

Silent Engagement with Sexual Violence Prevention Messages on Instagram

EL COMPROMISO SILENCIOSO CON LOS MENSAJES DE PREVENCIÓN DE LA VIOLENCIA SEXUAL EN INSTAGRAM

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Abstract: This exploratory pilot study examines how audiences respond to sexual violence prevention messages on Instagram and whether low visible engagement reflects indifference or implicit processing. Using an embedded mixed-methods design, the study combined EEG, eye-tracking, questionnaires, and qualitative interviews with six participants from Indonesia and Taiwan. The findings suggest that limited «likes, comments, or shares» do not necessarily indicate a lack of concern, as audiences may silently process and internalize messages influenced by psychological, sociocultural, and contextual factors. The study also indicates that neuroscience-informed evaluation can help explain hidden forms of digital engagement and cautions against relying solely on visible metrics to assess the effectiveness of social campaigns.

Keywords: Instagram; Neuroscience; Sexual Violence; Social Campaign; Silent Engagement.

Resumen: Este estudio piloto exploratorio examina cómo las audiencias responden a mensajes de prevención de la violencia sexual en Instagram y si la baja interacción visible refleja indiferencia o procesamiento implícito. Mediante un diseño mixto integrado, el estudio combinó EEG, seguimiento ocular, cuestionarios y entrevistas cualitativas con seis participantes de Indonesia y Taiwán. Los resultados sugieren que la escasez de «me gusta, comentarios o compartidos» no necesariamente indica falta de preocupación, ya que las audiencias pueden procesar e internalizar los mensajes de forma silenciosa, influidas por factores psicológicos, socioculturales y contextuales. El estudio también indica que una evaluación informada por la neurociencia puede ayudar a comprender formas ocultas de compromiso digital y cuestiona la dependencia exclusiva de métricas visibles para evaluar la efectividad de las campañas.

Palabras clave: Instagram; neurociencia; violencia sexual; campaña social; compromiso silencioso.



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1. Introduction

Sexual violence is a serious problem that is currently plaguing the world, including in the field of education. International studies over the past decade confirm that the prevalence of sexual violence in higher education is still high, with variations in numbers influenced by differences in definitions, measurement methods, and cultural and institutional contexts (Fedina et al., 2018).

Various efforts to prevent and handle sexual violence have been carried out in various countries and universities. Meta-analyses of various anti-sexual violence programs show that sexual violence prevention and handling (PHSV) programs on campus tend to have a stronger impact on knowledge, attitudes, and intentions (Kettrey et al., 2023). In the past decade, campuses have increasingly used Instagram and other platforms for education, dissemination of service information, and the formation of new social norms. In South Africa, digital technology is used to support case reporting and social media to provide education about sexual violence (Olaitan, 2024). In America, social media can also be an effective means of social movements to combat gender-based violence (Battisti et al., 2024). In Indonesia, Instagram has also become the primary communication channel for anti-sexual violence campaigns at various universities (Setiansah et al., 2025). Wide reach, ease of use, and low cost make social media a suitable medium for social campaign activities. Social media is an effective way to increase awareness about health and social issues, including those issues that are stigmatized (Kaufman et al., 2021).

In general, the main challenge is to ensure that the campaign's message is truly attention-grabbing, understood, and triggers the right emotional engagement. At this point, evidence-based communication approaches (e.g., message evaluation, content design, and understanding of message processing) become crucial so that digital campaigns do not stop at reach but instead impact knowledge, attitudes, and behaviors (Bondestam & Lundqvist, 2020). The problem is that public involvement with PHSV social media accounts is generally low (Setiansah et al., 2024). This is evident from the lack of public «likes, comments, and shares» on the PHSV task force's social media accounts.

From a social media theory perspective, user engagement is a key concept for assessing the effectiveness of social media use, including on platforms such as Instagram. No matter how good the information conveyed through social media is, it will be meaningless if it fails to engage the audience. Social media can only be called social media if there is interaction and engagement in conversation (Mühl-benninghaus, 2013). Therefore, PHSV Instagram account managers are obliged to apply social media logic in managing their accounts,

including the processes, principles, and practices for managing information, news, and communication with their users (van Dijck & Poell, 2013; Maryani et al., 2020). The problem is that social media's logic often fails to explain the invisible public response. Remaining silent does not necessarily guarantee future silence, and not liking or commenting on the issue means the user does not care or is not interested in the issue raised.

Capturing users' attention amid the many media and information options is not easy. The presence of digital media technology has shaped new media interactions and cultures in society. Understanding why users engage differently with social media content also requires attention to audience motivations and media-selection processes. In the context of sexual violence prevention campaigns, which are a sensitive issue, the challenges faced by media account managers have become even greater. The Uses and Gratification Theory explains that the public has the autonomy to choose media that meet their needs (Griffin et al., 2019). The media then compete for public attention. Content creators must be able to empathize, understand, and even restrain themselves when broadcasting content on sensitive issues.

Departing from these conditions, this study adopts an interdisciplinary approach by integrating principles from neuroscience to explore the less visible aspects of public responses to sexual violence-related posts on Instagram. This interdisciplinary perspective is motivated by rapid developments in digital technology, which have fundamentally transformed how individuals conduct their daily lives. Communication patterns have evolved, online behaviors have shifted, and even the ways people interpret and respond to social problems have been reshaped by digital environments. We must be able to work collaboratively with other disciplines, communities, and organizations to address today's challenges (Brandão et al., 2023).

