

Breaking or reinforcing stereotypes? The role of expertise and toxic attitude in live-streaming context

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Abstract

Social media is experiencing a rapid diversification of entertainment content, reshaping individual perceptions and the social construction of gender roles and stereotypes. Gaming-related content is now prevalent across asynchronous (e.g., YouTube) and synchronous (e.g., Twitch) platforms. However, the enduring male predominance in this field continues to reproduce gendered representations, reinforcing stereotypes that portray female content creators as less suited to gaming and lacking competitiveness or technical expertise. This study will be conducted on 128 participants and adopts a 2x2 between-subjects experimental design to examine how expertise and toxic attitude influence stereotypes toward female gaming content creators. The protocol integrates neurophysiological measures to assess engagement and implicit responses, alongside survey data capturing how different conditions affect perceptions of female gamers. Based on theoretical expectations, it is hypothesized that the absence of expertise will strengthen stereotypes of female gamers, whereas a toxic attitude may reduce them. When expertise and toxicity co-occur, however, the stereotype is expected to be disrupted, revealing a complex interplay between competence, behavior, and social judgment. The expected results will offer insights into how gender stereotypes in gaming are constructed, deepening

understanding of how social media reshapes female representation in digital cultures.

CCS Concepts

• **Psychology**; • **Sociology**; • **Multimedia content creation**;

Keywords

Stereotype, Gender role, Psychology, Gaming, Live-streaming Expertise, Toxicity

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1 INTRODUCTION

Despite near-gender parity among gamers (48% female, 51% male) [1], female players are systematically perceived as less skilled and less belonging than male counterparts [2, 3]. This bias manifests in harassment [5], identity concealment through gender-neutral avatars [6, 7], and defensive toxic behavior [8], ultimately reducing social capital development [2]. These patterns reveal that gender inequality persists not in participation but in social evaluation [9]. Toxic behavior, including flaming, trolling, and in-game sabotage [10–12], is endemic in competitive gaming contexts [10] and disproportionately impacts female players. This bias intensifies in public streaming environments, where female creators face continuous scrutiny and evaluation based on performance visibility. Female streamers constitute only 20% of Twitch content creators and face

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systematic disadvantages in visibility and earnings [13]. They are predominantly evaluated through gendered lenses, assessed on appearance and sexuality rather than expertise [14, 15], with their competence questioned even when demonstrating high-level skill [8]. Live streaming amplifies these biases by making behaviors publicly visible and continuously scrutinized, intensifying the gendered evaluation of female gaming content creators. This study integrates Social Role Theory (SRT) [16] to examine how female gaming content creators are perceived when displaying expertise and toxic behavior. SRT posits that gender stereotypes emerge from culturally shared expectations: women as nurturing and communal (care-focused, cooperative), men as agentic and competitive (competent, dominant). In gaming contexts, skill-oriented traits like expertise and dominance-related traits like toxic behavior are typically masculine-coded [16]. Female streamers displaying high expertise and toxic attitudes exhibit role incongruence, challenging conventional gender expectations. This incongruence contrasts with traditional views of women as communal and men as agentic, potentially triggering shifts in stereotype evaluation. High expertise and toxic behavior thus have the potential to disrupt social role expectations, reshaping how gender stereotypes are activated and maintained in digital gaming communities. Role Congruity Theory [17] refines the theoretical framework and highlights social penalties for deviating from gender-congruent roles. Female streamers displaying agentic behaviors may be perceived as less likable. This dynamic affects content evaluation [18], influencing how stereotypical perceptions are formed and reinforced. Engagement, encompassing attention, emotional involvement, and evaluative stance [19, 20], may be ambivalent when elicited by toxic attitudes, moderating the relationship between streamer behavior and stereotypical evaluations. Existing literature predominantly examines male players as aggressors and female players as defensive targets [8, 21, 22]. This study shifts focus to scenarios where female players simultaneously demonstrate high expertise and engage in toxic conduct. SRT provides a framework for investigating such role incongruence, examining how observers respond when female players violate traditional gender expectations. This approach advances both gaming research and extends SRT into contemporary digital contexts, enabling nuanced understanding of how deviations from gendered behavioral norms influence stereotype formation, reinforcement, or disruption in gaming communities.

