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Age, work experience, and baseline technostress as moderators of a brief mindfulness-based intervention in technology professionals: a secondary analysis of a randomized controlled trial

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Título: Edad, experiencia laboral y tecnoestrés basal como moderadores de una breve intervención basada en la atención plena en profesionales de la tecnología: un análisis secundario de un ensayo controlado aleatorizado.

Resumen: Las intervenciones basadas en mindfulness reducen el malestar psicológico en contextos laborales con alta intensidad digital, aunque sus efectos pueden variar en función de las características sociodemográficas y ocupacionales. Este estudio examinó si la edad, el género, la experiencia laboral, el nivel educativo, el rol profesional y el tecnoestrés basal (puntuación total en el ETT adaptado al español) moderaban la efectividad de un programa breve de mindfulness basado en MBSR y adaptado a las exigencias del trabajo digital (hiperconectividad, multitarea e interrupciones) sobre el estrés y la ansiedad percibidos entre profesionales de la tecnología. Realizamos un análisis secundario de un ensayo controlado aleatorizado (*N* = 64; intervención vs. control en lista de espera) con evaluaciones en el pretest, postest y seguimientos a los 3 y 6 meses. Se utilizaron GLM de medidas repetidas para estimar las interacciones grupo × tiempo × moderador, complementadas con análisis de regresión múltiple del cambio individual; también se exploró un término cuadrático para el tecnoestrés basal. La edad más joven y la menor experiencia laboral se asociaron con mayores reducciones en el estrés y la ansiedad percibidos. No se encontraron efectos moderadores significativos para el rol profesional, el género, el nivel educativo o el tecnoestrés inicial (lineal o cuadrático).
Palabras clave: Atención plena. Tecnoestrés basal. Edad. Experiencia laboral. Intervención psicológica. Profesionales de la tecnología.

Abstract: Mindfulness-based interventions reduce psychological distress in digitally intensive work contexts, although their effects may vary as a function of sociodemographic and occupational characteristics. This study examined whether age, gender, work experience, educational level, professional role, and baseline technostress (total score on the Spanish-adapted ETT) moderated the effectiveness of a brief mindfulness program based on MBSR and tailored to digital work demands (hyperconnectivity, multitasking, and interruptions) on perceived stress and anxiety among technology professionals. We conducted a secondary analysis of a randomized controlled trial (*N* = 64; intervention vs. wait-list control) with assessments at pretest, posttest, and 3- and 6-month follow-ups. Repeated-measures GLMs were used to estimate group × time × moderator interactions, complemented by multiple regression analyses of individual change; a quadratic term for baseline technostress was also explored. Younger age and shorter work experience were associated with larger reductions in perceived stress and anxiety. No significant moderation effects were found for professional role, gender, educational level, or baseline technostress (linear or quadratic).
Keywords: Mindfulness. Baseline technostress. Age. Work experience. Psychological intervention. Technology professionals.

Introduction

Technological acceleration has profoundly transformed work environments, particularly in the technology sector and in roles characterized by intensive ICT use. Hyperconnectivity, digital multitasking, and constant pressure to stay up to date have created contexts of high cognitive demand. In Spain, institutional reports have described an increase in psychosocial risks associated with digitalization—including information overload, work intensification, and difficulties disengaging from work—especially in ICT sectors and knowledge-intensive services (Fundación COTEC, 2023; Instituto Nacional de Estadística [INE], 2023). Empirical studies have linked these transformations to sustained increases in stress, anxiety, and attentional fatigue, even among workers without a prior clinical history (González-Fernández et al., 2024; Salanova et al., 2014).

Within this context, technostress has gained relevance as a construct that captures distress associated with sustained technological demands at work. This construct includes dimensions such as information overload, work–home invasion, uncertainty due to continuous updates, and professional insecurity (Tarafdar et al., 2015). Recent evidence suggests that higher levels of technostress are associated with more anxiety symptoms, reduced motivation, and impaired performance, with stronger associations among younger or less experienced workers (Ariño-Mateo et al., 2024; Spagnoli et al., 2020).

