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Open-Office Noise and Information Processing

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Data, code, and materials can be accessed at https://osf.io/dum9g/. The study was not preregistered. Correspondence concerning this article should be addressed to Lewend Mayiwar at lewend.mayiwar@bi.no.

Abstract

Purpose: We draw on arousal-based models to develop and test a model of open-office noise and information processing. Specifically, we examined whether open-office noise changes how people process information and whether such a change has consequences for task performance.

Design/Methodology/Approach: In a laboratory experiment, we randomly assigned participants (107 students at a business school) to either a silent condition or a condition that exposed them to open-office noise (irrelevant speech) while completing a task that requires cognitive flexibility. We measured participants' physiological arousal and the extent to which they processed information intuitively and analytically during the task.

Findings: Open-office noise increased urgent processing and decreased analytical processing, which led to a respective decrease and increase in task performance. In line with a neuroscientific account of cognitive processing, an increase in arousal (subjective and physiological) drove the detrimental effect of open-office noise on task performance.

Practical Implications: Understanding the information-processing consequences of open-office noise can help managers make more informed decisions about workplace environments that facilitate performance.

Originality: Our study is one of the first to examine the indirect effects of open-office noise on task performance through intuitive and analytical processing, while simultaneously testing and providing support for the accompanying physiological mechanism.

Keywords:

intuition, analysis, arousal, decision making, cognitive flexibility

Introduction

In recent years, organizations have adopted open-plan offices to enhance collaboration and performance in response to the complexity of modern work (Khazanchi et al., 2018). Open-plan offices are frequently advocated by managers; however, the prevalence of open-office noise stands as one of the most commonly reported concerns among employees (Kim & de Dear, 2013; Lee et al., 2020). This has sparked increasing efforts among managerial and organizational psychologists to understand the impact of the physical work environment on various employee outcomes (Appel-Meulenbroek et al., 2020; Ashkanasy et al., 2014; Ayoko et al., 2023; Ayoko & Ashkanasy, 2020, 2021; Davis et al., 2011; Elsbach & Pratt, 2007; Jahncke et al., 2011; McCoy, 2005; Morrison & Stahlmann-Brown, 2020; Otterbring et al., 2020; Sander et al., 2021; Smith-Jackson & Klein, 2009).

Interest in the physical and social environment of work is not new, however. It dates back to Taylor's (1911) concept of "scientific management," which sought to identify ways to improve employees' efficiency and productivity. Ayoko and Ashkanasy (2021) note that Taylor studied the practice of congregating and supervising collocated employees, which led to the Hawthorne studies (Mayo, 1949)—marking the beginning of a recognition of the social and physical work environment (Jung & Lee, 2015).

While noise is generally harmful for performance on cognitive tasks (see meta-analysis by Szalma and Hancock, 2011), results have also been mixed. Some studies have documented positive effects on task performance (Ball et al., 2015), while others have failed to detect significant effects (e.g., Sander et al., 2021). Indeed, researchers have suggested that workplace noise can be both positive and negative depending on the nature of the task (see Jett & George, 2003). Moreover, despite extensive research on the effects of open-office noise on task-related outcomes, organizational and psychological researchers have noted that the underlying processes remain poorly understood (e.g., Ashkanasy et al., 2014; Leroy et al., 2020; Szalma and Hancock, 2011).

Moving beyond testing the direct effect of open-office noise on task performance, we study whether, and if so, how noise indirectly impacts performance through changes in information-processing. Drawing on arousal-based models (Arnsten, 2009), we propose that noise is an environmental stressor that triggers a switch from careful and analytical processing of information to quick and intuitive processing. This change in information processing should impair performance in complex tasks.

The aim of this study is to examine how open-office noise impacts task performance through changes in intuitive and analytical processing and physiological arousal. We measure both intuitive and analytical processing as independent and multifaceted constructs. We conducted a laboratory experiment that manipulated open-office noise, thereby extending previous studies in organizational research which have mainly relied on cross-sectional designs.

