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WORK UNDERLOAD, NON-WORK INTERNET USE AND COGNITIVE SCREENING PERFORMANCE AMONG FEDERAL REGULATORY AUTHORITY OFFICERS IN PAKISTAN

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ABSTRACT

Work underload, defined as having less meaningful work than one's capacity permits, is a potentially important occupational stressor whose cognitive correlates remain understudied. This cross-sectional study of 161 officers from six Pakistani federal regulatory authorities examined associations among work underload, cyberslacking, and Montreal Cognitive Assessment (MoCA) scores. It assessed whether age moderated the association between cyberslacking and MoCA scores. Analyses included regression models, bootstrap estimation of an indirect association (5,000 resamples), interaction models, and the index of moderated mediation. Robustness checks used alternative standard errors, covariate adjustment, and daily cyberslacking hours as an alternative mediator. Mean MoCA score was 24.42 (SD = 2.36), and 72.7% of participants scored ≤25. Work underload was positively associated with cyberslacking (standardised $\beta = 0.71$, $p < .001$), while cyberslacking was negatively associated with MoCA score after adjustment for underload ($b = -1.06$, 95% CI [−1.46, −0.67]). The estimated indirect association was −0.91 (95% bootstrap CI [−1.30, −0.56]), approximately 43% of the estimated total association; the direct association also remained statistically significant. Age did not significantly moderate the cyberslacking–MoCA association ($p = .67$), and the index of moderated mediation was not statistically distinguishable from zero (index = −0.008, 95% CI [−0.031, 0.017]). An exploratory quadratic model suggested that the negative association weakened at higher cyberslacking scores. These results are associational: the cross-sectional design cannot establish temporal order, and MoCA is a screening instrument rather than a diagnostic assessment. Longitudinal research and independently validated cognitive assessments are needed before drawing causal or practical conclusions.

Keywords: Work Underload; Cyberloafing; Occupational Stress; Montreal Cognitive Assessment; Cognitive Screening; Regulatory Authorities

Introduction

Cognitive ability is a composition of "Fluid intelligence" (innate reasoning) and "Crystallised intelligence" (Education and life experiences) (1), the decline of which leads to "Cognitive impairment". "Mild Cognitive Impairment" is a preclinical phase within the Alzheimer's disease and incurs when impairment is disproportionate to one's age and



education level (2). When cognitive ability (fluid and crystalline intelligence) starts to deplete it affects short-term memory, visuospatial skills, and executive functions of employee brain (3). Mild cognitive impairment, however, does not occur in isolation. Instead, it emerges within a situational context, shaped by "Work Underload perceptions, desires and expectations" of employees (4).

Regulatory Authorities in Pakistan are known for their sub-optimal performance allowing capacity constraints among their officers. (5). Work underload has been associated with other detrimental outcomes (6). Capacity constraints indicate prevalent cognitive impairment, which, if left unaddressed, can impede the performance of officers (7) entrusted with laying out Pakistan's regulatory framework for governance and economic development (8). Therefore, officers of Regulatory Authorities of Pakistan are selected for testing for possible cognitive impairment in the context of this research.

The 2024 Lancet Commission on dementia prevention adopts a life-course approach and identifies 14 potentially modifiable risk factors (9). Cognitive and physical reserve are thought to develop across adulthood, supporting research into potentially relevant exposures before later life. However, not every less demanding job is underloaded, and cyberslacking is not necessarily the main way employees use discretionary time.

Digital engagement should not be assumed to be harmful. A meta-analysis of 57 studies of adults older than 50 associated some forms of digital technology use with lower odds of cognitive impairment and a lower rate of cognitive decline, while noting the need to consider bidirectional causality and differences in exposure type and timing (10). Non-work browsing may differ from purposeful digital activity. Still, the present study cannot determine whether browsing displaces cognitively demanding activity or whether cognitive and work-related factors influence browsing. The Montreal Cognitive Assessment (MoCA) is a brief screening instrument, not a diagnostic test, and its interpretation depends partly on education and testing context (11). The study examined age as a potential moderator, but this cross-sectional design cannot establish age-related changes in cognitive vulnerability.

Work underload may occur in units within regulatory authorities, including settings where staffing and the number of assigned tasks are misaligned. Although researchers have studied public organisations in relation to cyberloafing and job performance, evidence on work underload and cognitive screening performance in this context remains limited. Further evidence from regulatory authorities can clarify whether these associations hold in this context, as a systematic review by a Pakistan-based group of employees identified determinants of employees' cyberloafing (12).

