Journal of Science and Technology in Civil Engineering, HUCE, 2024, 18 (2): 99–112

THE INFLUENCE OF DISTRACTION AND WORKPLACE POLICIES ON MENTAL STATES AND PRODUCTIVITY IN MASONRY TASKS

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Article history:
Received 09/04/2024, Revised 01/05/2024, Accepted 22/05/2024

Abstract

Vietnam's construction sector is confronting the double-edged sword of technology, particularly smartphone distractions. This paper investigates their influence on masons' productivity and mental wellness. Over a period of study, three worker groups—each under varying smartphone access—were studied for changes in productivity, boredom, and mental wellness, measured through surveys and productivity by the daily brick count. The study's design included direct observations and daily surveys. The control group worked without restrictions, the second had limited smartphone access with breaks, and the third prohibited smartphones entirely. Findings indicated that restrictions notably reduced distractions. Initially, boredom increased, and mental wellness decreased but improved beyond control levels over time. The strict policy group displayed the highest productivity and mental wellness. The results illuminate the impact of smartphone restrictions in manual labor contexts, advocating for stringent policies to improve focus and output. The results of the strict restriction – higher mental wellness and productivity, despite an initial adjustment period – support strict smartphone limitations at construction sites. These findings are pertinent for industry stakeholders, suggesting that mindful smartphone use can enhance work quality and mental health. Such policy implications can lead to a more concentrated workforce and greater job satisfaction.

Keywords: masonry; productivity; distraction; mental wellness; workplace policies.

https://doi.org/10.31814/stce.huce2024-18(2)-08 © 2024 Hanoi University of Civil Engineering (HUCE)

1. Introduction

In the bustling and industrious backdrop of Vietnam's growing economy, the construction sector emerges as a cornerstone of developmental ambitions. Despite the nation's diligent strides, Vietnam's productivity lingers relatively low, notably in the Southeast Asian context, as evinced by academic studies spotlighting labor output metrics. Specifically, the productivity per person within this sector languished at 67.7% of the country's average, a mere $5,490 compared to the overall $8,106. This represents an increase of 7.87% from the previous year, where 4.8% is attributed to enhanced worker qualifications [1]. When placed in the broader Southeast Asian landscape, Vietnam's labor productivity supersedes only Cambodia's, trailing behind peers like Malaysia, Thailand, Indonesia, China, and the Philippines. Intriguingly, in the construction sphere alone, Vietnam's productivity hovers at approximately 93% of Cambodia's [2], underscoring a paradox where a country's general economic stride does not necessarily echo within one of its foundational industries. Within this pivotal industry, manual tasks such as masonry, carpentry, tiling, plastering, roofing, painting endure as testaments to traditional workmanship. Yet, when juxtaposed with mechanized counterparts, an intriguing paradox unfolds: the costliness of manual labor is accentuated when gauged against productivity figures. Scholarly analysis delineates a pronounced skew toward manual practices, thereby highlighting an area ripe for efficiency enhancements. The modern workplace landscape is significantly shaped by

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technological progress. The widespread use of smartphones, online platforms, and digital gadgets has the ambiguous consequence of potentially enhancing or impairing workers' mental health and efficiency. This new reality necessitates a thorough investigation into how these factors collectively impact job performance.

In this context, our research focuses on masonry, a fundamental component of construction activity, typically accounting for a large portion of the labor and spanning the longest continuous working periods within the construction process. We chose to study masonry for its prominence in construction and the practicality of conducting controlled experiments, particularly considering its susceptibility to worker distraction. Our aim is to provide insights that extend beyond masonry alone, potentially improving the welfare and productivity of workers engaged in a variety of manual construction tasks. The structure of this paper is as follows: an introduction that sets the stage for our discussion, followed by a review of the literature that examines the complex relationship between work environment and worker satisfaction. The methods section describes a preliminary study that identifies different types of workplace distractions, along with a detailed description of our main experimental setup, survey methodology, and the analytical techniques that have been applied. The subsequent sections report on the findings, delve into a comprehensive analysis, and conclude with a summary of key takeaways and their relevance for everyone involved in the construction industry, from policy makers to workers.

2. Literature Review

The literature review will delve into the specific impacts of workplace distractions, the nuances of manual labor productivity, and the complex interplay between the work environment, mental wellness, and worker engagement. All these factors will form the basis for a comprehensive model linking distraction, boredom, mental wellness, and productivity in the construction industry.

2.1. Labor Productivity and Skills

Linking these theoretical constructs to labor productivity, Sweis et al. [3] analyzed masonry construction productivity in the US, UK, and Jordan, finding differences chiefly in work methods and material handling skills. Jordan used double the unskilled labor per mason than the US and Scotland, relying on labor-heavy practices. The US and UK had comparable productivity levels, while Jordan's higher baseline suggested lower productivity. This study underscores the impact of manual labor efficiency on productivity. Additionally, research into how the work environment influences productivity, through factors like congestion and morale, as well as the need to address workplace distractions, leads to a model aimed at enhancing productivity and mental well-being in construction.

