



HHS Public Access

Author manuscript

J Health Commun. Author manuscript; available in PMC 2022 February 15.

Published in final edited form as:

J Health Commun. 2021 January 02; 26(1): 12–18. doi:10.1080/10810730.2021.1878311.

Double Vision on Social Media: How Self-Generated Alcohol-Related Content Posts Moderates the Link Between Viewing Others' Posts and Drinking

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Abstract

A robust finding is the positive association between self-generated alcohol-related content (SG-ARC) on social media (SM) and drinking among emerging adults; however, the reasons for this relationship are still unclear. A factor that has yet to be explored in combination with SG-ARC is how viewing others' alcohol-related content (ARC) may be impacting young adults' drinking. This cross-sectional study conducted across two universities asked students ($N=780$; $M=20.80$ years old; $SD=2.29$; 67.82% female) to self-report how many SG-ARC posts they posted, to estimate how much they saw others' ARC, and how much they drank weekly. SG-ARC was then evaluated as a moderator of the association between viewing others' ARC and drinking. A negative binomial regression model with robust sandwich estimators was employed. Results revealed that both SG-ARC and viewing others' ARC were positively associated with drinking. A significant two-way interaction between SG-ARC and others' ARC emerged such that viewing others' posts appeared to exert an influence on drinking, particularly for students who did not post as many SG-ARC posts. These findings provide evidence that seeing others' ARC may be socially influencing students to drink, especially if they do not post as much SG-ARC themselves, by altering their internalized drinking norms.

Keywords

Social Networking Sites; College Students; Social Influence; Peer influences

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Contributors

Dr. Mai-Ly N. Steers contributed to designing the study, collecting the data, co-wrote the introduction and results, and edited the entire manuscript to ensure it was cohesive. Dr. Rose Marie Ward contributed to designing the study, collecting the data, and writing the discussion. Dr. Clayton Neighbors contributed in designing the study and conducting the analysis. Angela Tanygin co-wrote the introduction and provided feedback. Ying Guo helped to collect the data and co-wrote the discussion. Finally, Elizabeth Teas co-wrote the discussion and provided feedback.

Conflict of Interest

No conflict of interests are declared.

Heavy drinking is common among young adults. Thirty-five percent of all heavy drinkers are between the ages of 18 and 25 (Substance Abuse and Mental Health Services Administration, 2019). Relative to young adults who have not attended college, college students are more likely engage in heavy episodic drinking, defined as 5 or more drinks on one occasion (29% vs. 25%), at least once in the past two weeks, and are more likely to report having been drunk in the previous month (38% versus 24% respectively; Johnston et al., 2003). As a result, college students may experience negative ramifications as a result of their drinking, such as poor academic performance, physical/sexual violence, and car accidents while intoxicated (Rinker, Diamond, Walters, Wyatt, & DeJong, 2016). The present study aims to understand how social media posts and peer influences may have interacting effects on college students' drinking.

Self-generated alcohol-related posts and drinking

Social media is integral to the lives of many young adults; 90% of people between the ages of 18–29 use at least one social media site (Pew Research Center, 2019). Moreover, posting alcohol-related content (ARC) to social media is pervasive among college students. As many participate in a culture of indulgent drinking (McCreanor et al., 2008; Measham & Brain, 2005; Szmigin et al., 2008) in which engaging in heavy drinking is seen as an enjoyable, communal activity crucial to college life (Angosta et al., 2019), college students may post ARC to social media as a way of commemorating past gatherings and events with friends (Geusens & Beullens, 2017; Hebden et al., 2015; Niland et al., 2013). Moreover, college students' ARC depicted in a positive, social light tends to garner the most positive validation (e.g., likes, comments; Boyle et al., 2017; Hendriks, Van den Putte, Gebhardt, & Moreno, 2018). Viewing positively-framed ARC on social media leads to a greater likelihood of the user posting such content themselves (Erevik et al., 2018). According to social learning theory (Bandura & Walters, 1977), by viewing others' ARC and the validation that it receives from other people (i.e. through comments, likes, shares, and other forms of engagement), users may vicariously learn that this behavior is validated by their peers and consequently model it themselves (i.e. by drinking and/or posting self-generated ARC) in order to receive the similarly positive peer responses. Hence, self-generated ARC (SG-ARC), which likely receive positive validation from peers (e.g., likes, comments), has been consistently linked to an increase in drinking behavior (Litt et al., 2018; Moreno, Christakis, Egan, Brockman, & Becker, 2012; Moreno et al., 2015; Rodriguez et al., 2016; Westgate, Neighbors, Heppner, Jahn, & Lindgren, 2014) as well as alcohol-related problems (Moreno et al., 2012; Ridout et al., 2012; Thompson & Romo, 2016).