Neuroscience, as a field that examines the functioning of the nervous system and the brain, offers valuable tools for understanding how individuals process information beyond what is observable through overt online behavior. In the context of digital communication, neuroscience-informed approaches enable researchers to capture psychological responses, such as attention and emotional engagement, that are often invisible in conventional social media metrics. Psychological perspectives on information processing also help explain why audiences may engage with sensitive digital content without expressing visible interaction. Dual-process theories suggest that individuals process information through both automatic emotional reactions and more reflective cognitive evaluation (Kahneman, 2011). In digital communication

environments, users may experience emotional or attentional engagement with campaign messages even when that engagement is not reflected in observable online behavior, such as liking, commenting, or sharing.

Although a substantial body of research has examined sexual violence prevention in higher education (Daigle et al., 2008; Sivertsen et al., 2019; Young & Wiley, 2021; Quran, 2022; Zarkasi et al., 2023), existing studies have largely focused on policy development, educational interventions, and self-reported evaluations of prevention programs. Far less attention has been paid to how audiences psychologically process sexual violence prevention messages in digital environments, particularly on social media platforms such as Instagram.

Based on this research gap, the present study adopts an exploratory approach to address the following overarching question: *How do audiences respond to sexual violence prevention content on Instagram?* More specifically, this study seeks to answer three interrelated research questions: (1) how can neuroscience-informed approaches be applied within communication and media studies to examine digital message engagement; (2) how do neuroscience-based indicators explain audience attention and emotional responses to sexual violence prevention content on Instagram; and (3) how can neuroscience-informed insights contribute to understanding audience engagement with sexual violence prevention content?

2. Method

This study is an exploratory pilot investigation that integrates neuroscience-informed approaches within a communication research framework. As an exploratory study, the results of this study are not intended to make generalizations. Its primary aim is to identify patterns of implicit responses and to assess the feasibility of applying neuroscience-informed methods to the study of digital communication. To examine efforts to enhance the effectiveness of sexual violence prevention campaigns, the study employs a mixed-methods design that combines quantitative and qualitative approaches. This design enables the capture of both measurable psychological responses and contextual interpretations of audience engagement, providing a more comprehensive understanding of how sensitive campaign messages are processed in digital environments.

A mixed-methods approach is used when the researcher believes that combining quantitative and qualitative methods will yield better results than using only one method (Creswell & Creswell, 2018). In the context of this study, the need for mixed methods arose to ensure that neuroscience

principles can be applied to Instagram content production; experiments are needed to demonstrate that neuroscience can explain how the audience's brains respond to social media content. On the other hand, discussion and deepening through qualitative methods are needed to ensure the integration of the two disciplines, leading to a more effective sexual violence prevention campaign model on Instagram. More specifically, this study uses an embedded mixed-methods design, in which qualitative and quantitative methods are implemented simultaneously (Bungin, 2020).

The quantitative component consisted of a quasi-experimental one-shot case study design, in which participants were presented with a simulated Instagram post while being simultaneously recorded with an EEG and an eye tracker. The qualitative component was obtained through post-experimental interviews with participants and focus group discussions with neuroscience researchers at the Mind Research and Imaging Center in Taiwan.

The quasi-experimental method in this study was used to answer the question of how the brain responds to sexual violence prevention messages. Eye tracking is used to examine visual attention patterns, while electroencephalography (EEG) is used to examine neural responses when participants view Instagram posts. The combination of EEG and eye tracking allowed simultaneous analysis of participants' neural responses and visual attention patterns to sexual violence prevention content. EEG and eye-tracking were employed as psychophysiological indicators of attention and emotional engagement to complement communication-based measures of message effectiveness.

EEG signals are analyzed as components of the ERP (Event-Related Potential) systems, the brain's electrical responses to specific stimuli (e.g., images, sounds, words, or events). Two ERP components are often used: P300, an indicator of attention allocation, and LPP (late positive potential), an indicator of emotional engagement, reflecting participants' attention and emotional reactions to the content. In addition to EEG, this study uses eye-tracking to identify participants' focal points of attention during content review. Eye tracking records the duration of gaze (fixation) on a specific area of the post as well as the viewing path (scan path) visualized in a heatmap. Eye-tracking technology provides valuable insights into how individuals process visual content on social media by measuring eye movements, fixation patterns, and gaze duration (Holmqvist et al., 2011; Duchowski, 2017). In the context of sexual violence prevention research on Instagram,

eye-tracking data can reveal the visual attention strategies that users use when interacting with sensitive content.

The researcher also uses qualitative methods to deepen the data by examining respondents' experiences and reference frameworks. Collecting data on the *field of experience* and *frame of reference* is very important because it can explain why respondents like or dislike a piece of content posted on Instagram. This design aligns with the study's purpose: to provide an in-depth description of the audience's engagement with the PHSV campaign's content.

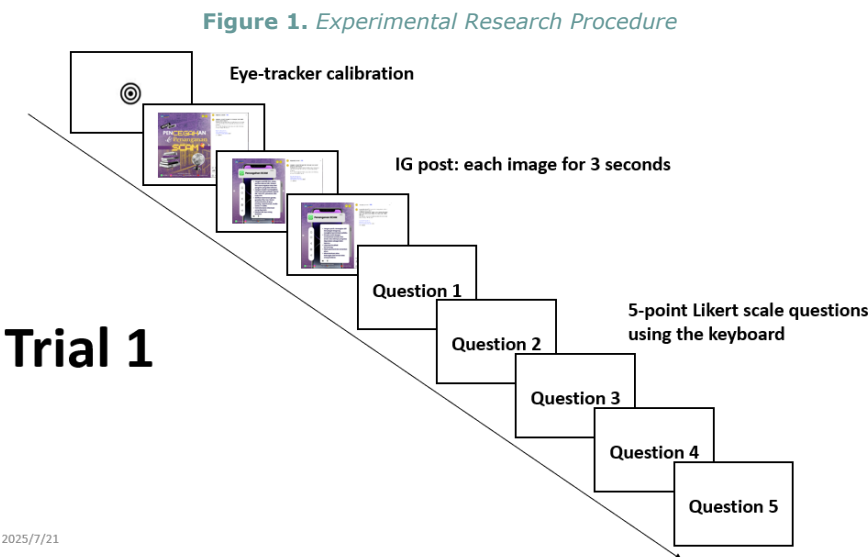
The experimental method followed a two-stage procedure: a visual stimulus session and an interview session. In the first session, participants were shown 50 Instagram posts consisting of 131 images taken from the PHSV Task Force Instagram account of a university in Indonesia, consisting of:

1. Sexual violence prevention content (carousel, posters, infographics).
2. Neutral posts in the form of images of nature as a baseline.