2.2. The Role of Work Environment

The work environment profoundly affects labor productivity in construction, with field factors like site congestion, morale, labor reassignment, and crew size changes playing substantial roles, as indicated by Ovararin and Popescu [4]. Construction efficiency and work safety, reliant on manual labor, is sensitive to such environmental factors [5]. Moreover, the increasing recognition of distractions, including digital devices, highlights their impact on productivity and cognitive focus, affecting work quality. Smartphones provide communication and information benefits but also introduce safety and privacy concerns. This necessitates policies that balance technology use on sites, ensuring productivity and safety are not undermined, as discussed by Sattineni and Schmidt [6].

2.3. Distraction in the Workplace

The concept of distraction in the workplace has been extensively studied, revealing its multifaceted nature and significant impact on work performance. As Namian et al. [7] synchronized from literature: distractions are generally defined as any event that diverts attention from the primary task, potentially impairing the safe and efficient execution of work. This diversion can occur through various channels, whether it be a conversation on a cellphone or an unexpected interruption from a device. Distraction, particularly in the construction industry, can have grave consequences, as the attentional capacity of humans is limited. When this resource is depleted or redirected, the performance of tasks requiring focused attention can deteriorate, leading to increased errors and accidents [8]. Another review by Roper and Juneja [9] review the intrusive nature of distractions, which regarded distractions as elements that tax attentional capacity, forcing the mind to prioritize and, at times, disregard certain stimuli. These distractions not only interrupt but also generate stress, manifesting as uncontrollable and unpredictable information overload. Covey [10] suggests that distractions typically demand immediate attention and action, disrupting the workflow and cognitive focus. Nnaji and Gambatese [11] synthesized distractions into two groups: (1) Internal distractions: Inexperienced crew, Inexperienced (unqualified) supervisor, Inability to retain skilled craftsmen, Multiple languages spoken on construction site, Lack of deserved positive feedback (compliments), Poor attitude towards safety, Lack of personal protective equipment (PPE) and safety resources, No safety incentive; (2) External distractions: Congested site, Lack of familiarity with equipment, Fast pace of work, Adverse weather condition, Frequent interruption/interferences, High number of overlapping work activities for crew, Unpredictability of the work tasks due to unknown information, Many different crews/trades on site at the same time, Low quality.

2.4. Mental Wellness in the Workplace

The mental well-being of workers is another dimension that directly affects job performance. Leung et al. [12] delve into the role of mindfulness and its potential to alleviate job-related stress, which is especially pertinent in high-stress environments like construction sites. Their research posits that certain mindfulness characteristics can indirectly improve performance by reducing stress, with specific aspects like observation and awareness being beneficial for managing both emotional and physical stress. This underscores the potential of psychological strategies and cognitive approaches in enhancing the overall well-being and productivity of construction workers.

2.5. Worker Engagement and Boredom

The notion of worker engagement intersects with the concept of boredom in the construction industry. Microbreaks, or short, informal breaks taken voluntarily between tasks, have been recommended as a strategy to improve workplace outcomes. The effects of these breaks, as investigated by Kau et al. [13], are twofold: they may promote performance and well-being, but the implications for productivity, especially in manual tasks, are not yet fully clear. The challenge lies in balancing the need for rest and mental respite with the potential for breaks to disrupt work and contribute to boredom, particularly in repetitive tasks that require sustained attention. Cummings et al. [14] define boredom in the workplace as the experience of monotonous and repetitive tasks that, despite requiring constant attention, lack stimulation. This state can lead to decreased vigilance and attention, negatively impacting productivity. Thus, understanding the role of boredom and developing strategies to mitigate its effects is critical for maintaining high levels of productivity, especially in manual labor-intensive tasks.

2.6. Impact of Technological Advancements

Mobile technologies have significantly altered the construction industry. Smartphones and tablets, along with their apps, offer numerous benefits like real-time weather updates, digital workflows, and enhanced communication, which streamline operations and foster information exchange on site, as detailed by Sattineni and Schmidt [6]. Yet, these advancements are a double-edged sword; they pose risks of distraction and safety concerns, raise privacy issues, especially with unstable internet connections, and face varied acceptance across the workforce demographics. Additionally, software glitches and application costs present further challenges to their comprehensive integration into construction work processes.