Impact of peer influences are among the most robust forces on students' drinking

A large body of literature has indicated that peer influences are one of the most significant predictors of drinking among college students (Borsari & Carey, 2001). One key finding is that most college students hold exaggerated perceptions regarding their peers' positive attitudes towards drinking as well as the extent of their peers drinking (e.g., students think that their peers drink more than they do and tend to think more positively of drinking heavily

than they do; Borsari & Carey, 2003). College students may also be subject to the modeling effect, in which they observe their peers consuming copious amounts of alcohol and become compelled to drink more heavily themselves.

College students are routinely subjected to two types of peer influences: direct peer influences and indirect peer influences. A friendly offer of a drink at a party and active attempts to persuade an individual to drink through teasing are both examples of direct peer influences. On social media, however, viewing peers' ARC which models heavy drinking exerts an indirect peer influence. These direct and indirect peer influences may be problematic in that they have been associated with increases in drinking and negative alcohol-related consequences among students (Lee et al., 2007). In a longitudinal study, Steers and associates (2019) found that drinking more and perceiving friends' approval of drinking behavior predicted increased SG-ARC over time. Although this study and many other studies have examined SG-ARC in relation to drinking, it may also be important to examine the influence of viewing others' posts on college students' drinking since such ARC may serve as a digital proxy for peer influences, which in turn contributes to problematic drinking among college students.

Viewing others' ARC posts serves as a proxy for peer influences

Norms perpetuated on social media exert a significant influence on young people (Carpenter & Amaravadi, 2019). Viewing others' posts on social media presents a unique scenario in which people are continuously subjected to the values and activities of select peers. As many ARC posts depict a glamorized view of drinking (Boyle, Earle, LaBrie, & Ballou, 2017), this can lead to an over-inflation of an individual's internalized perceptions of positive attitudes and drinking behaviors among the student body as a whole. Similarly, Nesi et al. (2017) found that viewing ARC on social media was correlated with initiation of drinking behavior and heavy drinking among adolescents a year later. Research has found a moderating effect of "online social identity" (the extent to which an individual values their online presence as part of their identity), such that greater viewing of others' ARC predicted more drinking, especially if participants were higher in online social identity (Pegg et al., 2018).

Combined influence of SG-ARC and viewing others' ARC

Although it may be informative to explore both SG-ARC and viewing others' ARC simultaneously, there is still a paucity of current literature examining the co-occurrence of both posting and viewing ARC, particularly in relation to college students. A meta-analysis of drinking behavior and alcohol-related social media use in adolescents and young adults conducted by Curtis and colleagues (2018) found a positive correlation between alcohol-related social media engagement (posting SG-ARC; liking, commenting, and viewing ARC on social media) and both drinking and alcohol-related consequences, but did not parse out the specific effects of viewing others' ARC or SG-ARC on social media. Additional research found that among adolescents, attitudes and perceived norms mediated the association between posting SG-ARC on social media, and both viewing ARC and alcohol abuse (Geusens & Beullens, 2018). A recent study also noted that viewing ARC on social

media mediated the association between intentions to drink heavily and perceptions of peer drinking behavior (Geusens et al., 2019). Finally, other research found a positive correlation between viewing ARC and posting SG-ARC among college students but did not explore how viewing and posting related to drinking (Erevik et al., 2018). Other research has indicated that even though students may observe ARC, they may not post SG-ARC (Hendriks, Van den Putte, Gebhardt, & Moreno, 2018) due to personal beliefs (e.g., ARC is “stupid”); however, the authors of this work did not assess whether non-posters of ARC drank less than posters of ARC. Hence, it is unclear whether SG-ARC moderates the association between viewing others’ ARC and drinking among college students.

