Towards a Neurophysiological Assessment Paradigm for Responses to Workplace Discrimination

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Synopsis

Understanding how leaders process discriminatory workplace interactions requires moving beyond self-report to examine implicit cognitive and emotional responses. This study adopts a multimodal neurophysiological approach to examine how discriminatory workplace scenarios modulate brain-body responses relative to neutral scenarios. Multimodal data (EEG, ECG, EOG, and eye-tracking) were collected from 60 participants while viewing a set of video stimuli. This stimuli set was validated first in an online survey prior to the laboratory study. Subjective analyses indicate affective differentiation between discriminatory and neutral stimuli along with modest autonomic modulation in preliminary ECG analysis. Ongoing analyses will further examine coordinated neural and interoceptive dynamics to clarify how fairness and diversity violations shape implicit physiological response beyond conscious self-reporting.

Background

Despite advances in organizational research, self-report approaches to workplace discrimination remain vulnerable to social desirability and interpretational biases, particularly in diversity-related contexts (Jordan et al., 2025). Consequently, subjective reports alone provide limited insight into implicit cognitive responses that may accompany exposure to discriminatory interactions. Complementing self-reports with neurophysiological measures enables assessment of such responses without relying on introspection and thereby strengthening inferences about underlying mechanisms.

Drawing on Affective Events Theory, discriminatory workplace interactions can be conceptualized as affective events whose impact depends on individual appraisal (Weiss & Cropanzano, 1996). When such interactions are perceived as violations of fairness and inclusion norms, they are expected to increase emotional salience, which may be reflected in subjective experience as well as physiological responses.

Multimodal neuro-physiological sensing provides a means to capture these implicit responses. EEG, ECG, EOG, and eye tracking allow the assessment of coordinated neural, autonomic, and behavioral dynamics during continuous, ecologically valid task contexts. In naturalistic viewing contexts, spontaneous eye blinks and blink-related EEG activity have been shown to be sensitive to changes in cognitive workload and task demands (Maffei & Angrilli, 2019; Alyan et al., 2023) while heartbeat-locked neural responses provide markers of affective-interoceptive processing during emotionally salient events (Tanaka et al., 2025).

Building on this framework, the present study adopts a multimodal approach to examine how discriminatory workplace scenarios modulate brain–body responses relative to neutral interactions. We hypothesize that discriminatory scenarios will elicit stronger subjective and physiological responses, reflected in increased cognitive workload and heightened affective–interoceptive engagement. Subjective differentiation and preliminary autonomic trends are already

supported, while neural indices of cognitive and interoceptive processing are currently under analysis.

Methods

The study employed a within-subjects design with multimodal sensors (EEG, ECG, EOG, and eye tracking) to assess neurophysiological responses to video-based workplace scenarios.

60 participants took part in the study (M age = 32.26, SD = 7.28), with 60.4% identified as men and 39.6% as women. Due to insufficient data quality, seven participants were excluded from the physiological analyses, resulting in a final sample of 53 participants. Participants reported an average of 3.57 years of leadership experience (SD = 4.41) held predominantly entry-level to midlevel leadership roles and managed on average 3.74 employees (SD = 8.47).

The stimulus set comprised 60 videos, (30 discriminatory, 30 neutral), each presented twice across 8 blocks (15 trials). Trials included a 500 ms fixation, valence and arousal ratings (EmojiGrid (Toet et al., 2018)), and three evaluative items assessing perceived fairness and acceptability (see Figure A). EmojiGrid responses were normalized, with higher valence values indicating more pleasant affect and higher arousal values indicating greater activation. Blocks were randomized and separated by short breaks to reduce fatigue and habituation effects.

Prior to the laboratory study, videos were validated in two independent online surveys, demonstrating reliable differentiation between discriminatory and neutral workplace scenarios. Convergent evidence was further obtained in a larger independent online study (n = 358), in which neutral scenarios were rated higher in valence, $t(357) = -31.47$, $p < .001$, whereas discriminatory scenarios elicited higher arousal, $t(357) = 10.59$, $p < .001$.

EEG (32-channel 10–20; Brain Products LiveAmp), ECG/EOG (BITalino), and gaze (screen-based EyeLogic) were recorded and synchronized via LSL with PsychoPy for stimuli presentation and markers. A baseline recording, including eyes-open and eyes-closed segments, was obtained before task onset.