Theory and Hypotheses

Open-Office Noise

The impact of open-office noise on task performance has been studied for many years. In general, studies indicate that open-office noise decreases task performance, especially in cognitive tasks that require attention and concentration (Szalma & Hancock, 2011). For instance, a field study among 539 employees found that mentally stressful tasks were particularly noise-sensitive (van Dijk et al., 1987), and employees reported experiencing difficulties with communication and reduced perception of danger signals when working in noisy conditions.

Irrelevant speech-based noise, such as colleagues chatting in the background (Haapakangas et al., 2014; Jahncke et al., 2013), is one of the most disturbing types of noise. It has been associated with impaired performance in various cognitive tasks (for a brief review of effects of speech-based noise on performance, see Sander et al., 2021). Such noise is difficult to ignore because not only is it variable and unpredictable, but we naturally pay attention to background conversations to extract meaning from them (Marsh et al., 2018).

Based on the extant literature, we hypothesized a negative direct effect of noise on performance.

H1. Open-office noise will reduce task performance.

It is worth noting, however, that while it is clear that noise triggers distractions and stress, the impact of noise on performance-related outcomes appears to be complex. A meta-analysis by Szalma and Hancock (2011) pointed to large heterogeneity in effects. This highlights the importance of studying the potential existence and influence of indirect pathways through which noise may affect performance, which have been largely overlooked. Here, we examine the information-processing pathways.

Information Processing

According to dual-process theories (Epstein, 1994; Kahneman, 2003; Mukherjee, 2010; Stanovich & West, 2000), people process information using two different modes. The intuitive mode, which is commonly thought of as the default mode of thinking, is characterized by quick responses based on gut feelings. Intuitive judgments are characterized by an unconscious cognitive process. However, the results of intuition often emerge as conscious feelings that individuals can perceive (Dane & Pratt, 2007). In colloquial terms, people frequently describe this affective aspect as a "gut feeling." The analytical mode, on the other hand, is characterized by slow, deliberate and effortful thinking. This mode of processing serves a key function in overriding intuitive responses.While intuition can be a valuable resource in conditions characterized by high ambiguity and time pressure (Gigerenzer & Gaissmaier, 2011), analytical decision-makers generally perform better than intuitive decision-makers in a range of tasks

(Alaybek et al., 2022). Analytical processing increases the exploration and identification of possible solutions (Harman, 2011) and reduces susceptibility to various decision biases (Chatterjee et al., 2000; Smith & Levin, 1996).

Studies suggest that individuals intuit more and analyze less in stressful environments. Researchers have associated sources of stress like noise with the use of cognitive shortcuts and an over-reliance on gut feelings (Bucchianeri & Corning, 2013; Yu, 2016). Kruglanski and Webster (1996) showed that processing information in the presence of noise increases the need for cognitive closure (a construct that is associated with intuitive processing). Stressful conditions seem to play a particularly strong role in impacting the urgency of information processing. According to Johnson et al. (2019), urgent intuition usually manifests as response inhibition deficits that are particularly likely under high arousal contexts, irrespective of whether the arousal is positive or negative. Thus, we propose:

H2. Open-office noise will reduce task performance through an increase in intuitive processing.

H3. Open-office noise will reduce task performance through a decrease in analytical processing.

The detrimental effect of open-office noise on performance is usually attributed to higher levels of arousal (Hillier et al., 2006), likely due to emotional irritation and annoyance. Studies have found that physiological arousal can increase to a notable degree even if the sound level in an office is relatively low (Bengtsson et al., 2004; Loewen & Suedfeld, 1992). Furthermore, even a small increase in arousal is sufficient to impair functioning of the prefrontal cortex (Arnsten, 2009), which is necessary for the performance of complex tasks (Chan et al., 2021).

