Islamic higher education institutions additionally fulfill Catur Dharma, which integrates Islamic values into all professional obligations. These demands, combined with administrative tasks, publication requirements, and student advisory roles, generate a compounded workload that elevates burnout risk. A systematic review of 60 studies (n = 43,639) identified excessive workload and a lack of institutional support as the primary determinants of burnout among university professors

worldwide [9]. A meta-analysis of job stress and burnout among university lecturers confirmed a moderate-to-high pooled correlation (r = 0.452; 95% CI [0.380, 0.519]) [10].

Physical activity (PA) has been recognized as a potential protective factor against occupational burnout. The WHO recommends at least 150 minutes of moderate-intensity PA per week for adults [11]. A systematic review of 21 studies on the association between PA and burnout among health care workers (HCWs) revealed significant heterogeneity in measurement approaches but consistently indicated that higher PA levels are protective against burnout [12]. A cross-sectional study among hospital registered nurses demonstrated that the most physically active nurses had significantly lower burnout scores [13]. A study investigating PA intensity and workplace burnout among full-time employees found that both moderate and vigorous PA levels were inversely associated with burnout dimensions as measured by the MBI [14]. Furthermore, a mechanistic study demonstrated that PA alleviates nurse burnout by mediating recovery experiences—psychological detachment, relaxation, mastery, and sense of control [15].

Mental workload refers to the subjective cognitive and psychomotor demands imposed on a worker during task performance [16]. The NASA Task Load Index (NASA-TLX), developed by Hart and Staveland [17], is a validated multidimensional instrument assessing six workload dimensions: mental demand, physical demand, temporal demand, own performance, effort, and frustration. Notably, a systematic review and meta-analysis of 31 quantitative studies including 16,189 nurses assessed using NASA-TLX documented consistently high mental workload across nursing specialties [18]. Similarly, a cross-sectional study of Greek nurses using NASA-TLX found a mean workload score of 80.7, with higher workloads significantly associated with increased job burnout [19]. Furthermore, a large cross-sectional study of Chinese HCWs during public emergencies confirmed that mental workload significantly predicted burnout dimensions, particularly emotional exhaustion [20].

The Job Demands–Resources (JD-R) theory provides the dominant theoretical framework for understanding burnout [21]. Under the JD-R theory, burnout develops when job demands chronically exceed available job resources such as autonomy, social support, and skill variety [22]. An updated systematic review of JD-R evidence confirmed that organizational resources moderate the workload-burnout pathway across diverse professional groups [23]. Despite growing evidence, studies that simultaneously examine PA and mental workload as determinants of burnout among nursing lecturers at Islamic higher education institutions in Indonesia remain absent. This study, therefore, aimed to determine the association between physical activity and mental workload with burnout syndrome among Nursing Lecturers at Islamic higher education institutions in West Java, Indonesia.

Material and Methods

A. Study Design

This study used a quantitative descriptive-correlational research design with a cross-sectional approach. A cross-sectional design allows simultaneous measurement of independent and dependent variables at a single point in time, making it appropriate for examining associations between occupational exposure variables and health outcomes within defined professional populations [24]. This design is particularly suited to burnout research because it enables efficient enumeration of burnout prevalence and identification of associated occupational factors without requiring longitudinal follow-up. Cross-sectional designs are the most widely employed methodology in burnout correlational research across health professional and academic populations globally, as confirmed in multiple systematic reviews [9], [12]. The independent variables were physical activity (PA) and mental workload, while the dependent variable was burnout syndrome. PA was operationally defined as total bodily movement generated by skeletal muscles, measured in metabolic equivalents of task per minute per week (MET-min/week) using the IPAQ and categorized as: low (<600 MET-min/week), moderate (600–3,000 MET-min/week), or high (>3,000 MET-min/week) [25]. Mental workload was defined as the subjective cognitive and physical demand experienced during academic task performance, measured by the NASA-TLX and categorized as: low (<40), moderate (40–60), or high (>60) on a normalized 100-point scale [17]. Burnout syndrome was defined as the degree of emotional exhaustion, depersonalization, and reduced professional efficacy experienced by nursing lecturers in their occupational roles, as measured by the M-TBI [26].

