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Work-Related Burnout, Insomnia, and Psychological Well-Being among Computer Programmers: A Correlational Study in Lahore, Pakistan

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Abstract

Background: Computer programmers face intensive cognitive demands, sustained concentration, tight deadlines, and extended working hours that may compromise occupational health. This study examined relationships among work-related burnout, insomnia, and psychological well-being among computer programmers in Lahore, Pakistan. Methods: A cross-sectional correlational study recruited 250 employed programmers, comprising 143 men and 107 women, aged 18–35 years. Data were collected between April and June 2024 through face-to-face questionnaires and Google Forms. Participants completed the Oldenburg Burnout Inventory, Bergen Insomnia Scale, and Psychological Well-Being Scale. Data were analyzed using descriptive statistics, Pearson correlations, simple linear regression, and independent-samples t tests in SPSS 23. Results: Burnout correlated positively with insomnia ($r = .248$, $p < .01$) and negatively with psychological well-being ($r = -.159$, $p < .05$). The insomnia–well-being correlation was nonsignificant ($r = -.053$, $p = .401$). Burnout explained 6.2% of insomnia variance and 2.5% of psychological well-being variance. Women reported significantly higher burnout ($p = .005$) and insomnia ($p = .022$) than men; their psychological well-being scores did not differ significantly ($p = .108$). Conclusion: Greater burnout was associated with more insomnia symptoms and modestly poorer psychological well-being among programmers. Occupational workload management and access to employee support deserve attention. Because this study was cross-sectional and relied on self-report measures, the findings should not be interpreted as evidence of causal relationships.

Keywords: work-related burnout; insomnia; psychological well-being; computer programmers; Pakistan

Introduction

Computer programming is central to contemporary technological development, encompassing the creation, testing, maintenance, and refinement of software applications. This work demands attention, concentration, learning, and iterative problem-solving. Programmers may contend with tight deadlines, high expectations for accuracy, and extended working hours. The broader acceleration of technology can intensify the pace and expectations of work, making the conditions under which digital products are produced an important occupational-health concern (Wajcman, 2008; Singh & Suar, 2013). Although programming can offer intellectual engagement and professional achievement, its

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demanding features may also coexist with exhaustion, sleep disruption, and reduced psychological well-being. Burnout is widely understood as a response to chronic occupational stress, particularly when demands exceed the resources available to meet them. The traditional conceptualization includes emotional exhaustion, cynicism or depersonalization, and reduced personal accomplishment (Maslach et al., 2001; Maslach & Leiter, 2016). Exhaustion reflects depletion of emotional, physical, and cognitive energy, whereas cynicism and disengagement describe psychological distancing from work. The Oldenburg approach, used in this investigation, operationalizes burnout through the related dimensions of exhaustion and disengagement rather than the full three-component Maslach framework (Demerouti et al., 2010). This distinction matters because different measures capture overlapping but nonidentical facets of occupational strain.

The job demands–resources (JD-R) model offers a useful explanation for how occupational pressures might become associated with burnout. Job demands, including intense workload and continued cognitive effort, can incur psychological costs, while job resources such as autonomy, social support, and adequate opportunities for recovery may reduce those costs (Demerouti et al., 2001; Bakker & Demerouti, 2007). Research on technology workers has emphasized self-efficacy and demands within information technology settings (Salanova et al., 2002). Evidence from software developers also identifies burnout as a relevant occupational-health outcome (Singh & Suar, 2013). These perspectives justify studying programmers specifically rather than assuming that observations in other occupational groups transfer without qualification. Insomnia is a second relevant concern. Difficulties initiating sleep, maintaining sleep, waking too early, or feeling unrefreshed can affect daytime functioning. Cognitive work depends on attention, memory, and flexible thinking; controlled and synthesized evidence concerning sleep loss suggests that impaired sleep can undermine these functions (Harrison & Horne, 1999; Pilcher & Huffcutt, 1996). In software development, fatigue can be consequential because programming often demands the detection and correction of subtle errors. Research explicitly examining mental fatigue during programming underscores the occupational relevance of the problem (Sarkar & Parnin, 2017).