The Current Study

Based on existing literature (Erevik et al., 2018; Moreno et al., 2012; Moreno et al., 2015; Rodriguez et al., 2016), we expected that there would be a positive association between SG-ARC and drinking (H1). Moreover, given the literature involving peer influences (Borsari & Carey, 2001; Lee, Geisner, Lewis, Neighbors, & Larimer, 2007) and viewing others’ ARC on social media (Nesi et al., 2017; Pegg et al., 2018), we expected to find a positive linkage between viewing others’ ARC and drinking (H2). Finally, although exposure to ARC is a common experience for college students, the amount of SG-ARC/ disclosure of personal drinking habits may vary greatly among students (Hendriks, Van den Putte, Gebhardt, & Moreno, 2018). Thus, we anticipated that posting SG-ARC would moderate the association between viewing others’ ARC and college students’ drinking (H3).

Material and methods

Participants

Data collection occurred over the course of a year at two large, public universities in the South and Midwest regions of the United States ($N=780$; $M=20.80$ years old; $SD=2.29$; Range: 18–29 years old). Respondents provided informed consent at the beginning of the online study. Participants self-identified as 67.82% female/32.18% male and the sample consisted of: 48.73% White/Caucasian; 30.04% Asian; 10.81% Black/African American; 4.14% American Indian/Alaskan; 1.34% Native Hawaiian/Pacific Islander; and 4.94% other.

Procedure

Students took a one-time, cross-sectional survey regarding how often they viewed others’ ARC, posted SG-ARC, and how much they drank on an average week in the past 3 months. So as to not constrain participants’ own perceptions of ARC, we did not explicitly define or provide examples of ARC but rather left it up to participants’ perceptions. The institutional review boards at each institution approved the study (STUDY00001168 and 02944e).

Measures

Drinking.—Participants self-reported their drinking on a typical week over the last three months via the first question of the Daily Drinking Questionnaire (DDQ; Collins et al., 1985). Respondents indicated how many drinks they consumed on each day of the week (Monday-Sunday). Responses were summed to create a drinks per week score.

Self-generated alcohol-related content posts (SG-ARC posts).—The first question of the DDQ was modified to reflect how frequently participants posted SG-ARC to social media. Participants reported over the past three months approximately how many SG-ARC posts they posted on each day of the week (Monday-Sunday) for an average week. Responses were summed to create a weekly total of SG-ARC posts.

Viewing of others' alcohol-related content posts (ARC).—Similar to SG-ARC posts, the same question of the DDQ was modified to reflect the number of ARC posts posted by others within their social media networks that participants viewed on an average week over the last three months. Similarly, responses were assessed on each day of the week (Monday-Sunday) and were summed to create a composite weekly score for viewing others' ARC.

Analytic Strategy

The drinking outcome of drinks per week was a count score. The positive skewness of the outcome variable suggested that a generalized linear model should be employed (Hilbe, 2011). Following a test of model fit based on the results of a deviance test which compared the fit of multiple generalized linear models, we determined that a negative binomial model with robust sandwich estimators would be most appropriate (Cameron & Trivedi, 2013). The predictor variables of self-generated alcohol-related posts (SG ARC posts) and others' alcohol-related posts viewed by participants (ARC posts viewed) were mean-centered such that the results reflected participants' average responses for SG ARC posting and viewing others' ARC posts. Additionally, because there are typically gender differences in drinking (Barry et al., 2013; McCabe et al., 2007; McCabe, 2002), we controlled for gender. The analysis was conducted in STATA 15/SE (StataCorp, 2017).

Results

Descriptive information

Means, standard deviations, and zero-order correlations are presented in Table 1. The only pre-requisite was that students had to be 18 years of age or older and be a social media user in order to participate. On average, students reported consuming 5.43 drinks per week ($SD = 10.62$; Range = 0 – 112), viewing 19.25 ARC posts by others ($SD = 28.75$; Range = 0 – 262) per week, and posting 3.17 SG-ARC posts ($SD = 9.44$; Range = 0 – 109) per week.

Negative binomial regression analysis main effects and interactions.

Table 2 presents the results for the negative binomial analysis in which the parameter estimates are log-linked. A negative binomial regression model was run in which the main effects of SG-ARC posts and ARC posts were entered in along with the interaction term of SG-ARC posts X ARC posts viewed in predicting drinks per week. Gender was dummy coded such that males were coded as “0” and females were coded as “1.”