The literature suggests four gaps: (1) the association between work underload and cyberslacking has received limited direct attention; (2) the relationship between cyberslacking and employees' cognitive performance has not been thoroughly examined; (3) the statistical pathway linking underload with cognitive performance remains rarely studied; and (4) age as a potential moderator has received limited attention in this context. This study had four objectives. First, it examined whether work underload was positively associated with cyberslacking. Second, it examined whether cyberslacking was negatively associated with



MoCA score among employees of Pakistani regulatory authorities. Third, it assessed whether cyberslacking statistically accounted for part of the association between work underload and MoCA score, that is, whether an indirect association was present. Fourth, it assessed whether the cyberslacking–MoCA association differed by age, with particular attention to whether it was stronger among older employees. The study extends the cyberslacking literature to cognitive screening performance, considers occupational conditions alongside cognitive ageing, and provides evidence from an under-researched public-sector setting.

The conceptual rationale is that employees whose capacities are underused may engage in non-work online activity to occupy discretionary time, and that this activity may be associated with lower cognitive screening performance. We cannot rule out that the association between work underload and MoCA performance is partly due to cyberslacking, a statistical effect. The study also examined whether the negative cyberslacking–MoCA association was stronger among older employees. The cross-sectional design means these relationships are associations rather than causal.

Methods

Design, setting and participants

This study has a cross-sectional study design in which officers of the six federal regulatory authorities of Pakistan (the Oil and Gas Regulatory Authority [OGRA], Securities and Exchange Commission of Pakistan [SECP], Pakistan Telecommunication Authority [PTA], Pakistan Electronic Media Regulatory Authority [PEMRA], National Electric Power Regulatory Authority [NEPRA] and Public Procurement Regulatory Authority [PPRA]) were studied. The final analytical sample comprised 161 officers selected from 2 paygrade strata (BPS-17-18 and BPS-19-22). Stratified sampling technique with a random-walk procedure was used to select officers within each stratum. Officers with internet connectivity and four months of official working time were eligible to participate in the study.

Measures:

Work underload: Work underload was operationalised in three aspects: perception, desire, and expectation. Scores for each dimension were the mean of the items on a 5-point scale. The arithmetic means of the scores within each of the three dimensions were computed to create an overall work-underload score, with higher scores representing higher perceived work underload. The mean composite score in the study sample was 3.57 (SD = 0.76). The instrument name, source, number of items per dimension, response anchors, and any reverse coding or missing item procedures should be reported as outlined in the questionnaire used. Internal consistency (e.g,, Cronbach's alpha or McDonald's omega) was not assessed for this scale because the analytic dataset contained only each participant's scale-level composite score and did not include the individual item responses on which such coefficients depend. Internal consistency is estimated from the covariance among items within a given sample and cannot be reconstructed from composite means and standard deviations (SDs), nor assumed from reliability reported in other samples. The reliability of this measure in the present sample is therefore unverified, and this is acknowledged as a limitation.



Cyberslacking behaviour: Cyberslacking behaviour was measured using a composite score of non-work-related internet use during working hours. A higher score indicated that cyberslackers responded more frequently. The mean composite score was 4.00 (SD = 0.92). Furthermore, participants reported hours spent on internet activities other than work each day, which were used to measure alternative activities in sensitivity analyses. Provide the instrument name, origin, number of items, response scale and anchors, scoring and aggregation procedure, and theoretical score range based on the questionnaire used. Internal consistency was not assessed for this measure for the same reason: the analytic dataset included only the composite score, and reliability coefficients require item-level responses. Random measurement error generally weakens observed associations, although in multivariable models its effect can vary in direction, reliability should therefore be examined in future work. The score range and aggregation method need to be explained because the reported composite score exceeds 5.

Cognitive screening performance: Cognition was assessed with the Montreal Cognitive Assessment (MoCA; score range 0–30) (13). For descriptive classification, scores ≤25 (i.e., <26) were classified as screen-positive and scores ≥26 as screen-negative, following the conventional cutoff proposed in the original validation (13). The MoCA is a screening instrument and does not establish a clinical diagnosis. The primary analyses used the continuous MoCA score. The reviews may be more applicable to a working-age sample as a function of education, language and testing conditions (11).

Moderator and covariates: We analysed age continuously (years) and in three descriptive groups (≤29, 30–44, and ≥45 years). We included tenure, [ay-grade stratum, and authority in sensitivity analyses. Participant gender was not available in the dataset, so it was neither described nor adjusted for. Sleep, mood and other potentially relevant factors were not measured and are acknowledged as limitations. Level of education was not included as a covariate because education is not a prerequisite for, or a recognized determinant of, non-work internet use, and officers in the pay grades studied (BPS-17 to BPS-22) are typically recruited with university-level qualifications, so educational variation in this sample is expected to be small.