Psychological well-being should not simply be treated as the absence of psychological symptoms. Ryff and Keyes (1995) describe a multidimensional construct encompassing positive functioning, including autonomy, environmental mastery, personal growth, positive relationships, purpose in life, and self-acceptance. Work-related exhaustion and disengagement may challenge these aspects of functioning, although the relationships need not be uniform for every individual. Psychological well-being is therefore a distinct outcome worth measuring alongside insomnia rather than inferring it from sleep disturbance alone. Sleep and occupational strain may interact in complex ways. Söderström et al. (2012) reported evidence linking insufficient sleep with clinical burnout, indicating that the direction of association may not be limited to a simple burnout-to-insomnia sequence. Work stressors and rumination are also relevant to impaired sleep (Berset et al., 2011). The conservation-of-resources perspective proposes that resource loss and pressure to preserve remaining resources can contribute to further strain (Hobfoll, 1998). In parallel, the transactional model of stress and coping emphasizes individuals' appraisal of demands and their perceived capacity to respond (Lazarus & Folkman, 1984). Together, these frameworks support the expectation that occupational burnout and sleep complaints may cluster, while leaving causal direction open.

The available literature also indicates links between insomnia and psychological difficulties in broader populations (Jansson-Fröjmark & Lindblom, 2008; Sivertsen et al., 2015). Yet findings about clinical symptoms do not necessarily demonstrate the same association with a positive-functioning well-being scale. A direct examination of burnout, insomnia, and psychological well-being in one programmer sample is therefore useful. The present investigation focuses on a Pakistani occupational context in which software employees' working conditions deserve greater attention. Its contribution lies in documenting the magnitude and direction of specific associations, using defined instruments, and identifying whether men and women report different levels of the measured outcomes. The objectives were to examine correlations between burnout and insomnia, between burnout and psychological well-being, and between insomnia and psychological well-being; assess whether burnout statistically predicts insomnia and well-being in separate simple regression models; and test gender differences. It was hypothesized that burnout would be positively associated with insomnia, negatively associated with well-being, positively predict insomnia, negatively predict well-being, and be higher among women than men. The study was correlational; accordingly, "predict" refers to statistical regression rather than temporal or causal prediction.

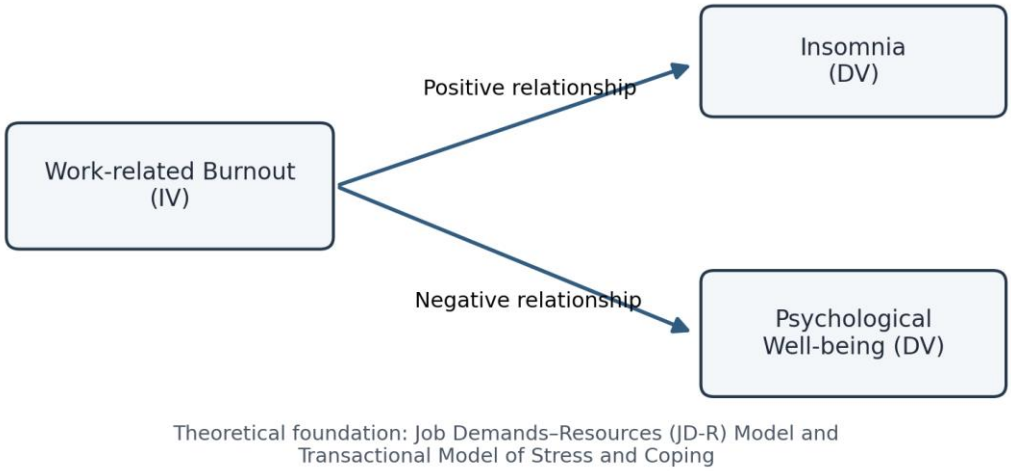


Figure 1. Hypothesized research model (original Figure 2.1).

Note. Work-related burnout was hypothesized to be positively related to insomnia and negatively related to psychological well-being.