Exponentiated parameter estimates (e^b) are interpreted as incidence rate ratios (IRR), which represented the expected proportion of change in the drinks per week for each unit increase in each of the predictor variables. Exponentiated values above 1 represent proportional

increases in the percentage of drinks per week as a result of the predictor variables whereas a value below 1 represents a proportional decrease in drinks per week.

As expected, the main effects for both SG-ARC posts (H1) and viewing others' ARC posts (H2) were significant predictors of drinks per week. For every additional SG-ARC post there was a 5.07% increase ($b=.0507$, $IRR = 1.0520$, $p < .001$) in participants' drinks per week. For each additional ARC they viewed, there was a 1.30% increase ($b = .0132$, $IRR = 1.0133$, $p < .001$) in participants' drinks per week. Gender was not a significant predictor ($b = -.1956$, $IRR = .8223$, $p = .17$). Finally, as anticipated, SG-ARC posts significantly moderated the association between viewing others' ARC and drinks consumed per week, such that the association was stronger among participants who posted fewer SG-ARC posts (H3; $b = -.0004$, $IRR = .9996$, $p = .05$). A test of the simple slopes revealed that the lines for lower levels of SG-ARC posts (0 and 15) were found to be significantly different from zero (See Figure 1). Thus, students who posted less ARC appeared to drink more as a function of viewing others' ARC.

Discussion

The current study highlights that social media posts provide insight into not only the poster's behaviors, but also consumers' corresponding behaviors. Previous research has indicated that viewing or posting ARC is related to higher alcohol consumption levels (Erevik et al., 2017; Litt et al., 2018). The present study extends the literature by determining that SG-ARC moderates the relationship between viewing others' ARC and alcohol use. Specifically, the relationship between drinking and viewing others' ARC was stronger, particularly for those who posted fewer SG-ARC posts.

Consistent with the literature (Litt et al., 2018; Steers et al., 2019), there was a positive association between SG-ARC and alcohol consumption (H1) such that those who report creating more SG-ARC also report higher drinking. This finding is not surprising as individuals who post more SG-ARC may be depicting drinking in social contexts and receiving positive validation from those within their network for posting such content (e.g., likes, comments; Hendriks et al., 2018). This positive reinforcement from their peers may encourage them to keep posting more SG-ARC, which may lead to increased consumption.

Since most ARC content is depicted in a positive light (Cavazos-Rehg et al., 2015; Erevik et al., 2017) and sometimes discusses extreme consequences of alcohol consumption (e.g., alcohol-related blackouts; Merrill et al., 2020; Riordan et al., 2019) which may be particularly salient to social networking site consumers, these ARC posts may shape consumers' sense of the norms surrounding the prevalence and acceptability surrounding alcohol use (Steers, Moreno, & Neighbors, 2016). Therefore, in line with expectations, we found a positive association between viewing others' ARC and alcohol consumption (H2). That is, the more students see others' ARC that likely glamorizes (Boyle, Earle, LaBrie, & Ballou, 2017) or depicts ARC in a sociable light (Hendriks et al., 2018), the more likely they are to increase their consumption because they have internalized that drinking is a fun, desirable behavior.

Additionally, we found support for our final hypothesis that SG-ARC moderates the relationship between viewing ARC and consumption (H3). Overall, our study provides evidence that the impact of other students' ARC on drinking is dependent upon how much SG-ARC the user themselves post. Results revealed students are more susceptible to increasing their drinking after viewing others' ARC when they not generating high levels of ARC themselves. That is, even though students may decide not to post much SG-ARC themselves, they still appear to be influenced to drink after viewing others' ARC. According to Social Learning Theory (Bandura & Walters, 1977), these particular students may be observing peers' ARC and begin modeling similar drinking behaviors because they perceive such behavior to be socially desirable.

By contrast, this effect was not significant for those who posted SG-ARC more frequently. This suggests there may have been a ceiling effect in terms of seeing others' ARC on drinking for those who posted SG-ARC more frequently since these students appeared to be drinking heavily already. Students who post SG-ARC more frequently and drink more heavily are also likely to affiliate with those who behave similarly to themselves (e.g., also drink heavily and post SG-ARC more frequently; Festinger, 1954; Gibbons, 1986; Suls et al., 1979). Therefore, viewing others' ARC may have less of an effect on these individuals due to oversaturation effects related to socializing with people who also drink heavily and post frequently and drinking and posting SG-ARC frequently themselves. However, although others' ARC may not be contributing to increases in these students' drinking, they may be helping to maintain students' already high levels of consumption by making drinking heavily and posting ARC seem normative.