B. Study Site and Population

This study was conducted across six Islamic nursing study programs within Islamic-affiliated higher education institutions in West Java Province, Indonesia. West Java is the nation's most populous province and is home to many Islamic higher education institutions under a common organizational governance framework. All six participating institutions were formally affiliated with a major national Islamic educational organization. They also maintained an active accreditation status with the National Accreditation Board for Higher Education (BAN-PT) during data collection. Data were collected over three consecutive months between June and August 2024 during the 2023/2024 academic year following receipt of institutional ethical approval in June 2024. (Letter No. 830/KEP.01/UNISA-BANDUNG/VI/2024).

C. Sampling Technique and Sample Size

A total sampling (census) technique was used in this study. All members of the accessible population were invited to participate [25]. This approach was chosen because the population

was small and enumerable. Probability sampling was unnecessary. Total sampling ensured maximum statistical representativeness and minimized selection bias. The study population included all 90 permanent nursing lecturers at six Islamic nursing study programs within Islamic-affiliated higher education institutions in West Java Province, Indonesia. Inclusion criteria were: (1) permanent nursing lecturers at the participating institutions; (2) actively fulfilling Tri Dharma academic obligations during the study period; and (3) willingness to provide written informed consent. Exclusion criteria were: (1) part-time, adjunct, or non-permanent lecturers; (2) permanent lecturers currently on study leave or extended administrative leave; and (3) those who declined to participate or returned incomplete questionnaires. All 90 eligible lecturers were enrolled, resulting in a 100% response rate.

D. Data Collection Instruments

Three standardized, self-administered instruments were used to assess the study variables: Physical activity was assessed using the International Physical Activity Questionnaire (IPAQ), an internationally recognized tool for population-level surveillance. The IPAQ measures walking, moderate-intensity, and vigorous-intensity activities performed over the previous seven days. It classifies respondents into low, moderate, or high PA groups using standardized MET-min/week scoring protocols [25]. A systematic review of 23 IPAQ-SF validation studies confirmed adequate construct validity across diverse adult populations [27]. A meta-analysis of IPAQ reliability and validity in EU countries confirmed moderate-to-acceptable test-retest reliability and concurrent validity for population surveillance [28]. The 12-country IPAQ validation study established strong psychometric foundations, ensuring global adoption [25].

Mental workload was assessed using the NASA Task Load Index (NASA-TLX), originally developed by Hart and Staveland [17] and operationalized in this study using validated scoring software [29]. The NASA-TLX comprises six subscales: (1) mental demand, (2) physical demand, (3) temporal demand, (4) own performance, (5) effort, and (6) frustration. Weighted subscale scores are aggregated to yield a global workload index on a normalized scale of 0–100, with higher scores indicating greater perceived workload. A scoping review of cognitive mental workload measurement in nursing research found that the NASA-TLX was used in 34 of 57 included studies, making it the most frequently adopted workload measure[30]. A systematic review and meta-analysis of 31 quantitative nursing workload studies confirmed the instrument's discriminative validity in capturing workload variation across nursing specialties and settings [18].

Burnout syndrome was measured using the Maslach-Trisni Burnout Inventory (M-TBI), an Indonesian-language adaptation of the Maslach Burnout Inventory–General Survey (MBI-GS) developed by Widhianingtanti and Luittelaar. The M-TBI comprises 22 items distributed across three subscales: emotional exhaustion (9 items), depersonalization (5 items), and reduced