Methods

Study design and setting. A cross-sectional correlational survey was undertaken among employed computer programmers in Lahore, Pakistan. Data collection occurred from April to June 2024 through face-to-face approaches and Google Forms. The dissertation identifies software-house recruitment sites including Programmers Force Software House, Salaar Software Technology Park, and Arfa Karim Technology Park. The sampling description refers to both convenience and purposive selection; the sample is therefore best characterized as nonprobability, criterion-based recruitment rather than a probability sample. Participants. The final sample comprised 250 programmers, including 143 men (57.2%) and 107 women (42.8%). Participants were aged 18–35 years ($M = 25.76$, $SD = 3.82$) and were working in software houses or companies. Eligibility specified at least one year of programming experience and more than 40 working hours per week. Trainees, employees with irregular schedules, respondents with relevant confounding medical conditions, and persons unable to understand the questionnaire were excluded according to the source protocol. These restrictions define the sampled workforce and constrain transferability to freelancers, older programmers, and individuals with fewer working hours. Among respondents, 171 (68.4%) held bachelor's degrees and 79 (31.6%) master's degrees. Programming experience was one to two years for 114 (45.6%), two to three years for 81 (32.4%), and more than three years for 55 (22.0%). Weekly working time was 40–50 hours for 177 (70.8%) and over 50 hours for 73 (29.2%). All participants were described as full-time office employees. Socioeconomic categories were upper class ($n = 22$, 8.8%), upper-middle class ($n = 118$, 47.2%), and middle class ($n = 110$, 44.0%). Nuclear-family respondents numbered 162 (64.8%); joint-family respondents numbered 88 (35.2%).

Measures. Burnout was assessed using the 16-item Oldenburg Burnout Inventory (OLBI). Its eight disengagement items and eight exhaustion items include positively and negatively worded statements rated on a four-point response scale. Larger appropriately scored totals represent more burnout. Internal consistency in the present sample was $\alpha = .70$. The study reported an observed total range of 23–57 and a potential range of 16–64 (Demerouti et al., 2010). Insomnia was assessed using the six-item Bergen Insomnia Scale (BIS), developed by Pallesen et al. (2008). Items address difficulties falling asleep, maintaining sleep, early awakening, nonrestorative sleep, daytime impairment, and dissatisfaction with sleep. Responses refer to the previous month and are recorded by frequency; higher total scores indicate more frequent insomnia symptoms. The source described a total score from 0 to 42 and an observed range of 0–42; internal consistency in the results table was $\alpha = .76$. An earlier methods paragraph states $\alpha = .77$, so the value presented in the formal results table is retained here. Psychological well-being was assessed with the 18-item version of the Ryff Psychological Well-Being Scale (Ryff & Keyes, 1995). This instrument addresses six dimensions of positive psychological functioning; reverse coding is required for negatively phrased items. Responses are on a seven-point scale, with a theoretical total range of 18–126. In the present sample, scores ranged from 27 to 120 and demonstrated

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internal consistency of α = .82. The dissertation's general background discussion also mentions other reliability estimates; the sample-specific table value is used consistently in this report. Procedure and ethics. The research topic received departmental approval from the Department of Psychology, Lahore Garrison University. The source reports that permission was obtained from scale authors, university authority letters were used, and participants provided informed consent with the option to withdraw. Participants completed demographic information and the three questionnaires; estimated completion time was approximately 20 minutes. Completed responses were entered into SPSS version 23 for analysis. An institutional ethics committee approval identifier was not supplied in the uploaded material and is therefore not asserted here. Statistical analysis. Descriptive statistics summarized participant characteristics and scale distributions. Cronbach's alpha assessed internal consistency. Pearson product–moment coefficients assessed bivariate relationships. Two separate simple linear regressions examined burnout as the sole explanatory variable for insomnia and psychological well-being, respectively. Independent-samples t tests assessed gender differences, and Cohen's d was reported for significant differences. Statistical significance was interpreted at conventional thresholds identified in the original tables. Because no raw dataset was supplied, this article reproduces the reported analyses rather than claiming to have re-estimated them.

Results

Descriptive, psychometric, correlational, regression, and gender-comparison statistics for the 250 participants are presented below. All results are reproduced from the original study tables.

Table 1. Sociodemographic characteristics of participants (N = 250)

Characteristic	n	%	M	SD
Age (years)			25.76	3.82
Gender				
Men	143	57.2		
Women	107	42.8		
Education				
Bachelor's	171	68.4		
Master's	79	31.6		
Employment status: full-time	250	100		
Programming experience				
1–2 years	114	45.6		
2–3 years	81	32.4		
>3 years	55	22.0		
Work environment: office	250	100		
Weekly work hours				
40–50 hours	177	70.8		
>50 hours	73	29.2		
Socioeconomic status				
Upper class	22	8.8		
Upper-middle class	118	47.2		
Middle class	110	44.0		
Family system				
Nuclear	162	64.8		
Joint	88	35.2		

Note. The source reports no participants in the unpopulated part-time, freelance, remote, <1-year experience, and <40-hour categories; these are not treated as independently verified zero-count observations. M = mean; SD = standard deviation.