Statistical analysis of the study

We first calculated descriptive statistics and Pearson correlations and used Spearman correlations as a rank-based sensitivity check. We examined the associations between work underload and cyberslacking, and between cyberslacking and MoCA score, using linear regression. To assess whether cyberslacking statistically accounted for part of the association between work underload and MoCA score, we estimated the indirect association (a × b) using percentile bootstrapping (5,000 resamples; 95% confidence interval) (15). An indirect association whose confidence interval excluded zero was interpreted as evidence of a statistically non-zero indirect association, not as proof of causal mediation. To test whether the cyberslacking–MoCA association was stronger at older ages, we mean-centred cyberslacking and age and entered their product term into the MoCA model. We estimated simple slopes at the mean age and one standard deviation below and above the mean; we also



examined an age-group model. The index of moderated mediation (16) was estimated using 3,000 bootstrap resamples, with age moderating the cyberslacking–MoCA path. An additional interaction model tested whether age moderated the underload–cyberslacking path. All interpretations of the indirect association remain associational because exposure, mediator and outcome were measured cross-sectionally.

Robustness checks included heteroscedasticity-consistent (HC3) standard errors (17), cluster-robust standard errors by authority, adjustment for gender, tenure, pay-grade stratum, authority and age, hours per day as an alternative mediator, and adjustment for cyberslacking intention. They also included a behavioural control term and an exploratory quadratic term for cyberslacking. Receiver operating characteristic (ROC) analysis examined how well work underload, cyberslacking and daily hours discriminated between participants scoring ≤25 and >25 on the MoCA in this sample. Residual normality (Shapiro–Wilk $p = .26$), multicollinearity (VIF = 2.02) and influence (maximum Cook's D = 0.06) were acceptable. Associations were reported as unstandardised and standardised coefficients, with Cohen's f^2 for unique predictor contributions (18). The ROC estimates and data-derived thresholds should be regarded as exploratory because they were evaluated in the same sample used to derive them.

A sensitivity power calculation (noncentral F distribution, one numerator degree of freedom, $\alpha = .05$) indicated that, with N = 161, the study had approximately 80% power to detect an interaction effect of $f^2 \approx 0.05$ (an incremental R^2 of approximately 3%). All tests were two-sided. Analyses were conducted in Python using Pandas, SciPy and statsmodels. Item-level responses were unavailable for this analysis, so we could not evaluate internal consistency or latent-variable measurement models.

Results

The sample comprised 161 officers; 42.9% were aged 30–44 years, 62.7% had at least five years of tenure, and 78.9% belonged to the lower pay-grade stratum. Participants were drawn from all six authorities, ranging from 11.8% (PPRA, n = 19) to 21.7% (OGRA, n = 35). OGRA had the most participants (n = 35), followed by SECP and PTA (n = 31 each). This distribution reflects the sampling procedure, in which officers were selected within pay-grade strata rather than in proportion to each authority's size, so these shares should not be read as the authorities' relative workforce size. The overall score of 72.7% on MoCA ≤25, used as the prespecified screening threshold for positive results in the study, should not be interpreted as the prevalence of clinical cognitive impairment. The screen-positive proportion was similar across age groups (70.7%–73.9%). It was descriptively higher among employees having ≥5 years of service (75.2% vs 68.3%) and Stratum 2 (76.5% vs 71.7%). Between-authority proportions ranged from 67.7% (PTA) to 84.2% (PPRA); given the small subgroup sizes (n = 19–35), these comparisons are descriptive and should be interpreted cautiously (Table 1).

Table 1. ***Sample Characteristics and Subgroup Proportions With MoCA Scores ≤25 Among Regulatory Authority Employees***



Characteristic	*n (%)*	*MoCA ≤25 (%)*
Gender		
Male	110 (68.3)	72.7
Female	51 (31.7)	72.5
Age group (years)		
≤29	41 (25.5)	70.7
30–44	69 (42.9)	73.9
≥45	51 (31.7)	72.5
Tenure		
4 months to <5 years	60 (37.3)	68.3
5 years or more	101 (62.7)	75.2
Pay-grade stratum		
BPS-17–18 (Stratum 1)	127 (78.9)	71.7
BPS-19–22 (Stratum 2)	34 (21.1)	76.5
Regulatory authority		
OGRA	35 (21.7)	68.6
SECP	31 (19.3)	77.4
PTA	31 (19.3)	67.7
PEMRA	23 (14.3)	69.6
NEPRA	22 (13.7)	72.7
PPRA	19 (11.8)	84.2

Note. N = 161. Percentages in the n (%) column are percentages of the full sample; MoCA ≤25 (%) is the percentage within each subgroup scoring ≤25 on the Montreal Cognitive Assessment. BPS = Basic Pay Scale; OGRA = Oil and Gas Regulatory Authority; SECP = Securities and Exchange Commission of Pakistan; PTA = Pakistan Telecommunication Authority; PEMRA = Pakistan Electronic Media Regulatory Authority; NEPRA = National Electric Power Regulatory Authority; PPRA = Public Procurement Regulatory Authority.

