

An Investigation of Viewer Attention in Response to Gender-Biased Comments on the Internet

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Abstract: *The development of the internet has provided people with a platform for the exchange of views and information. Nevertheless, it is also a dual-edged sword, which some individuals make extreme or biased comments, including gender bias. The proliferation of gender-biased comments on the internet not only incites and perpetuates stereotypes and discrimination but also exerts a discernible influence on people's cognitive processes, thereby impinging upon their judicious assessment of social events. In order to investigate the impact of gender-biased comments on individuals' perception of news related to social events, three news scenarios were selected as stimuli: a traffic accident caused by a male driver, a traffic accident caused by a female driver, and a sexual harassment case involving a man victimizing a woman. The news content comprised two components: the left section was the comment section, and the right section contained the news report with images and texts. A cohort of twenty-four participants was recruited and divided into two groups. The control group perused comments grounded in factual information, whereas the experimental group engaged with comments filtered through a gender-oriented lens. To record and quantify participants' engagement with both comments and news content, an eye-tracker was integrated into the experimental design. The resulting eye-tracking data served as a reflective index of participants' attention allocation and psychological engagement. Statistical analyses were conducted after the trial. The results showed, in instances where gender was not explicitly articulated in comments, participants exhibited an increased attention to gender-specific information concerning the female driver, a trend not replicated in the case of the male driver. Crucially, when comments critiqued the driver based on gender, female participants exhibited an increased attentional bias towards the female driver as opposed to the male driver. Meanwhile, male subjects demonstrated an elevated psychological load in response to negative comments directed at the male driver. In the context of the sexual harassment case, the emergence of gender-based comments directed at the female victim prompted heightened psychological load among female participants. These findings demonstrated that gender-biased stereotypes are deeply ingrained within the cognitive framework of individuals, influencing attitudes and behaviors, whether consciously or subconsciously. The research emphasized the importance for news media to adopt an objective and impartial stance in reporting and advocates for individuals to contribute responsive and unbiased comments in the online sphere.*

Keywords: *Psychological load, Attention, Eye-tracking, Gender bias, Comments, Media, New, Internet*

1. Introduction

Gender bias, grounded in societal gender classifications, denotes unjust attitudes directed towards genders and their individual members. Its genesis is found in gender stereotypes, perpetuated by enduring social conceptions and realities of inequality between men and women. As highlighted by Brinkman and Rickard in 2009, gender bias manifests as a derogatory behavior rooted in physiological sex differences^[2]. Those fostering bias perceive the targeted gender as possessing a lower social status, with women historically bearing the brunt of such biases. Biased attitudes wield the potential to shape individual behaviors, resulting in gender discrimination and even instances of aggression (Zhang, 2015)^[10]. Furthermore, bias could make significant negative impact to social harmony and stability, fostering alienation among individuals. This alienation, in a cyclical fashion, reinforces biases, which is hard to eradicate once established.

In accordance with social learning theory (Xu, 2015)^[9], individuals acquire prejudice through direct or indirect experiences. Given the limitations of firsthand experiences within an individual's finite life, the foundational aspect of human knowledge structure rests upon indirect experiences (Genesee, 2011). Indirect experiences primarily accrue from various external sources, including parents, friends, news. While media plays a pivotal role in disseminating information especially in the internet era, some of them

contribute to the propagation of biased information, including gender bias. These media may selectively report news with an ostensibly unbiased perspective (Zhou, 2015)^[11]. For instance, they may emphasize men and downplay women in positive events, concentrate on women's roles, and render men "invisible" in negative events (Lu, 2015). Additionally, comments within these media on the internet can also be fraught with biased language.

The development of the internet has provided a platform for individuals to share and discuss their views, enhancing the freedom of speech. However, some individuals use extreme or strongly biased language in their comments, contributing to the dissemination of prejudice. A survey found that more than 90% of comments on Weibo about the opposite sex were negative, biased, or even insulting (Zhang, 2022)^[12]. Moreover, these biased comments often incorporate group concepts such as "you" and "us," prompting viewers to form a group identity (Rutland, 2010). In this situation, viewers unwittingly include themselves in the group either issuing or subject to prejudice, actively adopting the identity of a group member. This shift in identity transforms a critique directed at strangers into one aimed at their own group and, by extension, themselves as group members. This substantially heightens the viewer's involvement in prejudicial events, intensifying emotional experiences that induce or exacerbate prejudice and influence public objective judgment.