Importantly, neurocognitive models point to arousal as a key determinant of information processing (Bechara et al., 1997; Christopoulos et al., 2019; Figner & Murphy, 2011; Johnson et al., 2020; Lieberman, 2007), suggesting that intuitive processing is associated with greater arousal and analytical processing with lower arousal (Arnsten, 2009). In stressful situations, the prefrontal cortex switches from thoughtful top-down control based on what is relevant to the task at hand to bottom-up processing (Arnsten, 2009). These neural changes correspond to a switch from reflective (analytical) processing by the prefrontal cortex to rapid and reflexive (intuitive) responses by the amygdala (Lieberman, 2007; Pham, 2007; Yu, 2016).

We define arousal in line with Russell's (2003) definition, viewing it as a state of readiness for action or energy expenditure at one extreme versus need for sleep and rest at the other. Moreover, we view arousal as a state of the central nervous system, reflected in both physiological responses and subjective experiences. There is also considerable interest in including both subjective and physiological measures of arousal, as neuroscientists still debate whether these represent distinct forms of arousal (e.g., LeDoux and Pine, 2016). We propose:

H4. Open-office noise will reduce task performance through an increase in arousal.

Method

Transparency and Openness

The study was notified to the Norwegian Centre for Research Data (NSD) before data collection. The study was not preregistered. We report how we determined the sample size and all exclusions, manipulations, and measures. We did not perform any analyses before completing data collection. All analyses were performed in RStudio 1.4.1106 (RStudio Team, 2022). The data, code, and materials are available on the study's Open Science Framework (OSF) page: https://osf.io/dum9g/.

Participants and Procedure

Participants were students at a business school in Oslo, Norway. Participants had the option to enter a lottery to receive a gift card worth 500 NOK by taking part in the experiment.

The sample size was set a priori to $N = 100$ based on available resources. The final sample consisted of 107 participants ($M_{\text{age}} = 30$, $SD_{\text{age}} = 7.93$, 27 males, 71 females).[1]

After arriving to the lab, participants were connected to sensors that recorded their physiological arousal. Participants completed a task measuring cognitive flexibility and answered a questionnaire measuring cognitive processing, subjective arousal, and provided demographic information.[2] The experiment was designed on PsyToolkit (www.psytoolkit.org; Stoet, 2010, 2017).

Open-Office Noise Manipulation

Participants were randomly assigned to either a silent condition ($N = 52$) or an open-office noise condition ($N = 55$). Participants in the control condition completed the task without any background sound. Participants in the noise condition were exposed to a combination of typical open-office sounds throughout the experiment. The sound file (obtained from www.soundsnap.com) is available on the OSF page. Participants listened to the recording on headphones (DT 770 PRO 80 OHM).

The final sound file's decibel level (dB) was 65 (a normal conversation is 60-65 dB). We chose recordings that included intelligible speech-based noise. Another important feature of the manipulation is the intermittence of the sound, characterized by an "externally generated,

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[1] Based on recommendations by Lakens (2022), we conducted a sensitivity analysis to determine the smallest effect size the study could detect. We used the *simr* package (Green and MacLeod, 2016) in R (RStudio Team, 2022). This study had 80% power (with $\alpha = 5\%$, two-tailed) to detect a regression coefficient of -0.12.

[2] Participants also completed three scales that were part of a student thesis: the mindfulness attention awareness scale (Brown & Ryan, 2003), Langer's mindfulness scale (Bodner & Langer, 2001), and mind wandering questionnaire (Mrazek et al., 2013). These variables are not reported here but are available in the dataset.

randomly occurring, discrete event that breaks continuity of cognitive focus on a primary task" (Coraggio, 1990, p. 19).

Measures

Cognitive Processing. We used a 22-item cognitive processing questionnaire developed by Bakken et al. (in preparation) to measure the extent to which participants relied on analytical and intuitive processing during the task. The questionnaire can be accessed on the OSF project page. The questionnaire consists of four primary dimensions: Rational (5 items; $\alpha = .80$), Control (6 items; $\alpha = .73$), and Urgency (4 items; $\alpha = .81$), Affective (3 items; $\alpha = .72$).[3] Example items include "I evaluated systematically all key uncertainties" (Rational subscale) and "I made the decision because it felt right to me" (Affective subscale). Items were rated on a scale from 1 (strongly disagree) to 5 (strongly agree).