Against this backdrop, brief mindfulness-based interventions have demonstrated reductions in psychological distress and improvements in self-regulatory processes in demanding work settings (Bartlett et al., 2021; Hülsheger et al., 2013). Mindfulness—defined as nonjudgmental attention to present-moment experience—has been implemented in multiple formats, with Mindfulness-Based Stress Reduction (MBSR; Kabat-Zinn, 1990) and its abbreviated versions being among the most widely used in organizations (Lomas et al., 2019). Recent reviews suggest benefits for cognitive and emotional processes involved in attentional regulation (Creswell, 2017; Goldberg et al., 2022; Hölzel et al., 2011). In ICT-intensive roles, mindfulness has been proposed as a relevant strategy to reduce the impact of digital overload and promote attentional and emotional regulation at work (Daniel et al., 2022; Glomb et al., 2011).

From an individual-differences perspective, the person–environment fit model (Kristof-Brown et al., 2005) and the

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transactional model of stress and coping (Lazarus & Folkman, 1984) posit that responses to work demands depend on the match between employee characteristics and contextual conditions, as well as on cognitive appraisal of demands and the coping resources available. Consistent with these models, variables such as age (years), gender, work experience (years), and professional role (occupational category; e.g., development/engineering/analytics) may be associated with greater or lesser change following mindfulness-based interventions, insofar as they relate to differences in exposure to demands (e.g., cognitive load and interruptions) and to resources for attentional and emotional regulation (Bartlett et al., 2021; Carmody & Baer, 2008). Accordingly, it is plausible that the magnitude of change following a brief intervention differs across subgroups defined by these characteristics (Eby et al., 2005).

Technostress has rarely been examined as a potential moderator of response to mindfulness-based interventions in organizational samples (Braun et al., 2024; Galante et al., 2023). Baseline technostress may condition subsequent change in stress and anxiety following interventions aimed at self-regulation. In addition, a non-linear relationship has been proposed, such that intermediate levels of technostress may be associated with larger reductions in distress, whereas very low or very high levels may be associated with smaller changes (Rey-Merchán et al., 2022; Spagnoli et al., 2020). This hypothesis requires empirical confirmation in real-world organizational contexts.

Identifying predictors of heterogeneity in the effects of mindfulness-based interventions helps target these programs to profiles most likely to benefit and optimize implementation in organizations with generational and functional diversity, supporting a more efficient allocation of resources (Hyland et al., 2015; Zhang et al., 2023). Consistent with this view, adaptive approaches have been associated with improvements in stress, productivity, and organizational climate in technology-related organizational contexts (Bartlett et al., 2021; Bostock et al., 2019; Donald et al., 2019; Good et al., 2016; Reb et al., 2014).

Research on moderators of mindfulness-based interventions has focused primarily on clinical or educational populations, and is comparatively more limited in organizational samples with intensive ICT use. The present study incorporates technostress as a potential moderator and examines interindividual differences in response to a brief intervention. To this end, we conducted a secondary analysis of a previously published randomized controlled trial (Pérez-Marqués, 2024) and tested whether group × time effects on perceived stress and anxiety varied as a function of age (years), work experience (years), professional role (self-reported occupational category), and baseline technostress; gender and educational level were examined as exploratory moderators. Although these variables have been linked to differential response in prior research, no specific hypotheses were formulated regarding their effects, as the primary focus was placed on moderators related to career stage and digital work context (age, experience, role, and technostress). Therefore, their results are reported as secondary exploratory findings rather than as primary effects. We hypothesized that younger age and shorter work experience would be associated with larger reductions in stress and anxiety. Exploratorily, we examined the potential influence of professional role and a non-linear pattern of baseline technostress.

Method

Design

This study is a secondary analysis of a randomized controlled trial with 1:1 allocation (intervention vs. wait-list control), with assessments at pretest, posttest, and 3- and 6-month follow-ups.

Participants

A total of 64 employees from the private technology sector participated. All were employed at a single company based in Zaragoza (Spain) and were randomly assigned (1:1) to the experimental group (n = 32) or the wait-list control group (n = 32). In both groups, men were the majority (experimental: 56.3%; control: 62.5%), and mean age was similar (experimental: 31.8 years; control: 32.1 years). Regarding educational attainment, the most frequent category was intermediate or higher technical training (experimental: 56.3%; control: 59.4%), followed by university education (experimental: 43.7%; control: 40.6%). Most participants reported ≥ 5 years of work experience (experimental: 87.5%; control: 84.4%). Professional roles included software developers, systems engineers, and data analysts. No statistically significant differences were observed between the experimental and control groups in the sociodemographic and occupational variables considered (all ps > .05; see Table 1).