Providing two post-stimulus types allows for comparison of reactions to PHSV and neutral posts. PHSV posts that are displayed by themselves are divided into two categories, namely *high-like posts* and *low-like posts* from the audience. Thus, each respondent is given three groups of stimuli: high-like posts, low-like posts, and *scene posts*. Each stimulus was shown to the respondents for 3 seconds, with a 1-second interval between stimuli, followed by a questionnaire with answers on 5 Likert scales. The questions are structured to find out how relevant the stimulus is to:

1. Respondent's emotional reactions
2. Message clarity
3. Reflection on the issue
4. Perception of effectiveness
5. Encouragement for respondents to seek further information.

Questionnaire responses were used primarily to support qualitative interpretation and were not analyzed statistically due to the study's pilot nature.



Source: Prepared by the uthor

Table 1. *Experiment equipment*

Equipment	Purpose
1. Video-based eye tracker – EyeLink II	Record gaze data (fixation, saccade, scanpath)
2. 32-channel EEG	Record ERPs during stimulus viewing
3. Stimulus presentation via Experiment Builder	

Source: Prepared by the author

The research subjects in this study are students, lecturers, and education staff from 2 institutions: one in Indonesia and one in Taiwan. The researcher selected respondents using accidental sampling based on their likelihood of availability. There were 6 respondents in the EEG and eye-tracking experiment, consisting of 3 Taiwanese and 3 Indonesians, with 1 female and 5 males. In addition, the sample showed substantial gender imbalance, with only one female participant, which may have influenced emotional and attentional responses to sensitive content related to sexual violence. Small samples are common in neuromedia pilot studies due to the complexity and cost of EEG experiments. Because simultaneous EEG and eye-tracking recording is technically demanding and time-intensive, the number of participants that

could be tested was limited. The inclusion of participants from Indonesia and Taiwan was intended to provide preliminary cross-cultural perspectives within an exploratory Asian context. All respondents provided *informed written consent* from the Mind Research and Imaging Center, National Cheng Kung University, Taiwan. This research has also received an ethical clearance letter from the Research Ethics Committee, Institute for Research and Community Service, Universitas Jenderal Soedirman, Indonesia, under approval number 01.037/KEP-SOSHUM/VIII/2025.

Figure 2. *The Process of Providing Visual Stimulus to Respondents*



Source: Research data

After obtaining data from the experiment, the research team conducted interviews with respondents to explore factors that also affected their emotional responses to the posts they had seen. The questions included the respondents' knowledge about sexual violence prevention as well as the physical and psychological conditions experienced while participating in the experiment. This interview session also serves to deepen the data obtained from EEG recordings and eye-tracking. Interviews can also provide insight into other factors that influence respondents' responses to the stimulus.

After the entire series of experiments and interviews was completed, a focus group discussion (FGD) was held with neuroscience experts. Four neuroscience experts serve as resource persons on the use of neuroscience in communication and media. The FGD was conducted to discuss the results and interpret the experiment's outcomes, examine other factors, such as socio-

cultural background, that affect participants' responses to the stimulus, and explore the potential for larger-scale research.

EEG preprocessing was conducted in EEGLAB using MATLAB R2020b. Raw EEG recordings were imported from Curry .cdt files, resampled to 250 Hz, and band-pass filtered from 0.5 to 50 Hz. Non-EEG and auxiliary channels, including the trigger and eye-movement channels, were removed prior to ICA. Independent component analysis was conducted on the continuous EEG data using the extended runica algorithm. Components reflecting ocular, muscular, channel-noise, or other non-neural artifacts were identified by visual inspection of scalp maps, time courses, and power spectra, and were removed on a participant-specific basis. The continuous EEG data were epoched from -200 to 3000 ms relative to stimulus onset and baseline-corrected using the -200 to 0 ms prestimulus interval. Trigger codes 1–50 corresponded to Instagram post stimuli and were classified as *high-like* or *low-like* according to the stimulus coding table. Natural scenes were identified using trigger code 51.

ERP measures were extracted from the baseline-corrected epochs. P300 mean amplitude was computed from 300 to 600 ms, and LPP mean amplitude was computed from 400 to 900 ms. Analyses focused on centro-parietal and parietal electrodes, particularly CPz and Pz. Frequency-domain features were estimated using Welch's power spectral density method. Mean theta, alpha, and beta power were extracted for 4–7 Hz, 8–12 Hz, and 13–30 Hz, respectively.

For each participant, EEG features were averaged within each condition. A one-way repeated-measures ANOVAs was then conducted with stimulus condition as the within-subject factor: *high-like* posts («likes» ≥ 50 , $n = 25$ posts; 81 epochs), *low-like* posts («likes» < 50 , $n = 25$ posts; 50 epochs), and natural scenes ($n = 10$ epochs). Follow-up paired-samples t-tests were used to examine pairwise differences between conditions. Given the small pilot sample, all inferential results were interpreted with caution; partial eta squared was reported as the ANOVA effect size.

Eye-tracking data were collected simultaneously with the EEG during the same stimulus-viewing task. Gaze position was recorded using an EyeLink II eye tracker (SR Research Ltd., Canada), with a maximum sampling rate of 500 Hz. The eye tracker was calibrated for each participant before the task. Participants viewed high-like Instagram posts, low-like Instagram posts, and natural scenes; each stimulus was presented for 3 s followed by a 1 s interval.