The Affective and Urgency subscales serve as indicators of an intuitive mode of information processing, while the Rational and Control subscales serve as indicators of analytical processing.

We used this scale because we needed a measure of situational information processing. Existing scales which measure participant's general and stable preference for intuitive and analytical processing do not allow us to test the influence of situational factors like open-office noise. Bakken et al.'s scale is based on the intuitive and analytic decision-making scale developed by Sinclair and colleagues (Sinclair, 2010; Sinclair & Ashkanasy, 2005) supplemented

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[3] An earlier version of the cognitive processing questionnaire also included a fifth dimension, Knowing, that was conceptually related to both intuitive and analytic processing, depending on context. It was therefore considered irrelevant for this study. See Bakken and Hærem (2020).

with additional items devised to reflect the content of the various dual-process theories of reasoning reviewed earlier.

Arousal. We measured both subjective and physiological arousal.

We used the self-assessment manikin (Bradley & Lang, 1994) to measure subjective arousal, which we also used as a manipulation check. Participants rated their level of arousal during the task on a 9-point Likert scale that included graphic pictures representing different levels of arousal, ranging from “calm” to “excited.”

For physiological arousal, we measured participants’ skin conductance using Biogauge Sudologgers (Tronstad et al., 2008). Participants were connected to sensors that apply a very small electric current (30 mV) to the skin beneath three measuring electrodes connected to the palm and forearm of the participants’ non-dominant hand.

Skin conductance was recorded at a sampling frequency of 1.1111 Hz (i.e., every 0.9 s). To analyze skin conductance activity, we used Ledalab 3.4.9 (www.ledalab.de). We used continuous decomposition analysis to decompose the data into phasic (i.e., short-term response to specific stimuli) and tonic (i.e., long-term, general response) components, and used the average phasic driver (CDA.SCR) in our analyses. Following Benedek and Kaernbach’s (2010) recommended procedure, the minimum amplitude criterion was set to 0.05 μS.

Control Variables. Gender (0 = Male, 1 = Female) and age were included as control variables. Previous research has found gender differences in cognitive processing (Gur et al., 1999; Tranel et al., 2005) and arousal (Matthews et al., 2001; Sauro et al., 2003; Wolf et al., 2001). Age has also been associated with cognitive and affective processes related to cognitive flexibility (Axelrod & Henry, 1992).

Task Performance. We selected a task that is expected to be sensitive to noise, recognizing that certain tasks may have lower sensitivity, such as strongly routinized tasks. We selected the Wisconsin card sorting task (via www.psytoolkit.org), a popular measure of an executive function known as mental shifting (Chan et al., 2021; Diamond, 2013). Performance in this task requires concentration and attention and should therefore be sensitive to the kind of noise investigated in the current study.

Participants sorted a stack of cards into four different groups across 60 trials, one at a time. Participants receive feedback indicating whether their classification was correct, but they receive no instructions on how to classify the cards. After a period of trial and error, participants generally learn the correct rules (Buchsbaum et al., 2005). However, the rules change at multiple points during the task, rendering past rules incorrect. Thus, participants must continuously adapt to this dynamic task by revising their assumptions.

The task involves matching the series of response cards with any of four cards. The matching must satisfy one of three rules: matching along dimensions of number (1, 2, 3, 4), color (red, green, blue, yellow), or shape (triangle, square, circle, star). Participants had a maximum of five seconds to select a card.

The primary dependent measure in this task is the number of perseverative errors, which indicates a continued application of a card-sorting rule that is no longer appropriate. For each trial, we coded whether participants' choice was an error or not an error (i.e., a binary variable; 0 = error, 1 = not an error). The average duration of this task was six minutes.