2 OBJECTIVES

This study investigates how expertise and toxic attitude shape stereotypical schemas in live-streaming contexts. A 2x2 experimental design manipulates expertise and toxicity, integrating neurophysiological measures and self-report data.

RQ1: How do female gaming content creators' expertise and attitude independently and interactively influence viewers' perceptions of their agency, communion? This examines how expertise (high vs. low) and toxic attitude (present vs. absent) influence perceptions of agency and communion, measured through self-report questionnaires. This establishes how each experimental condition affects communion and agency perceptions, providing foundation for examining stereotype formation effects.

RQ2: How do viewers' perceptions of agency and communion, shaped by the content creator's expertise and attitude, influence stereotype judgments? Each manipulation generates distinct agency and communion perceptions regarding expertise and toxicity. Varying agency levels directly influence stereotypical judgment formation contingent on experimental conditions. This examines how agency levels shape gender stereotype formation, assessed through self-report questionnaires and implicit association tests.

RQ3: Does content evaluation (implicit vs explicit) moderate the relationship between viewers' perceptions and stereotype judgments? Live-streaming content is fundamentally entertainment-oriented; evaluative responses constitute an integral component of stereotype formation inseparable from the medium. To obtain unbiased assessment accounting for social desirability, the study employs self-report and neurophysiological responses capturing implicit emotional activation and cognitive engagement bypassing conscious reporting.

The conceptual model (Figure 1) illustrates the sequential process through which observable characteristics influence gender stereotype formation. Firstly, the content stimuli varying in expertise and toxic attitude shape gender norms perceptions (Agency, Communion). After the agency and communion levels influence stereotype judgments. Finally the content evaluation (explicit and implicit measures) moderates the relationship between role perceptions and stereotype outcomes.

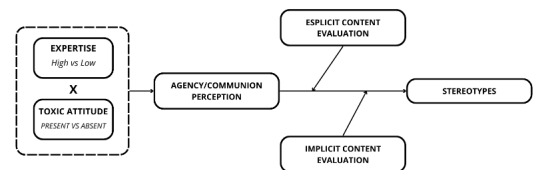


Figure 1: Conceptual model of the hypothesized relationships.

3 METHODS

3.1 SAMPLE

A total of 140 participants (ages 18-40) will be recruited, reflecting typical live-streaming demographics [23-25]. To ensure gender balance, recruitment forms collect sex assigned at birth and self-identified gender. Recruitment closes upon reaching predefined gender quotas.

Participants will report familiarity with gaming videos to ensure prior exposure. They will rate familiarity with, viewing frequency of, and liking for FPS games and overall gaming experience, including both the broader genre and the specific game used. The Ambivalent Sexism Inventory [26] will assess sexism levels.

Power analysis (G*Power 3.1) [27] indicates 128 participants are sufficient for detecting medium interaction effects ($f=0.25$, $\alpha=.05$, power=.80) in between-subjects ANOVA [28]. An additional 12 participants (10%) account for potential data loss from neurophysiological instruments. This sample size meets minimum standards for neuroscientific experiments with video stimuli [29]. The study was approved by the university ethics committee (No. 113/2025, 25/09/2025) and follows Declaration of Helsinki [30] and GDPR guidelines. All participants will sign informed consent.

3.2 Materials

Experimental stimuli were designed to vary perceptions of a female content creator's expertise and toxicity in live-streaming gaming contexts.

3.2.1 VIDEO GAMEPLAY. Video content featured Valorant, a popular Twitch esports title, ensuring ecological validity and audience familiarity. Valorant was selected because, as a first-person shooter, it is easier to follow and interpret even for non-regular esports viewers, enabling participants to observe skill differences easily regardless of gaming experience. Two gameplay videos followed identical structure: starting menu, training session, deathmatch, menu navigation. One video featured a player with no Valorant experience; the other featured a professional esports player. To objectively validate expertise differences, expert gameplay achieved perfect training scores (30/30) and won the deathmatch (40 kills), characterized by superior reaction time, accuracy, and response time. Non-expert gameplay scored substantially lower in training (8/30) and lost the deathmatch (9 kills) [31]. Objective performance metrics were reinforced by the actress's voice-over commentary providing audio feedback on expertise level.