Participants had a mean work-underload composite score of 3.57 (SD = 0.76) and a mean cyberslacking composite score of 4.00 (SD = 0.92). Participants additionally reported an average of 2.48 hours per day (SD = 1.73) of non-work-related internet use. The questionnaire-based cyberslacking composite and self-reported daily hours were analysed as separate measures. Higher scores on the respective measures represented greater reported work underload and cyberslacking behavior. The mean MoCA score was 24.42 (SD = 2.36).

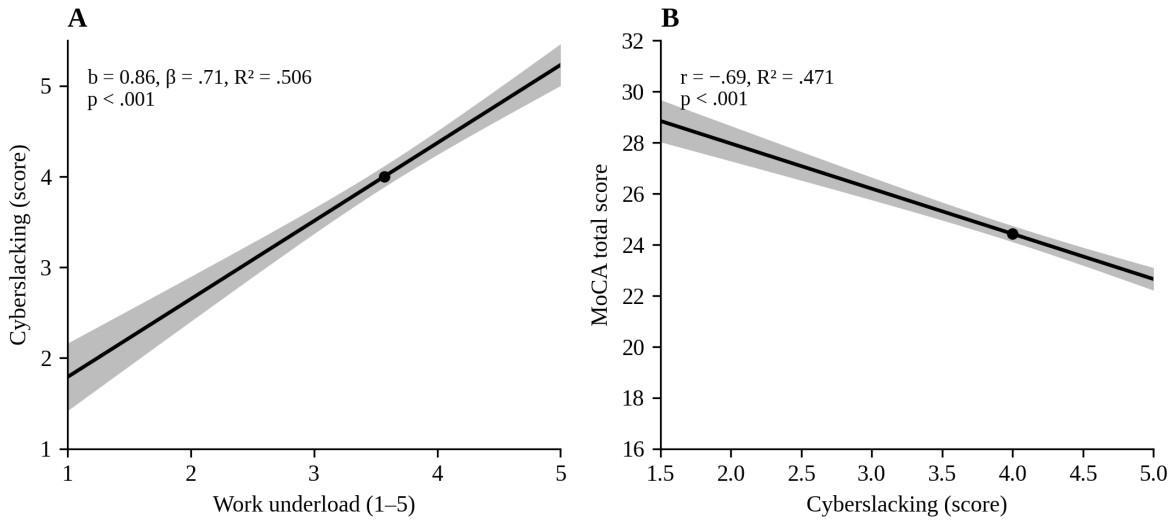
Work underload was positively correlated with cyberslacking score (r = .71) and daily hours (r = .67), both p<0.01. Lower MoCA scores were correlated with higher work underload (r= -0.68), cyberslacking score (r = -0.69) and daily hours (r = -0.72). Age was not significantly correlated with the variables shown. These are associations and do not establish that under-stimulation causes off-task internet use (Table 2).

Table 2. ***Descriptive Statistics and Pearson Correlations Among Study Variables***

Variable	*M*	*SD*	1	2	3	4	5
1. Work underload	3.57	0.76	–				
2. Cyberslacking (score)	4.00	0.92	.71**	–			
3. Cyberslacking (hours/day)	2.48	1.73	.67**	.78**	–		
4. MoCA total	24.42	2.36	−.68**	−.69**	−.72**	–	
5. Age (years)	38.56	10.07	−.02	−.10	−.10	−.01	–

Note. N = 161. Correlations are Pearson coefficients. MoCA = Montreal Cognitive Assessment (range 0–30). Work underload was rated on a 1–5 scales. Cyberslacking (hours/day) is self-reported daily hours. *p < .05, **p < .01 (two-tailed).

Work underload was positively associated with cyberslacking (b = 0.86, 95% CI [0.71, 1.01], standardised β = 0.71, p < .001), explaining approximately 50.6% of the variance in cyberslacking. Cyberslacking was negatively correlated with MoCA score (r = −.69, p < .001). In the model including work underload, cyberslacking remained negatively associated with MoCA score (b = −1.06, 95% CI [−1.46, −0.67], f² = 0.18). The estimates changed modestly after covariate adjustment (b = −1.20 for cyberslacking and b = 0.90 for underload predicting cyberslacking; Table 5) without altering the direction or significance of the cyberslacking–MoCA association. The findings indicate associations, but the cross-sectional design does not establish causal direction (Figures 1–3).



