Literature Review: Notification Feedback Mechanisms and Their Impact on Focus and Productivity in Deep Work Sessions

Introduction

In today's digital workplace, desk-based employees frequently engage in deep work sessions—periods of concentrated, uninterrupted focus essential for high-productivity tasks such as analysis, writing, or problem-solving. However, smartphone and computer notifications, delivered through haptic (vibratory), audio (sound-based), and visual (screen-based) cues, often disrupt these sessions, potentially impairing attention and output. This is a critical area in Human-Computer Interaction (HCI) and occupational psychology, as excessive interruptions can lead to reduced efficiency, increased stress, and lower overall well-being. Understanding these effects is vital for designing better workplace tools and policies to enhance productivity. The specific research question guiding this review is: How do different notification feedback mechanisms (haptic, audio, and visual cues) affect desk-based employees' focus and productivity during their deep work sessions?

Proxy Paper

A key proxy paper for this research is "Effects of Information Widgets on Time Perception during Mentally Demanding Tasks" by Li et al. (2025). This study investigated how multimodal information widgets (visual, auditory, and haptic modes) influence time perception, cognitive performance, and emotional responses in office-like mentally demanding environments using a prototype called TickSens. Through a within-subjects experiment with 30 participants, the authors compared these modes against blank and timer baselines, assessing technology acceptance, task performance, and emotions via self-reports and performance metrics. Key findings showed that all three modalities improved cognitive performance and positive emotions compared to baselines: visual modes excelled in task performance, auditory cues boosted focus, and haptic feedback enhanced user acceptance, with varied preferences among users.

This paper serves as a methodological foundation due to its similar focus on multimodal cues in demanding tasks, akin to deep work. Our proposed study will extend it by specifically targeting desk-based employees in real-world deep work sessions (e.g., 1-2 hour focused periods), incorporating productivity measures like task completion rates and self-reported focus disruption, and exploring long-term effects over multiple days rather than single sessions. This

addresses the proxy's limitation of short-term lab-based evaluation by applying similar experimental designs in naturalistic office settings.

Thematic Summary

Theme 1: Impact of Multimodal Notifications on Performance and Strain

Research consistently demonstrates that haptic, audio, and visual notifications can interrupt tasks, affecting performance and increasing strain, though effects vary by individual factors. For instance, Ohly and Bastin (2023) conducted a field experiment with 247 participants, finding that disabling notifications for one day reduced interruptions, leading to higher perceived productivity and lower strain, particularly for those with medium-to-high telepressure (social pressure to respond quickly) or low-to-medium fear of missing out (FoMO). Visual, auditory, and haptic cues averaged 65.3 daily interruptions, negatively impacting performance via distraction, but no rise in internal interruptions occurred for high-FoMO individuals. Similarly, Kushlev et al. (2016) in a two-week experiment with 221 participants showed that enabling auditory, tactile, and visual alerts increased inattention and hyperactivity symptoms, correlating with lower productivity and well-being; minimizing alerts by silencing and stowing phones reversed these effects. However, Pielot and Rello (2017) found mixed results in a 24-hour notification disablement study, where participants reported increased productivity but also anxiety and loneliness, suggesting emotional trade-offs in interruption reduction.

These studies highlight agreements on the disruptive potential of multimodal cues but reveal contradictions: while Ohly and Bastin emphasize benefits for specific personality types, Kushlev et al. indicate broader negative impacts on attention, underscoring the need for personalized interventions.

Theme 2: Efficiency and Interference of Notification Modalities in Task Contexts

Studies on modality preferences in multi-device or immersive settings reveal that combined cues can enhance awareness but often cause interference, depending on context and timing. Abreu et al. (2016) tested visual, audio, and haptic notifications in second-screen TV scenarios with 30 participants, finding that a combination of visual (on TV) and haptic (on tablet) cues, spaced at least 30 seconds apart, was most efficient for alerting without excessive disturbance, though all modalities caused some cognitive interference to primary tasks. Ghosh et al. (2018) explored similar modalities in VR, prototyping notifications to minimize shifts from immersion; haptic and audio cues were less disruptive than visual for maintaining focus, but all attracted immediate attention, potentially reducing productivity in high-concentration activities. Cidota et al. (2016) compared audio and visual notifications in AR remote collaboration, noting that audio cues

better preserved local workers' focus by avoiding visual overload, though combined use risked divided attention.