Results

Correlations

Table I shows the means, standard deviations, and correlations. The large dataset (due to repeated trials in the task) means that even small correlations become significant. Thus, *p*-values alone are not very informative. We define correlations equal to or larger than .10 as meaningful, following Funder and Ozer (2019), highlighted in bold in the table.

Table I

Means, Standard Deviations, and Correlations

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9
1. Noise	0.51	0.50									
2. Affect	3.44	0.76	-**.19****								
3. Urgency	3.53	0.82	.07**	-.06**							
4. Rational	3.13	0.87	-**.12****	.02	-**.37****						
5. Control	2.93	0.72	-.01	.02	-**.48****	**.59****					
6. SA	4.17	1.63	.05**	**.21****	**.11****	-**.11****	-.04**				
7. PA	0.00	1.00	**.18****	.03*	**.12****	-**.15****	-.07**	-.01			
8. Choice	—	—	-.00	-.02	-.01	.01	-.01	-.01	-.03*		
9. Gender	—	—	.05**	-.06**	**.12****	-**.17****	-.09**	**.15****	-.03*	.01	
10. Age	30.17	7.93	-.05**	-.05**	**.12****	.01	-.06**	-.02	-.00	.00	-.00

Note. Affect and Urgency are the two subdimensions of intuitive processing. Rational and Control are the two subdimensions of analytical processing. SA = subjective arousal, PA = physiological arousal, Choice (0 = error, 1 =correct choice), Gender (0 = male, 1 = female). Correlations >= .10 are highlighted in bold. * $p < .05$. ** $p < .01$.

The noise condition (vs. silent condition) correlated positively with physiological arousal ($r = .18, p < .001$) and negatively with Rational processing ($r = -.12, p < .001$). Surprisingly, however, noise correlated negatively with Affective processing ($r = -.19, p < .001$).

Physiological arousal correlated negatively with the Rational subdimension of analytical processing ($r = -.15, p < .001$) and positively with the Urgent subdimension of intuitive processing ($r = .12, p < .001$). This is consistent with our arousal-based account of cognitive processing. Subjective arousal correlated positively with the affective subdimension of intuitive processing ($r = .21, p < .001$).

Gender correlated positively with subjective arousal ($r = .15, p < .001$), indicating greater subjective arousal among females. Gender was also negatively correlated with the Rational processing ($r = -.17, p < .001$) and positively with Urgent processing ($r = .12, p < .001$). Age correlated positively with urgent processing ($r = .12, p < .001$).

Analysis of Indirect Effects

We used the *mediation* R package (Tingley et al., 2014) and computed six models within a mixed-effects model framework to examine the indirect effect of the two subdimensions of intuitive processing, the two subdimensions of analytical processing, and subjective and physiological arousal. Each analysis was performed with 1000 simulations using the quasi-Bayesian Monte Carlo method.

We estimated point estimates and 95% confidence intervals for the indirect effect. An indirect effect is considered significant at the .05 level if the confidence interval does not include zero. We controlled for age and gender as they correlated with information processing and arousal. Results remain the same when excluding these control variables from the models.

Each participant had 60 responses on the dependent variable (0 = preservative error, 1 = not a preservative error). Positive values indicate higher performance on the task. We included trial (60 trials) as a random intercept.[4] Figures 1 shows the models and path coefficients. A summary of the indirect effects is provided in Table II.