Comments constitute a significant component of the internet and media, offering insights into people's genuine thoughts. In recent years, scholars have observed an escalation in gender-biased comments on the internet. They analyzed the reasons behind the existence and proliferation of these biased and comments, also seeking ways to mitigate confrontation and weaken conflicts. Most previous studies have employed non-quantitative analyses (Liu, 2021; Zhang, 2022; Liao, 2023)^{[5][6][12]}. This study aims to employ quantitative methods to investigate the impact of comments on the audience when viewing news of social events. Several news pieces with comment sections are used as stimuli. Whether the comments contain gender-based negative language in the comment sections serves as an independent variable. An eye-tracker is introduced to capture participants' gaze when viewing the news, reflecting their psychological behaviors. This approach enables the study to generate quantitative and accurate results, with eye-tracking data serving as dependent variables that reveal how people read the news. The findings of this study could provide deeper insights into how people's comments affect others on the internet and offer constructive insights for fostering a healthier and more equal environment.

2. Method

2.1. Participants

In this study, 24 participants ($M=23.7$, $SD=7.30$), comprising 11 males and 13 females, were randomly selected from a supermarket in Shanghai, China. They were randomly assigned to two groups, namely Group A and Group B. Participants were informed about the general purpose of the study, and potential risks and harms associated with the experiment were communicated. All participants attended voluntarily.

2.2. Stimuli

Experimental materials included three news articles related to social events and their corresponding comment sections. The news articles covered a traffic accident caused by a male driver (N1), a traffic accident caused by a female driver (N2), and a sexual harassment case involving a man victimizing a woman (N3). The comments were categorized into two groups: gender-based comments and fact-based comments. In N1 and N2, gender-based comments criticized the driver through a gender lens, referring to "the male driver" and "the female driver." In N3, gender-based comments blamed the female victim. Fact-based comments in N1 and N2 addressed the accidents without mentioning the gender of the driver. In N3, fact-based comments criticized the harassment behavior and did not mention the female victim. Two groups of participants viewed fact-based and gender-based comments, respectively. The comments sections and news articles followed a parallel layout, with the comment section on the left-hand side and the news article and picture on the right-hand side. Additionally, two irrelevant news articles were inserted between the experimental materials as distractors to prevent participants from discerning the experimental purpose.

2.3. Design and Procedure

The experiment employed a between-group design, wherein all participants were randomly allocated to two groups: Group A participants were instructed to view news accompanied by objectively fact-based comments, while Group B participants were directed to view news accompanied by highly gender-biased comments. Upon signing the informed consent form, participants positioned themselves in front of the screen as instructed. An eye-tracking device was positioned beneath the screen to capture participants' eye movements during screen browsing. The computer was interconnected with both the screen and the eye-tracking device to control the experimental process. Following a successful calibration, the trial commenced. Five images, each containing comment sections and news articles with pictures, were sequentially presented, with each image displayed for 30 seconds (after repeated testing, it was determined that 30 seconds was the average time required for normal individuals to browse through one experimental material). The entire experiment lasted approximately five to ten minutes. At the conclusion of the experiment, each participant received a dessert.

Upon completion of the experiment, eye-tracking data for both groups were exported, including Total Fixation Duration (TFD) and Average Saccade Amplitude (ASA). Areas of Interest (AOIs) were categorized as follows: N1 - the male driver in the news image, N2 - the female driver in the news image, N3 - the male harasser and the female victim in the news image. Additionally, texts containing gender information in the three news articles were also categorized as AOIs, namely "female" and "male."

2.4. Data Analysis

To examine the impact of biased information on individuals' attention while perusing the news, between-group T-tests were conducted on the data from the experimental and control groups. To explore the influence of the gender factor, within-group T-tests on the data in N1 and N2 (male and female drivers) were also carried out.

3. Results

3.1. Between-group T-tests Analysis for TFD

As indicated in Table 1, for N1 (male driver), there was no significant difference ($t=1.76, p>0.05$) between Group A subjects' Total Fixation Duration (TFD) ($M=1.12, SD=0.94$) for gender information in the article and Group B ($M=0.90, SD=0.60$). However, for N2 (female driver), Group A subjects ($M=0.95, SD=0.67$) paid more attention to gender information in the article than Group B ($M=0.54, SD=0.48$). Although this difference did not reach statistical significance ($t=1.75, p>0.05$), the p-value was very close to 0.05.

3.2. Within-group T-tests Analysis for TFD

As per Table 1, within-group t-tests for N1 and N2 (male driver and female driver) in Group B revealed that female participants had a significantly higher TFD ($t=1.76, p<0.05$) for female drivers in N2 ($M=0.74, SD=0.69$) than for the male driver in N1 ($M=0.25, SD=0.31$), while male participants did not exhibit an attentional preference for the gender of the culprit driver.