Gaze data were segmented by stimulus onset using the same trigger structure as the EEG data. Fixations were extracted during the 0–3000 ms viewing window. The main eye-tracking measures were fixation duration, dwell

time, and fixation distribution across predefined areas of interest, including image, title/headline, and text regions. Participant-level condition means were used for analysis, and the results were interpreted as exploratory indices of visual attention.

3. Results

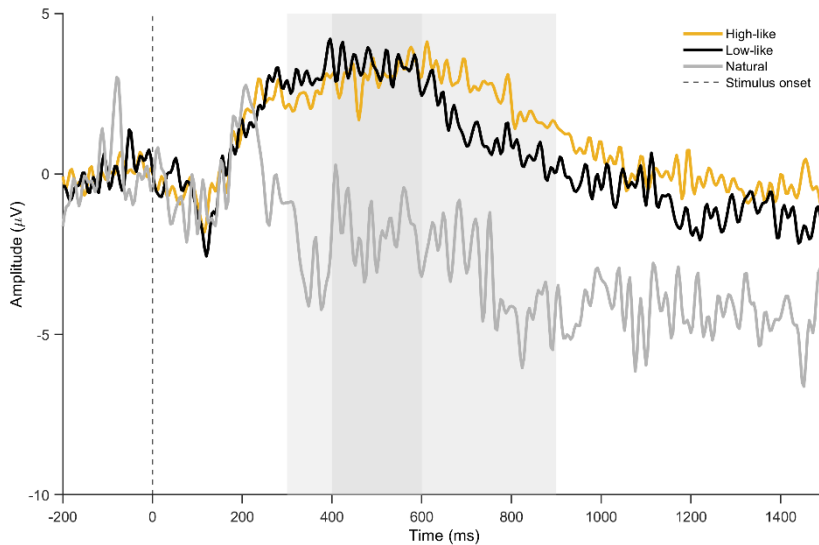
3.1. Neural and Visual Responses to Sexual Violence Prevention Posts on Instagram

In this section, the results of the EEG and eye-tracking research will be presented. After artifact correction, repeated-measures ANOVA revealed a significant effect of stimulus condition on P300 mean amplitude at Pz, $F(2, 10) = 6.54$, $p = .015$, partial $\eta^2 = .57$. Follow-up paired-samples t tests showed that low-like posts differed from natural scenes, $t(5) = 3.69$, $p = .014$. The comparison between *high-like* posts and natural scenes approached significance, $t(5) = 2.40$, $p = .061$. *High-like* and *low-like* posts did not differ significantly, $t(5) = -0.29$, $p = .780$. The effect of stimulus condition on LPP mean amplitude at Pz was also significant, $F(2, 10) = 5.21$, $p = .028$, partial $\eta^2 = .51$. Follow-up comparisons indicated that *low-like* posts differed from natural scenes, $t(5) = 3.36$, $p = .020$, whereas *high-like* posts did not differ significantly from natural scenes, $t(5) = 2.22$, $p = .077$, or from *low-like* posts, $t(5) = 0.47$, $p = .656$ (see figure 3).

For frequency-domain measures, alpha-band power showed a significant condition effect, $F(2, 10) = 6.64$, $p = .015$, partial $\eta^2 = .57$. Follow-up tests indicated that *low-like* posts differed from natural scenes, $t(5) = 5.91$, $p = .002$. The comparison between *high-like* posts and natural scenes approached significance, $t(5) = 2.54$, $p = .052$, whereas *high-like* and *low-like* posts did not differ, $t(5) = 0.18$, $p = .863$.

Other EEG measures did not show significant omnibus condition effects after ICA correction, including P300 mean amplitude at CPz, P300 peak amplitude at Pz and CPz, LPP mean amplitude at CPz, theta-band power, and beta-band power.

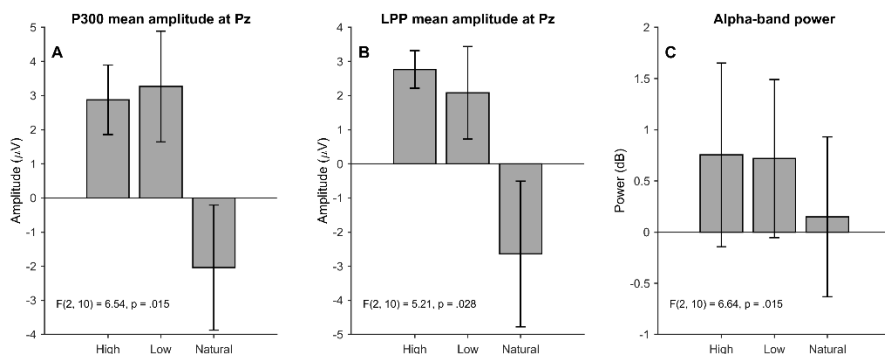
Overall, the EEG results indicated condition-related differences in selected ERP and spectral measures, particularly P300 mean amplitude at Pz, LPP mean amplitude at Pz, and alpha-band power. These effects were primarily driven by differences between Instagram-post stimuli and natural scenes, particularly for low-like posts. Direct comparisons between *high-like* and *low-like* posts were not significant for any of the EEG measures analyzed.

Figure 3. Grand-average ERP waveforms at Pz by stimulus condition

Source: Research data

Waveforms represent the group-average event-related potentials for *high-like* Instagram posts, *low-like* Instagram posts, and natural scenes after ICA-based artifact correction. The vertical dashed line indicates stimulus onset. The shaded regions indicate the P300 analysis window (300–600 ms) and the LPP analysis window (400–900 ms). Both Instagram-post conditions showed a more positive-going activity than the natural-scene condition during the P300 and LPP time ranges, suggesting greater attentional and sustained evaluative processing of Instagram stimuli relative to neutral natural scenes. However, the *high-like* and *low-like* waveforms were visually similar and should not be interpreted as evidence of a reliable like-count effect. All waveforms were baseline-corrected using the –200 to 0 ms prestimulus interval.

