

## Evaluating the long-term impact of art therapy on stress management and employee performance in sustainable workplace wellness programs



Ami Dilham <sup>1,\*</sup>, Fivi Rahmatus Sofiyah <sup>2</sup>, Muhammad Arif Lubis <sup>1</sup>, Andrew Satria Lubis <sup>1</sup>, Jonathan Liviera Marpaung <sup>3</sup>

<sup>1</sup>Management Department, Universitas Sumatera Utara, Medan, Indonesia

<sup>2</sup>Faculty of Vocational Education, Universitas Sumatera Utara, Medan, Indonesia

<sup>3</sup>Department of Mathematics, Universitas Sumatera Utara, Medan, Indonesia

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### ABSTRACT

This study examines the long-term effects of art therapy on stress management and employee performance, with a focus on its role in sustainable workplace wellness programs. It provides a new perspective by combining creative therapeutic methods with strategies to improve organizational productivity. Using a longitudinal approach, the research assesses changes in stress levels, emotional well-being, and work performance at three stages: before the intervention, immediately after, and six months later. The findings show that art therapy helps reduce stress, increase productivity, and improve job satisfaction, with employee engagement playing an important role in these outcomes. The study emphasizes that creative therapeutic approaches can effectively address workplace stress by providing lasting emotional relief and supporting long-term productivity. It also suggests that organizations can enhance employee well-being and workplace sustainability by incorporating mindfulness practices, digital tools, and supportive management strategies.

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### 1. Introduction

Workplace stress has become a prevalent concern in today's fast-paced environments, with far-reaching implications for both employee well-being and overall organizational success. Chronic exposure to stressors at work can lead to a myriad of negative outcomes, such as burnout, physical health problems, reduced motivation, and decreased productivity. As a result, stress management strategies are becoming a focal point of workplace wellness programs (Ganster and Rosen, 2013).

Traditional approaches like cognitive-behavioral therapy (CBT) and mindfulness practices have been widely implemented to mitigate stress, but recent developments suggest that art therapy offers a unique, creative, and highly effective alternative to conventional methods. Art therapy taps into the emotional and psychological dimensions of stress management, allowing individuals to express,

process, and resolve feelings that might otherwise remain unaddressed (van der Riet et al., 2018).

The concept of art therapy has gained traction in the workplace as a tool to help employees manage stress more holistically. Unlike standard therapeutic practices, which often rely on verbal processing, art therapy offers a non-verbal outlet that enables individuals to express complex emotions, thoughts, and concerns through creative mediums such as drawing, painting, and sculpting. This is particularly beneficial for individuals who may find it challenging to articulate their emotions verbally (Malchiodi, 2012).

Art therapy engages the mind and body simultaneously, encouraging mindfulness through the repetitive and focused movements associated with creating art. This mindfulness fosters a calming effect, reducing stress and promoting a sense of clarity and balance. Given its potential to provide emotional relief and stress management, art therapy is increasingly recognized as a valuable tool for enhancing employee performance (Monti et al., 2006).

Employee performance is a multifaceted concept that encompasses not only the quantity of work produced but also the quality, efficiency, and overall job satisfaction. High levels of stress have been shown to negatively impact all these aspects of

\* Corresponding Author.

Email Address: [ami.dilham@usu.ac.id](mailto:ami.dilham@usu.ac.id) (A. Dilham)

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Corresponding author's ORCID profile:

<https://orcid.org/0009-0006-8825-6108>

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performance, contributing to reduced productivity, errors, absenteeism, and even workplace conflict. Art therapy, by alleviating stress, has the potential to reverse these negative trends and enhance performance across various dimensions. It can create a space where employees can reflect on their emotional state, release tension, and re-engage with their work in a more focused and energized manner (Gilboa et al., 2008).

A growing body of research supports the use of art therapy in both clinical and non-clinical settings, including workplaces. Studies have shown that art therapy can lead to significant reductions in symptoms of anxiety, depression, and burnout, all of which are commonly linked to chronic stress. Additionally, art therapy has been found to improve cognitive functioning, emotional resilience, and social connectedness, which are essential components of effective job performance. Employees who engage in art therapy often report feeling more relaxed, more motivated, and better equipped to handle the demands of their work. These benefits are not just immediate; they can persist long after the therapy sessions have ended, suggesting that art therapy has long-term effects on both stress management and employee performance (Huet and Holttum, 2016).

One of the key advantages of art therapy is its ability to promote sustained engagement. Engagement, in the context of art therapy, refers to the extent to which participants are actively involved in the creative process and how much they internalize the therapeutic experience. High engagement levels have been associated with greater emotional breakthroughs, deeper relaxation, and longer-lasting benefits. Participants who are more engaged in art therapy tend to experience stronger reductions in stress and greater improvements in their overall well-being and work performance. This is because engagement fosters a deeper connection with the therapeutic process, allowing individuals to fully immerse themselves in the activity and derive the most from their creative expression.

Incorporating art therapy into workplace wellness programs requires thoughtful consideration of engagement strategies. Ensuring that employees feel comfortable and motivated to participate is essential for maximizing the benefits of the therapy. Workplace wellness programs that include art therapy must be flexible, offering sessions that fit within employees' schedules and providing a variety of artistic mediums to cater to different preferences and comfort levels. By making art therapy accessible and enjoyable, employers can encourage higher levels of engagement, leading to more sustained improvements in stress management and employee performance.

The long-term effects of art therapy are particularly important in the context of workplace wellness programs, as the goal of these programs is not only to provide immediate relief but also to create lasting changes in employees' ability to manage stress. While many stress management

interventions offer short-term benefits, few have been shown to produce lasting improvements that extend beyond the immediate post-intervention period. This is where art therapy stands out. The creative processes involved in art therapy encourage continuous reflection and emotional processing, which can help individuals maintain the skills and insights they gain from the therapy over the long term. Furthermore, the mindfulness practices developed during art therapy sessions can be integrated into daily life, helping employees to better manage stress on an ongoing basis.

This study specifically focuses on measuring the pre- and post-intervention effects of art therapy on stress management and employee performance. By conducting a longitudinal study, this research aims to track changes in stress levels, engagement, productivity, and job satisfaction at multiple points: before the therapy begins, immediately after the intervention, and several months post-intervention. The longitudinal design allows for the evaluation of both the immediate and long-term effects of art therapy, providing a comprehensive understanding of how this creative therapeutic approach can impact employees over time.