The participants included 143 men (57.2%) and 107 women (42.8%), with a mean age of 25.76 years (SD = 3.82). Most participants held bachelor's degrees (68.4%), and 29.2% worked more than 50 hours weekly (Table 1).

Table 2. Psychometric properties of study measures (N = 250)

Measure	Items	M	SD	α	Observed range	Potential range
OLBI	16	39.97	5.72	.70	23–57	16–64
BIS	6	25.23	9.23	.76	0–42	6–48*
PWB	18	78.25	18.37	.82	27–120	18–126

*The BIS potential range of 6–48 is reproduced exactly from original Table 4.1, although the instrument description states 0–42; requires reconciliation before submission. α = Cronbach's alpha.

Internal consistency was α = .70 for the OLBI, α = .76 for the BIS, and α = .82 for the psychological well-being scale (Table 2).

Table 3. Pearson correlations among study variables (N = 250)

Variable	1	2	3
1. Work-related burnout	—		
2. Insomnia	.248**	—	
3. Psychological well-being	−.159*	−.053	—

Note. *p < .05; **p < .01. Insomnia and psychological well-being: p = .401.

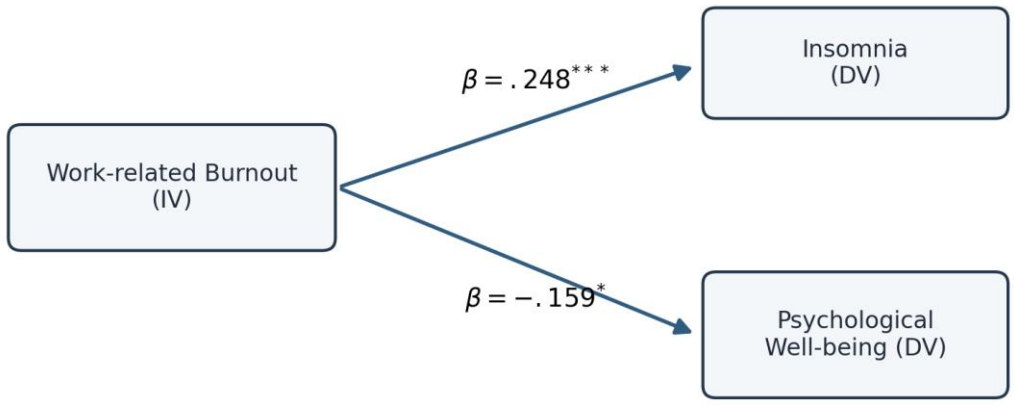
Burnout was positively related to insomnia (r = .248, p < .01) and negatively related to psychological well-being (r = −.159, p < .05). Insomnia and psychological well-being were not significantly correlated (r = −.053, p = .401; Table 3).

Table 4. Simple linear regression of insomnia and psychological well-being on burnout (N = 250)

Outcome / predictor	B	β	SE	R^2	F(1,248)
Insomnia: intercept	9.230	—	4.01		
Insomnia: burnout	.400	.248***	0.99*	.062	16.26
Well-being: intercept	98.64	—	8.12		
Well-being: burnout	−.510	−.159*	.201	.025	6.43

Note. *p < .05; ***p < .001 for standardized coefficients. *SE = 0.99 for the burnout–insomnia slope is as printed in the original table and appears inconsistent with the other reported values; verify original output. The source reports ΔR^2 equal to R^2 for both models.

Burnout was a significant positive statistical predictor of insomnia (β = .248, R^2 = .062, F[1, 248] = 16.26, p < .001), and a significant negative predictor of psychological well-being (β = −.159, R^2 = .025, F[1, 248] = 6.43, p < .05). These single-predictor models explained 6.2% and 2.5% of outcome variance, respectively (Table 4).



Theoretical foundation: Job Demands-Resources (JD-R) Model and Transactional Model of Stress and Coping

Figure 2. Statistical research model (original Figure 4.1).

*Note. Standardized regression coefficients from the original study. *p < .05; ***p < .001.*

Table 5. Gender differences in burnout, insomnia, and well-being (N = 250)

Outcome	Men M (SD) n=143	Women M (SD) n=107	t	p	Cohen's d
Burnout	39.09 (5.77)	41.15 (5.46)	−2.87	.005	.36
Insomnia	24.07 (9.96)	26.77 (7.95)	−2.30	.022	.29
Well-being	79.87 (18.91)	76.09 (17.47)	1.62	.108	—

Note. Original table identifies t(298), inconsistent with N = 250. Reported t, p, and d values are preserved, but the degrees of freedom must be confirmed from SPSS before submission.