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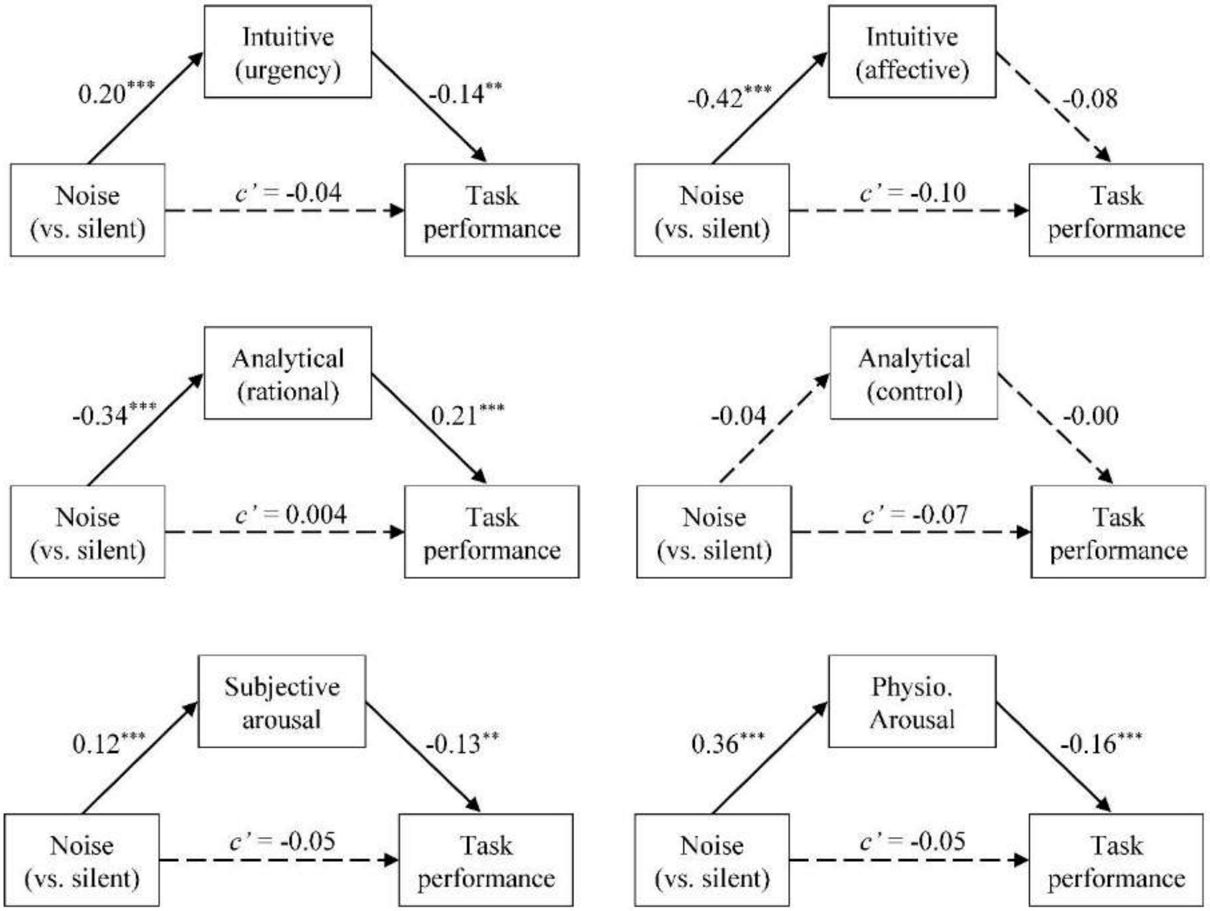
[4] The *mediation* package does not support more than one random effect.

Figure 1

Indirect Effect Models



Note. Solid line = significant path, dashed line = non-significant path. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table II

Summary of Indirect Effects

Indirect effect	Estimate [95% CI]
Noise→Urgent→Performance	-0.002 [-0.004, -0.0005]*
Noise→Affective→Performance	0.002 [-0.001, 0.01]
Noise→Rational→Performance	-0.005 [-0.01, -0.002]*
Noise→Control→Performance	< 0.00 [< 0.00, > 0.00]
Noise→Sub. Arousal →Performance	-0.001 [-0.002, -0.0003]*
Noise→Phys. Arousal→Performance	-0.004 [-0.01, -0.001]*
Noise→Phys. Arousal→Urgent proc.	0.02 [0.01, 0.03]*
Noise→Phys. Arousal→Affective proc.	0.02 [0.01, 0.03]*
Noise→Phys. arousal→Rational proc.	-0.03 [-0.04, -0.02]*
Noise→Phys. arousal→Controlled proc.	-0.01 [-0.02, -0.0005]*

Note. * Significant indirect effect.