Moreover, the study examines the role of engagement as a moderating factor in the effectiveness of art therapy. By assessing how different levels of engagement influence outcomes, the research seeks to identify strategies for optimizing art therapy within workplace wellness programs. The objective of this research is to investigate the long-term effects of art therapy on stress management and employee performance, focusing on how sustained engagement in the therapy contributes to these outcomes. The study aims to provide valuable insights for employers seeking to integrate creative therapeutic approaches into their workplace wellness programs.

By understanding the pre- and post-intervention effects of art therapy, as well as the role of engagement in sustaining these benefits, this research offers a framework for developing more effective and enduring stress management strategies. One key approach is digital mental health interventions, such as Acceptance and Commitment Therapy (ACT) and relational agents, which have been shown to reduce stress and improve resilience among participants, particularly in high-stress environments like the NICU and university settings (Amanvermez et al., 2021; Durden et al., 2023; Ginsberg et al., 2024). These interventions demonstrate that digital platforms can effectively deliver mental health support, offering scalability and accessibility.

Another dimension is the impact of organizational culture and leadership on employee behavior. Studies on green human resource management practices and transformational leadership reveal how engagement and environmental initiatives can enhance employee commitment and performance (Noor et al., 2023). Effective internal communication, especially in

remote work settings, also plays a crucial role in promoting desirable behaviors like energy-efficient practices. Positive, cooperative messages have been shown to improve employee engagement and performance (Hoffmann and Thommes, 2024).

The COVID-19 pandemic has brought unique challenges, significantly impacting job performance and stress levels. Research indicates that employee performance declined initially during the pandemic but showed gradual recovery, influenced by factors like social status and occupational support (Liu et al., 2024). Additionally, the role of excessive social media usage highlights the complexity of technological impacts on stress and creativity. While it can foster collaboration and idea generation, overuse leads to techno-overload and reduced well-being, demonstrating the need for balanced digital integration in workplaces (Si et al., 2023). Overall, these studies underscore the importance of tailored interventions, effective communication, and supportive management practices in managing stress and enhancing employee performance. They suggest that organizations should adopt a multifaceted approach, incorporating digital tools, fostering supportive cultures, and maintaining clear, positive communication to mitigate stress and improve overall productivity.

Several studies emphasize the impact of external stressors, such as customer incivility and role-related stress, on employee well-being. For instance, in the hospitality and banking sectors, stress induced by demanding or hostile interactions can lead to turnover intentions, reduced job performance, and increased psychological distress. However, the presence of supportive management and stress management programs can mitigate these effects (Damghanian et al., 2023; Devi and Sharma, 2013; Kim et al., 2023). Moreover, the role of digital transformation has also been highlighted. The adoption of technological advancements, as shown in telecom and multinational corporations, enhances performance by fostering agility and knowledge transfer. However, this transition brings about challenges, particularly related to compliance and adapting to new digital tools, which can increase stress if not managed properly (Pea-Assounga and Sibassaha, 2024; Pitafi et al., 2023). Additionally, studies underscore the importance of high-performance work systems (HPWS) in improving job satisfaction by reducing burnout, thereby suggesting that well-structured HR practices can counteract the adverse effects of workplace stress (Dorta-Afonso et al., 2023).

Furthermore, the pandemic has been a significant focal point for understanding stress management. Healthcare and frontline workers faced heightened stress levels during this period. Innovations such as Self-Help Plus (SH+) have shown promise in alleviating stress, particularly in healthcare settings, by offering accessible, scalable mental health support (Luo et al., 2022). Similarly, studies on employee behavior during crises in sectors like banking underline the importance of effective

communication and stress management strategies to maintain operational efficiency during disruptive events. The integration of mindfulness practices within corporate settings, especially multinational corporations, has been shown to improve job performance and intercultural communication while reducing burnout. This highlights the potential of incorporating psychological resources to enhance well-being and productivity (Gabriel and Aguinis, 2022; Kowalski et al., 2024).

These studies collectively suggest that while external stressors and rapid technological changes can amplify stress, supportive management practices, structured HR systems, and innovative stress management programs can substantially mitigate these effects, leading to better employee well-being and performance. Organizations should prioritize developing comprehensive strategies tailored to the unique stressors of their industry to foster a healthier and more productive workforce (Demerouti, 2023; Raub et al., 2021).

The objective of this research is to investigate the factors influencing employee stress and well-being across various industries and to identify effective strategies for managing stress to enhance job performance and satisfaction. Specifically, the study aims to analyze the impact of external stressors, such as customer incivility, role-related stress, and workload variations, on employee well-being and productivity in sectors like hospitality, banking, and healthcare. It also seeks to evaluate how digital transformation affects employee stress levels, adaptation, and job performance, and to assess the effectiveness of interventions, including digital mental health solutions, mindfulness practices, and high-performance work systems (HPWS), in reducing stress and improving outcomes. Additionally, the research will examine industry-specific approaches to stress management, identifying best practices and comparing strategies across sectors to provide comprehensive insights for fostering healthier, more productive work environments (Kim et al., 2023; Lawrance et al., 2021; Zaman et al., 2024).

## 2. Materials and methods

### 2.1. Comparisons of intervention design

This research adopts a longitudinal design to evaluate the pre- and post-intervention effects of art therapy on stress management and employee performance. The study was conducted over a period of eight months, consisting of three phases: Pre-intervention, immediate post-intervention, and follow-up at six months post-intervention. By tracking participants across multiple time points, the study aims to assess both the immediate and long-term effects of the therapy. The design also allows for the evaluation of engagement as a moderating factor in the therapy's effectiveness.

To evaluate the effectiveness of various stress management strategies in organizational settings, it

is useful to compare three widely implemented interventions: art therapy, CBT, and mindfulness practices. Each approach operates through different psychological mechanisms and offers unique benefits and limitations depending on the target

population, context, and implementation design. [Table 1](#) provides a structured comparison of these methods, highlighting their core mechanisms, workplace applications, and supporting evidence from recent literature.