Overall, our findings suggest that just examining whether or not a participant posts SG-ARC in isolation limits our understanding of the overall impact of ARC on users' alcohol consumption. It is imperative to examine the bi-directional nature between posting SG-ARC and viewing others' ARC since users are not only cultivating their own SG-ARC, but they are likely also simultaneously consuming others' ARC. In general, participants reported that they viewed much more ARC than they themselves posted; thus, one of the implications of these results for clinicians is that even if students are not posting SG-ARC themselves, the constant stream of ARC may be affecting students' internalized drinking norms and in turn, their drinking. Moreover, clinicians may also have to consider the impact that social media has on heavier drinkers who also post SG-ARC more frequently. It may be difficult for these students to change their drinking and posting behaviors if those within their social circles are also engaging in and validating these behaviors on a consistent basis since these students may feel such drinking and posting behaviors are normative.

Limitations and Future Directions

Although this study has many strengths, it not without limitations. As previously noted, we did not define what would be considered an ARC post to participants because our definitions might have constrained what participants considered to be ARC. For instance, participants may not have included the drunk selfies they posted and saw posted by others in the weekly tallies if they did not explicitly contain alcohol. However, it is possible that students may have been confused about what constitutes an ARC post, which could have led to

overestimations or underestimations of their and others' ARC. In addition, the participants were students enrolled in universities in the United States. Additional research is needed to determine if these findings generalize to students outside of the United States and to non-college students or adolescent populations.

Relatedly, the study relied on the participants' reports of how much they consumed, posted SG-ARC, and viewed others' ARC online. Future studies may consider gaining access to the participants' accounts through web scraping services to determine how much ARC they generate and how much actually see others' ARC. Having primary access to the participants' ARC and the ARC they viewed would allow for additional analysis, including how often they post or others posted ARC, when they post or others posts, and what the content of their posts or others' posts is. The themes in these posts would build on previous literature (Riordan et al., 2019) and provide other potential moderators between viewing others' ARC and alcohol consumption. It is possible that those creating fewer SG-ARC may create posts that have common themes.

In addition, the salience or amount of interaction with participants' SG-ARC and others' ARC is unknown. It is possible that pictures or certain types of ARC posts might have garnered more attention (e.g., posting about binge drinking), and therefore might be more impactful on participants' or others within their social media networks' subsequent behavior than other ARC posts. Furthermore, to understand the relationship between consuming ARC and alcohol use more fully, future studies might consider examining what leads to increases or decreases in SG-ARC over time, and whether changes in SG-ARC subsequently moderates viewing others' ARC and alcohol consumption.

Conclusions

On social media, users cultivate their experience. For example, they self-select groups and individuals to follow. By only following certain people, users may be narrowing or limiting their perspective regarding how much alcohol use is normative. Given that students may be self-selecting or comparing themselves to those who think or behave equivalently to themselves (e.g., drink as much or as frequently as they do; Festinger, 1954; Gibbons, 1986; Suls et al., 1979), the results of this study indicate that students may be creating a closed feedback loop in which social media networks containing more ARC may be dynamically contributing to increases in drinking and/or maintaining heavy drinking for users within that network.

Acknowledgements

Research reported in this publication was supported by the National Institute on Alcohol Abuse and Alcoholism of the National Institutes of Health under Award Numbers: R00AA02539403, K99AA025394, and R34 AA022400. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