Figure 4. EEG responses by stimulus condition



Source: Research data

Bars represent group means, and error bars represent standard errors of the mean. Panel A shows P300 mean amplitude at Pz, Panel B shows LPP mean amplitude at Pz, and Panel C shows alpha-band power. Repeated-measures ANOVAs showed significant condition effects for P300 mean amplitude, $F(2, 10) = 6.54, p = .015$, partial $\eta^2 = .57$; LPP mean amplitude, $F(2, 10) = 5.21, p = .028$, partial $\eta^2 = .51$; and alpha-band power, $F(2, 10) = 6.64, p = .015$, partial $\eta^2 = .57$ (see figure 4).

Descriptively, *high-like* and *low-like* Instagram posts showed larger P300 and LPP amplitudes than natural scenes, indicating stronger neural engagement with social-media content than with neutral visual baselines. The clearest pairwise differences were observed between *low-like* posts and natural scenes, whereas direct comparisons between *high-like* and *low-like* posts were not significant. Thus, the figure supports a cautious interpretation that Instagram-post stimuli differed from natural scenes, but it does not provide evidence that the number of «likes» alone reliably modulated EEG responses.

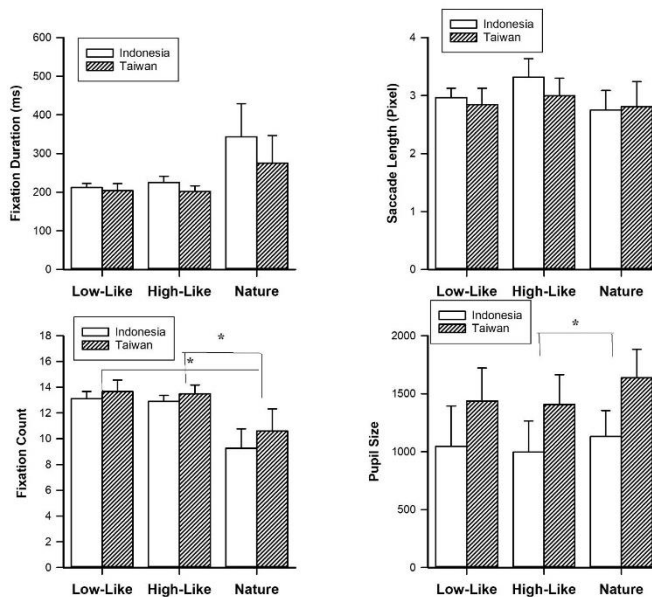
Eye-tracking results provided complementary evidence for condition-related differences in visual attention (see Figure 5). Given the small subgroup sizes, the eye-tracking results were treated as exploratory. A mixed-model ANOVA revealed a significant main effect of stimulus condition on fixation counts, $F(2, 8) = 16.22, p = .002$, partial $\eta^2 = .802$. Follow-up paired-samples t tests indicated that *low-like posts* significantly differed from natural scenes, $t(5) = 4.65, p = .006$. The comparison between *high-like posts* and natural scenes also reached significance, $t(5) = 4.24, p = .008$. However, no significant difference was observed between *high-like* and *low-like posts*, $t(5) = -1.05, p = .34$. No

significant main effect of group condition was found, $F(1, 4) = 0.40$, $p = .56$, partial $\eta^2 = .091$. In addition, the interaction between stimulus condition and group condition was not significant, $F(2, 8) = 0.21$, $p = .82$, partial $\eta^2 = .05$.

For pupil size, a significant main effect of the stimulus condition was observed, $F(2, 8) = 5.37$, $p = .03$, partial $\eta^2 = .573$. Follow-up paired-samples t tests showed that *high-like posts* significantly differed from natural scenes, $t(5) = -4.00$, $p = .01$. The comparison between *low-like posts* and natural scenes did not reach significance, although a trend was observed, $t(5) = -1.89$, $p = .12$. No significant difference was found between *high-like* and *low-like posts*, $t(5) = -1.02$, $p = .36$. Similarly, no significant main effect of group condition was detected, $F(1, 4) = 1.30$, $p = .32$, partial $\eta^2 = .245$, and the interaction effect was also not significant, $F(2, 8) = 0.54$, $p = .60$, partial $\eta^2 = .119$.

For fixation duration and saccade length, no significant effects were observed.

Figure 5. Eye-tracking indices by stimulus condition and participant group



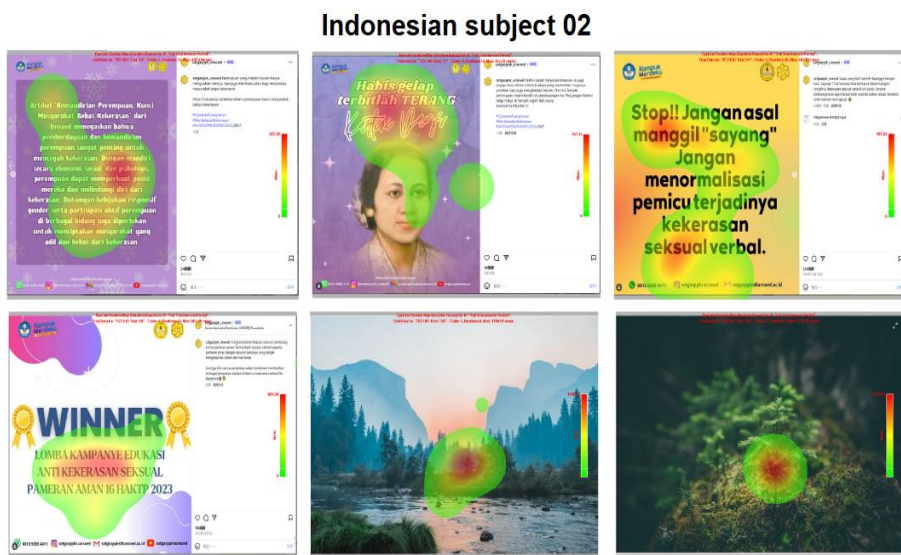
Source: Research data

Bars represent mean values, and error bars represent standard errors of the mean for Indonesian and Taiwanese participants across *low-like posts*, *high-*