Women scored higher than men on burnout (41.15 vs. 39.09; p = .005) and insomnia (26.77 vs. 24.07; p = .022). Although men scored higher on well-being (79.87 vs. 76.09), this gender difference was not significant (p = .108; Table 5).

Discussion

This study examined occupational burnout alongside insomnia and psychological well-being in a sample of young adult programmers working in Lahore. Three findings stand out: burnout was associated with more insomnia complaints, burnout was associated with lower positive psychological functioning, and insomnia itself was not significantly correlated with the well-being total. The combination suggests that burnout is a relevant workplace correlate of both sleep and psychological functioning, while the two outcomes should not be treated as interchangeable. The relatively small correlation coefficients and explained variances make the results informative but not deterministic. The positive burnout–insomnia association is broadly consistent with occupational evidence linking stress, inadequate recovery, and disturbed sleep. Söderström et al. (2012) reported that insufficient sleep predicted clinical burnout, a result which complements the present association while also illustrating the uncertainty about causal direction. Berset et al. (2011) examined rumination as a pathway connecting work stressors and impaired sleep. In programmers, unresolved tasks, repeated debugging attempts, impending delivery deadlines, and concerns about code quality may plausibly sustain work-related mental engagement after hours. Such mechanisms are conceptually reasonable, but the present study did not assess rumination, after-hours coding, or objective sleep duration, and cannot establish that any one mechanism explains the observed correlation. The JD-R framework provides an occupational interpretation of this finding. Where performance requirements are high and resources for recovery are constrained, workers may experience growing exhaustion and disengagement (Demerouti et al., 2001; Bakker & Demerouti, 2007). The conservation-of-resources framework similarly highlights the challenge of protecting depleted resources, including time and energy for rest (Hobfoll, 1998). The observed burnout–insomnia link is consistent with these perspectives but should not be represented as a direct empirical test of their mechanisms. Job autonomy, social support, workload fluctuation, and organizational resources were not modeled, so the relative contribution of different occupational pressures remains unknown.

The negative association between burnout and psychological well-being is also coherent with existing approaches to occupational functioning. Chronic exhaustion may undermine the energy required for personal growth and meaningful engagement, while disengagement can coexist with lower purpose or satisfaction. Maslach et al. (2001) describe burnout as a multidimensional occupational response, and Schaufeli and Bakker (2004) connect job demands and resources with burnout and engagement. Nevertheless, a correlation of −.159 is small. Most variation in well-being was not accounted for by burnout in this sample, suggesting that important determinants may lie beyond occupational strain, including relationships, coping resources, circumstances outside work, and personal sources of meaning. Those possibilities were not directly tested and should be investigated rather than presumed. A noteworthy result was the nonsignificant correlation between insomnia and psychological well-being. This contrasts with a simple expectation that sleep complaints always co-occur with lower psychological functioning. Broader sleep research has linked insomnia to anxiety and depression (Jansson-Fröjmark & Lindblom, 2008; Sivertsen et al., 2015), but positive psychological well-being is not equivalent to psychopathology. Differences in outcome definitions may therefore partly explain why associations observed with distress measures do not automatically replicate with the Ryff scale. The narrow age range, restriction to

employed programmers, measurement error, and variability in how individuals cope could also matter. No explanation can be singled out using these data. Importantly, the null insomnia–well-being result also means the study cannot legitimately claim demonstrated mediation of burnout effects through insomnia. Regression results were directionally consistent with the correlations, as expected when a single predictor is used. Burnout explained approximately 6.2% of insomnia variation and 2.5% of psychological well-being variation. These proportions indicate limited predictive performance at the individual level despite statistically significant sample associations. They also emphasize that practical interventions should not be based solely on a person's burnout score. Causal language in interpreting the analyses must remain restrained: contemporaneous self-report measures cannot determine whether burnout precedes sleep disturbance, whether sleep problems contribute to subsequent burnout, or whether an unmeasured factor affects both. The literature on insufficient sleep and burnout cautions against assigning only one direction (Söderström et al., 2012).