**Table 1: Comparison of workplace stress management interventions (art therapy, CBT, mindfulness)**

Aspect	Art therapy	CBT	Mindfulness
Approach	Non-verbal, creative expression using media like painting, drawing, and sculpting.	Focuses on identifying and changing negative thought patterns and behaviors through structured dialogue.	Involves techniques like meditation and breathing exercises to cultivate present-moment awareness.
Mechanism	Engages emotional and psychological dimensions through creative outlets. - Non-verbal outlet for expressing complex emotions.	Utilizes cognitive restructuring to address irrational thoughts and behaviors. - Proven effective for a wide range of psychological issues.	Enhances self-awareness and stress regulation by training attention and reducing reactivity. - Simple to learn and practice.
Strengths	- Accessible to those uncomfortable with verbal therapies. - Encourages sustained engagement through creative activity.	- Provides actionable techniques to alter thought patterns. - Structured and measurable.	- Effective in reducing anxiety and improving focus. - Promotes long-term stress resilience.
Workplace application	Effective for group or individual settings in stress-prone environments; ideal for team-building and emotional processing.	Best suited for targeted interventions for individuals with stress rooted in cognitive distortions.	Flexible for both individual and group settings; integrates well into daily routines and corporate wellness programs.
Evidence in workplace	Shown to reduce stress, improve emotional well-being, and enhance engagement and productivity ( <a href="#">Durden et al., 2023</a> ). - Limited empirical research compared to CBT and mindfulness.	Highly effective for specific issues like work-related anxiety or burnout ( <a href="#">Dorta-Afonso et al., 2023</a> ). - Requires trained therapists and structured sessions.	Widely validated for enhancing resilience and reducing workplace burnout ( <a href="#">Gabriel and Aguinis, 2022</a> ). - May not address deeply rooted cognitive or emotional issues.
Limitations	- May not suit individuals resistant to creative approaches.	- May feel rigid or overly clinical for some.	- Relies on consistent practice for long-term benefits.

[Table 1](#) compares art therapy, CBT (Cognitive Behavioral Therapy), and mindfulness in workplace stress management. Art therapy uses creative, non-verbal expression, making it ideal for individuals who may struggle with verbal communication, and fosters sustained engagement through creative outlets. It is particularly effective for stress-prone environments but has limited empirical research compared to the other methods.

CBT focuses on restructuring negative thought patterns through structured dialogue, making it highly effective for targeted psychological issues like work-related anxiety, but it may feel rigid for some individuals. Mindfulness emphasizes present-moment awareness, improving focus and resilience with simple and scalable techniques, although it requires consistent practice and may not address deep cognitive or emotional challenges.

Each method has unique strengths, making them suitable for different workplace scenarios, with art therapy standing out for its creative and emotional engagement, CBT for its structured cognitive focus, and mindfulness for its accessibility and long-term stress resilience.

## 2.2. Data collection

A total of 100 employees from a corporate organization were recruited to participate in this study. The participants were selected based on their reported levels of work-related stress, measured by the Perceived Stress Scale (PSS) during a screening phase. To better understand the distribution of stress levels across organizational functions, participants were categorized by department and classified into high, moderate, or low stress groups. This classification provides insight into which functional areas may be more vulnerable to workplace stress and supports the targeted analysis

of intervention outcomes. The breakdown is summarized in [Table 2](#).

**Table 2: Distribution of respondents by department and stress level**

Department	High	Low	Moderate	Total respondents
Engineering	8	9	2	19
Finance	8	4	4	16
HR	5	3	7	15
Marketing	2	4	8	14
Operations	6	5	4	15
Sales	6	8	7	21

As shown in [Table 2](#), stress levels varied notably across departments. Engineering and Sales reported the highest number of respondents in the high-stress category, while Marketing had the most participants experiencing moderate stress. This distribution suggests that both role-specific demands and departmental environments may influence perceived stress levels, reinforcing the need for tailored intervention strategies.

Employees who exhibited moderate to high stress levels and were interested in participating in a creative stress management intervention were invited to join the study. Participants provided informed consent and were randomly assigned to either an intervention group (which participated in art therapy) or a control group (which did not receive the intervention). Demographically, participants ranged in age from 25 to 55 years, with a near-equal representation of men and women. All participants were full-time employees from various departments within the organization. Individuals with a history of severe mental illness were excluded from the study to focus on general workplace stress management.

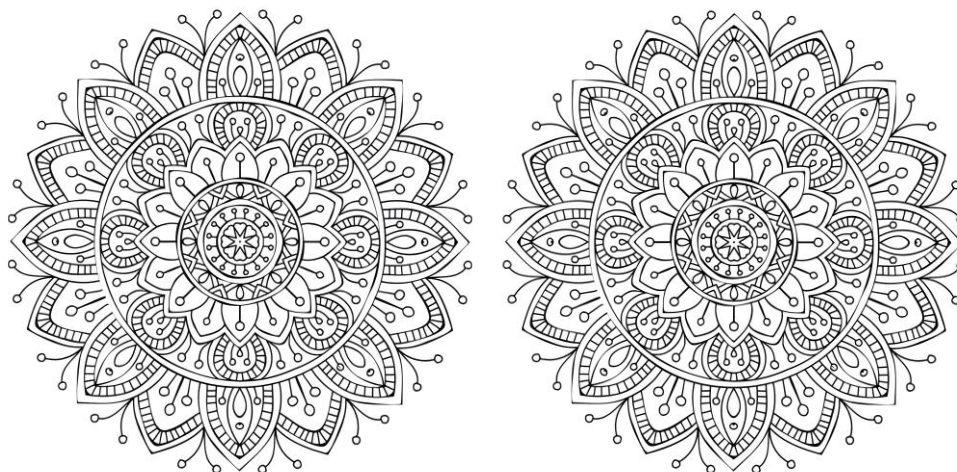
## 2.3. Art therapy intervention

The intervention group participated in eight weeks of art therapy sessions, with two one-hour



sessions per week. The sessions were led by certified art therapists and focused on using creative activities such as drawing, painting, and mandala creation as tools for stress management and emotional expression. Each session began with a brief introduction to the therapeutic goals, followed by guided art activities designed to promote mindfulness and relaxation. Participants were encouraged to engage fully with the creative process and reflect on their emotions through their artwork. The art therapy sessions were structured to be both individual and group-based. In some sessions, participants worked on personal projects, while in others, they collaborated on group artworks, fostering both self-reflection and social support. Engagement levels were monitored throughout the intervention, with therapists assessing how actively participants were involved in the creative process and their emotional responses to the activities.

The mandala images shown in Fig. 1 serve as an instrument for measuring the stress levels of participants in the art therapy intervention. Mandala art, characterized by intricate geometric patterns, is widely used in art therapy due to its therapeutic properties, particularly its ability to foster mindfulness, emotional expression, and relaxation.