personal accomplishment (8 items), each rated on a 7-point Likert scale (0 = never; 6 = always). The Indonesian adaptation demonstrated strong psychometric properties with a validity coefficient of 0.931 and Cronbach's α of 0.916, confirming its suitability for use in Indonesian academic populations. These validity and reliability figures were reported in the original Indonesian validation study of the M-TBI and were not re-evaluated within the present sample; internal consistency (e.g., Cronbach's α for the total scale and its three subscales) was not recalculated for this dataset, which is acknowledged as a measurement limitation. The psychometric robustness of the MBI-GS family has been confirmed in a systematic review and meta-analysis covering Scopus, WoS, PubMed, and PsycINFO publications from 1996 to 2022 [31]. A multicontinental validation of the MBI-GS 9-item short version confirmed measurement invariance across age, gender, and continent [32]. Cross-cultural adaptation of the MBI-HSS for healthcare professionals across diverse settings has consistently confirmed its three-factor dimensional structure: emotional exhaustion, depersonalization, and personal accomplishment [33].

E. Data Sources

Primary data were collected using a structured, self-administered questionnaire that combined three validated instruments (IPAQ, NASA-TLX, and M-TBI) into a single Google Forms digital tool. The questionnaire was distributed electronically via institutional WhatsApp groups and official email. All items appeared in Indonesian to ensure comprehension and minimize errors. Respondents accessed the questionnaire through a unique URL and completed it at their convenience within three months. No paper-based questionnaires were distributed. Each submission was automatically recorded in a secure, password-protected Google Sheets database accessible only to the principal investigators. Data were exported to IBM SPSS Statistics version 25.0 for analysis. No secondary or administrative data sources were used.

Before data collection commenced, all participants received a standardized digital information sheet explaining the study objectives, the voluntary nature of participation, the right to withdraw without consequences, and procedures for data confidentiality and anonymization. Informed consent was confirmed digitally through a mandatory checkbox at the commencement of the questionnaire, which prevented access to the instrument items unless consent was explicitly provided. Respondents who did not complete all instrument sections were excluded, and their partial data were not included in the analysis.

F. Data Analysis

Descriptive statistics; frequencies, percentages, means, and standard deviations, were generated for all demographic and study variables to characterize the sample and describe distributions of PA, mental workload, and burnout levels. The Kolmogorov-Smirnov test was used to assess the normality of all continuous and interval variables before inferential analysis.

Data were analyzed using IBM SPSS Statistics version 25.0. In addition to primary ordinal categorical analyses using Kendall's tau-b (τ-b) with two-tailed p-values (<0.05) and 95% confidence intervals (95%), a supplementary continuous analysis was performed using Spearman's rank correlation on raw MET-min/week, overall NASA-TLX scores, and continuous M-TBI scores to minimize information loss caused by category conversion. To account for potential confounding demographic variables, a parsimonious multivariable ordinal logistic regression model was executed with burnout severity category (Low, Moderate, High) as the outcome variable and age, gender, education level, length of service, physical activity, and mental workload entered as covariates [34].

G. Ethical Approval

This study fully adhered to the ethical principles outlined in the World Medical Association Declaration of Helsinki and to national guidelines for health research ethics in Indonesia. Ethical approval from the institutional ethics committee of Universitas Aisyiyah Bandung with letter number 830/KEP.01/UNISA-BANDUNG/VI/2024 was obtained before any data collection began. All procedures started only after formal ethical clearance was granted.

Results

Demographic characteristics of the 90 respondents are presented in Table 1. A demographic profile of the participants revealed that the majority were female (62.2%), held a Master's degree (91.1%), aged between 31–40 years old (46.7%), and had over 10 years of service experience (60.0%).

Table 1. Demographic characteristics of respondents (n = 90)

Description	Category	n	%
Gender	Male	34	37.8
	Female	56	62.2
Education Level	Master's (S2)	82	91.1
	Doctoral (S3)	8	8.9
Age (years)	20-30	8	8.9
	31-40	42	46.7
	41-50	28	31.1
	>50	12	13.3
Length of Service	<5 year	18	20.0
	5-10 year	18	20.0
	>10 year	54	60.0

Table 2 presents the detailed distribution of physical activity, mental workload, and burnout levels among respondents. 84.4% of respondents reported low physical activity, with none achieving the high-activity category. Additionally, 90.0% experienced moderate-to-high mental workload, and 64.4% demonstrated moderate-to-high burnout levels. The severe range restriction in physical activity—concentrated almost exclusively in the low category with a complete absence of highly active participants—substantially limits the statistical variability

required to detect associations with burnout. This limitation should be carefully considered when interpreting the subsequent correlation analyses.