Gender differences provide another potentially actionable observation. Women in this sample reported somewhat greater burnout and insomnia than men, with small standardized differences. The study did not establish a statistically significant gender difference in positive psychological well-being. The observed contrasts should not be generalized to all female and male programmers in Pakistan, especially because the study was not a representative population survey. Gender differences can depend on role assignments, work arrangements, domestic responsibilities, organizational culture, and access to support, none of which were analyzed as explanatory mechanisms here. The results suggest the value of equitable assessment of workload and recovery opportunities while discouraging assumptions about the experiences of any individual employee. The occupational context adds practical significance. Computer programmers carry out sustained knowledge work in which concentration and problem solving are central. Experimental and review evidence on sleep loss indicates vulnerabilities in cognitive performance, including flexible decision-making and attention-demanding activities (Harrison & Horne, 1999; Pilcher & Huffcutt, 1996). Sarkar and Parnin (2017) likewise examined mental fatigue during programming tasks. Although this survey did not measure software defects, productivity, absenteeism, or turnover, the convergence of burnout and insomnia suggests that workplace approaches concerned with recovery may be relevant to both employee experience and potentially safer sustained performance. Any impact on code quality or organizational outcomes would require separate measurement.

The findings have implications for organizational practices in the participating sector. Employers can consider routinely assessing occupational demands, communicating realistic project timelines, supporting regular breaks and reasonable working hours, and creating confidential routes to mental-health assistance. The sample consisted largely of programmers working 40–50 hours weekly, with nearly one-third reporting more than 50 hours, indicating that workload and time allocation are pertinent areas for future investigation. Clear expectations and supportive supervision may also matter in the JD-R account of occupational well-being (Bakker & Demerouti, 2007). Such strategies are reasonable implications of the broader framework rather than interventions proven effective by the present correlational data.

Limitations

Several limitations qualify the conclusions. First, recruitment relied on a nonprobability sample of programmers from Lahore, with an upper age limit of 35 years and specified minimum work experience and hours. This may exclude workers with different occupational histories, older employees, trainees, and other employment patterns. The findings consequently cannot provide national prevalence estimates. Second, measures were self-reported at a single point in time, allowing recall differences, common-method effects, and social desirability to influence associations. Third, no information was available about validated diagnostic classification of insomnia, clinical mental-health outcomes, or independent sleep assessment. BIS scores indicate symptoms, not necessarily confirmed clinical disorder. Fourth, the analyses used unadjusted correlations and regressions, making residual confounding plausible. Additional reporting limitations deserve correction before publication. The source characterizes recruitment as both convenience and purposive sampling, provides inconsistent insomnia alpha values across its text and table, and includes a gender t-test degrees-of-freedom entry inconsistent with its stated sample size. The insomnia scale's potential range is also presented inconsistently between methods and descriptive tables. The current account resolves these discrepancies conservatively by using the formal results table for reliability, the described BIS scoring range of 0–42, and by flagging rather than silently altering the gender degrees of freedom. Some bibliographic entries in the thesis also show duplicates or inconsistent

details. Their accuracy should be checked against originals prior to external submission; no new references have been imported into this article.

Future Directions

Future work should employ more varied, multisite samples that include differing ages, programming roles, work arrangements, and schedules. Longitudinal data would clarify temporal ordering among sleep and occupational strain. More detailed measures of job demands, recovery time, supervisor support, and work–family pressures would allow theoretically informed multivariable analysis. Repeated sleep measures or objective monitoring, combined where appropriate with validated clinical assessments, could supplement self-report questionnaires. Including performance indicators may also determine whether the observed occupational-health relationships are linked to measurable software development outcomes. Finally, qualitative work could document how programmers understand and manage pressure, disengagement, and opportunities for recovery in their specific employment settings.

Conclusion

Among 250 computer programmers employed in Lahore, higher work-related burnout was associated with more insomnia symptoms and modestly poorer psychological well-being. Insomnia and psychological well-being were not significantly correlated with each other. Women reported higher average burnout and insomnia than men, whereas their well-being scores did not differ significantly. Burnout explained only a small proportion of variation in either outcome. These cross-sectional findings underscore the relevance of addressing occupational strain and recovery in programming workplaces, while highlighting the need for rigorous longitudinal and multisite research to identify mechanisms and assess possible interventions.

Ethical Considerations and Declarations

Ethical considerations: The source study reports departmental topic approval, permission to use the measures, voluntary participation, and informed consent. Formal ethics committee reference: not provided in the source materials.

Funding: Not reported in the uploaded materials.

Conflicts of interest: Not reported in the uploaded materials.

Data availability: Participant-level data were not included in the provided documents; availability must be confirmed by the study author.

Author contributions and corresponding author: To be supplied by the authors before journal submission.

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