like posts, and natural scenes. The panels show fixation duration, saccade length, fixation count, and pupil size. Mixed-model ANOVAs showed significant effects of stimulus condition on fixation count and pupil size, whereas fixation duration and saccade length showed no significant effects. Because each participant group included only three participants, these results should be interpreted as exploratory.

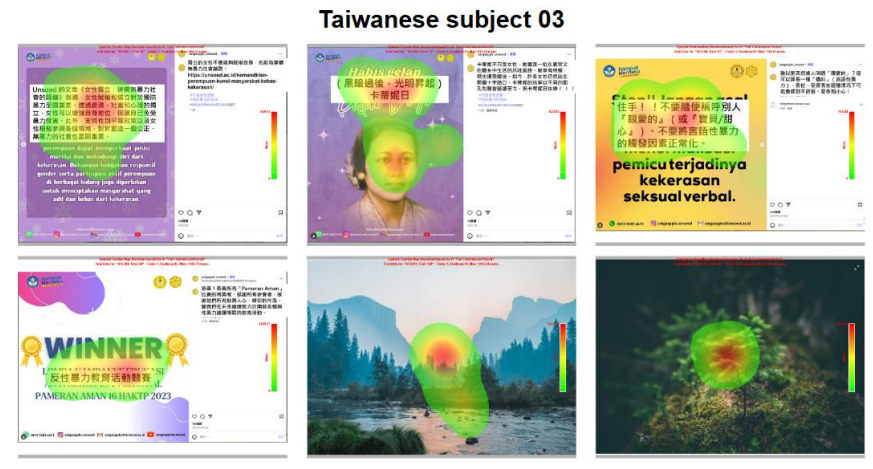
Significant differences in eye-tracking results for *low-like posts*, *high-like posts*, and natural scenes are evident in the heat maps in Figures 6 and 7. In the natural scenes, Indonesian and Taiwanese participants focus only on the middle. Meanwhile, in *low-like* and *high-like posts*, participants' areas of interest are more widely distributed. They pay considerable attention to the title, text, and images on both *low-like* and *high-like post* types.

Figure 6. Data from the Indonesian eye tracker results



Source: Research data

Figure 7. Data from the Taiwanese eye tracker results



Source: Research data

3.2. Factors Shaping Responses to Sexual Violence Prevention Messages

In accordance with the mixed-methods research design, after conducting EEG and eye-tracking experiments, researchers also conducted interviews with participants. From the interviews conducted, several findings emerged. There were four factors that affected the results of the experiment and participants' responses to the content to prevent sexual violence on Instagram.

First, physical comfort also affects neural responses. Another factor affecting the results of the experiment using EEG and an eye tracker is the participants' physical condition. The EEG results for respondent Taiwanese participant 1 showed that he responded more positively to *low-like posts* than to *high-like posts*, and that this effect was stronger for natural scenes. This is certainly interesting because it differs from the overall response of other participants. From the in-depth interview results, it was evident that the participants were already tired, so knowing the simulation session would end soon made their responses more positive.

Second, both brain and emotional reactions are influenced by prior knowledge and experience. Participants with a high interest in the PHSV issue showed positive emotional reactions. They are willing to tolerate the discomfort that occurs during the simulation process. They are also willing to

spend more time and give more attention to the content and to the questions. This condition was shown by Taiwan 3, who is a female participant and knows the issues and various programs for the prevention and handling of sexual violence on her campus.

I had heard about sexual violence on campus, but I was happy and excited to be involved in this research. I wanted to know what it was like and how it worked, because it was the first time I was involved in research like this (Indonesian Participant 2).

Yes, there are also cases of sexual violence on my campus, and here the prevention efforts are quite massive as well. There is a Gender Equity Education Commission that conducts roadshows for departments, produces posters, organizes gender film festivals, and more (Taiwan Participant 3).

On the other hand, participants who do not have an interest in the issue of sexual violence tend to be impatient, intolerant of discomfort, so they also do not finish reading or listening to simulated posts for reasons of too short a time and others. As seen in Indonesian participant 3's reaction, «Oh no, I don't want to participate like that. I didn't have time to read all of them.»

Third, the in-depth interviews have confirmed which type of media content is most interesting and memorable to participants. One of the most prominent answers is that posting stories or cases is the easiest way to attract attention, as it can make the public feel connected to the issue being campaigned for. However, it should not be displayed in a vulgar manner.

I remember the post about toxic masculinity because it relates to things I've seen happening among my friends. I was also reminded of the post that said not to call «babe». In my opinion, what is effective is a poster that has a story, a real story or a case, so people feel relatable to the issue. You can add pictures too, but it's better to just animate rather than real people (Taiwanese Participant 3).

The answers of the Taiwan 3 participants were also in line with the questions through a questionnaire about how strong the content of sexual violence prevention caused emotional reactions in participants. From these answers, content that makes participants feel connected, based on cases or real stories, includes content that causes quite strong emotional reactions in participants.