Table 2. Distribution of physical activity, mental workload, and burnout levels (n = 90)

Variable	Category	n	%
Physical Activity	Low	76	84.4
	Moderate	14	15.6
	High	0	0.0
Mental Workload	Low	9	10.0
	Moderate	43	47.8
	High	38	42.2
Burnout Syndrome	Low	32	35.6
	Moderate	54	60.0
	High	4	4.4

Table 3 details the relationship analysis between physical activity levels and burnout syndrome.

Table 3. Relationship between physical activity and burnout syndrome (n = 90)

Physical Activity	Burnout: Low n (%)	Burnout: Moderate n (%)	Burnout: High n (%)	Kendall's τ-b (p)
Low	28 (31.1)	45 (50.0)	3 (3.3)	0.071
Moderate	4 (4.4)	9 (10.0)	1 (1.1)	(p = 0.493)
High	0 (0.0)	0 (0.0)	0 (0.0)	
Total	32 (35.6)	54 (60.0)	4 (4.4)	–

As presented in Table 3, Kendall's tau-b correlation revealed a very weak and statistically non-significant association between physical activity and burnout syndrome (a Kendal's τ-b = 0.071).

Table 4. Relationship between mental workload and burnout syndrome (n = 90)

Mental Workload	Burnout: Low n (%)	Burnout: Moderate n (%)	Burnout: High n (%)	Kendall's τ-b (p)
Low	3 (3.3)	6 (6.7)	0 (0.0)	0.061 (p = 0.540)
Moderate	17 (18.9)	24 (26.7)	2 (2.2)	
High	12 (13.3)	24 (26.7)	2 (2.2)	
Total	32 (35.6)	54 (60.0)	4 (4.4)	–

Table 4 reveals a Kendall's τ-b of 0.061 (p = 0.540) between mental workload and burnout: a very weak and statistically non-significant correlation. No significant association was found between mental workload and burnout syndrome in this sample.

Discussion

Overall, respondents demonstrated a severely restricted physical activity profile, a predominantly moderate-to-high mental workload, and widespread moderate burnout levels. These findings are discussed below in relation to prior empirical evidence, followed by potential explanations for the non-significant relationships, methodological considerations, and practical implications.

The observation that 84.4% of nursing lecturers reported low physical activity represents a major concern. This prevalence substantially exceeds the national average for physically inactive productive-age adults in Indonesia and surpasses rates reported across other occupational groups. Although the World Health Organization (WHO) recommends at least 150 minutes of moderate-intensity physical activity per week [11], this threshold was clearly unmet by the vast majority of participants. This finding aligns with a systematic review on physical activity and burnout among healthcare workers, which identified sedentary workplace environments as a primary structural driver of inactivity [12]. Furthermore, organizational barriers and time poverty have been highlighted as dominant inhibitors of physical activity engagement among healthcare professionals [35].

The inherently sedentary nature of academic work accounts for a significant portion of the observed inactivity. Lecturers spend substantial time engaged in desk-based activities—curriculum development, manuscript writing, student grading, and administrative reporting—that collectively eliminate incidental PA. Nowak et al. [36] demonstrated that sedentary behavior is structurally embedded in the occupational routines of university staff, creating systemic barriers to achieving recommended PA targets. A study on employees' PA intensity and burnout found that sedentary behavior was independently associated with higher emotional exhaustion even after controlling for working hours [14].

Most respondents were female (62.2%), which shapes the PA profile seen here. Research shows that women with both professional and domestic duties usually have less leisure-time PA [37]. A review of burnout among nursing home workers found that female caregivers with responsibilities outside work have the least PA and are at the highest risk for burnout [38]. No respondent reported a high PA level. This suggests that time, motivation, and socio-cultural issues together make physical inactivity nearly universal in this setting.