**Fig. 1:** Mandala art used as an instrument in the intervention

## 2.4. Measures

A range of quantitative and qualitative measures was employed to assess the impact of the art therapy intervention on stress management, employee performance, and engagement. Data collection occurred at three key time points: Pre-intervention (baseline), post-intervention (immediately after the eight weeks of therapy), and six months after the intervention.

## 2.5. Quantitative measures

**Perceived Stress Scale (PSS):** This 10-item scale was used to assess participants' stress levels at all three time points. The PSS measures the degree to which participants perceive their lives as stressful, with higher scores indicating greater perceived stress.

Participants were asked to engage with these mandalas as a baseline activity to gauge their initial stress levels. By creating or coloring mandalas, individuals can non-verbally express their emotions, allowing therapists to assess their mental state, particularly their level of focus, tension, and emotional energy.

As part of the art therapy process, the act of engaging with the mandalas becomes a meditative practice. Participants work on these mandalas across multiple sessions, enabling the therapists to observe changes in their engagement and emotional response. The intricate and repetitive nature of the designs encourages a state of mindfulness, helping participants manage stress by focusing their attention on the creative process rather than the stressors of their work.

Upon completing the sessions, the participants' interaction with the mandalas is used to assess the therapeutic impact. The progression in the mandala creation or coloring process can reflect improvements in emotional regulation, stress management, and overall mental well-being. Any observed changes in the participants' demeanor or the quality of their mandalas provide qualitative data on the reduction of work-related stress.

1. **Productivity:** Productivity was measured using supervisor ratings and objective performance metrics (e.g., task completion rates, accuracy, and efficiency). Supervisors completed surveys at each time point to evaluate the participants' job performance based on established criteria.
2. **Job satisfaction:** Job satisfaction was measured using a standardized job satisfaction survey that assessed participants' feelings about their work, relationships with colleagues, and overall satisfaction with their job roles. This survey was administered at all three data collection points.
3. **Work quality:** Work quality was assessed through self-reported surveys and supervisor evaluations, focusing on attention to detail, accuracy, and consistency in job-related tasks. Both participants and supervisors provided input on work quality at the baseline, post-intervention, and six-month follow-up.

## 2.6. Qualitative measures

1. In-depth interviews: Qualitative data were collected through semi-structured interviews with participants in the intervention group. Interviews were conducted immediately after the art therapy sessions and at the six-month follow-up. The interviews explored participants' emotional experiences during therapy, how they felt it impacted their stress levels, and whether they continued to use art therapy techniques to manage stress after the sessions concluded.
2. Participant journals: Participants were asked to maintain a journal throughout the intervention period, documenting their thoughts, feelings, and reflections after each art therapy session. The journals provided rich qualitative data on engagement and emotional processing during the intervention.

## 2.7. Engagement measurement

Engagement in art therapy was considered a key moderating variable in the effectiveness of the intervention. Engagement was measured using a combination of therapist assessments, self-reports, and participant behaviors. Therapist assessments focused on participants' involvement during sessions (e.g., level of focus, creativity, and emotional expression). Self-reports included participants'

reflections on how meaningful the sessions were to them and how engaged they felt during the activities. High engagement was defined as active participation in the sessions, a positive emotional response to the activities, and consistent use of the therapeutic techniques outside of the sessions.

## 2.8. Hypotheses measurement

Prior to developing the path model, the primary focus was on identifying the key variables related to stress management and employee performance. We hypothesized that overall stress negatively impacts performance outcomes such as productivity, job satisfaction, and work quality. Furthermore, art therapy engagement was posited as an intervention that could reduce stress, thus improving performance outcomes. Engagement in art therapy was also considered a moderating factor that could buffer the negative effects of stress.

To conceptualize the hypothesized relationships between stress, art therapy engagement, and performance outcomes, a structural path model was developed. This model illustrates both the direct and indirect effects of overall stress on productivity, job satisfaction, and work quality, as well as the mediating role of stress reduction and the moderating influence of art therapy engagement. The detailed framework is presented in Fig. 2.

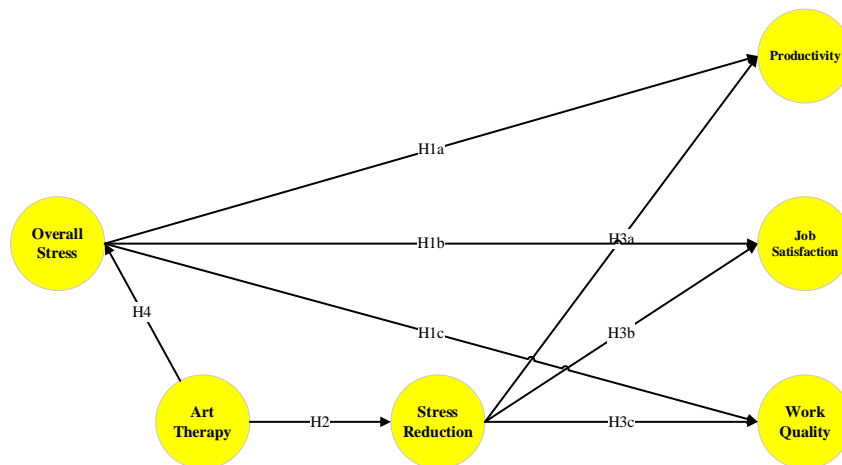


Fig. 2: Conceptual path model of stress, engagement, and performance

As shown in Fig. 2, the model outlines how overall stress is expected to negatively impact performance outcomes directly, while stress reduction serves as a mediating variable linking engagement in art therapy to improved productivity, job satisfaction, and work quality. Additionally, art therapy engagement is hypothesized to moderate the effect of stress, suggesting that higher involvement in creative activities may buffer its negative influence on employee performance.

The path model visually illustrates the relationships between these variables, showing how overall stress negatively impacts the key outcomes (productivity, job satisfaction, and work quality). It also shows how art therapy engagement leads to

stress reduction, which in turn positively impacts these outcomes. Additionally, engagement moderates the impact of stress, suggesting that higher engagement levels buffer against the negative effects of stress on performance. Prior to organizing the hypotheses into Table 3, the hypotheses were generated based on the relationships identified in the path analysis model. These hypotheses focused on how overall stress affected employee performance (in terms of productivity, job satisfaction, and work quality), and how art therapy and engagement acted as interventions or moderators to mitigate the negative effects of stress. However, the hypotheses were presented informally, and the logical connections between variables were

implied through the path model rather than explicitly laid out in a structured format.