2.7. Development of the Four-Factor sub-model

Building on the insights from these studies, it becomes evident that a sub-model encompassing distraction, boredom, mental wellness, and productivity is required to fully understand and improve construction labor productivity. It is called a sub-model because these four factors are the most prominent and a hollistic model should include many more factors as variables that are difficult to measure. Namian et al. [7] emphasize the influence of distraction on hazard recognition and safety perception, which can also extend to productivity. Additionally, Orhan et al. [15] highlight the impact of technology on self-regulation and work engagement, factors that are intimately tied to worker productivity. The sub-model should consider the correlation between distraction and mental activity using wearable technology, aiming to monitor worker distraction in real-time. This technological approach could offer objective data to inform and refine policies and practices in the construction industry. Moreover, the literature suggests that while focusing on tasks is essential, especially in high-stress jobs, some degree of distraction may actually facilitate coping with job stress and improve performance, as indicated by Shimazu and Schaufeli [16]. Thus, the model should balance the cognitive load and the need for mental engagement to prevent both overstimulation and understimulation, which can lead to decreased productivity.

3. Methodology

This section details the methodological framework adopted for this study, comprising both preliminary investigations and an experimental design aimed at assessing the interrelations between distraction, boredom, mental wellness, and productivity in construction tasks. The methodology framework is deliniated in Fig. 1.

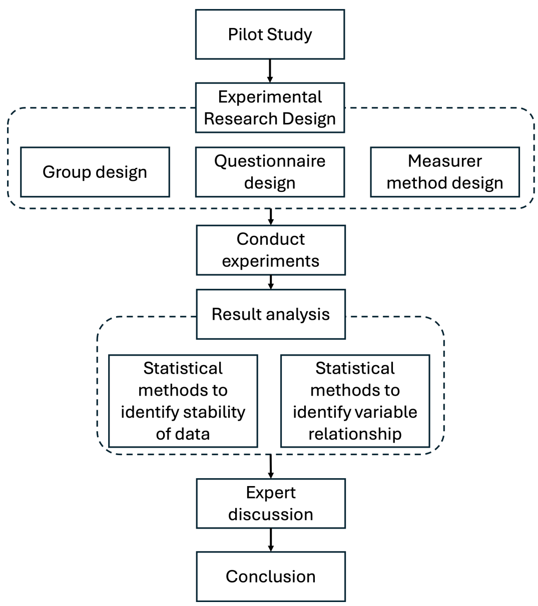

Figure 1. The methodology of the study

3.1. Pilot study

In the preliminary phase of our research, the team conducted field visits to several construction sites to directly observe masonry operations and engage with the workers and foremen involved. A total of 20 masonry work crew members and 3 foremen were interviewed to gather in-depth insights into the nature of their tasks, work arrangements, and the types of distractions they encounter.

Masonry work, being the focal point of this pilot study, was observed in action to understand the setup and execution of tasks. Teams typically consisted of three workers: two highly skilled masons responsible for laying bricks and ensuring precision, and one less skilled laborer tasked with various support activities such as transporting materials and preparing plaster. Effective communication was observed to be vital within and between teams to coordinate efforts and respond to immediate needs or instructions. Various approaches were considered for measuring productivity within this craft. The most straightforward methods involved either counting the number of bricks laid after each work shift or measuring the constructed wall volumes. These quantitative measures provided a clear indicator of output and facilitated comparisons of productivity under different working conditions. Masonry workers usually follow an 8-hour shift pattern with an allocated one-hour lunch break. However, productivity was noted to vary significantly depending on several factors, including whether work was performed indoors or outdoors. To better control variables and understand their impact on productivity, the study decided to focus on either indoor or outdoor settings for subsequent experimental observations. An interesting finding from the interviews was the workers' expressed need for additional short breaks. Beyond the traditional lunch break, there was a desire for two mini-breaks during each half-shift, primarily for personal needs such as using the restroom or smoking. This insight into worker preferences underscores the importance of considering workday structuring as a factor that could influence overall productivity and satisfaction.

The pilot study's qualitative data, grounded in direct observations and interviews, laid the groundwork for developing a comprehensive understanding of the masonry work environment. This understanding informed the design of the main experimental study, which sought to quantify the relationships between distraction, boredom, mental wellness, and productivity, and how these factors dynamically interact within the construction setting.

3.2. *Experiment research design*

Prior to detailing the experimental research design, the research team engaged in a crucial preliminary step: the assembly and consultation of an expert panel. This panel was comprised of five human resource directors, each representing one of the top ten construction companies in Vietnam in the list by [17]. With 15 to 20 years of field experience, these experts brought a wealth of knowledge and insight into construction site operations and worker management.

The purpose of this collaborative endeavor was twofold. Firstly, to align the research objectives with the practical and strategic interests of the companies, particularly regarding the development of effective workplace policies. Secondly, to refine the methodology based on expert insights to ensure its relevance and applicability in the context of Vietnamese construction work practices. At the outset, the researchers facilitated an orientation session for the panel members. This session focused on communicating the study's aims and the preliminary findings of the pilot research. Experts were familiarized with the operational definitions of key constructs such as distractions, mental wellness, boredom, and productivity as they pertain to the construction industry.

Throughout a series of meetings, the panel engaged in in-depth discussions about the research design. They contributed to the refinement of survey questions, the observational strategies for measuring internal distractions, and the selection of appropriate normalization techniques for data analysis. Their input was invaluable in ensuring that the proposed methods were not only theoretically sound but also practical and implementable within the daily operations of construction sites. Table 1 shows an extract of the survey that will be used daily on investigating masonry workers.