3.3. Between-group T-tests Analysis for ASA

As depicted in Table 1, for N1, there was no significant difference ($t=1.72, p>0.05$) in the Average Saccade Amplitude (ASA) between Group A ($M=3.87, SD=0.54$) and Group B ($M=3.63, SD=0.94$). The ASA of male subjects in Group A was greater than that of subjects in Group B. Gender-specific analysis revealed that male subjects had a greater ASA in Group A ($M=3.85, SD=0.74$) than in Group B ($M=3.26, SD=0.47$), with a p-value very close to 0.05 ($t=1.89, p>0.05$). For N3, ASA was significantly longer ($t=1.72, p<0.05$) in Group A ($M=3.82, SD=0.70$) than in Group B ($M=3.27, SD=0.74$). Separate t-tests for subjects of different genders revealed that ASA was also significantly higher ($t=1.80, p<0.05$) for females in Group A ($M=4.00, SD=0.42$) than in Group B ($M=3.38, SD=0.71$). However, males in both Group A and Group B did not exhibit a significant difference.

3.4. Within-group T-tests Analysis for ASA

Referencing Table 1, separate gender-specific data analysis for N1 showed that male subjects in Group B ($M=3.26$, $SD=0.47$) had a significantly greater ASA than females ($M=3.90$, $SD=1.13$), a gap that did not reach a statistically critical range ($t=1.81$, $p>0.05$) but had a p-value very close to 0.05.

Table 1. The result of TFD and ASA

		Group A		Group B	
		TFD/ s	ASA/ °	TFD/ s	ASA/ °
N1	Vehicle	0.76	3.87	0.91	3.62
	Male driver	0.27		0.36	
	Gender information	1.11		0.90	
N2	Vehicle	1.58	3.64	1.12	3.26
	Female driver	0.39		0.56	
	Gender information	0.95		0.54	
N3	Female victim	0.59	3.82	0.79	3.27
	Male harasser	0.64		0.81	
	Gender information	1.08		0.70	

4. Discussion

This study aimed to investigate the impact of gender biased online comments on individuals' viewing behaviors of news. Participants in Group A viewed fact-based comments, while those in Group B viewed gender-based comments. An eye-tracker was utilized to record participants' reading patterns, providing quantifiable data on their gaze processing. The eye-tracking parameters included Total Fixation Duration (TFD) and Average Saccade Amplitude (ASA). TFD represented the overall attention participants devoted to a specific Area of Interest (AOI), with higher TFD indicating increased attention. ASA reflected participants' psychological load when viewing the news and comments, with lower ASA indicating higher cognitive load. The results of data analyses revealed several significant findings.

When browsing news about a female driver's accident, participants of the control group exhibited a longer fixation duration to gender related information of the female driver. This revealed their preference for seeking gender information in the news text when gender labeling was not mentioned in the comments. This phenomenon was not observed in the case of the male driver's accident. Additionally, during the comparison of news images of traffic accidents, female subjects gazed longer at the female driver than at the male driver, suggesting heightened attention toward the female driver. Male subjects exhibited shorter saccade amplitudes when reading news with negative gender-based comments about the male driver, indicating increased psychological load in situations where men were being criticized. Analysis of the data for the sexual harassment case (N3) revealed that female subjects showed smaller saccade amplitudes when gender was mentioned in the comment section, suggesting a heavier psychological load when viewing the news.

The term 'female driver' is recurrently utilized in Chinese news reports concerning traffic accidents, often depicting them as unskilled operators, prone to violent traffic offenses, catalysts for accidents, and innocent victims incapable of resisting (Lu, 2019)^[7]. This media portrayal induces cognitive bias, associating the mere concept of "female drivers" with a myriad of negative comments. Contrary to this biased representation, reports indicate that the majority of traffic accidents are caused by male drivers (China Justice Big Data Service Platform, 2020)^[3]. Even in cases where women are present in safety accidents without being at fault, pre-existing impressions predispose individuals to unjustly blame women (Zhang, 2021)^[13]. The media and journalists, in pursuit of capturing attention, exhibit a propensity to employ "female driver" as a sensational news headline and gimmick. For the sake of news sensationalism, they deliberately obfuscate the truth of incidents and manipulate the causes and consequences, implicitly guiding public perception to attribute fault to a female driver (Lu, 2019)^[7]. Within such a media environment, a negative stereotype of "female drivers" becomes ingrained in the collective consciousness of the public (Bar-Tal, 2011)^[1]. Intriguingly, in car accident cases involving male drivers, journalists generally refrain from specifying the gender of the driver. This deliberate omission further contributes to the public's ease of access to biased enlightenment, fostering an impression that female drivers have higher accident rates than their male counterparts (Li, 2015)^[4].