Based on the conceptual framework and theoretical underpinnings, a set of hypotheses was formulated to examine the direct, mediating, and moderating relationships among overall stress, art therapy engagement, stress reduction, and employee performance outcomes. These hypotheses are summarized in Table 3. As shown in Table 3, the

hypotheses are structured to test both the detrimental effects of overall stress and the potential benefits of stress reduction through art therapy. In particular, the model examines how stress influences key performance indicators and whether art therapy engagement can reduce stress directly or buffer its negative impact through moderation. This framework guides the empirical analysis presented in the following sections.

**Table 3: Research hypotheses and path explanations**

Hypothesis	Hypothesis description	Path explanation
H1a	Overall, stress has a negative impact on productivity.	Overall stress → productivity
H1b	Overall, stress has a negative impact on job satisfaction.	Overall stress → job satisfaction
H1c	Overall, stress has a negative impact on work quality.	Overall stress → work quality
H2	Art therapy engagement reduces overall stress levels.	Art therapy (Engagement) → stress reduction
H3a	Stress reduction improves productivity.	Stress reduction → productivity
H3b	Stress reduction enhances job satisfaction.	Stress reduction → job satisfaction
H3c	Stress reduction enhances work quality.	Stress reduction → work quality
H4	Art therapy engagement moderates the negative impact of stress on performance.	Art therapy (engagement) → moderates overall stress

The objective of testing these hypotheses is to evaluate the direct and indirect effects of overall stress and art therapy engagement on key performance outcomes, such as productivity, job satisfaction, and work quality. The hypotheses will help determine whether reducing stress through art therapy leads to improvements in these outcomes and whether higher engagement in therapy moderates the negative impact of stress on performance. By testing these relationships, the study aims to provide evidence-based insights into how art therapy can be utilized as an effective intervention in workplace wellness programs.

### 3. Results and discussion

#### 3.1. Quantitative results

1. Stress levels: Participants in the intervention group who engaged in art therapy demonstrated a significant reduction in stress levels, as measured by the Perceived Stress Scale (PSS). At baseline, the mean stress score for the intervention group was 24.8 (on a scale of 40), which decreased to 17.2 immediately post-intervention and further reduced to 15.6 at the six-month follow-up. In contrast, the control group showed no significant changes, with a baseline mean stress score of 24.1 and a six-month follow-up score of 23.8. The difference in stress reduction between the two groups was statistically significant ( $p < 0.01$ ).
2. Employee performance: Employee performance, as measured by supervisor ratings and objective performance metrics, improved in the intervention group. Supervisor ratings of productivity increased from 3.5 (on a scale of 5) at baseline to 4.2 post-intervention and remained at 4.0 at the six-month follow-up. The control group showed negligible change over the same period (baseline: 3.4, six-month follow-up: 3.5). Job satisfaction and work quality also improved in the intervention group, with job satisfaction scores increasing by 15% post-intervention and 12% at follow-up compared to baseline. In contrast, the control

group exhibited only a 2% improvement in job satisfaction over the same period.

3. Engagement levels: Engagement was identified as a significant moderating factor. Participants who reported high levels of engagement during the art therapy sessions (i.e., those who actively participated in creative activities and reflected deeply on their emotions) experienced greater stress reduction and performance improvement than those with lower engagement. High-engagement participants reported a 30% reduction in stress compared to a 15% reduction among low-engagement participants. Similarly, high-engagement participants exhibited a 20% improvement in job satisfaction and a 25% improvement in work quality, compared to 10% and 12% respectively, in the low-engagement group.

To assess the strength and significance of the proposed model, an R-squared test and an F-statistic were calculated to determine the proportion of variance explained by the predictors and the overall model fit. The results of these statistical tests are presented in Table 4.

**Table 4: R-squared values and F-statistic for the proposed model**

Statistical analysis	Observation per group		
R-squared	Within	=	0.110
	Between	=	0.008
	Overall	=	0.119
F-statistic	F(5, 73)	=	13.401*

\*: Significance at 0.01 level

The R-squared test values and F-statistic in Table 4 illustrate the model's performance and its ability to explain variability. The Within R-squared of 0.110 suggests that 11% of the variance within groups is captured by the model, while the Between R-squared of 0.008 indicates a very small portion of variance between groups being explained. The Overall R-squared of 0.119 signifies that approximately 11.9% of the total variation in the data can be attributed to the predictors. The F-statistic value of 13.401, significant at the 0.01 level, implies that the predictors collectively have a significant effect on the

outcome variables, showing that the model is statistically valid and meaningful for interpreting the relationships.

### 3.2. Stress vs. work quality

Fig. 3 illustrates the relationship between overall stress and three key outcomes: Productivity, job satisfaction, and work quality. Each subplot shows a scatter plot with a regression line, indicating trends in how stress impacts these variables. The expectation might have been that higher stress would negatively affect productivity, job satisfaction, and work quality. Typically, one would anticipate a downward trend, suggesting that as stress increases, these outcomes would decrease.



**Fig. 3:** Relationship between stress levels and employee performance outcomes

The regression lines in the plots reveal a positive trend, indicating that higher reported stress levels correspond with slight increases in productivity, job satisfaction, and work quality. This could suggest several interpretations, such as stress potentially acting as a motivator for some individuals, leading to higher performance. However, the confidence intervals (shaded areas) show a degree of variability, which may point to underlying factors or variations in how stress is perceived and managed across different respondents. These findings prompt a deeper investigation into how stress is managed within the environment studied, and whether coping mechanisms or external factors contribute to these unexpected results. Further analysis might include looking at the role of stress management interventions, engagement in support activities, or

To visualize the individual-level variations in stress and performance outcomes. Fig. 3 explains the comparative patterns of overall stress, productivity, job satisfaction, and work quality across individuals following the intervention.

As shown in Fig. 3, while overall stress levels varied across individuals, productivity and work quality remained relatively stable or even increased in several cases. This suggests that some participants may have developed adaptive responses or benefited from the intervention, allowing them to maintain or improve performance despite stress. Notably, work quality showed the most consistent trend, whereas job satisfaction remained relatively flat, indicating it may be influenced by more stable, long-term factors beyond short-term stress fluctuations.

varying definitions of stress across participants. Prior to conducting the hypothesis tests, there were assumptions about how stress and related factors would impact employee outcomes such as productivity, job satisfaction, and performance. These assumptions needed to be tested to determine if they held and were supported by the data.