The consultation process resulted in a well-rounded and expert-vetted research methodology. The discussions led to a consensus on the best practices for data collection, considering the unique aspects

Table 1. Survey contents for daily examination of workers

Var.	Purpose	Question
External Distraction	Noise	How often are you interrupted by noise or activities not related to your work, such as loud machinery or other teams' operations?
	Interruption	Rate how other workers or supervisory staff interruptions affect your concentration and work flow?
		...
Boredom	Level	Rate your level of boredom during today's shift?
	Frequency	How often did you feel bored during specific tasks or times in today's shift?
		...
Mental wellness	General mood	How would you rate your overall mood today?
	Stress level	How much stress did you feel during your shift?
		...

of construction sites and the well-being of the workers. The involvement of these seasoned professionals guarantees that the experimental design is grounded in industry knowledge and poised to yield results that are both academically robust and industrially relevant. This expert-informed approach sets the stage for the detailed experimental research design that follows.

Distraction Assessment. The assessment of distractions, a key component of this study, was structured around both self-reported perceptions and objective observations. Workers will respond to a streamlined series of questions gauging the frequency and intensity of external disruptions like noise, other teams' operations, and environmental factors at the end of each shift. Simultaneously, a rigorous observational protocol utilizing video footage will capture instances of internal distractions, noting behaviors indicating disengagement or idle time.

Boredom Assessment. Complementing the distraction evaluation, the mental state of boredom among workers will be measured through a succinct set of survey prompts. These will succinctly query the workers about the frequency of boredom experienced during the shift, its impact on concentration, coping strategies employed, and the perceived effect on work quality and output.

Mental Wellness Assessment. Mental wellness, another pillar of the study, will be captured via a succinct survey, asking workers to reflect on their mood, stress levels, job satisfaction, energy, and relaxation at the end of each shift. The responses will provide a snapshot of the workers' psychological state and its fluctuations correlated with workplace dynamics.

Productivity Measurement. The tangible measure of productivity will be straightforward – the count of bricks laid by each team at the end of the day, providing a direct and quantifiable output of the day's labor.

Research Duration. The panel reached a consensus that the experiment should span a minimum of 10 working days to allow for the clear observation of trends and garner statistically significant insights. The contractor has also approved an 18-day research timeframe to prevent project delays. Moreover, a longer duration risks confounding variables like weather shifts, which can cyclically affect productivity.

Through this holistic approach, blending qualitative and quantitative measures, the research aims to distill a clear understanding of how distractions, boredom, and mental wellness interact and influence productivity within the construction sector. This comprehensive strategy paves the way for subsequent analyses and insights that could significantly benefit policy-making and workplace practices in the industry.

4. Research results and discussions

4.1. Data descriptive

The selected project for this research is a construction site located in Hanoi, comprising a series of 210 low-rise residential houses. The work environment is primarily indoor, minimizing the variables of weather and providing a controlled setting to assess the impact of distractions, mental wellness, and productivity more accurately. The study was conducted over 18 consecutive working days, spanning a total of 3 weeks. This duration was chosen to ensure a comprehensive collection of data and to observe any patterns or trends that may emerge over a standard construction project timeline.

The construction workers engaged in daytime shifts, beginning at 8 AM and concluding at 5 PM, with a designated one-hour lunch break. This consistent schedule provided a standardized framework for comparing daily productivity and worker well-being across different groups. Workers were divided into three distinct groups for the purpose of the study:

- Control Group (5 teams of three): This group operated under standard conditions, with no imposed restrictions on the use of electronic devices during work hours, mirroring the typical workday experience.

- Mildly Restricted Group (5 teams of three): Workers in this group were not permitted to use electronic devices during active work periods. However, they were granted two mini-breaks, each lasting 5 minutes, in addition to the regular lunch break, during which they were allowed to use their smartphones. The break times are compensated at the end of each half shift, meaning that the workers have to stay at the construction site 10 minutes longer at noon and at the end of days.

- Strictly Restricted Group (5 teams of three): This group faced a stringent policy where the use of electronic devices was prohibited throughout the workday. Short breaks were permitted solely for restroom use and other necessities.

Figure 2. Measurements of four factors in the temporal study

Fig. 2 depicts the measurement of four factors during the course of the research duration.

The preliminary analysis of the graphs suggests a notable pattern in the data: the control group consistently exhibited higher levels of distraction compared to the mild and strict restriction groups. Boredom levels in both the mild and strict groups started off significantly high but gradually decreased to align with the control group over time. Mental wellness showed a marked improvement in the mild and strict groups, initially low but rising over time to surpass the control group. Intriguingly, productivity appeared consistently higher in the mild and strict groups when compared to the control group. These initial observations are confirmed by looking at the boxplots in Fig. 3. While these insights provide an initial understanding, a thorough investigation using rigorous statistical methods is necessary to draw precise conclusions.