A convenience sample was recruited on a voluntary basis within the framework of a psychological intervention program promoted by the company. Exclusion criteria included self-reported severe mental disorder or ongoing psychiatric treatment at study baseline, as indicated via self-report.

No dropouts or losses to follow-up were recorded. Sample size in the original trial was planned using an a priori power analysis, which estimated a minimum of 56 participants to detect a medium effect size (d = .50) with α = .05 and power = .80 (G*Power; Pérez-Marqués, 2024). In the present secondary analysis, the full available cohort was retained (N = 64). However, this sample size was not determined a priori to detect moderation effects (e.g., group × time × variable interactions), and thus these analyses should be interpreted as exploratory.

Table 1
Sociodemographic and professional profile of participants by group (N = 64)

Variable	Category	Experimental group (*n* = 32)	Control group (*n* = 32)	*p*
Gender	Male	18 (56.3%)	20 (62.5%)	.59
	Female	14 (43.7%)	12 (37.5%)	
Age	*M (SD)*; 95% CI	31.8 (5.5) [29.8–33.8]	32.1 (5.6) [30.1–34.1]	.70
Educational level	University degree	14 (43.7%)	13 (40.6%)	.84
	Intermediate or higher technical training	18 (56.3%)	19 (59.4%)	
Work experience	< 5 years	4 (12.5%)	5 (15.6%)	.85
	5–10 years	15 (46.9%)	14 (43.8%)	
	> 10 years	13 (40.6%)	13 (41%)	
Professional role	Software developer	12 (37.5%)	11 (34.4%)	.88
	Systems engineer	10 (31.3%)	11 (34.4%)	
	Data analyst	10 (31.3%)	10 (31.3%)	

Note. Age is expressed as mean and standard deviation (*M, SD*), with 95% confidence intervals. Data correspond to the sample used in the original study (Pérez-Marqués, 2024), disaggregated here by experimental and control groups to facilitate moderator analyses. No statistically significant baseline differences were observed between groups in any variable ($p > .05$).

Measures

Three instruments were used to assess the study variables: the Perceived Stress Scale (PSS-10), the Beck Anxiety Inventory (BAI), and the Technostress at Work Scale (ETT), along with an ad hoc sociodemographic questionnaire assessing age, gender, educational level, professional role, and years of work experience.

Perceived stress was assessed using the Spanish version of the PSS-10, validated by Remor (2006) based on the original instrument by Cohen et al. (1983). The scale consists of 10 items assessing the subjective perception of lack of control and overload during the last month, rated on a five-point Likert scale (0 = never, 4 = very often). In the analyzed sample, internal consistency was satisfactory ($\alpha = .85$).

Anxiety was measured with the Beck Anxiety Inventory (BAI), using the Spanish adaptation by Sanz and Navarro (2003) based on the original version by Beck et al. (1988). The BAI includes 21 items with a four-point response format (0 = not at all, 3 = severely). Internal reliability was high in this sample ($\alpha = .90$).

Technostress was assessed with the Technostress at Work Scale (ETT), a Spanish adaptation of the instrument developed by Tarafdar et al. (2007). The scale includes 20 items distributed across five dimensions (techno-overload, techno-invasion, techno-complexity, techno-insecurity, and techno-uncertainty), rated on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). In this sample, internal consistency was adequate ($\alpha = .89$).

Intervention

The intervention consisted of a brief manualized mindfulness program developed in the primary study (Pérez-Marqués, 2024), based on MBSR (Kabat-Zinn, 1990) and adapted to the digital work context. The aim was to train sustained attention, detect attentional automaticity, and regulate stress in work situations characterized by high informational load.

The program was delivered over eight weeks through weekly 90-minute in-person group sessions led by a psychologist trained in mindfulness and organizational psychology. Groups consisted of 10–12 participants. Sessions combined formal practices (breath-focused attention, body scan, and mindful movement) with informal practices tailored to the work context (e.g., brief pauses in response to notifications or task transitions; observing thoughts associated with multitasking; regulation strategies before and after periods of high informational demand).