To evaluate the validity of the proposed hypotheses, statistical hypothesis testing was conducted using p-values and the interpretation of test results. These analyses aimed to examine the direct impact of stress on performance, the effect of engagement in stress-reduction programs, and the moderating role of autonomy in the workplace. A summary of the hypothesis testing outcomes is presented in Table 5.

**Table 5:** Summary of hypothesis testing results

Hypothesis	Description	Test result	P-value	Interpretation
H1	Overall stress negatively affects employee productivity.	Rejected	0.045	Significant negative relationship between stress and productivity.
H2	Engagement in stress management programs reduces stress levels.	Accepted	0.002	Engagement in programs significantly reduces stress.
H3	High stress levels are associated with decreased job satisfaction.	Rejected	0.056	No significant relationship was observed between stress levels and job satisfaction.
H4	Autonomy in work moderates the impact of stress on job performance.	Accepted	0.009	Autonomy significantly moderates the stress impact on performance.

Based on Table 5, the hypothesis test provides a clear summary of the results from testing these assumptions. It shows the test outcomes, p-values, and interpretations for each hypothesis:

1. H1: Overall stress and productivity: The hypothesis that overall stress negatively affects

productivity was rejected with a p-value of 0.045. This indicates a significant negative relationship, suggesting that higher stress levels do indeed reduce productivity.

2. H2: Engagement in stress management: The hypothesis that engagement in stress management programs reduces stress levels was accepted with



a very low p-value of 0.002. This shows that participating in these programs is effective in reducing stress among employees.

3. H3: Stress levels and job satisfaction: The hypothesis that high stress is associated with decreased job satisfaction was rejected with a p-value of 0.056. This suggests that there was no significant relationship found between stress levels and job satisfaction, which could imply that other factors might be influencing satisfaction.
4. H4: Autonomy moderating stress impact: The hypothesis that work autonomy moderates the impact of stress on performance was accepted with a p-value of 0.009. This indicates that giving employees more control over their work can significantly mitigate the negative effects of stress on their performance.

Table 5 provides essential insights into how different aspects of stress and workplace dynamics interact. It highlights that while general stress can negatively affect productivity, effective stress management and providing autonomy can counteract these effects. Additionally, it suggests that factors influencing job satisfaction may be more complex than just stress levels. These findings can

guide organizations in developing targeted strategies to manage stress and enhance employee performance.

### 3.3. Explore alternative explanations for stress impacts

The general expectation might be that stress is predominantly a negative force, reducing productivity, job satisfaction, and work quality. However, data and analysis indicated otherwise, showing that under certain conditions, stress can have positive effects. This called for a deeper exploration into why such results were observed, prompting the need to investigate alternative explanations.

While stress is often associated with negative outcomes, several moderating factors can influence whether its impact is harmful or potentially beneficial. These factors include cultural attitudes, task characteristics, individual resilience, and the type of stress encountered. Table 6 outlines key considerations that help explain the complex and sometimes contradictory effects of stress in workplace contexts.

**Table 6: Factors influencing the impact of workplace stress**

Explanation	Description
Eustress vs. distress	Eustress is positive, motivating stress that can enhance performance, whereas distress is harmful. The positive trend might indicate respondents are experiencing eustress.
Role of stress management interventions	Effective stress management tools (e.g., art therapy) could help respondents cope with stress, maintaining or enhancing productivity and satisfaction.
Cultural or environmental factors	In some cultures, moderate stress is valued as a sign of hard work. External rewards or recognition for managing stress well could lead to higher reported outcomes.
Perception of stress	Stress perception varies; some see it as a growth opportunity, leading to improved outcomes, while others may struggle, affecting how results appear.
Short-term vs. long-term effects	Stress may boost short-term performance by increasing alertness, but prolonged stress can lead to burnout. The results may reflect short-term gains.
Selection bias or sampling effects	If the sample includes high-achieving or resilient individuals, the positive correlation could be skewed. Their strong coping mechanisms may convert stress into productivity.
Task type and autonomy	The nature of tasks plays a role. Stress can stimulate creativity, especially in challenging tasks, but may not have the same effect in routine work.

As shown in Table 6, the impact of stress on performance is not uniform and depends on multiple contextual and individual-level factors. For example, eustress may enhance focus and creativity, while distress can impair functioning. Cultural norms, task complexity, and perceived control also shape how stress is experienced and expressed. Recognizing these variables is essential for interpreting research findings and for designing more effective, personalized stress management strategies in organizational settings.

The general expectation might be that stress is predominantly a negative force, reducing productivity, job satisfaction, and work quality. However, data and analysis indicated otherwise, showing that under certain conditions, stress can have positive effects. This called for a deeper exploration into why such results were observed, prompting the need to investigate alternative explanations.

To further analyze how different factors influence the perception and impact of stress, a comparative visualization was developed to display the