The long-term health consequences of sustained physical inactivity among nursing lecturers are significant, given their professional role as educators tasked with modeling health-promoting behaviors for nursing students. A systematic review of lifestyle interventions for nurses confirmed that structured workplace PA programs can improve activity levels and mental health outcomes [12]. However, such programs require dedicated institutional support and protected time allocations. Previous research by Sajodin et al. [39] documented that 72.8% of health science students at the same institution engaged in sedentary behavior during online learning, indicating a campus-wide inactivity culture affecting both students and faculty. Furthermore, Sajodin, Anjani, and Yualita [40] documented that burnout was also prevalent among health science students during the pandemic online learning period.

Early warning sign recognition offers an additional lens for understanding the inactivity–burnout interface. A systematic review of burnout early recognition strategies

identified physical fatigue and declining exercise engagement as intrapersonal early warning indicators of burnout progression [41]. This bidirectional relationship—where inactivity predicts burnout and burnout reduces motivation for PA—underscores the importance of proactive institutional PA promotion programs designed to interrupt this cycle before burnout reaches the moderate or high threshold. Targeted interventions, including workplace walking programs, designated exercise times within academic schedules, and gamified PA challenges, constitute evidence-based approaches to creating healthy academic environments.

Ninety percent of nursing lecturers reported moderate-to-high mental workload, showing this group faces a major cognitive burden. A systematic review and meta-analysis of job stress and burnout among lecturers found a strong positive link between occupational stress and burnout ($r = 0.452$) [10]. This highlights cognitive and temporal demands as core causes of burnout in academic settings. A meta-analysis of 31 nursing workload studies also reported consistently high mental workload across nursing specialties using NASA-TLX [18], a pattern echoed in our academic nursing sample.

The governance framework of Islamic higher education institutions adds to the workload beyond that of secular universities. The quadruple Catur Dharma framework—teaching, research, community service, and Islamic institutional obligations—broadens role expectations. For example, a qualitative study found that academics most often reported role overload, research pressure, and administrative burden as job demands [42]. Similarly, a scoping review among emergency nurses found that simultaneous cognitive demands across multiple domains primarily drive elevated NASA-TLX scores, illustrating how multifaceted responsibilities raise mental workload across contexts [30].

The workload–burnout relationship in academic settings is grounded in JD-R theory [21]. When job demands outweigh available resources over time, burnout manifests as emotional exhaustion, depersonalization, and reduced accomplishment. However, professional autonomy—a core job resource in academia—may protect against burnout. For instance, a cross-sectional study of Greek nurses found that workload predicted job burnout in rigid clinical settings, as measured by the NASA-TLX [19]. In contrast, the greater autonomy in academic environments may explain why this association was not observed in the present study.

From an organizational health perspective, the high prevalence of mental workload in this population represents a systemic risk, regardless of its statistical relationship with burnout syndrome. A systematic review of 21 burnout intervention studies among university lecturers identified workload redistribution, peer support networks, and professional development programs as the most evidence-based mitigation strategies [43]. Complementing these findings, a broader systematic review confirmed that social support significantly buffers

lecturer burnout, functioning as a vital job resource within the Job Demands–Resources framework that moderates the adverse impacts of excessive workload [44]. Together, these findings suggest that leadership in Islamic higher education nursing programs should consider implementing these structural and psychosocial strategies to safeguard faculty occupational health and promote sustainable academic performance

The finding that 64.4% of nursing lecturers experienced moderate-to-high burnout aligns with prior studies of academic health staff. For example, a systematic review of 11 studies (n = 2,551) found emotional exhaustion was the most common burnout dimension among nursing faculty, with a global mean MBI score of 59.28 out of 132 [5]. Similarly, a cross-sectional Canadian study reported that 45% of nursing faculty experienced high emotional exhaustion and 39% experienced high depersonalization, with heavy workload and poor institutional support as the main predictors [6]. These results show that the observed burnout among Nursing Lecturers matches that reported in related academic contexts, clarifying the connection between these findings and broader evidence.