Fourth, several participants and discussants perceived similarities in how sexual violence issues are handled in Indonesia and Taiwan. Both countries are in Asia with almost the same values in looking at the issue of sexual violence. Based on interviews with informants, it can be concluded that issues and cases of sexual violence are equally found in both countries. The approach to

prevention and handling when a case occurs is largely the same, including the power dynamics involved and the social media campaigns.

During the focus group discussion, participants noted that the situation is not substantially different from that of Indonesian universities. When cases of sexual violence occur on Taiwanese campuses, they are often handled internally and out of public scrutiny, particularly when the alleged perpetrator holds an official position within the university. Power relations may also discourage individuals from openly expressing support for victims or publicly responding to such cases. Under these circumstances, it is unsurprising that sexual violence prevention content shared through university PHSV task force social media accounts receives relatively few explicit forms of engagement.

4. Discussion

4.1. Interpreting EEG and Eye-Tracking Findings

The EEG findings provide preliminary evidence that Instagram post stimuli and natural scenes differed in neural processing. Significant condition effects were observed for P300 mean amplitude at Pz, LPP mean amplitude at Pz, and alpha-band power. These measures are commonly associated with attentional allocation, sustained evaluative or affective processing, and oscillatory engagement. Thus, the results suggest that socially meaningful Instagram stimuli may have engaged attentional and evaluative processes differently from natural scenes. However, the results did not support a reliable neural distinction between *high-like* and *low-like posts*. Across ERP and frequency-domain measures, direct comparisons between *high-like* and *low-like posts* were not statistically significant. Therefore, the present EEG results should not be interpreted as evidence that like count alone modulated neural responses. Instead, the clearest pattern was a difference between Instagram-post stimuli and natural scenes.

The strongest pairwise effects were observed between *low-like posts* and natural scenes. This pattern may reflect enhanced evaluative processing of social-media content relative to non-social natural images. One possible interpretation is that *low-like posts* required an additional appraisal or expectancy-related processing, perhaps because socially lower-ranked content was more ambiguous or evaluatively salience. However, this interpretation remains speculative. The present design cannot fully separate the effects of like count from other stimulus-level differences, such as visual complexity, semantic content, emotional salience, or post-composition.



The absence of significant *high-like* versus *low-like* differences may also reflect limited statistical power. With only six participants, the study was likely underpowered to detect subtle within-subject effects of like count. Thus, the non-significant *high-like* versus *low-like* comparisons should not be taken as definitive evidence against a like-count effect. At the same time, the descriptive pattern did not consistently favor *high-like posts* over *low-like posts*, suggesting that any like-count effect was weak or unstable in the present dataset.

Eye-tracking results provide complementary evidence of condition-related differences in visual attention. Descriptively, Instagram posts elicited more frequent fixations than natural scenes, suggesting more active visual sampling of the multiple textual and visual elements embedded in the posts. In contrast, natural scenes showed longer fixation durations, which may reflect more sustained gaze at fewer visual regions. Saccade length appeared slightly greater for *high-like posts*, suggesting broader scanning across post elements. Pupil size showed descriptive differences across participant groups and conditions, but this measure was interpreted with caution because pupil diameter can be influenced by luminance, contrast, fatigue, and calibration factors. Given the small subgroup sizes, the eye-tracking results were treated as exploratory and used to complement, rather than confirm, the EEG findings.

4.2. Audience Responses Beyond Visible Engagement Metrics

The findings suggest that Instagram-post stimuli generally elicited stronger attentional and emotional responses than natural scenes. However, the present pilot study did not find any statistically significant differences between high-like and low-like posts. These results indicate that audience engagement with sexual violence prevention content cannot be fully explained by visible interaction metrics alone. Although social endorsement cues such as likes, comments, and shares are often assumed to influence audience attention, their effects were not clearly reflected in the neural measures observed in this study. Previous communication research suggests that visible engagement metrics may function as heuristic cues of relevance and credibility, influencing how audiences evaluate and attend to online content (Hayes et al., 2016; Lim & Rasul, 2022). However, the absence of significant differences between high-like and low-like posts in the present study provides only limited support for claims that social endorsement alone shapes neural engagement. Rather than serving as direct indicators of audience involvement, engagement metrics may be better understood as elements of the broader communicative environment within which users interpret and engage with digital content.

These findings are consistent with recent communication scholarship that calls for a broader conceptualization of engagement beyond observable platform behaviors. Davies et al. (2024) argue that engagement on digital platforms cannot be reduced to measurable actions such as likes or comments, as users often interact with information through subtler practices, including reading, reflection, and private sharing. Similarly, studies of online participation have shown that audiences frequently engage through observation and cognitive processing without displaying visible interaction behaviors (Burke et al., 2011; Highfield & Leaver, 2016).

The present findings support this perspective, suggesting that the absence of visible responses does not necessarily indicate indifference or lack of concern. Qualitative findings revealed that participants perceived several factors that may discourage public expressions of support, including cultural norms, power relations, and differences in personal knowledge and experience regarding sexual violence. As a result, individuals may continue to process, evaluate, and reflect on campaign messages even when they choose not to express their reactions publicly via social media.

The value of incorporating neuroscience-informed approaches into communication research has also been highlighted in previous studies. For example, Maynard et al. (2018) demonstrated that neuroscience measures can provide insights into audience responses to tobacco-control campaigns that may not be fully captured through surveys or focus groups alone. Consistent with this perspective, the present study suggests that neuroscience-informed measures can complement conventional communication research methods by helping to identify forms of engagement that remain hidden within standard social media analytics, particularly in the context of sensitive and socially consequential issues such as sexual violence prevention.

4.3. Silent Processing of Sensitive Campaign Messages

The EEG and eye-tracking findings revealed no statistically significant differences between high-like and low-like posts. These results suggest that the relatively low levels of visible engagement observed on PHSV task force Instagram accounts should not be interpreted as evidence of campaign failure or audience indifference. Rather, the findings indicate that audiences may continue to process and respond to sexual violence prevention messages even when such responses are not expressed through observable platform behaviors.