Across the eight sessions, content followed a progression aimed at generalization to the workplace: (1) psychoeducation and breath awareness practice; (2) body scan and noticing distraction; (3) brief pauses in response to interruptions and task transitions; (4) observing thoughts and multitasking automatisms; (5) emotion regulation under overload and time pressure; (6) acceptance of unexpected interruptions and attentional reorientation; (7) application to typical work tasks (meetings, messaging, screen-based work); and (8) consolidation, practice planning, and relapse prevention. Materials for between-session practice (written instructions and audio recordings) were provided, and attendance was recorded.

To promote adherence, participants were offered an optional practice workbook with guided exercises and self-reflection prompts. Home practice was not quantified using standardized logs; however, participants were encouraged to record frequency (days/week) and approximate duration. Implementation fidelity was monitored using a structured checklist completed by the instructor after each session, together with a brief weekly self-rating of protocol adherence (0–10) and a record of any incidents.

The intervention was implemented during working hours and within the workplace setting, with organizational support and examples tailored to the digital context.

To support retention, sessions were scheduled in advance and integrated into work planning, reducing logistical barriers (e.g., travel time and scheduling constraints). Participants in the wait-list control group were informed from the outset that they would have access to the same program after

completion of the follow-up period, which may help explain the absence of dropouts in this group as well.

Procedure

The study was conducted in collaboration with a technology company based in Zaragoza (Spain). Participation was voluntary and followed an internal informational session explaining the study objectives (to evaluate the effects of a brief mindfulness program on perceived stress and anxiety) and procedures. The invitation was disseminated through the company's internal communication channels (corporate email and internal announcements), and enrollment was completed voluntarily through a digital form managed by the research team. Interested employees provided digital informed consent prior to baseline assessment, which specified the voluntary nature of participation, the right to withdraw at any time without work-related consequences, and the confidential and coded handling of data.

Inclusion criteria were: (a) active employment contract with the company and (b) availability to attend weekly sessions. Exclusion criteria included: (a) self-reported severe psychiatric diagnosis and/or (b) ongoing psychiatric treatment at study baseline.

After completing baseline assessment (pretest), participants were randomly assigned (1:1) to the intervention group or the wait-list control group. The allocation sequence was computer-generated, and group assignment was communicated after completion of the pretest assessment. Due to the nature of the intervention, participant blinding was not feasible.

For the ETT, a Spanish-adapted version was used following a back-translation procedure and review by a panel of three experts, who reached consensus on semantic and conceptual equivalence. A pilot test with 10 technology-sector employees was conducted to verify item comprehension and contextual appropriateness.

The company provided time and space for program implementation but was not involved in participant selection, data collection, data management, or data analysis, which were conducted exclusively by the research team. The study was carried out in accordance with the Declaration of Helsinki and European data protection regulations (EU Regulation 2016/679). Within this organizational context, formal review by an external ethics committee was not requested; however, voluntary participation, informed consent, and data confidentiality were ensured in line with applicable ethical principles.

Data analysis

We examined whether the intervention effect over time (group × time interaction) varied as a function of sociodemographic and occupational variables. Statistical analyses were conducted using IBM SPSS Statistics (Version 26). Repeated-measures GLMs were performed with a 2 × 4 design, in which group (intervention vs. wait-list control) was the between-subjects factor and time (pretest, posttest, and 3- and 6-month follow-ups) was the within-subjects factor. Analyses were conducted separately for perceived stress and anxiety. For each outcome, the group × time × moderator interaction term was estimated for each moderator (age, work experience, professional role, gender, educational level, and baseline technostress), with the aim of identifying differences in temporal trajectories between groups as a function of these characteristics. For technostress, the baseline total score on the ETT was included as a continuous variable.

Professional role, gender, and educational level were entered as between-subjects factors. To facilitate interpretation and graphical representation of interactions, age and work experience were categorized using median split cutoffs (< 35 vs. ≥ 35 years; < 10 vs. ≥ 10 years). Statistical significance was set at $p < .05$, and effect sizes were reported using partial eta squared (η_p^2). When significant interactions were observed, post hoc comparisons were conducted with Bonferroni adjustment.

As a complementary analysis, multiple linear regressions were conducted to predict total change from pretest to the 6-month follow-up (T1–T4) in perceived stress and anxiety. Standardized β coefficients and adjusted R^2 values were reported, and multicollinearity was evaluated using variance inflation factors (VIFs). Exploratorily, a quadratic term for baseline technostress was included in the regression models to evaluate a potential curvilinear relationship with change.