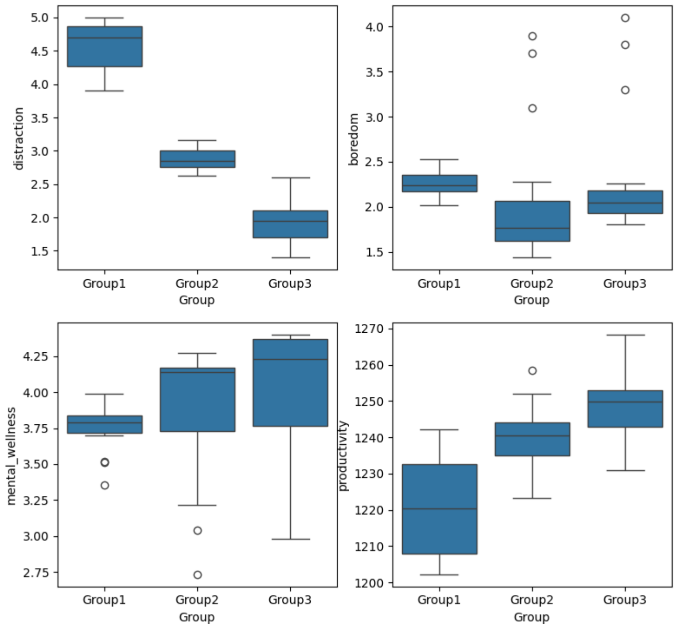

Figure 3. Boxplots of four factors during the study time

4.2. Multivariate and Longitudinal Analysis of Experimental Groups

In an overview of the data collected over the 18-day study period, a notable pattern emerges from the visual charts. Distraction levels appeared relatively stable from the onset, which may indicate a quick adaptation to the workplace environment or the pervasive nature of distractions. However, boredom and mental wellness, directly expecting impact from the change in distraction—demonstrated initial instability. This is an expected outcome in human-centric studies, where individuals require an adjustment period to adapt to new policy implementations before the effects stabilize. To draw meaningful comparisons and conclusions from this data, it is imperative to pinpoint when these factors reach a state of equilibrium. Identifying these stability points in time-series data is crucial, as any analysis conducted during periods of fluctuation may yield misleading interpretations. For such purpose, a few popular methods such as Moving Average Control Chart (MACC), Exponentially Weighted Moving Average (EWMA), Shewhart Control Charts, Statistical Process Control (SPC), and Cumulative Sum (CUSUM) control charts [18] can serve as potent analytical tools to detect shifts in the mean levels of a process. CUSUM is favored for its high sensitivity, memory (it takes into account the information from all previous data points), timeliness, simplicity and robustness; CUSUM can provide a visual representation of how cumulative sums of deviations from a target value change over time [19]. The methodology involves plotting the cumulative sum of deviations against time, which helps to quickly identify significant shifts from the expected level of measurement.

CUSUM operates on the principle that it continuously aggregates the differences between individual data points and a specified target value or the mean. Mathematically, this is represented as:

$$CUSUM_k = \sum_{i=1}^{k} (x_i - \overline{x}) \tag{1}$$

where $CUSUM_k$ is the cumulative sum up to point k, x_i is the data point at time i, and $\overline{x}$ is the target or mean value. When plotted in Fig. 4, a departure from the baseline indicates a shift in the process mean.

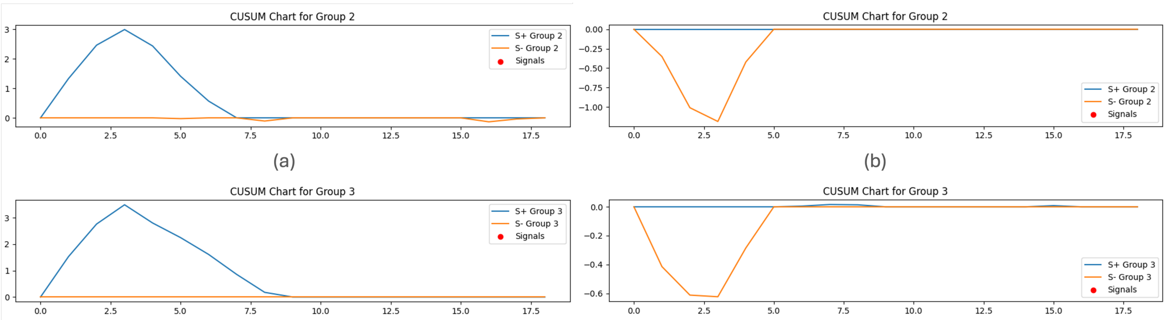

Figure 4. The CUSUM control charts of boredom (a) and mental wellness (b)