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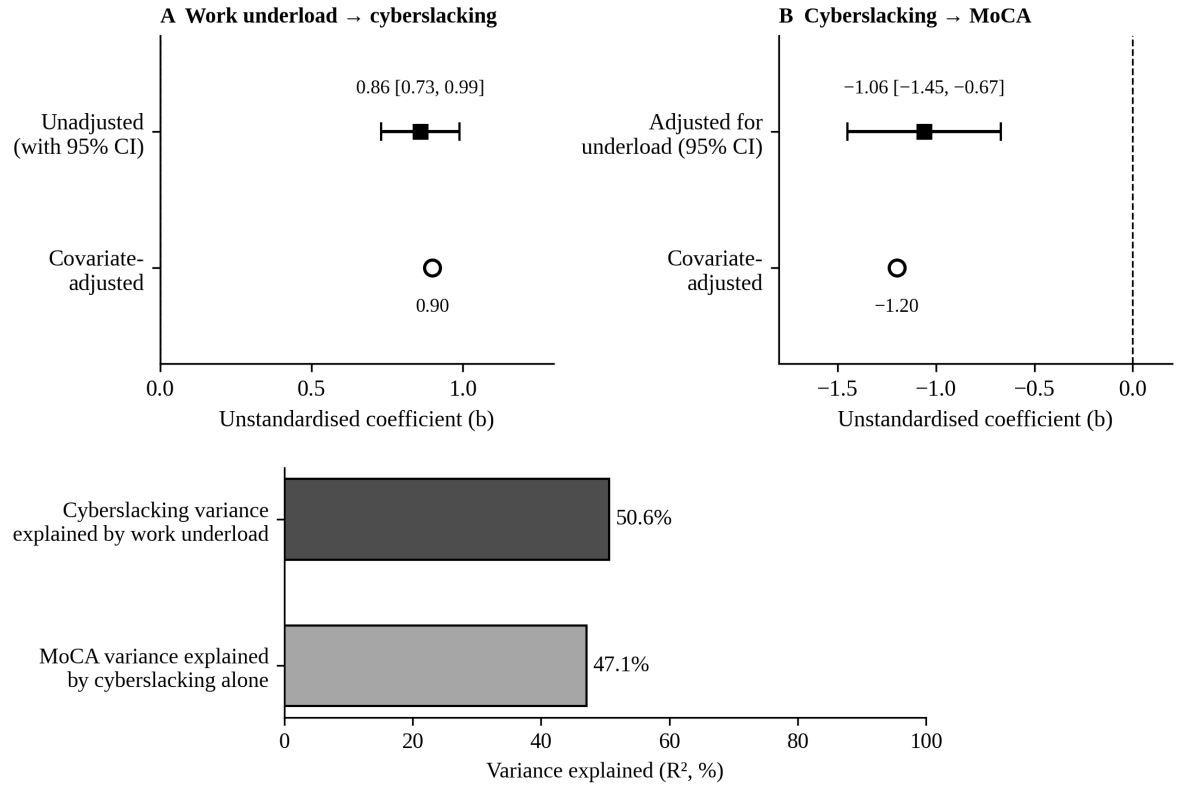


Figure 1. Model-implied linear associations of work underload with cyberslacking (A) and cyberslacking with MoCA score (B). Figure 2. Unstandardised regression estimates with and without covariate adjustment. Figure 3. Variance explained in cyberslacking and MoCA score.

The bootstrap confidence interval for the estimated indirect association excluded zero, and the direct association also remained statistically significant ($p < .001$). The indirect estimate accounted for approximately 43% of the total estimated association. Substituting daily hours for the cyberslacking score produced a similar statistical pattern (indirect association = −1.00, 95% CI [−1.34, −0.68]). The primary pattern also remained after covariate adjustment (underload b = −1.03, cyberslacking b = −1.20, $R^2 = .58$; Table 5). Because all variables were measured cross-sectionally, these results describe an indirect association rather than evidence of a causal mechanism (Table 3).

Table 3. ***Statistical Mediation of Work Underload → MoCA Through Cyberslacking***

Path	B	95% CI	Standardised β
a: Underload → Cyberslacking	0.86	0.71 to 1.01	0.71
b: Cyberslacking → MoCA (controlling underload)	−1.06	−1.46 to −0.67	−0.41
c: Total association, Underload → MoCA	−2.11	−2.47 to −1.75	−0.68

Path	B	95% CI	Standardised β
c′: Direct association, Underload → MoCA	−1.20	−1.68 to −0.74	−0.39
a × b: Indirect association	−0.91	−1.30 to −0.56	−0.29

Note. Percentile bootstrap confidence intervals were based on 5,000 resamples, except for the total association, whose interval was the ordinary least-squares confidence interval. All paths had $p < .001$. The 95% bootstrap confidence interval for the standardised indirect association was −0.42 to −0.18.