Regarding missing data, the proportion was below 5% and did not show a systematic pattern. To maximize the use of available information for each test while maintaining a straightforward interpretation of parameter estimates, analyses were conducted using pairwise deletion. No imputation procedures were applied because, given the very low proportion of missing values and the absence of indications of systematic bias, imputation would have introduced additional assumptions (e.g., missingness mechanism and imputation model) without a clear benefit in precision (Little & Rubin, 2019).

Results

No dropouts were recorded in the experimental group, and mean attendance was 91% (range: 87–100%). At the end of the intervention, more than 75% of participants reported engaging in at least three self-directed practices per week, based on informal records and a semi-structured report; therefore, these data should be interpreted as non-standardized estimates.

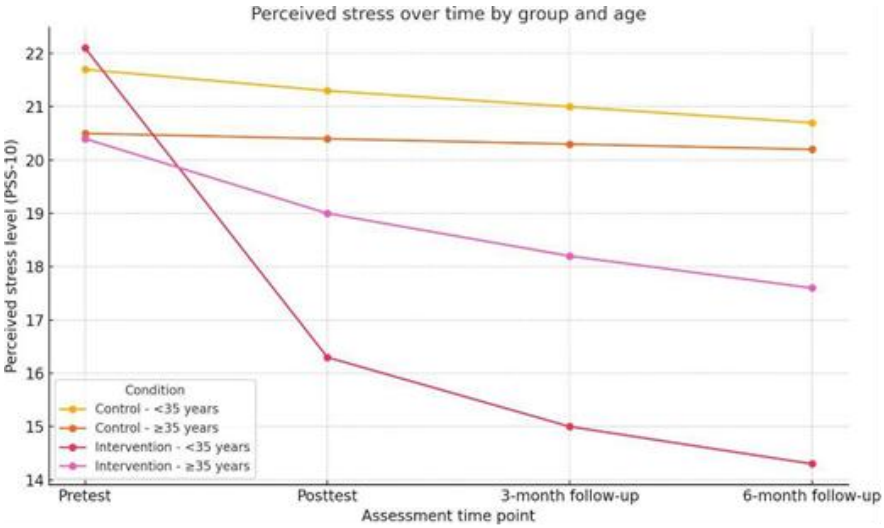
Repeated-measures GLM analyses indicated several significant moderation effects in the trajectories of the assessed outcomes. First, a significant group × time × age interaction was observed for perceived stress, $F(3, 180) = 4.21$, $p < .01$, $\eta p^2 = .12$. To facilitate graphical representation and interpretation of the interaction, age was categorized using the sample median (< 35 years vs. ≥ 35 years). Figure 1 illustrates this interaction, showing a larger reduction in perceived

stress among the younger subgroup in the intervention group.

Younger participants in the intervention group showed a more pronounced reduction in perceived stress from pretest (M = 22.1, SD = 6.8) to the 6-month follow-up (M = 14.3, SD = 5.9; 95% CI of the difference [–9.5, –5.6]), compared to those aged ≥ 35 years (M = 20.4 → 17.6; 95% CI [–4.3, –1.1]).

Figure 1

Evolution of perceived stress levels by group and age (< 35 years vs. ≥ 35 years)