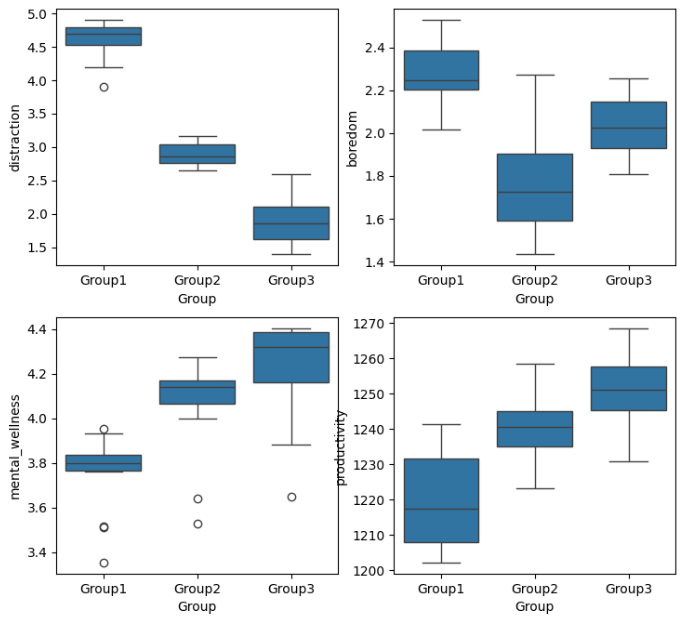

Figure 5. Boxplots of four factors during the period of 5-18th days

While the data charts do not explicitly highlight distinct signal points, the gradual alignment of the chart lines towards the baseline between the 5th and 7th days implies the onset of a stabilization period for boredom and mental wellness factors. In conjunction with insights derived from Fig. 2, this observation has informed the decision to focus on the data from the 5th to the 18th day for a more detailed and reliable analysis. Upon examining the boxplots in Fig. 5, which represent the selected stable data period, there is a marked contrast in the distributions of boredom, mental wellness, and productivity across the groups when compared to the boxplots of the entire data period depicted in Fig. 3. The interquartile ranges in Fig. 5 are noticeably tighter, indicating a reduced spread and greater data consistency. Outliers are almost removed from the boxplots. This suggests that after the initial adjustment period, the impact of the different workplace policies on these factors became more pronounced and distinct among the groups.

In advancing the analysis, the authors aim to assess the collective impact of group designation, time progression, and their potential interaction on the combined variables of distraction, boredom, mental wellness, and productivity. This multivariate consideration is crucial to understanding the full spectrum of effects across these interrelated outcomes.

The typical approach for such an analysis might involve a technique such as Multivariate Analysis of Variance (MANOVA) [20], which examines multiple dependent variables in the context of independent variable influences. However, this method is contingent upon a strict set of statistical prerequisites, including the normal distribution of dependent variables within groups, homogeneity of variance-covariance matrices, absence of multicollinearity, and independent observations. To assess the normality of the data, Shapiro-Wilk test (Table 2) is often used [20].

Table 2. Shapiro-Wilk Test for Normality (by Variable)

	Statistics	p-value*	Interpretation
Distraction	0.899	0.001	The distribution of data is not normal
Boredom	0.978	0.568	Not enough evidence to state that the distribution of data is not normal
Mental wellness	0.947	0.052	Not enough evidence to state that the distribution of data is not normal (but p-value is marginally greater than 0.05
Productivity	0.958	0.127	Not enough evidence to state that the distribution of data is not normal

*when $p - value < 0.05$, the null hypothesis is rejected, meaning the data is not normal.

To check for the equality of variances, the Levene's test is commonly employed [21]. The results of the Levene's test show that $statistics = 69.419$, $p - value = 0.000$, meaning the null hypothesis is rejected, therefore variances are not equal across groups. The aggregate outcome of the conducted tests indicates that the prerequisites for a valid MANOVA are not met, precluding its use in our analysis to prevent the misinterpretation of data and the inherent risks associated with such methodological misapplications. Turning to Generalized Estimating Equations (GEE) as an alternative to MANOVA, the authors find a method well-suited for analyzing correlated data such as repeated measures. GEE is robust against violations of MANOVA's assumptions, particularly with non-normal data distributions and heterogeneity of variances. It models the average response, given the covariates, while accounting for correlations within clusters of data [22, 23].

In essence, GEE uses the relationship:

$$\sum D_i' V_i^{-1} (Y_i - \mu_i) = 0 \tag{2}$$

where Y_i is the observed data, μ_i is the expected response, D_i is the gradient of μ_i, and V_i is the variance-covariance matrix for the i^{th} subject. By iterating through this equation, GEE estimates the parameters that consider the intra-group correlation, offering a robust approach for our longitudinal data analysis.