Cyberslacking was negatively associated with MoCA score at each examined age value; the estimated simple slopes ranged from −1.63 to −1.90 MoCA points per scale point, and all reported 95% confidence intervals excluded zero. In the continuous-age model (not adjusted for work underload), the estimated slopes were −1.71 at one standard deviation below the mean age, −1.78 at the mean age and −1.84 at one standard deviation above the mean age. The age-group estimates were comparable, as were their CIs (≤29 years: -1.90; 30-44 years: -1.63; ≥45 years: -1.85). The results from the interaction test revealed no evidence that age moderated the association between cyberslacking and MoCA scores (p-value = 0.67); this does not imply that there is no moderating effect in other populations. (Table 4, Figure 4)

Table 4. ***Estimated Association Between Cyberslacking and MoCA Score at Different Ages***

Age level	Slope b (MoCA points per cyberslacking scale point)	95% CI	n
−1 SD (≈28.5 years)	−1.71	−2.15 to −1.27	161
Mean (≈38.6 years)	−1.78	−2.07 to −1.48	161
+1 SD (≈48.6 years)	−1.84	−2.24 to −1.44	161
Age ≤29	−1.90	−2.51 to −1.30	41
Age 30–44	−1.63	−2.08 to −1.18	69
Age ≥45	−1.85	−2.38 to −1.32	51

Note. Simple slopes were estimated from the mean-centred interaction model for continuous age (without adjustment for work underload) and from separate regressions within age groups. The ‘n’ column reports the group sample size where applicable; continuous-age rows refer to the full analytic sample (N = 161).

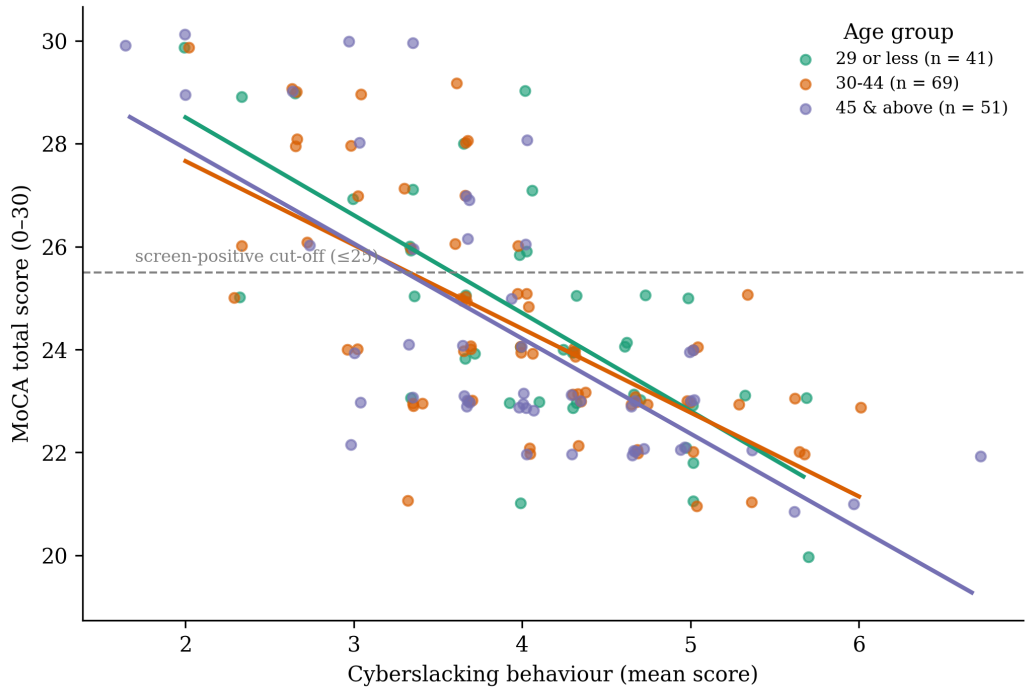


Figure 4. MoCA total score by cyberslacking score, with fitted lines for the three age groups. Small random jitter was added for display.

Participants scoring ≤25 on the MoCA reported higher mean work-underload scores (3.80 ± 0.66 vs 2.93 ± 0.61; d = 1.34), cyberslacking scores (4.33 ± 0.78 vs 3.14 ± 0.66; d = 1.58), and daily cyberslacking hours (3.17 ± 1.51 vs 0.66 ± 0.56 hours; d = 1.90) than participants scoring >25. The sample-derived areas under the ROC curve were 0.84 for work underload, 0.88 for the cyberslacking score and 0.97 for daily hours (Figure 5). We derived all AUCs within the study sample, and they require external validation before interpreting them as predictive performance. In a logistic model, each one-point increase in work underload was associated with 2.5-fold higher odds of screening positive (odds ratio [OR] = 2.5, 95% CI [1.11, 5.71]), and each one-point increase in cyberslacking was associated with 6.7-fold higher odds (OR = 6.7, 95% CI [2.83, 15.98]). The Youden-index-based thresholds were about 3.56 for low workload and 4.0 for high cyberslacking load (sensitivity 72% at low workload and specificity 91% at high cyberslacking load). These estimates are exploratory given that thresholds were selected and evaluated within the same sample and are likely optimistic.