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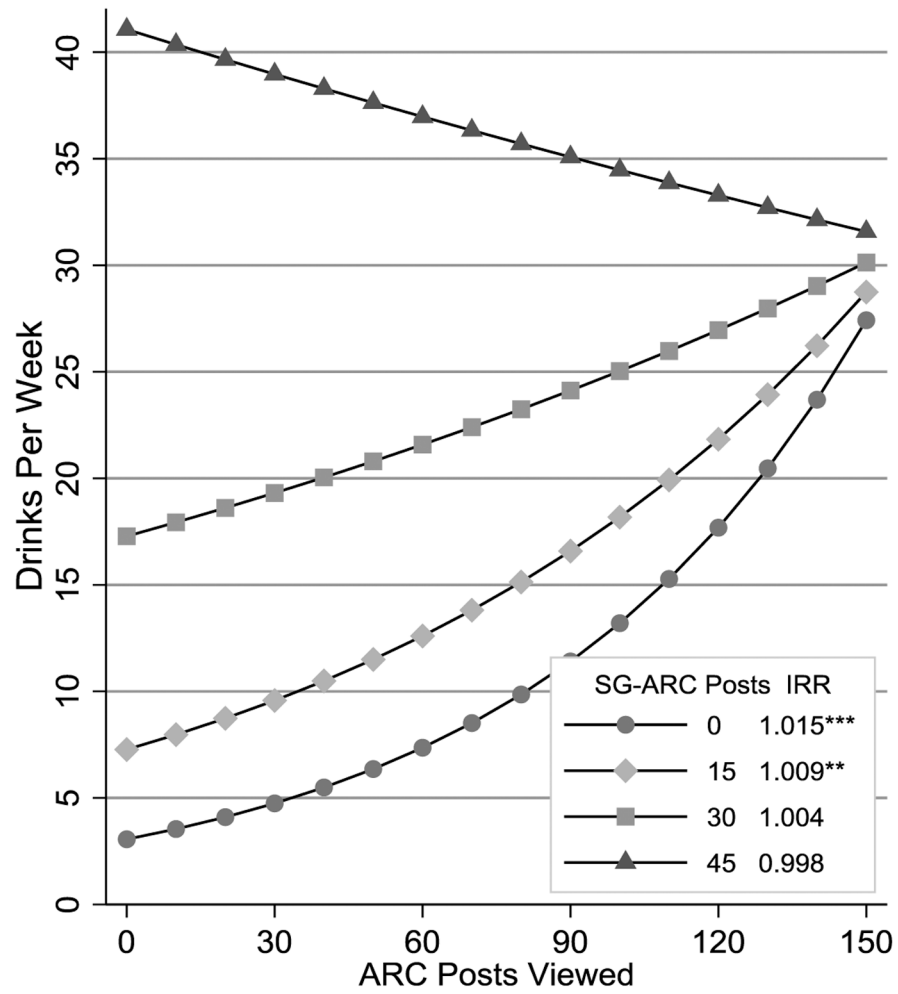


Figure 1. Negative binomial moderation analysis revealed that SG-ARC posts were a moderator of the association between others' ARC posts viewed and drinks per week

Table 1.

Zero-order Correlations between the main variables.

| Variable | 1. | 2. | 3. | 4. |
|------------------------------|-------|--------|--------|-------|
| 1. Gender | -- | | | |
| 2. Viewing others' ARC Posts | .039 | -- | | |
| 3. SG-ARC posts | .080* | .279** | -- | |
| 4. Drinks per week | .011 | .292** | .313** | -- |
| Means | | 19.25 | 3.17 | 5.43 |
| Standard Deviation | | 28.75 | 9.44 | 10.62 |

Note: $N=780$.*
 $p < .05$.**
 $p < .001$; Male = 0; Female = 1

Table 2.

Negative Binomial Regression Results

| Outcome | Predictor | <i>b</i> | <i>SE b</i> | <i>Z</i> | <i>p</i> | <i>e^B</i> | <i>e^B</i> 95% CI |
|-----------------|---------------------------------|----------|-------------|----------|----------|----------------------|-----------------------------|
| Drinks per week | Intercept | 1.6947 | .1242 | 13.65 | .00 | 5.4450 | 4.279 – 6.946 |
| | Gender | -.1956 | .1437 | -1.36 | .17 | .8223 | .620 – 1.090 |
| | ARC Posts viewed | .0132 | .0028 | 4.76 | .00 | 1.0133 | 1.008 – 1.019 |
| | SG-ARC Posts | .0507 | .0133 | 3.80 | .00 | 1.0520 | 1.025 – 1.080 |
| | SG-ARC Posts X ARC Posts viewed | -.0004 | .0001 | -1.93 | .05 | .9996 | .999 – 1.000 |

Note. $N=780$. e^B are exponentiated coefficients, which are interpretable as rate ratios; Male = 0; Female = 1.