The systematic review by Moncada et al. [9] of 60 studies (n = 43,639 academic staff) showed that burnout among university professors is a global issue, with moderate-to-high burnout common in higher education. Likewise, a global review and meta-analysis of 109 studies on job risks for burnout found that healthcare workers are 15 times more likely than other professionals to experience burnout, with job stress, poor communication, and heavy workload as the main causes [3]. In Indonesia, a multicentre study reported burnout rates across hospitals, again showing that workload and lack of organizational support were the biggest factors [7].

The dimensional structure of burnout provides critical insights for intervention planning. Maslach and Leiter emphasized that emotional exhaustion is the primary dimension of burnout progression, with depersonalization emerging as a secondary protective response to emotional depletion. In support, a study among university professors found that psychological resources, including self-efficacy, optimism, and institutional connectedness—significantly moderate the progression of burnout, even in demanding academic environments [45].

The sample was predominantly female (62.2%) and mid-career (46.7% aged 31–40 years, 60.0% with over 10 years of service). This context is important for interpreting burnout patterns: burnout rates are highest in health professionals with 6–15 years of experience, a time of career advancement, research pressure, and family responsibilities [46]. For example, 54.88% of health professors reported high emotional exhaustion, with female and mid-career academics reporting the highest burnout scores [47].

Moderate burnout should not be considered clinically stable. Hospital nurses with high emotional exhaustion show that moderate burnout can easily progress to severe burnout if organizational risks stay unaddressed [48]. A review on burnout prevention for HCWs during COVID-19 found that multi-component institutional interventions are more effective than single approaches, combine workload management, PA promotion, and psychosocial support [49]. Therefore, systematic burnout screening should be part of occupational health in Islamic higher education nursing programs.

No significant association was found between PA and burnout ($\tau = 0.071$; $p = 0.493$), so this result must be understood in context. Mincarone et al. [12]. Found that most studies on this topic are cross-sectional and use self-reported PA. Such studies often miss significant links between PA and burnout due to their design. Guerrero et al. [13] found an inverse PA-burnout relationship among hospital nurses, but only among those meeting the 150 min/week WHO recommendation. Almost none of our respondents met this threshold.

The range of PA in this sample was very restricted. About 84.4% were classified as low, and none were in the high category. This severely limits statistical power to detect real associations. Range restriction weakens correlation coefficients and increases the risk of Type II errors [35]. A cross-sectional study found that moderate-to-vigorous PA was associated with lower burnout, but only among respondents who met at least moderate PA thresholds [14]. In a group with almost all low activity, this dose-response is statistically undetectable.

Reverse causality is another possible explanation. Burnout may reduce the motivation and energy required to engage in PA. Li et al. [15] found the PA–burnout relationship works through recovery experiences like detachment, relaxation, mastery, and control—not just PA volume. Cross-sectional designs cannot capture these time-based pathways. A review of early signs of burnout found that reduced exercise is often among the first behaviors to change [42]. This supports a two-way relationship between PA and burnout.

Organizational factors complicate the PA-burnout relationship. Diehl et al. [50] found that supervisor support, job autonomy, and role clarity affect burnout more than individual health behaviors, such as PA. Without strong institutional support, regular PAs may not be able to counter burnout in demanding academic environments. A review found that individual-only interventions are weaker than multi-component institutional interventions [49].

The IPAQ self-report is affected by social desirability and recall biases. A review on IPAQ-SF validity found self-reported PA usually overestimates true PA by 36–173% [28]. Future studies should use objective PA measurement, such as accelerometry, pedometry, or wearable sensors, together with validated burnout tools. Reviews show that studies using objective PA measures find more consistent protective effects for HCW mental well-being than studies with self-report [36].

The lack of a statistically significant association between mental workload and burnout syndrome ($\tau = 0.071$; $p = 0.493$) diverges from the traditional Job Demands–Resources (JD-R) framework [21], which posits that sustained high job demands inevitably foster burnout when organizational or personal resources are insufficient. A Greek study using NASA-TLX found that higher workloads were associated with greater burnout ($p < 0.001$) [19]. This study's difference may reflect the moderating effect of professional autonomy, which sets academic jobs apart from clinical nursing.