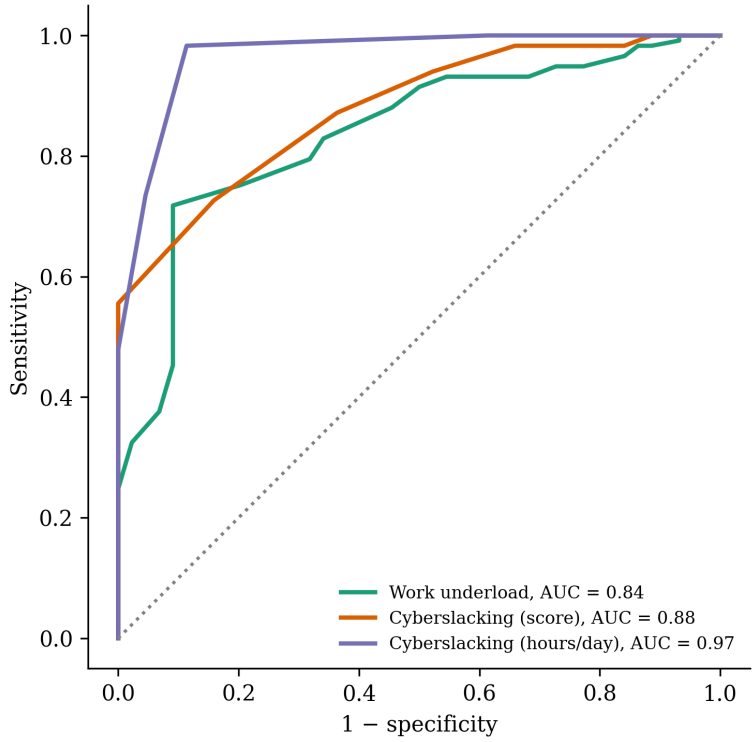


Figure 5. ROC curves for distinguishing participants with MoCA scores ≤25 from those scoring >25 using work underload, cyberslacking score and daily cyberslacking hours.

Spearman correlations were similar to the Pearson correlations (underload–cyberslacking ρ = .71; cyberslacking–MoCA ρ = −.66; underload–MoCA ρ = −.71; daily hours–MoCA ρ = −.76; all $p < .001$). The unique contributions were $f^2 = 0.18$ for cyberslacking and $f^2 = 0.16$ for underload. The maximum Cook's D was 0.06, and one observation had a studentised residual beyond ±3. Interpret these sensitivity results considering the sample size and the number of analyses performed. (Table 5)

Table 5. ***Sensitivity Analyses for the Cyberslacking–MoCA Association and the Direct Association Between Work Underload and MoCA Score***

Specification	**Cyberslacking → MoCA (b; SE/CI where available)**	**Work underload → MoCA, direct association (c′; SE/CI where available)**	**Conclusion**
Primary OLS (Table 3)	−1.06 (SE 0.20)	−1.20 (SE 0.24)	Both $p < .001$

Specification	Cyberslacking → MoCA (b; SE/CI where available)	Work underload → MoCA, direct association (c′; SE/CI where available)	Conclusion
HC3 robust SEs	−1.06 (SE 0.21)	−1.20 (SE 0.25)	Both p < .001
Cluster-robust SEs by authority (6 clusters)	−1.06 (SE 0.23)	−1.20 (SE 0.26)	Both p < .001; few clusters, interpret with caution
Adjusted for tenure, pay grade, authority, age	−1.20	−1.03	Both p < .001; R^2 = .58
Hours per day replaces cyberslacking score	−0.65	−1.11	Both p < .001; indirect association −1.00 (95% CI −1.34 to −0.68)

Age did not moderate the work-underload–cyberslacking association (interaction b = 0.003, p = .65). The index of moderated mediation was −0.008 (95% CI [−0.031, 0.017]), so the data did not support an age-dependent indirect association. The conditional indirect associations were estimated to be -0.84, -0.92 and -1.00, respectively, one SD below the mean age and one SD above the mean age, and the CIs for all three associations did not contain zero at these three examined ages. This does not show that indirect association varies with age, because the index CI was with 0. Given the exploratory nature of this analysis, we also added a squared cyberslacking term to the model, which was significant in improving model fit (R2 = 0.588; quadratic b = 0.31, SE = 0.11, p-value = 0.004). Estimated slopes became less negative in the analysed cyberslacking values with 1.70 points below the sample mean (-1.07), above the mean, and -0.44 points above the mean.