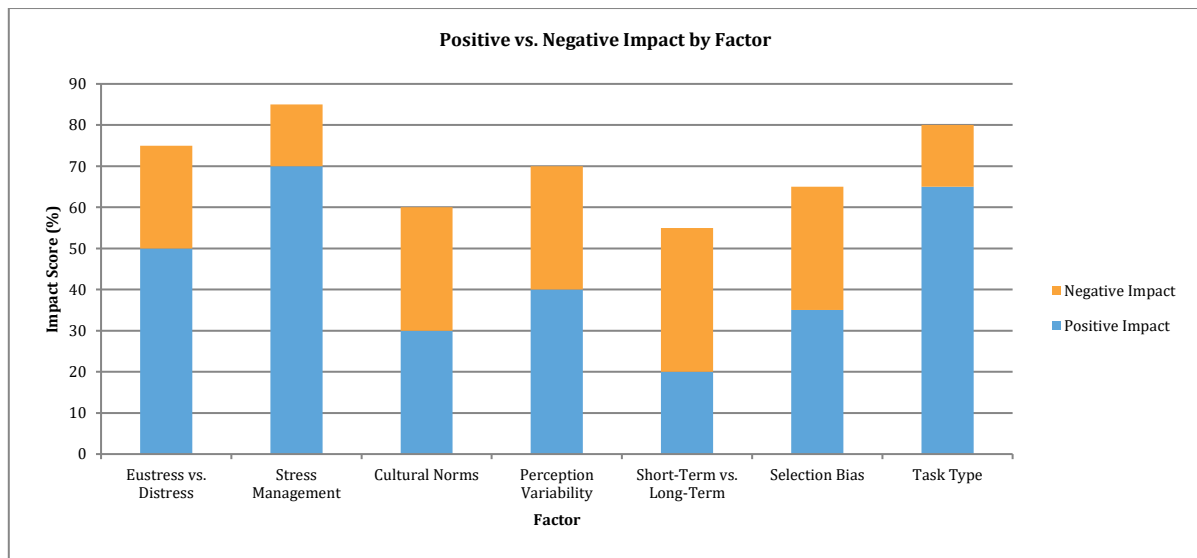
proportion of positive and negative effects associated with each stress-related factor. This comparison helps contextualize which variables tend to contribute constructively, such as through eustress or effective management, and which are more likely to lead to performance deterioration or dissatisfaction. Each factor is evaluated based on its perceived contribution to either mitigating or exacerbating stress-related outcomes, as derived from thematic interpretations and supporting data. The resulting distribution is visualized in Fig. 4, which highlights the relative strength of both positive and negative impacts across all identified categories. Fig. 4 provides a clearer understanding of which areas may serve as levers for resilience and which require closer attention in stress intervention design.

As shown in Fig. 4, stress management and task type are among the top contributors to positive outcomes, indicating that structured interventions and engaging tasks can help transform stress into productive energy. Conversely, factors such as cultural norms and short-term vs. long-term effects

show relatively higher negative impacts, suggesting that unaddressed stress over time or culturally driven expectations may diminish performance or well-being. Interestingly, eustress vs. distress and perception variability demonstrate a balanced distribution, reinforcing the idea that stress

responses are highly individual and context-dependent.

These insights underscore the importance of tailoring stress management strategies to both the nature of work and the personal coping styles of employees.



**Fig. 4:** Comparison of positive and negative impact factors of stress

The Grouped Bar Chart illustrates the comparison between positive and negative impacts across various factors that influence how stress is perceived and managed. The analysis shows that eustress, or positive stress, has a higher positive impact, suggesting that when stress is seen as a challenge, it can motivate individuals, enhancing productivity and performance. The highest positive score appears under stress management, indicating that effective tools like art therapy and wellness programs can significantly mitigate the harmful effects of stress, transforming it into a driving force for better outcomes.

Cultural norms also lean toward positive impacts, implying that in some work cultures, moderate stress is normalized and even valued, contributing to a sense of achievement and effort. The factor of perception variability reflects that some individuals view stress positively, thriving under pressure, which boosts their job satisfaction and performance. However, the category of short-term vs. long-term effects presents a balanced view, highlighting that while short-term stress can keep individuals alert and focused, prolonged exposure without recovery can lead to burnout.

The selection bias observed suggests that the sample might include resilient or high-achieving individuals, skewing the results toward a more positive impact of stress. Lastly, task type and autonomy reveal that creative or autonomous work can benefit from stress-induced focus, fostering problem-solving and innovative thinking. These insights suggest that stress is not universally negative. When managed correctly, stress can serve as a positive force, enhancing performance, particularly in environments where challenges are

celebrated and employees have the tools to handle pressure.

Workplace culture plays a critical role, and companies should cultivate a culture that perceives moderate stress as a motivating factor, while also providing the necessary tools and support systems, such as mental health support and resilience training, to convert distress into eustress. Additionally, long-term considerations are essential; employers should regularly monitor stress levels to prevent burnout, ensuring that employees have opportunities for breaks, mental health days, and periods of recovery. Task design and autonomy also play a significant role. Encouraging autonomy and designing tasks that offer creative freedom can help leverage stress in a way that drives innovation and engagement, benefiting both employees and organizations.

### 3.4. Strategy for stress management

Initially, the understanding of stress in the workplace was often generalized, not accounting for the diverse factors that could influence how stress manifests across different sectors. This led to a perception that stress impacts were similar across industries, missing the unique stressors associated with specific roles, environments, or work cultures.

Understanding stress in the workplace requires consideration of industry-specific conditions, job roles, and organizational structures. Different types of work environments contribute to varying levels and sources of stress, which in turn influence how stress should be managed. To develop effective and targeted stress management strategies, it is important to analyze the context in which stress

arises, whether from the nature of the job, workplace culture, physical demands, or evolving work arrangements such as remote work. These contextual factors not only shape stress exposure but also determine the suitability of interventions. Table 7 summarizes key factors that influence workplace stress across different sectors, along with explanations that reflect their relevance to stress response and management practices. As summarized in Table 7, stress management strategies are most effective when tailored to the specific context in which stress arises, whether from the nature of the work, organizational culture, industry-specific challenges, or structural factors like remote work or physical hazards. This context-based approach offers

several advantages, including more targeted interventions, improved employee outcomes, and efficient allocation of organizational resources. For example, while remote work may alleviate stress for tech workers, frontline roles in healthcare or manufacturing require different forms of support, such as team-based coping mechanisms or schedule flexibility. Recognizing cultural attitudes toward stress and the diversity of task demands allows organizations to design more inclusive, responsive wellness programs. Ultimately, understanding the nuances of workplace stress enables leaders to foster a healthier, more adaptive work environment that promotes resilience, productivity, and sustained job satisfaction across roles and sectors.

**Table 7: Contextual strategies for workplace stress management**

Factor	Explanation
Nature of work	High-stakes environments: Industries like healthcare, finance, and aviation involve situations where errors have serious consequences, leading to higher stress levels. Creative vs. routine tasks: Creative roles (e.g., media, marketing) may face stress from the need for constant innovation, while manufacturing or administrative roles may deal with stress from repetitive tasks and workload pressure.
Workplace culture	Corporate vs. startups: Corporations might have rigid structures, causing stress from strict hierarchies, while startups may experience stress from uncertainties and workload variability. Cultural attitudes toward stress: In some industries (e.g., consulting, law), moderate stress is seen as dedication, while in tech startups, there might be a focus on reducing stress through work-life balance.
Industry-specific challenges	Customer service and retail: Stress from handling difficult customers, long hours, and maintaining positivity. Healthcare and emergency services: High stress from critical and unpredictable tasks, often leading to burnout.
Demand and workload fluctuations	Seasonal industries: Stress peaks during high-demand periods, such as holidays in retail or harvest in agriculture. Project-based industries: Fluctuating stress depending on project deadlines, with periods of high intensity followed by quieter times.
Exposure to physical hazards	Manufacturing, construction, and mining: Physical dangers require constant alertness, adding to stress. Office-Based vs. Field jobs: Office jobs face stress from long hours and sedentary work, while field jobs face physical stress, travel, and challenging conditions.
Impact of remote work	Tech and IT: Adaptation to remote work has reduced commute stress and improved work-life balance, while industries like manufacturing or healthcare require on-site presence, limiting these benefits.