Table 3. Generalized Estimating Equations regression analysis

Code	Variable	Coef.	Standard Error	z-value	P-value	95% Confidence Interval
Dis.	...	...	...	...	...	...
Bor.	...	...	...	...	...	...
MW	Intercept	3.5837	0.036	98.661	< 0.001	[3.513, 3.655]
MW	C(Day)[T.5]	0.2659	3.31e-16	8.03e+14	< 0.001	[0.266, 0.266]
MW	C(Day)[T.6]	0.2738	2.96e-16	9.25e+14	< 0.001	[0.274, 0.274]
MW	...	...	...	...	...	...
MW	C(Day)[T.18]	0.009	4.19e-16	2.14e+13	< 0.001	[0.009, 0.009]
MW	C(Group)[T.2]	0.3142	0.061	5.185	< 0.001	[0.195, 0.433]
MW	C(Group)[T.3]	0.472	0.076	6.185	< 0.001	[0.322, 0.622]
Pro.	Intercept	1217.9543	2.602	468.161	< 0.001	[1212.8, 1223.05]
Pro.	C(Day)[T.5]	4.9411	1.07e-13	4.61e+13	< 0.001	[4.941, 4.941]
Pro.	C(Day)[T.6]	9.9975	1.69e-13	5.9e+13	< 0.001	[9.998, 9.998]
Pro.	...	...	...	...	...	...
Pro.	C(Day)[T.18]	-7.0813	1.69e-13	-4.18e+13	< 0.001	[-7.081, -7.081]
Pro.	C(Group)[T.2]	20.5548	3.766	5.459	< 0.001	[13.174, 27.935]
Pro.	C(Group)[T.3]	31.3238	4.754	6.589	< 0.001	[22.006, 40.641]

For the shake of space saving, Table 3 presents a portion of the GEE regression analysis results.

The Generalized Estimating Equations (GEE) regression analysis sheds light on the dynamic patterns of distraction, boredom, mental wellness, and productivity among construction workers from day 5 to day 18 under different workplace policies.

In terms of distraction, the analysis reveals that the policies implemented in Groups 2 and 3 are successful in reducing distraction compared to the control group, Group 1. Group 2 workers experienced 1.708 units less distraction, and Group 3 workers experienced even less, with a decrease of 2.714 units. This significant group effect, along with day-to-day variations—most notably an increase on Day 18—suggests the influence of both the intervention and temporal factors on distraction levels. The boredom variable follows a similar pattern, where Group 2's policy particularly stands out, reducing boredom by 0.516 units, and Group 3's policy leads to a 0.243 unit decrease. Again, significant day effects are noted, indicating that boredom levels fluctuated throughout the observed days.

Mental wellness appears to improve significantly in Groups 2 and 3, with Group 2 reporting a 0.314 unit increase and Group 3 showing an even higher increase of 0.472 units. These improvements over the control group imply a positive impact of the group-specific policies on the workers' mental state. Productivity also saw a significant uptick in the intervention groups, with Group 2's productivity increasing by 20.555 units and Group 3's by 31.324 units, suggesting that the interventions not only improve workers' mental wellness but also translate into tangible productivity gains.

The analysis interprets the intercept as the estimated average value of the outcome variable for Group 1 on Day 6. All p-values in the analysis are below 0.05, indicating that the observed effects are statistically significant. Lastly, the 95% confidence intervals provide a reliable estimate of where the true effects are likely to fall, ensuring the findings are robust and dependable. Fig. 6 depicts the trends with cloudy confident intervals for mental wellness and productivity across three groups.

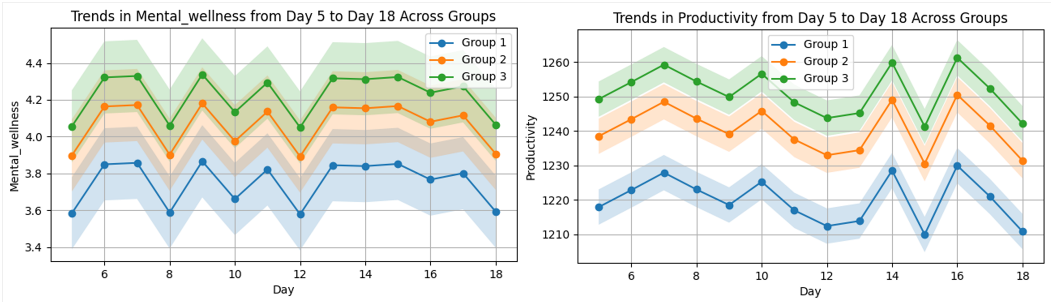

Figure 6. Trends of mental wellness and productivity across groups

In Fig. 6, we observe that the trends of mental wellness for groups 3 and 2 consistently exceed those of the control group throughout the study. This is visually reinforced by the presence of confidence intervals, depicted as cloud-like shadings surrounding the trend lines, which, despite some overlaps, emphasize the positive trajectory in mental wellness for the intervention groups. Productivity trends underscore a more pronounced differentiation among the three groups, exhibiting distinct paths without overlapping areas in the confidence intervals, suggesting a clear advantage for the groups with restricted smartphone access.