Discussion

Work underload was positively associated with cyberslacking, and cyberslacking was negatively associated with MoCA score. The estimated indirect association indicated that cyberslacking statistically accounted for part of the association between underload and MoCA score, approximately 43% of the estimated total association. The age interaction and index of moderated mediation were not statistically significant, so the data did not show that the cyberslacking–MoCA association was stronger among older employees. These findings are cross-sectional associations and should not be interpreted as evidence that underload causes cyberslacking or that cyberslacking causes lower cognitive performance.



The positive association between underload and cyberslacking mirrors other findings in the previous literature that reduced work stimulation could relate to personal internet use (18-20). Future research could utilise the concept of cognitive reserve (21) to examine whether the duration of sustained work demands is related to cognitive outcomes. The negative relationship between cyberslacking and MoCA scores also applies to research about media multitasking and attention (22), with mixed results. The present study's analysis does not allow us to distinguish between cause and selection, reverse causality, or confounding. The age x student interaction in the sample studied. does not imply that the association is the same across all ages, especially given the limited age range (up to 58 years) and sample size, and the controversy over the timing of cognitive changes with ageing (23). All conditional indirect estimates were comparable in magnitude across age values examined, and the index of moderated mediation was not significantly different from 0. Describing this exploratory quadratic result as a threshold or floor is premature, since it would strengthen the negative association at low cyberslacking scores; it must be replicated. Underload may also be motivation for cyberslacking in the workplace or due to stress (24); underload could also be because of cognitive or engagement differences, which can also guide online behaviour. These alternative explanations will require longitudinal or experimental investigations.

The results indicate a need to consider work underload as an organizational issue for regulatory authorities, but the researcher does not conclude that job redesign is an effective intervention to enhance cognitive functioning. For prospective studies, the following tasks can be observed: Task enrichment, Task rotation, Stretch assignments and Workload balancing. Underload and cyberslacking were used to differentiate MoCA screen-positive and screen-negative participants in this sample; however, these measures should be used as a screen, not as independent validation, and should be supported by fairness and practical benefit.

Overall, 72.7% scored below the prespecified MoCA cutoff (≤25). This is a screen and not a clinical judgment of cognitive impairment. Differences in how well people score on MoCA tasks may depend on testing conditions, population characteristics, and language and education level (11,25,26).

Limitations and future research

This cross-sectional study cannot establish temporal order, and reverse causation or unmeasured factors—including sleep, mood, and disengagement may explain some of the observed associations. Self-reported measures may introduce common-method bias, and the relatively large effect estimates require replication. Factors that could affect MoCA scores irrespective of cyberslacking include language, testing conditions and fatigue. Education level was not measured; however, education is not required for non-work internet use, and officers in the grades studied are typically recruited with university-level qualifications, so educational differences are unlikely to be a major source of confounding of the cyberslacking-MoCA association. MoCA is also a screening tool and is not intended for clinical diagnosis. The findings are not generalizable because the sampling approach

(stratified random-walk sampling within each of the six authorities) and the smaller number of officers in the higher pay grade stratum (BPS-19-22; 21.1% of participants) limit generalizability. Caution is warranted when interpreting cluster-robust estimates because of the limited number of authority clusters. Internal consistency was not evaluated for the work-underload and cyberslacking scales because item-level responses were not available in the analytic dataset; reliability coefficients such as Cronbach's alpha or McDonald's omega, and factor-analytic checks of dimensionality, require item-level data and cannot be derived from composite scores. The reliability and factor structure of these scales in this sample are therefore unverified, and future studies should report them. The study may not have had the power to detect small-effect-size age-moderation effects. Future research should use longitudinal designs, measure internet use objectively when appropriate to the ethical context, compare language groups, and prospectively evaluate job enrichment to assess whether shifts in work underload are a contractual cause of shifts in cognitive performance.

Conclusion

In the six Pakistani regulatory authorities studied, work underload was positively correlated with cyberslacking, while cyberslacking was negatively correlated with MoCA scores. Approximately 43% of the estimated total association was indirect due to the cross-sectional design; causality cannot be inferred through an indirect pathway. This was not the case for the association between cyberslacking and MoCA, which did not significantly moderate with age. Describe the findings as preliminary and associational. It might be warranted to further examine work underload as an organizational work-design factor, but longitudinal studies and independent validation are required to make inferences regarding cognitive outcomes or to support screening applications.

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