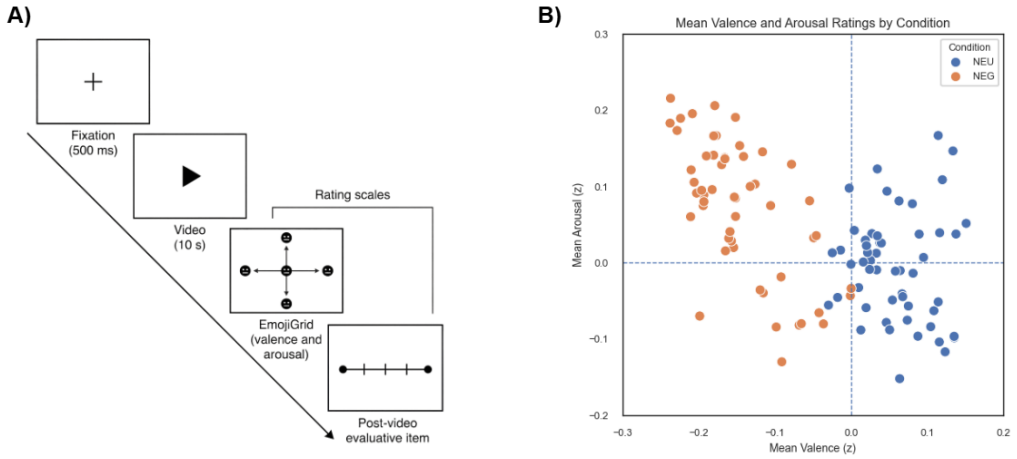

Figure (A) Timeline of a task trial for each video. Each trial began with a 500 ms fixation cross, followed by a 10 second video. Participants then provided valence and arousal ratings using the EmojiGrid and completed post-video evaluative items. Figure (B) Mean standardized valence and arousal ratings by condition. Each point represents a participant's mean rating for neutral (NEU) and discriminatory (NEG) scenarios.

Results

Subjective ratings of discriminatory scenarios were rated as clearly more unpleasant (M = −0.144, SD = 0.061) than neutral scenarios (M = 0.058, SD = 0.047) and elicited higher arousal (NEG: M = 0.072, SD = 0.089; NEU: M = −0.005, SD = 0.070). Paired-samples tests confirmed robust condition differences for both valence, $t(52) = -22.03$, $p < .001$, and arousal, $t(52) = 6.97$, $p < .001$ (see Figure B), replicating the online survey results.

All physiological signals were analyzed at the per-video level. ECG data were preprocessed in NeuroKit2, including cleaning, R-peak detection, and extraction of heart rate and time-domain HRV measures. Trials with fewer than five R-peaks or durations under seven seconds were excluded, leading to the removal of seven participants due to insufficient data quality. Mean heart rate (HR) and HRV indices (MeanNN, RMSSD) were extracted per stimulus and normalized within participants. Trend-level effects indicated higher heart rate, $t(52) = -1.93$, $p = .060$, and lower MeanNN, $t(52) = 1.89$, $p = .065$, during discriminatory scenarios. No difference emerged for RMSSD, $t(52) = -0.32$, $p = .752$. These preliminary findings suggest modest autonomic modulation during exposure to discriminatory scenarios.

Discussion

The subjective findings indicate that the experimental paradigm successfully elicits affectively differentiated responses to discriminatory workplace interactions. Discriminatory workplace scenarios were consistently rated as more unpleasant and more arousing than neutral workplace scenarios, confirming effective affective differentiation. Preliminary autonomic results suggest modest physiological engagement during exposure to discriminatory content, reflected in directionally consistent trend-level patterns across heart rate and MeanNN.

The primary contribution of this work lies in the development of a multimodal neurophysiological assessment paradigm by integrating EEG, ECG, EOG, and eye tracking. The study seeks to examine how cognitive, autonomic and interoceptive processes unfold during the exposure to workplace discrimination. Ongoing analyses will clarify whether discriminatory interactions elicit increased cognitive demands and heightened affective-interoceptive processing, providing insight into implicit responses that may not be available through self-reports alone.

Disclosures

The authors declare no competing interests.

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