Direct Effect of Noise on Task Performance (H1)

The direct effect of open-office noise on performance was not significant ($\beta = -0.07$, $p = .492$, 95% CI = -0.27, 0.13). Thus, we did not find support for H1.

Indirect Effect via Intuitive Processing (H2)

There was a significant indirect effect through the urgent subdimension of intuitive processing (Table II). Open-office noise increased urgent processing ($\beta = 0.20$, $p < .001$, 95% CI = 0.15, 0.25), which in turn predicted lower task performance ($\beta = -0.14$, $p = .006$, 95% CI = -0.25, -0.04). This supports H2.

The indirect effect through the affective dimension of intuitive processing was not significant. Contrary to our prediction, noise decreased affective processing ($\beta = -0.42$, $p < .001$, 95% CI = -0.47, -0.37). Affective processing was negatively but not significantly associated with task performance ($\beta = -0.08$, $p = .098$, 95% CI = -0.19, 0.02).

Overall, we found evidence for an indirect effect via the urgent subdimension of intuitive processing but not via the affective subdimension, providing mixed support for H2.

Indirect Effect via Analytical Processing (H3)

There was a significant indirect effect through the rational subdimension of analytical processing. Open-office noise reduced rational processing ($\beta = -0.34$, $p < .001$, 95% CI = -0.39, -0.29) which was positively associated task performance ($\beta = 0.21$, $p < .001$, 95% CI = 0.10, 0.32).

There was no significant indirect effect through the control dimension of analytical processing. Open-office noise did not significantly impact controlled processing ($\beta = -0.04$, $p = .101$, 95% CI = -0.08, 0.00). Controlled processing was not significantly associated with task performance ($\beta = -0.00$, $p = .492$, 95% CI = -0.11, 0.10).

Overall, we found evidence for an indirect effect via the rational subdimension of analytical processing but not via the controlled subdimension, providing some support for H3.

Indirect Effect via Arousal (H4)

The indirect effect through both subjective arousal and physiological arousal were significant. Open-office noise increased subjective arousal ($\beta = 0.12$, $p < .001$, 95% CI = 0.08, 0.16), which in turn was negatively associated with task performance ($\beta = -0.13$, $p = .008$, 95% CI = -0.23, -0.04). Similarly, open-office noise increased physiological arousal ($\beta = 0.36$, $p < .001$, 95% CI = 0.32, 0.40), which in turn was negatively associated with task performance ($\beta = -0.16$, $p = .001$, 95% CI = -0.26, -0.07). These results provide support for H4.

Finally, as a direct test of neurocognitive models that emphasize the central role of physiological arousal in driving cognitive processes (Arnsten, 2009), we explored whether noise indirectly influenced information processing through changes in physiological arousal. The indirect effect of noise via physiological arousal on urgent, affective, rational, and controlled processing were all significant. The increase in physiological arousal from noise increased urgent processing ($\beta = -0.06$, $p < .001$, 95% CI = 0.03, 0.08) and affective processing ($\beta = 0.06$, $p < .001$, 95% CI = 0.04, 0.09) and reduced rational ($\beta = -0.08$, $p < .001$, 95% CI = -0.11, -0.06) and controlled processing ($\beta = -0.03$, $p = .036$, 95% CI = -0.05, -0.002). Except for the indirect effect on controlled processing, the remaining estimates corresponded to what is considered above minimally meaningful effect sizes (Funder & Ozer, 2019).

Discussion

Theoretical Contributions

The current study examines the influence of open-office noise on information processing from a dual-process theoretical lens, demonstrating how intuitive and analytical modes of processing change in noisy workplace environments, and the downstream consequences for task performance. These hitherto unexplored pathways present an opportunity to uncover novel and valuable insights into the processes by which noise impacts cognitive performance.