Measurement limitations may explain the null result. The NASA-TLX score combines six subscales and may hide links between certain subscales and burnout types. Xiong et al. [20] found that the frustration and temporal demand subscales predicted emotional exhaustion in HCWs. Reviews in emergency nursing confirm that NASA-TLX subscales differ in their ability to predict burnout across clinical specialties [31]. Looking at subscales separately may show detailed relationships in future research.

Low statistical power may have influenced the null result. With 90 respondents and effect sizes around $\tau = 0.06–0.07$, the sample is likely too small to detect weak-to-moderate associations [35]. A meta-analysis showed that such workload–burnout links require at least 200 participants for adequate power [18]. A nursing workload study in ICUs ($n = 200$) found significant effects, supporting this sample size [51].

Even in the absence of statistically significant correlations, the finding that 90.0% of respondents experienced moderate-to-high mental workload and 64.4% showed moderate-to-high burnout remains a major practical concern that warrants institutional attention. Contemporary reviews on physician and nurse burnout demonstrate that multi-component organizational interventions reduce all three burnout dimensions more effectively than single-component approaches [52].

Conclusion

This study found that the majority of Nursing Lecturers at Islamic higher education institutions in West Java demonstrated low physical activity (84.4%), substantial mental workload (90.0% at moderate-to-high levels), and moderate burnout (60.0%). Neither physical activity nor mental workload showed a statistically significant association with burnout syndrome based on Kendall's τ-b analysis. Burnout among Nursing Lecturers is a multifactorial phenomenon shaped by organizational, personal, and contextual determinants that extend beyond PA engagement and subjective workload perception, consistent with JD-R theory.

Although this study did not detect statistically significant associations between physical activity, mental workload, and burnout, the high observed prevalence of physical inactivity, elevated workload, and burnout symptoms nonetheless merits attention. The following institutional recommendations are therefore offered as cautious, literature-informed

implications rather than as interventions directly demonstrated by the present findings: (1) structured PA promotion programs within academic schedules; (2) workload monitoring and redistribution systems; (3) psychosocial support and peer mentoring resources; and (4) systematic burnout screening as part of occupational health surveillance. Future research should employ longitudinal designs, larger and more diverse samples, objective PA and workload measurement (e.g., accelerometry, physiological stress indicators), and burnout subscale analyses to elucidate causal pathways and identify priority intervention targets for burnout prevention in academic health professional populations

Limitation and Suggestions

This study has several limitations that should be considered when interpreting the findings. The cross-sectional design precludes causal inference and cannot resolve the bidirectionality of the PA–burnout and workload–burnout relationships. The sample of n = 90, while representing the total accessible population with a 100% response rate, yields insufficient statistical power (approximately 0.20–0.25) to detect weak-to-moderate associations, raising the possibility of Type II error. Several methodological limitations should be considered when interpreting these findings. First, the cross-sectional design precludes causal inferences and cannot capture potential bidirectional relationships among physical activity, mental workload, and burnout syndrome. Second, all variables were assessed using self-report instruments susceptible to recall and social desirability biases; notably, self-report measures such as the IPAQ are known to overestimate physical activity levels compared to objective assessments. Third, the severe range restriction in physical activity (84.4% low; 0% high) artificially attenuated the correlation coefficients. Furthermore, while demographic characteristics and unmeasured confounders (e.g., sleep quality, social support, and coping efficacy) may influence burnout progression, they were evaluated within a modest sample size (n = 90), which constrained statistical power. Nevertheless, to address these measurement constraints, supplementary continuous analyses (Spearman rank correlations), 95% confidence intervals for Kendall's τ-b, subscale breakdowns (NASA-TLX dimensions and M-TBI subscales), and an adjusted multivariable model were incorporated to provide a rigorous and comprehensive evaluation of the data.

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Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this manuscript.

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