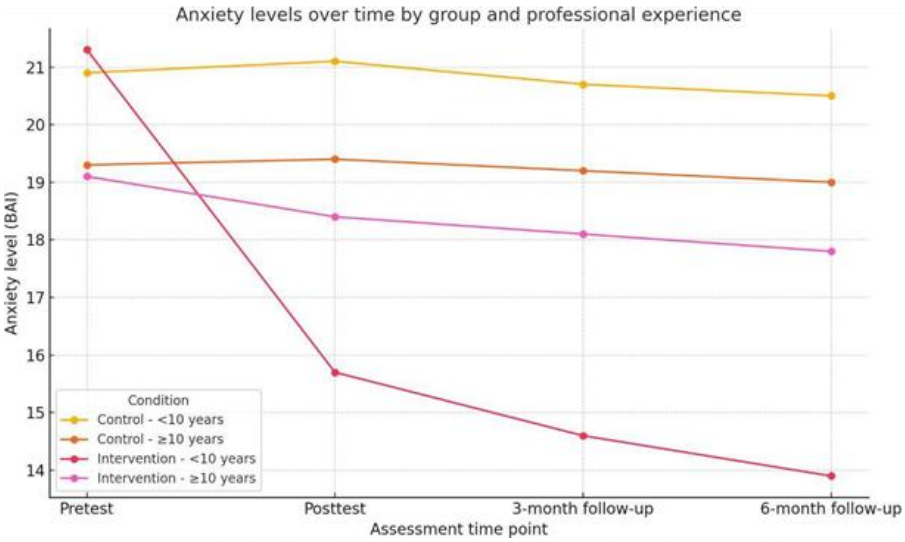


Note. Perceived stress was assessed using the Perceived Stress Scale (PSS-10). Age was dichotomized using the sample median (< 35 years vs. ≥ 35 years). Values represent group means at each time point.

A significant group × time × work experience interaction was also identified for anxiety levels, $F(3, 180) = 3.77$, $p = .02$, $\eta p^2 = .09$. Work experience was categorized using the sample median (< 10 years vs. ≥ 10 years). Participants with fewer years of experience showed a greater decrease (M = 21.3, SD = 7.5 → M = 13.9, SD = 6.2; 95% CI [–9.1, –5.2]) compared to those with longer work trajectories (M = 19.1 → 17.8; 95% CI [–2.9, –0.6]). Figure 2 visually depicts this pattern.

Figure 2

Evolution of anxiety levels by group and work experience (< 10 years vs. ≥ 10 years)



Note. Anxiety was assessed using the Beck Anxiety Inventory (BAI). Work experience was dichotomized using the sample median (< 10 years vs. ≥ 10 years). Values represent group means at each time point.

When significant interactions were identified, planned post hoc comparisons with Bonferroni adjustment were conducted to determine which specific subgroups differed. The reduction in perceived stress was greater in the younger experimental subgroup (< 35 years) compared to the ≥ 35 experimental subgroup (p = .02) and compared to the younger control subgroup (p = .03). No differences were observed between the ≥ 35 experimental and control subgroups (p = .64). Similarly, the less experienced experimental subgroup (< 10 years) showed a greater reduction in anxiety than the corresponding control subgroup (p = .04), whereas no significant post hoc differences were found among the more experienced subgroups (p = .55).

Professional role did not reach statistical significance as a moderator (p = .067). Multiple linear regression models indicated that both age (β = –.41, 95% CI [–.58, –.24], p < .01) and years of work experience (β = –.36, p = .02) predicted total change in perceived stress from pretest to follow-up (T1–T4), with an adjusted R^2 of .29. Similar results were observed for anxiety (β = –.39 and –.33, respectively), with an adjusted R^2 of .32. No indications of problematic multicollinearity were found among predictors (VIF < 2.0).

To explore a potential non-linear relationship between baseline technostress and change, a quadratic term for baseline technostress was included in regression models predicting total change (T1–T4). The coefficients did not reach statistical significance (stress: β = –.14, p = .092; anxiety: β = –.09, p = .118), providing no conclusive evidence of a curvilinear pattern. All detailed results, including interaction effects and regression models (linear and quadratic), are summarized in Table 2.

Table 2
Moderation effects on changes in perceived stress and anxiety

Moderator variable	Dependent va-riable	Type of effect	Statistic	p	Effect size / R^2
Age (< 35 vs. ≥ 35 years)	Perceived stress	Group × time × age interaction	$F(3,180) = 4.21$	< .01	$\eta p^2 = .12$
Work experience (< 10 vs. ≥ 10 years)	Anxiety	Group × time × experience interaction	$F(3,180) = 3.77$	.02	$\eta p^2 = .09$
Gender	Stress / Anxiety	Not significant	—	> .10	—
Educational level	Stress / Anxiety	Not significant	—	> .05	—
Professional role	Perceived stress	Not significant	$F = 2.85$	.067	$\eta p^2 \approx .07$
Age + experience (regression)	Perceived stress	Significant prediction	β = –.41 / –.36	< .01 / .02	$R^2 = .29$
Age + experience (regression)	Anxiety	Significant prediction	β = –.39 / –.33	< .01 / .02	$R^2 = .32$
Baseline technostress² (regression)	Perceived stress	Quadratic term	β = −.14	.092	—
Baseline technostress² (regression)	Anxiety	Quadratic term	β = −.09	.118	—