Our findings extend dual-process theories of information processing (Epstein, 1994; Kahneman, 2003; Lieberman, 2007; Stanovich & West, 2000) by uncovering how specific modes of intuition and analysis might be differentially triggered by environmental stressors like background noise. While we did not find support for a direct effect of open-office noise on task performance, we found that noise increased urgent processing and reduced analytical processing. Surprisingly, noise reduced affective processing too, suggesting that noise might not only impair analytical processing but also interrupt people's ability to trust their gut feelings.

Moreover, physiological arousal drove the effect of noise on cognitive processing. Physiological arousal was positively associated with urgent and affective processing, and negatively associated with rational and controlled processing. These findings align well with how neuroscientists describe the impact of external stressors such as noise on cognitive processing (Arnsten, 2009).

Moreover, the insignificant direct effect of noise on performance might be due to the existence of other indirect pathways going in opposite directions that cancel each other out, resulting in a total effect of noise that is not detectably different from zero (Hayes, 2009; Mathieu & Taylor, 2006). For instance, Ball et al. (2015) found that exposure to the noise of irrelevant speech facilitated insight problem solving, which is believed to be driven by rapid and nonconscious processes, as in the affective subdimension of intuitive processing in the present study.

Since we did not find a direct effect of noise on task performance, we only discuss the indirect effects through cognitive processing. In line with Haye's (2009) discussion of indirect effects, we refrain from labeling the cognitive processing variables as mediators, which is the term more commonly used in the Baron and Kenny's (1986) mediation analysis tradition.

Finally, a limitation in the dual-processing literature is that researchers have measured individuals' general style of information processing. Researchers employing such measures merely assume that individuals process information in accordance with their individual preferences for intuitive or analytical thinking. We measured in-situ cognitive processing during a specific task, and we used a physiological measure as an additional measure to understand cognitive processing.

Limitations and Future Research

The findings are based on a laboratory experiment using a simulated open office. Although findings from laboratory experiments generally accord well with field experiments

(Anderson et al., 1999; Falk et al., 2013; Herbst & Mas, 2015; Mitchell, 2012), future research is needed to test the generalizability of the current findings to organizational settings.

Moreover, our experiment consisted of only one noise condition that we compared to a silent condition. It would be useful to examine how open-office noise impacts information processing at different levels and types of noise, and across different types of tasks.

On a related note, the noise manipulation was somewhat weak, as evidenced by the rather small increase in subjective arousal. This might also explain why some of the effects were weak. Furthermore, the indirect effects do not imply causation since the associations between cognitive processing and performance are correlational (Podsakoff & Podsakoff, 2019). Future studies might want to test these indirect effects using an experimental-causal-chain approach (Podsakoff & Podsakoff, 2019).

Finally, there was no significant correlation between subjective and physiological arousal. The convergence of these two measures might depend on how in tune individuals are with their bodily senses (McCall et al., 2015). In addition, neuroscientists still debate whether these should be expected to converge. LeDoux and Pine (2016) argue that physiological and subjective arousal emerge from distinct neuronal circuits and should be studied as independent constructs.

Practical Implications and Concluding Remarks

Our findings offer insight into the information-processing mechanisms underlying the effect of open-office noise on task performance. Managers should be aware that open-office environments, although perceived as promoting collaboration and creativity, can introduce seemingly mild stressors that impede analytical processing and hinder performance in complex tasks. By recognizing the potential trade-offs associated with open-office environments, managers can make informed decisions when it comes to workplace design and policies.

Complex tasks requiring attention and concentration may be better suited to quieter environments or may require additional support or accommodations in noisy settings. Moreover, some employees may naturally lean more towards intuitive processing, while others may prefer analytical approaches. Taking these differences into account when assigning tasks and designing work environments can help optimize performance.

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