Psychological perspectives on information processing help explain this pattern. Dual-process theories suggest that responses to communication



messages are shaped not only by conscious and deliberate evaluation but also by automatic emotional and cognitive processes (Kahneman, 2011). In the context of sensitive issues such as sexual violence, audiences may experience emotional reactions, reflection, or concern without translating these responses into visible online actions. Emotional processing perspectives similarly suggest that individuals may avoid overt engagement with distressing content to regulate discomfort while continuing to engage with the message cognitively (Foa & Kozak, 1986). As a result, the absence of likes, comments, or shares does not necessarily imply the absence of attention, emotional engagement, or message processing.

The present findings can also be interpreted through communication theories that address public expression and self-censorship. According to the Spiral of Silence framework, individuals may refrain from expressing opinions publicly when they perceive an issue as socially sensitive, controversial, or potentially risky (Gearhart & Zhang, 2015). Even in digital communication environments, users often monitor the perceived opinion climate before deciding whether to engage publicly. Consequently, visible silence may coexist with active cognitive and emotional engagement.

In the context of sexual violence prevention campaigns, this tendency may be reinforced by cultural norms, social stigma, and institutional power relations. Publicly interacting with campaign content may be interpreted as taking a position on a sensitive issue or challenging existing institutional structures. Consistent with the qualitative findings of this study, participants indicated that concerns about cultural expectations, power dynamics, and personal experiences could discourage open expressions of support, even as individuals could engage with the content privately. Similar patterns have been observed in studies of digital feminist activism, which show that discussions of sexual violence often involve complex emotional, social, and political considerations that shape how people participate in online conversations (Mendes et al., 2018).

These findings highlight the importance of evaluating sensitive-issue campaigns beyond conventional engagement metrics. For communication practitioners and campaign organizers, low levels of visible interaction should not automatically be interpreted as a lack of audience engagement. Instead, audience responses may take the form of attention, reflection, emotional processing, or private discussion, all of which remain largely invisible within platform analytics but may nevertheless contribute to the broader communicative impact of the campaign.

4.4. Reconceptualizing Engagement as Silent Engagement

The findings of this study suggest that audience engagement with sexual violence prevention content cannot be adequately understood through visible interaction metrics alone. Although no statistically significant differences were observed between high-like and low-like posts, the EEG, eye-tracking, and qualitative findings collectively indicate that audiences may continue to attend to, process, and reflect on campaign messages even when they do not publicly express their responses through likes, comments, or shares. These findings reinforce the argument developed in the previous sections that visible engagement metrics provide only a partial picture of how audiences interact with sensitive campaign content.

This study contributes to communication research by reconceptualizing engagement with social campaign messages as a multidimensional process that extends beyond observable platform interactions. While previous studies have often relied on metrics such as likes, comments, and shares to evaluate audience engagement, the present findings suggest that meaningful responses may also occur through cognitive, emotional, and reflective processes that remain largely invisible within conventional social media analytics.

Building on previous discussions of passive participation and invisible forms of online engagement (Burke et al., 2011; Highfield & Leaver, 2016; Davies et al., 2024), this study introduces the concept of *silent engagement*. In this study, silent engagement refers to cognitive, emotional, and reflective engagement with digital content that occurs without visible platform interactions such as liking, commenting, or sharing. The concept captures forms of audience involvement that may not be observable through conventional engagement metrics but nevertheless represent meaningful responses to communication messages.

This perspective expands existing understandings of audience engagement in digital communication environments and highlights the need for more comprehensive approaches to evaluating the effectiveness of social campaigns, particularly those addressing sensitive and stigmatized issues such as sexual violence prevention. By combining communication theory with neuroscience-informed measures, the study demonstrates how hidden forms of engagement can be identified and incorporated into broader assessments of campaign effectiveness.

4.5. Research Limitations

Several limitations should be noted. First, the overall sample was small, with only six participants, which limited statistical power, generalizability, and the ability to conduct robust subgroup comparisons between Indonesian and Taiwanese participants. Second, participants were recruited through convenience sampling during a limited international data-collection period; therefore, the sample should not be considered representative of either population. Third, trial counts were unequal across stimulus conditions, and the natural-scene condition contained fewer trials than the Instagram-post conditions, which may have affected the stability of both EEG and eye-tracking estimates. Fourth, although ICA-based artifact correction was applied to the EEG data, the simultaneous EEG and eye-tracking setup may have increased ocular, muscular, or mechanical artifacts. Similarly, eye-tracking measures such as pupil size may have been influenced by luminance, contrast, fatigue, calibration quality, or individual differences unrelated to stimulus engagement. Finally, because this was an exploratory pilot study combining EEG, eye tracking, questionnaires, and qualitative interviews, the findings should be interpreted as preliminary rather than confirmatory evidence of social feedback effects. Future studies should use larger and more representative samples, balanced trial numbers, more tightly controlled visual stimuli, and preregistered multimodal analysis procedures.

Ethics and Transparency

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Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

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Author Contributions

Contribution	Author 1	Author 2	Author 3	Author 4
Conceptualization	X			X
Data curation		X	X	
Formal Analysis	X	X	X	X
Funding acquisition	X			
Investigation	X	X	X	X
Methodology	X	X	X	
Project administration	X			X
Resources	X	X		
Software		X	X	
Supervision	X	X		
Validation	X	X		
Visualization			X	
Writing – original draft	X			X
Writing – review & editing	X	X	X	

Data Availability Statement

The datasets generated and/or analyzed in the current study are not publicly available but can be obtained from the first and second authors upon reasonable request. Requests for access to the data may be directed to the email addresses listed in the author information section of this article.

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