3.2.2 Streamer interpretation. A professional actress minimized confounding effects related to streamer personality. Actress selection referenced female streamers focused on gaming content rather than other categories, limiting biases associated with aesthetic appeal or likability. She was selected for prior experience as both a live-streaming viewer and active gamer, ensuring familiarity with movements, communication style, and on-camera behavior typical of Twitch environments. Visual presentation was neutral and consistent across conditions, aligning with non-stereotypical representations of female Valorant streamers. She followed a standardized pre-approved script, ensuring consistency and reducing behavioral variability. The actress exhibited two attitude styles across expert/non-expert conditions: neutral and toxic. Neutral behavior featured harmless gameplay/opponent commentary, neutral facial expressions, and calm reactions during key events. Toxic behavior featured three remark types: self-directed ("I don't look too rusty"), other-directed ("Go hell"), context-directed ("I'm sure it's the fault of the latest patch"). Toxic interpretation included anger/disgust facial expressions and physical frustration manifestations (e.g., hitting the table) during key moments, particularly when eliminated. Behaviors were based on prior aggression and toxicity studies [11, 12], enhancing replicability and data interpretation validity. Each video mirrored typical live-streaming sessions: introduction, sponsorship, training, deathmatch, final message, farewell.

3.3 EXPERIMENTAL DESIGN

This study investigates how a female content creator's expertise and attitude may shape female stereotypes, utilizing neuroscientific responses and surveys. A controlled experimental design will simulate the conditions (Figure 2), employing a between-subjects approach where participants are randomly assigned to one of four groups, maintaining gender and age balance. Each participant will watch a live-stream video showcasing a specific type of female content creator activity. This setup enables comparison and analysis of participants' rational and implicit reactions across different groups. The groups are organized as follows:

- Expert x Neutral (EN)
- Expert x Toxicity (ET)
- Not-expert x Neutral (NN)
- Not-expert x Toxicity (NT)

3.4 INSTRUMENTATIONS

The study uses iMotions v.10.0 to present stimuli, administer surveys, and synchronize/ extract neurophysiological responses. EEG data will be collected with Enobio-20 [32] using gel-based electrodes positioned via international 10-20 system. An Implicit Association Test (IAT) [33] will measure reaction times for implicit "female gamer" stereotype associations. The Beta over Alpha plus Theta Ratio (BATR), an EEG indicator [34], tracks cognitive engagement by averaging beta power divided by summed alpha and theta powers per electrode. BATR is continuous: positive values indicate engagement, negative values suggest unfavorable responses. It complements emotional indices by focusing on cognitive involvement during visual attention tasks in digital environments [35, 36]. The Approach-Withdrawal Index (AWI), calculated as right-left alpha power difference, reflects neural balance underlying approach-withdrawal motivation and emotional stimulus valence [37]. AWI will assess motivational tendencies, particularly withdrawal responses to irritating/aversive stimuli.

3.5 SELF-REPORT

Participants complete a post-stimulus questionnaire within iMotions. Perceived expertise is measured using Ohanian's Source Credibility Expertise subscale [38]; toxic behavior using the adapted Buss-Perry Aggression Questionnaire short form [39] (Verbal Aggression, Non-verbal Aggression, Anger subscales). Content creator warmth/ competence perceptions are assessed using Koenig and Eagly [40] items on Communion and Agency dimensions. Additionally, participants indicate how they interpret the streamer's gender identity to assess potential stereotype influence. Emotional responses are measured using two adapted constructs of Irritation and Entertainment [41, 42]. These assess explicit perceived emotional quality and engagement. Gender perceptions use adapted items from Yao et al. [43], using four dimensions from the original scale (Lack of Femininity in Life; Lack of Sociability in Life; Lack of Competence in Gaming; Gaming Preferences) and the Traditional Masculinity-Femininity Scale (TMF) [44]. Five author-created items evaluate role congruence between streamer and content (e.g., whether creator appears a natural fit), measuring how well demeanor matches content. All items use 7-point Likert (1=strongly disagree; 7=strongly agree) and Semantic scales, administered in



Figure 2: Experimental conditions of the study, showing the four combinations of expertise (expert vs. not-expert) and attitude (neutral vs. toxic).