Note. Interaction terms reflect differences in the temporal evolution of perceived stress and anxiety according to the moderator variables examined. Age and work experience were dichotomized using the sample median (< 35 vs. ≥ 35 years; < 10 vs. ≥ 10 years). Regression models were computed on total change from pretest to follow-up (T1–T4). Quadratic analyses of baseline technostress were interpreted as exploratory. ηp^2 = partial eta squared; R^2 = adjusted coefficient of determination; β = standardized beta coefficient.

Discussion

This secondary analysis examined sociodemographic and occupational moderators of response to a brief mindfulness-based intervention among technology-sector employees. Unlike the primary study, which focused on the overall efficacy of the program (Pérez-Marqués, 2024), the present work aimed to identify heterogeneity in response and to determine which profiles exhibited greater changes over the follow-up period.

Overall, the findings indicated that age and work experience were associated with differential benefits in the psychological outcomes assessed. Specifically, younger participants showed greater reductions in perceived stress, and those with fewer years of work experience exhibited greater reductions in anxiety. This pattern is consistent with previous research documenting interindividual variability in mindfulness-based interventions and suggesting potential differences related to career stage and coping styles (Eby et al., 2005; Lomas et al., 2019; Zhang et al., 2023). From the perspective of the transactional model of stress and coping (Lazarus & Folkman, 1984), one possible explanation—although not directly tested—is that individuals at earlier stages of their professional trajectory may differ in their appraisal of demands and resources, which could facilitate the adoption of practices aimed at regulating attention and emotional reactivity. However, because these processes were not directly measured, such interpretations should be considered hypotheses for future research rather than definitive explanations.

In digitally intensive work contexts, the interplay between age, work experience, and technostress may contribute to distinct levels of vulnerability and potential for improvement. Although regression analyses did not indicate problematic multicollinearity (VIF < 2), the expected correlation between age and experience suggests that future studies should model both predictors jointly and continuously, potentially incorporating interaction terms or non-linear approaches, particularly in larger longitudinal samples.

In this regard, the potential interaction between age, work experience, and technostress warrants further exploration. It is plausible that younger and less experienced employees may exhibit distinct profiles of exposure and adaptation to digital demands, which could influence receptivity to interventions targeting attentional regulation in technology-driven contexts (Tams et al., 2018). Alternatively, the greater magnitude of change observed in these subgroups may re-

flect differences in baseline levels of distress or greater room for improvement, a hypothesis that would require more targeted analyses. Regarding professional role, no statistically significant moderation was observed ($p = .067$). Given the sample size and subgroup division, this finding should be interpreted cautiously.

It is possible that a more detailed characterization of task demands, cognitive load, interruption patterns, and digital exposure—beyond broad occupational categories—would be necessary to detect robust differences between roles. Future research could incorporate more granular measures of work context (e.g., messaging intensity, frequency of interruptions, multitasking demands) to determine whether such variables account for part of the variability in intervention response.

With respect to baseline technostress, no evidence of moderation was observed in linear models. The exploratory quadratic term also failed to reach statistical significance, providing no empirical support for a curvilinear pattern in this sample. Although prior research has proposed non-linear associations between technostress and psychological outcomes (Spagnoli et al., 2020; Upadhyaya & Vrinda, 2021), the present findings do not support this hypothesis. Given the modest sample size and exploratory nature of the analyses, future studies with larger and more heterogeneous samples will be necessary to evaluate this possibility with adequate statistical power.

Regarding effect magnitude, the observed interaction effect sizes ($\eta p^2 = .12$ for age and $\eta p^2 = .09$ for work experience) fall within the moderate range according to conventional benchmarks (Cohen, 1988), where values around .01 are considered small, .06 moderate, and ≥ .14 large. In practical terms, approximately 9% to 12% of the variance in the temporal trajectory of stress and anxiety may be attributed to the interaction between group, time, and the moderators examined. This magnitude is comparable to that reported in meta-analyses of brief mindfulness interventions in occupational settings (Bartlett et al., 2021; Virgili, 2015), suggesting that the effects observed are not only statistically significant but also potentially meaningful in applied organizational contexts.