4.3. Discussions

The data unequivocally demonstrate that implementing distraction-reduction policies yields positive outcomes. Both the mild (Group 2) and strict (Group 3) restriction groups experienced a substantial decrease in distraction levels compared to the control group (Group 1). This supports the hypothesis that limiting access to smartphones and other electronic devices during work hours is beneficial.

Interestingly, after an initial adjustment period of a few days, both boredom levels decreased, and mental wellness and productivity saw notable increases that surpassed the control group's performance. These observations suggest that workers adapt to policy changes and that, once acclimatized, they can achieve a better state of well-being and higher productivity. Comparing groups with mild versus strict restrictions reveals a complex scenario. Group 2, permitted smartphone use during mini breaks, experienced less boredom. Yet, Group 3, with no device access, reported greater mental wellness, countering the pilot study where breaks were preferred. This might be because Group 2's breaks, perceived as workday extensions due to later end times, could diminish mental wellness. Additionally, entertaining as they are, media distractions might lead to anxiety or guilt later in the day. Productivity patterns between the two groups also reveal that, on average, the strict restriction policy in Group 3 led to a marginal increase in productivity, averaging 25 more bricks per day than Group 2. This quantitative measure of output underscores the effectiveness of stricter distraction-limiting policies.

Based on these insights, the study recommends that for masonry tasks, which are crucial and intensive, a "strict restriction"policy should be favored. This policy would involve the work hours, thereby reducing distractions. The subsequent rise in productivity suggests that even without the provision of mini breaks for smartphone use, workers can maintain focus and efficiency throughout their shift. This recommendation aligns with broader findings in occupational research, which emphasize the importance of minimizing interruptions for concentration-intensive tasks. The initial resistance or discomfort associated with such policies is counterbalanced by the longer-term benefits observed in worker output and mental state.

Another interesting observation is that the mental wellness and productivity between the second and the third groups behaved inconsistently when distraction and boredom presented more stably. A possible reason is that distraction and boredom did not fully explain the changes in mental wellness and productivity. There might be other factors, such as weather, social news, or flu epidemics that are hidden in the model.

It is noteworthy that these recommendations are task-specific and may not generalize across all construction activities. For example, jobs that are less continuous or require less constant attention might benefit from a different approach. Furthermore, the potential negative feelings arising from the removal of breaks could be mitigated by other forms of brief mental and physical respite that do not involve digital distractions.

The study also opens up questions for future research. For instance, understanding the long-term effects of such policies on worker satisfaction and retention would be valuable. Additionally, exploring variations of the strict policy, perhaps including non-digital break activities, could provide further insights into optimizing worker well-being and productivity.

To summarize, while the strict restriction policy may appear stringent, its positive impact on productivity and mental wellness are crucial. In industries where precision and focus are paramount, reducing distractions holds clear benefits. It is imperative, however, that companies communicate these policies effectively and with consideration for the well-being of their employees, ensuring that the work environment supports both productivity and a positive mental state.

5. Conclusions

This study embarked on an exploration of the interplay between workplace policies, particularly those restricting smartphone use, and various factors including distraction, boredom, mental wellness, and productivity within the context of masonry tasks in construction. The experiment spanned 18 working days and grouped workers into three categories: unrestricted, mildly restricted, and strictly restricted in terms of smartphone access.

The findings reveal that imposing restrictions on smartphone usage significantly diminishes distractions on-site. The adaptation period for workers under new policy regimes is characterized by fluctuating levels of boredom and mental wellness, which stabilize after a few days. Remarkably, after this initial adjustment phase, both mental wellness and productivity not only improved but surpassed those of the control group. Group 3, which operated under a strict no-smartphone policy, demonstrated marginally higher productivity levels compared to Group 2, which allowed mini-breaks.

This study's results advocate for the strict restriction policy as the optimal approach for masonry tasks, aligning with the overarching goal of enhancing worker productivity and well-being. The nuanced insights into the effect of smartphones on workers' mental states and output are pivotal for stakeholders in the construction industry. They provide a basis for developing strategic workplace policies that balance technological access with productivity and employee satisfaction. The study, while insightful for masonry work, may not translate directly to other construction roles with varying demands. Future research could broaden its scope to include diverse construction tasks and assess the impact of different workplace policies. It is vital to explore how technology use and restrictions play out across various job functions, especially those with intermittent tasks requiring different cognitive engagement. Longitudinal studies could further clarify how such policies affect worker well-being and job performance over time. As the construction industry evolves, continued research is key to crafting policies that support the productivity and well-being of the workforce.

This research contributes to the body of knowledge on workplace productivity and mental wellness in the construction industry. It suggests that while smartphones can offer advantages, their usage during work hours may be detrimental to both focus and output. By adopting stricter policies, construction sites can potentially increase productivity and enhance the mental wellness of their workforce, leading to more efficient project completion and a happier work environment.

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