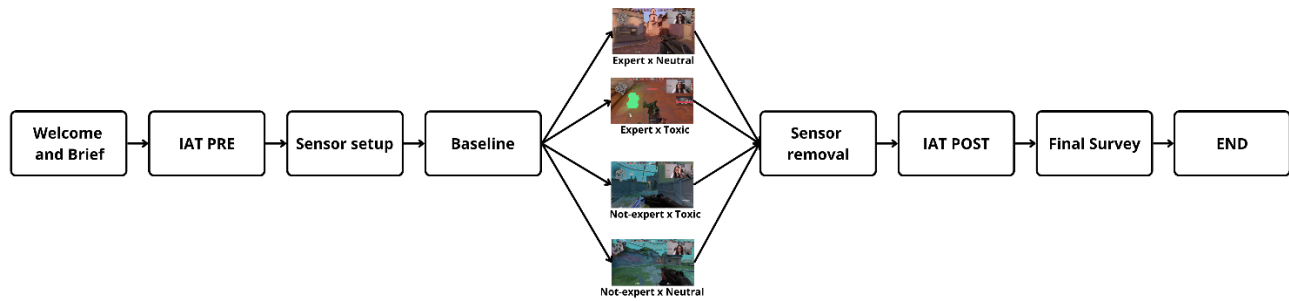


Figure 3: Overview of the experimental protocol sequence, including baseline, stimulus presentation, and post-experiment phases.

English. The complete questionnaire with items and dimensions is shown in Appendix 1.

3.6 PROTOCOL

Upon arrival, participants are welcomed, seated at the experimental monitor, provided with an information sheet, and asked to read and sign informed consent. Following consent, participants complete IAT_PRE. EEG sensors are then applied. Two baselines are collected before experimental tasks. First, participants completed a 60-second eyes-closed baseline to record resting-state activity. This was followed by a 120-second eyes-open baseline, during which participants watched a neutral sea documentary clip. Baselines serve as EEG signal processing reference data. Participants receive instructions: "A friend invited you to watch a live-streaming session. Please relax and enjoy the show." After the experimental phase, EEG sensors are removed and participants complete IAT_POST and the post-experiment questionnaire. The procedure lasts approximately 60 minutes. EEG sensors are cleaned and sanitized per hygiene and safety regulations after each session. The whole experimental protocol is illustrated in Figure 3.

3.7 STATISTICAL ANALYSIS

Statistical analysis uses JAMOVI 2.6, an R-based package [45]. Items will be averaged, internal reliability assessed using Cronbach's alpha [46] and McDonald's Omega [47] per construct. Four hierarchical regression models with mediation analysis test study hypotheses. In the first step, the dependent variables related to the perception of the content creator, Communion and Agency, were examined. In the second step, the models investigated how experimental conditions predicted stereotypes toward female gamers and role congruity, to assess how viewers' communion and agency perceptions, mediated by content evaluation, influence stereotype attribution and perceived role congruence between the streamer and the content. Before analysis, normality, homoscedasticity, and multicollinearity assumptions are checked via residual plots, Shapiro-Wilk tests, and variance inflation factors. Repeated-measures ANOVA on IAT D-scores examines implicit association differences across four conditions (EN, EA, NN, NA).

Table 1: Summary of hypotheses with associated measures

Research Question	Hypotheses	Associated measure
RQ1: How do female gaming content creators' expertise and attitude independently and interactively influence viewers' perceptions of their agency, communion?	H1a: Agency is higher in conditions featuring toxic attitude compared to neutral conditions.	Agency
	H1b: Communion is higher in conditions featuring neutral attitude compared to those with a toxic attitude.	Communion
	H1c: Agency is higher in expertise conditions compared to non-expertise conditions.	Agency
	H1d: Communion is lower in expertise conditions compared to non-expertise conditions.	Communion
	H1e: Conditions characterized by toxic attitude increase agency score more strongly than expertise conditions.	Agency
	H1f: Neutral attitude conditions reduce agency levels even when expertise is present.	Agency
RQ2: How do viewers' perceptions of agency and communion, shaped by the content creator's expertise and attitude, influence stereotype judgments?	H2a: Higher levels of agency will be associated with lower stereotype endorsement and lower perceived role congruity toward female gamers.	Female Gamer Stereotype Role Congruity TMF IAT
	H2b: Higher levels of communion will be associated with higher stereotype endorsement and higher perceived role congruity toward female gamers.	Female Gamer Stereotype Role Congruity TMF IAT
	H2c: Under the expertise condition, higher levels of agency will lead to fewer stereotypical judgments compared to the toxic attitude condition.	Female Gamer Stereotype TMF IAT
	H2d: Under the neutral attitude condition, higher levels of communion will lead to more stereotypical judgments compared to the toxic attitude condition.	Female Gamer Stereotype TMF IAT
	H3a: Higher levels of explicit entertainment evaluation will moderate lower stereotype endorsement toward female gamers.	Female Gamer Stereotype TMF Entertainment
RQ3: Does content evaluation (implicit vs explicit) moderate the relationship between viewers' perceptions and stereotype judgments?	H3b: Higher levels of explicit irritation evaluation will moderate higher stereotype endorsement toward female gamers.	Female Gamer Stereotype TMF Irritation
	H3c: Higher levels of BATR will moderate lower stereotype endorsement toward female gamers.	Female Gamer Stereotype TMF BATR
	H3d: Higher levels of AWI will moderate higher stereotype endorsement toward female gamers.	Female Gamer Stereotype TMF AWI