Synthesis across these papers shows haptic cues often reduce visual clutter for better acceptance, while audio aids focus in visually demanding tasks; contradictions arise in interference levels, with Abreu et al. favoring visual-haptic pairs for efficiency, versus Cidota et al.'s preference for audio to minimize distraction.

Research Gap

Despite insights into notification modalities, a key gap persists in studies directly examining their differential effects on focus and productivity during prolonged deep work sessions for desk-based employees. Most research, like Li et al. (2025), focuses on short-term lab tasks or specific contexts (e.g., VR, AR, second-screens), with limited exploration of real-office deep work (e.g., 1-2+ hours without breaks). Contradictory findings on modality superiority—visual for performance (Li et al., 2025) versus audio for focus (Cidota et al., 2016)—highlight the need for context-specific comparisons. Additionally, individual differences like FoMO (Ohly & Bastin, 2023) are underexplored in deep work scenarios. Our study addresses this by building on Li et al.'s methodology to test modalities in authentic desk-based deep work, filling this gap to inform better notification designs for workplace productivity and well-being.

References

Abreu, J., Almeida, P., Silva, T., & Aresta, M. (2016). Notifications efficiency, impact, and interference in second-screen scenarios. *International Journal of Human–Computer Interaction*, 32(12), 917-930. https://doi.org/10.1080/10447318.2016.1210870

Cidota, M., Lukosch, S., Datcu, D., & Lukosch, H. (2016). Comparing the effect of audio and visual notifications on workspace awareness using head-mounted displays for remote collaboration in augmented reality. *Augmented Human Research*, 1(1), 1-15. https://doi.org/10.1007/s41133-016-0003-x

Ghosh, S., Winston, L., Panchal, N., & Mishra, P. (2018). NotifiVR: Exploring interruptions and notifications in virtual reality. *IEEE Transactions on Visualization and Computer Graphics*, 24(4), 1447-1456. https://doi.org/10.1109/TVCG.2018.2793698

Kushlev, K., Proulx, J., & Dunn, E. W. (2016). "Silence your phones": Smartphone notifications increase inattention and hyperactivity symptoms. *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*, 1011-1020. https://doi.org/10.1145/2858036.2858359

Li, Z., Shi, D., Gao, Q., Chen, Y., Wang, N., & Liu, X. (2025). Effects of information widgets on time perception during mentally demanding tasks. *Proceedings of the 2025 CHI Conference on Human Factors in Computing Systems*, Article 123. https://doi.org/10.1145/3706598.3713270

Lind, C. M., Diaz-Olivares, J. A., Lindecrantz, K., & Eklund, J. (2020). A wearable sensor system for physical ergonomics interventions using haptic feedback. *Sensors*, 20(21), 6010. https://doi.org/10.3390/s20216010

Ohly, S., & Bastin, L. (2023). Effects of task interruptions caused by notifications from communication applications on strain and performance. *Journal of Occupational Health*, 65(1), e12408. https://doi.org/10.1002/1348-9585.12408

Patel, V., Chesmore, A., Legner, C. M., & Pandey, S. (2022). Trends in workplace wearable technologies and connected-worker solutions for next-generation occupational safety, health, and productivity. *Advanced Intelligent Systems*, 4(1), 2100099. https://doi.org/10.1002/aisy.202100099

Pielot, M., & Rello, L. (2017). Productive, anxious, lonely: 24 hours without push notifications. *Proceedings of the 19th International Conference on Human-Computer Interaction with Mobile Devices and Services*, Article 11. https://doi.org/10.1145/3098279.3098526