In this study, when individuals encountered news (N2) titled "female driver," they had already

formulated a preconceived hypothesis rooted in past experiences and stereotypes, positing that “a female driver’s poor skills caused the car accident” even before reading the news text. This pre-existing hypothesis guided their subsequent browsing and reading behaviors as they actively sought evidence to substantiate their initial assumption. In the experimental group, comments labeled with gender provided ample evidence to confirm the preconceived hypothesis. Conversely, in the control group where comments lacked gender labels, viewers were left without useful information, prompting them to pay greater attention to the news text in the hope of discovering details about the gender of the drivers that could validate their preconceived hypotheses. In contrast, individuals did not exhibit a similar inclination to seek information about the gender of the offender in the N1 news concerning male drivers. This lack of intentional search for the label of male drivers stems from the absence of equivalent negative stereotypes and prejudices associated with male drivers, unlike the case of female drivers. Consequently, there was no predetermined hypothesis prompting viewers to actively search for and confirm gender-related information in the news about male drivers.

Saccade amplitude serves as an indicator of psychological load, with a smaller average saccade amplitude indicating that the subject is experiencing heightened tension and anxiety during this stage (Tokuda S, 2012)^[8]. The news media and public opinion exhibit greater tolerance towards male drivers, seldom using “male drivers” as a sensational “gimmick” or focal point in news. Attacks against female drivers are more prevalent on the Internet, contrasting with the infrequency of such incidents directed at male drivers. Consequently, when male subjects encountered numerous comments labeled with the male gender and targeting “themselves,” they exhibited increased tension in response. In the case of news about a female driver (N2), the pervasive nature of negative comments about female drivers has become so ingrained that individuals subconsciously accept this setting, resulting in a diminished emotional response and psychological fluctuations when browsing news and comments associated with the gender of female drivers.

The heightened attention female participants paid to images of female drivers can be elucidated through the self-association effect. This effect denotes that individuals tend to be more sensitive when exposed to information that pertains to them (Bar-Tal, 2011). Given that female participants and female drivers shared the common identity of being women, this shared identity heightened the sensitivity and attentiveness of female participants when viewing images of female drivers relevant to their identity. This phenomenon is also reflected in the mean eye-roll amplitude of N3, where a substantial number of female victims faced blame in the comments section. The propagation of the immoral “victim guilt theory” triggered heightened empathy and anger among female participants, leading to a greater psychological load at this stage and manifesting in a shorter mean average saccade amplitude.

The experiment substantiates that comments on the internet platforms have significant influence over individuals. These comments serve as windows into the thoughts of viewers, creating a reciprocal impact on others. While media strives for balance and objectivity in news reporting, the actual dissemination process encounters contradictions. Given the internet’s pivotal role in contemporary life, playing a crucial part in spreading, conveying, and exchanging information, it is essential for both media and users to uphold objectivity and impartiality in their perspectives. Biased narratives have the potential to impose a negative psychological burden on viewers and reinforce stereotypes. The standard for comments and reports should prioritize rationality and responsibility.

Nevertheless, this experiment has certain limitations that merit future improvement. To ensure participants notice comments, the experimental materials, including comment sections and news articles, were presented together. In real-world scenarios, viewers may navigate webpages or apps by scrolling, introducing variations in viewing processes that could impact results. Future studies could align the display more closely with actual viewing behavior. Additionally, conducting further investigations based on different demographic characteristics such as age, location, and occupation could offer detailed insights into this area.

5. Conclusion

In conclusion, this study delved into the influence of gender-biased comments on the viewers. Utilizing comments with or without gender labels in news of social events as the independent variable and changes in viewers' gazing behavior as the dependent variable, data analysis results revealed that subjects had pre-existing stereotypes about female drivers. Participants exhibited a heightened focus on the gender information of female drivers in car accident news reports, a phenomenon not observed for male drivers. Additionally, individuals were accustomed to negative gender-based comments directed at

female drivers, while male subjects showed sensitivity to negative comments about male drivers. Notably, in a sexual harassment case, criticism directed at the female victim induced significant psychological tension among female subjects. The study emphasizes the importance of media reporting based on objective and unbiased facts, also calling for individuals to contribute responsive and impartial comments online.

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