4 EXPECTED RESULTS

Expected results will clarify expertise's role for female content creators and how toxic attitude influences stereotypical judgments in digital media contexts. Analyzing implicit and explicit responses will identify participants' unspoken reactions, crucial for investigating socially sensitive issues individuals may not openly express. Table 1 shows the following research hypotheses with the associated measures.

5 CONTRIBUTIONS

This study expands current knowledge on female gender stereotypes within the gaming context, offering a more nuanced understanding of women's roles as content creators. The theoretical framework of the study highlights the importance of considering the entertainment environment as a key factor shaping perceptions of female roles in a field where women's presence is steadily increasing. By examining expertise and behavioral attitudes, the study aims to demonstrate how traits traditionally associated with male agency and competence can significantly influence perceptions of a female streamer. When women display these characteristics, they may either reinforce or mitigate gender stereotypes, depending

on the perceived role congruence between their behavior and the context.

The combined use of neurophysiological measures and reaction time tests allows the observation of both explicit and implicit responses, providing more robust evidence beyond self-reported data. This methodological integration revealed that implicit engagement often uncovers attitudes and perceptions that individuals may hesitate to express openly due to social desirability or fear of judgment. The study aims to extend SRT from both theoretical and methodological perspectives. From a theoretical perspective, the study advances SRT by examining how agentic elements traditionally associated with masculine traits influence perceptions of social roles and the gender stereotypes attached to them. By focusing on contexts in which women enact these agentic behaviors, the study provides new insights into how role incongruence shapes the construction and evaluation of gendered expectations. From a methodological perspective, the study contributes to expanding SRT by integrating neurophysiological measures alongside self-report data within a rapidly evolving media landscape characterized by heightened gender visibility, particularly in live-streaming and digital gaming environments. This multimethod approach enables a more comprehensive investigation of gender role processes, capturing both explicit evaluations and implicit, embodied responses to role-incongruent behaviors.

This study has limitations. First, findings cannot be generalized beyond female streamers, as only female gender was considered. Future research will extend the design to include male streamers and trans women, enabling broader gender comparisons. Second, using a female actress with neutral aesthetic isolated independent variable impacts but may have influenced audience interpretation of her gender identity, potentially affecting stereotype activation. Future research should examine different visual presentations and how expertise/toxicity variations influence gender stereotypes. Third, pre-recorded videos adapted to simulate Twitch streaming enabled precise experimental control and variable isolation while integrating neurophysiological measures. However, findings should be confirmed in real live-streaming environments to examine stereotype activation in naturalistic contexts and account for interactive elements like live chat, which contribute to community dynamics and stereotype formation.

The findings of this study will carry important practical implications for multiple stakeholders within the digital gaming and live-streaming ecosystem. The results may assist inclusivity-oriented brands in more carefully selecting ambassadors by considering not only creators' expertise but also their behavioral conduct.

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During the preparation of this work, the authors used Claude.AI to improve the readability and language of the manuscript. After using this service, we reviewed and edited the content as needed and take full responsibility for the publication's content.

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A APPENDICES

In the appendix section, three levels of Appendix headings are available.

A.1 A.1 Questionnaires with items