From an applied perspective, the moderate effect sizes suggest that brief mindfulness programs integrated into the work routine may generate relevant psychological changes in real-world technological environments. However, variability associated with age and work experience indicates that impact is not homogeneous across professional profiles. These findings support the consideration of implementation strategies tailored to organizational context and career stage (e.g., adaptations based on career phase or digital interruption exposure) in order to optimize preventive resource allocation.

Methodologically, the combination of repeated-measures GLM and multiple linear regression enabled complementary approaches to examining heterogeneity in response. The longitudinal model assessed full trajectories of change (pretest, posttest, and follow-ups), estimating group × time × moderator interactions that reflect differences in temporal dynamics. In contrast, regression models examined cumulative change between pretest and the 6-month follow-up (T1–T4), allowing estimation of the relative contribution of age and work experience as continuous predictors of overall change and quantification of their joint explanatory power. Thus, whereas GLM analyses inform on differential evolution over time, regression models provide a more synthetic estimate of total impact and facilitate interpretation of moderators' predictive value beyond factorial contrasts. Importantly, identifying differences in magnitude does not imply absence of benefit in other subgroups, but rather variation in intensity of change. Therefore, findings should be interpreted without an exclusionary view of efficacy, recognizing that heterogeneity reflects differences in degree rather than presence or absence of effect.

Several limitations should be acknowledged. First, the modest sample size ($N = 64$) and recruitment from a single company limit generalizability. Studies examining interaction and non-linear effects require larger samples to reliably detect true effects, and reduced sample sizes decrease statistical power and predictive stability (Maxwell & Kelley, 2011). In particular, power to detect moderation effects (group × time × variable) was likely limited, and these findings should therefore be interpreted cautiously. This limitation is especially relevant for non-linear analyses, such as the quadratic term for baseline technostress, which typically require larger samples for stable estimation and adequate power. Second, all measures were self-reported, raising the possibility of common method bias (Podsakoff et al., 2003). Third, between-session practice was recorded informally and non-standardized, preventing precise examination of dose–response relationships and limiting interpretation of adherence as a potential explanatory factor (Carmody & Baer, 2008). Additionally, no qualitative data were collected regarding participants' subjective experiences, which could have enriched understanding of perceived change processes, acceptability, and potential implementation barriers or facilitators.

Furthermore, although dichotomization of age and work experience facilitated graphical representation, it reduces statistical sensitivity; future research should prioritize continuous predictors and non-linear modeling approaches. Finally, although the Spanish adaptation of the ETT showed adequate internal consistency, it has not yet undergone formal published validation, which may limit construct validity. Moreover, measurement invariance across relevant subgroups (e.g., by age or work experience) was not formally tested, and structural differences in item interpretation cannot be entirely ruled out. Future research should prioritize formal psychometric validation of the Spanish version of the ETT in organizational populations, including factorial structure and measurement invariance analyses, given its relevance for studying technostress in digitally intensive work environments.

Conclusions

This study provides evidence on sociodemographic and occupational moderators of response to a brief mindfulness-based intervention in digitally demanding work environments. Consistent with our hypotheses, younger participants and those with fewer years of work experience showed larger reductions in perceived stress and anxiety, as indicated by both interaction analyses and regression models. Professional role did not show statistically significant moderation (p = .067), and no evidence of moderation by gender or educational level was observed.

Regarding baseline technostress, no moderation effects were found in the linear models. The exploratory analysis including a quadratic term also failed to reach statistical significance; therefore, the presence of a curvilinear pattern cannot be supported empirically in this sample. Although prior literature has suggested potential non-linear relationships, the current results do not corroborate that hypothesis. Given the modest sample size and the exploratory nature of the analyses, future research with greater statistical power and broader ranges of technostress will be needed to evaluate this possibility more precisely.

Overall, the findings underscore the value of further investigating heterogeneity in response to brief mindfulness-based interventions in technology-related contexts and of evaluating adaptation strategies according to career stage and job characteristics. However, the sample size (N = 64) and exclusive reliance on self-report measures may have limited power to detect complex interactions (including non-linear effects) and may restrict generalizability. In addition, home practice was recorded in a non-standardized manner, and no qualitative indicators of participant experience or of the instructor–participant relationship were included—issues that should be addressed in future studies.

Complementary information

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