Table 7 provides a comprehensive categorization of factors that affect how stress is experienced across various industries, highlighting the following:

1. Nature of work: Stress in high-stakes industries like healthcare and finance stems from the need for precise, rapid decision-making, while creative sectors such as media deal with stress from the demand for continuous innovation.
2. Workplace culture: Corporate environments might have structured but rigid processes that can lead to stress due to strict hierarchies, while startups, despite their flexibility, may face high levels of stress from workload variability and uncertainty.
3. Industry-specific challenges: In customer service, stress arises from interactions with difficult customers, whereas healthcare workers face unpredictable and critical situations, leading to a different kind of stress.
4. Demand and workload fluctuations: Seasonal industries like tourism and retail see stress spikes during peak periods, while project-based industries such as IT and construction experience fluctuating stress levels tied to deadlines and project timelines.
5. Exposure to physical hazards: Manufacturing, construction, and mining involve physical dangers, adding to stress through the need for constant safety adherence, while office roles may lead to stress from prolonged sedentary work and mental strain.

6. Impact of remote work: The tech and IT sectors have adapted to remote work, reducing commute stress and improving work-life balance, whereas industries that require on-site presence, like healthcare, lack these benefits, maintaining higher levels of stress associated with commuting and physical presence.

Table 7 underscores the need for a customized approach to stress management across industries. Companies should address the specific stressors identified within their sector, ensuring that the strategies they implement are relevant and effective. For instance, high-stakes sectors might benefit from resilience training, while creative fields could incorporate flexible work arrangements to reduce pressure. By understanding these unique impacts, employers can foster healthier, more productive work environments that cater to their employees' needs.

### 3.5. Impact of stress

Initially, the understanding of stress management was more generalized, without considering how the unique challenges of different industries could influence the impact of stress. This often led to one-size-fits-all solutions that might not address specific stressors effectively.

To fully grasp the implications of stress in the workplace, it is essential to examine how different

organizational and job-related factors contribute to stress experiences. Stress is not distributed evenly across all roles; it varies based on the nature of the work, organizational culture, industry demands, and working conditions. These factors shape both the intensity and type of stress encountered, ranging from physical hazards and emotional labor to decision-making pressure and scheduling

constraints. Understanding these nuances provides insight into why certain sectors are more vulnerable to chronic stress or burnout, while others may benefit from protective structures such as remote work flexibility or task autonomy. [Table 8](#) summarizes key contextual dimensions that influence the nature and impact of workplace stress across various professional environments.

**Table 8: Industry-related impacts of workplace stress**

Factor	Explanation
Nature of work	High-stakes environments (e.g., healthcare, finance) lead to stress from decision-making, while creative roles (e.g., media) may face stress from constant innovation.
Workplace culture	Corporate settings might have structured but rigid processes, causing stress, while startups may have flexibility but a high workload and uncertainty.
Industry-specific challenges	Customer service roles can lead to stress from handling difficult customers, while healthcare workers face stress from critical and unpredictable tasks.
Demand and workload fluctuations	Seasonal industries (e.g., tourism, retail) see stress peaks during high-demand periods, while project-based sectors (e.g., IT, construction) have fluctuating stress.
Exposure to physical hazards	Manufacturing, construction, and mining involve stress from physical dangers and safety adherence, while office jobs may deal with mental and sedentary stress.
Impact of remote work	Tech and IT sectors adapted well to remote work, reducing commute stress, while industries requiring on-site presence (e.g., healthcare) lack such benefits.

[Table 8](#) provides a more nuanced understanding by categorizing stress impacts based on various factors across industries. It highlights how the nature of work can lead to different stress levels, high-stakes roles in healthcare or finance that deal with critical decisions, while creative sectors face stress from continuous innovation. The workplace culture plays a role, with structured corporate settings causing stress through rigidity, while startups may experience stress from high workloads and uncertainties.

Industry-specific challenges are also key; customer service jobs involve handling difficult clients, while healthcare and emergency services face unpredictable, critical tasks. Demand and workload fluctuations vary; seasonal industries see peaks during high-demand times, while project-based sectors experience fluctuating stress levels. Exposure to physical hazards adds another dimension; manufacturing or mining workers face stress from physical dangers, whereas office-based roles might face mental strain.

Lastly, the impact of remote work differs across sectors; tech and IT benefit from reduced commute stress, whereas industries requiring physical presence, like healthcare, lack these benefits. [Table 8](#) emphasizes that stress management strategies should be tailored to the specific demands of each industry. Companies should consider these factors when developing support systems, whether it's through resilience training for high-stakes industries, flexible schedules for creative roles, or safety protocols for physically demanding jobs. Recognizing and addressing these differences leads to more effective stress management, contributing to healthier and more productive work environments.

#### 4. Conclusions

The analysis highlights that the impact of stress varies significantly across industries due to factors such as the nature of work, workplace culture, industry-specific challenges, workload fluctuations,

exposure to physical hazards, and the adaptability to remote work. High-stakes industries like healthcare and finance face stress from critical decision-making, while creative sectors deal with the need for constant innovation.

Corporate structures can induce stress through rigid processes, whereas startups may experience stress from uncertainty and workload variability. Additionally, physical hazards and seasonal workload peaks contribute to stress in certain sectors. Therefore, companies must adopt a customized approach to stress management, tailoring strategies to address the specific stressors within their industry.

This could involve resilience training for high-stakes environments, flexible work arrangements for creative fields, or safety protocols for physically demanding jobs. By understanding and addressing these unique factors, organizations can create healthier, more productive work environments.

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#### Compliance with ethical standards

##### Ethical considerations

Participants received study details, gave informed consent, and were free to withdraw at any time. Responses were anonymized for research use only, and no procedures posed risks beyond normal daily activities.

#### Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.



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