

Internet and Social Media Use in American Adults

Cameron S. Kay<sup>1</sup>, Stefania R. Ashby<sup>1</sup>, & Ashley L. Miller<sup>1</sup>

<sup>1</sup> University of Oregon

Author Note

Correspondence concerning this article should be addressed to Cameron S. Kay, 1451 Onyx Street, Eugene, OR 97403. E-mail: ckay@uoregon.edu

### Abstract

The present study examined individual differences in interactions with social media content and media consumption in American adults. Secondary data analyses were conducted using an early 2018 phone survey collected by the Pew Research Center (2018). Results showed that older age was associated with lower social media use overall, but these age-related differences varied across social media sites. That is, age-related differences were largest with respect to Snapchat and Twitter use relative to Facebook use. Male respondents also reported less frequency of social media use overall but exhibited greater use of both Twitter and YouTube than female respondents. Examination of media consumption revealed that both age and media format are significant predictors of the volume of media consumption. Older respondents were reading more than younger respondents, and books in print were read less than those in electronic formats. A marginal interaction between age and media format suggests that the amount of media consumed increases with age more for individuals using exclusively electronic or audiobook formats than for those using exclusively print or mixed media formats.

*Keywords:* social media use, internet attitudes, media format, age, sex, pew research center

### Internet and Social Media Use in American Adults

Social media sites are commonly defined as an internet-based service allowing for the creation and broadcast of user-generated information (Boyd & Ellison, 2008; Kaplan & Haenlein, 2010; Obar & Wildman, 2015). Obar and Wildman (2015) emphasize the user-generated aspect of this definition, arguing that this content is the lifeblood of social media. Although that may sound hyperbolic, it logically follows that if a site is created with the express purpose of providing user-generated content, it must have user-generated content to function as intended. By way of illustration, without videos created by users, YouTube, a social media site that allows its users to upload and share videos, would fail to serve its primary purpose. Netflix, a site that allows users to only stream videos, does not require user-generated content, as it does not serve user-generated content, and, by extension is not a social media site. Beyond the functional aspects of social media sites, the user-generated focus also highlights the importance of individual differences in the user-service relationship, as users invariably have characteristics that affect how they consume and generate content.

Moreover, in an increasingly internet-based world, many new formats for media consumption have come forward. The days of reading the morning paper as the only source of world news are gone; rather, the internet provides a myriad of other media formats from which to choose. With increasing usage of digital media formats in recent years, there has been a growing interest in whether or not the format of media consumption relates to how well information is learned and retained (Delgado, Vargas, Ackerman, & Salmerón, 2018; DeZee, Durning, & Denton, 2005; Margolin, Driscoll, Toland, & Kegler, 2013). DeZee et al. (2005) found that students in their third year of a medical clerkship did not show any performance differences regardless of whether they chose to use electronic or print resources as their primary method of study. However, a meta-analysis by Delgado et al. (2018) found that paper-based reading may result in better comprehension than digital-based reading. Inconsistent findings from prior work highlights the importance of understanding individual

differences in media consumption and choices to interact with media in various formats.

To explore these individual differences in how people both generate social media content and consume media in general, we conducted secondary data analyses using recent survey data collected by the Pew Research Center (2018). First, we examined how frequency of social media use might vary as a function of sex, age, and social media site. Second, we examined relationships between age and media format and how these two factors may predict the volume of media consumption.

### Method

As stated above, survey data examining attitudes towards technology and use of technology and social media was collected by the Pew Research Center (2018). For the current study, we conducted a secondary data analysis looking at factors that relate to frequency of social media use, as well as factors that relate to overall media consumption.

### Participants

Two thousand, two people were surveyed by telephone (75.02% cell phone; 24.98% landline) over a period of 7 days in January of 2018. We excluded any participants who reported that they do not even occasionally use the internet or email ( $n = 273$ ). The resulting sample comprised 1729 people (45.29% female). Ages ranged from 18 to 97 ( $M$  age = 48.29;  $SD$  age = 17.94)<sup>1</sup>. Concerning race, 68.48% identified as white, 12.78% identified as black, 3.64% identified as Asian, 2.95% identified as mixed race, and 12.15% refused to answer or reported being from some other race.

### Materials and Procedure

Research personnel were instructed to read from a script while interviewing each participant. For landline users, the script began as follows: “Hello, I am \_\_\_\_\_ calling on behalf of the Pew Research Center. We are conducting a telephone opinion survey about \_\_\_\_\_

---

<sup>1</sup> Note that the descriptive statistics for age are slightly lower than reality. Ages 97 and older were recorded as simply 97 in the data.

some important issues today and we would like to include your household. May I please speak with the YOUNGEST [RANDOMIZE: (MALE / FEMALE)], age 18 or older, who is now at home? [IF NO MALE/FEMALE, ASK: May I please speak with the YOUNGEST (FEMALE / MALE), age 18 or older, who is now at home?]

For cell phone users, the script was slightly different: “Hello, I am \_\_\_\_\_ calling on behalf of the Pew Research Center. We are conducting a telephone opinion survey about some important issues today. I know I am calling you on a cell phone. If you would like to be reimbursed for your cell phone minutes, we will pay all eligible respondents \$5 for participating in this survey. This is NOT a sales call.”

Once participants passed initial screening (e.g., 18 years of age or older) and provided verbal consent to the interview, they were asked a series of questions pertaining to internet use (e.g., “How often do you use the internet?”; options ranged from 1 = “Almost Constantly” to 5 = “Less Often”), social media use (e.g., “Do you use any of the following social media sites online or on your cell phone: Twitter, Instagram, Facebook, Snapchat, YouTube, WhatsApp, Interest, and LinkedIn?”), as well as perceptions of social media’s influence on the self and society (e.g., “When you add up all the advantages and disadvantages of the internet, would you say the internet has mostly been a good thing or a bad thing for society?”; options included: “Good Thing”, “Bad Thing”, “Some of Both”, and “Don’t Know”). Participants were also asked about reading habits (e.g., “During the past 12 months, how many books (print, electronic, and audiobooks) did you read either all or part of the way through?”) and reading format preferences (e.g., “Thinking about all of the books you have read in the past 12 months, were any of those printed books, audiobooks, or E-books?”). The interview ended with a series of demographic questions assessing variables including participant sex, age, race, marital status, education, current employment status, income, and political affiliation.

## Data analysis

Data was analyzed using R (Version 3.5.1; R Core Team, 2018) and the R-packages *bindrcpp* (Version 0.2.2; Müller, 2018), *car* (Version 3.0.2; Fox & Weisberg, 2011; Fox, Weisberg, & Price, 2018), *carData* (Version 3.0.2; Fox et al., 2018), *cowplot* (Version 0.9.3; Wilke, 2018), *dplyr* (Version 0.7.8; Wickham, François, Henry, & Müller, 2018), *emmeans* (Version 1.3.0; Lenth, 2018), *forcats* (Version 0.3.0; Wickham, 2018a), *Formula* (Version 1.2.3; Zeileis & Croissant, 2010), *ggplot2* (Version 3.1.0; Wickham, 2016), *here* (Version 0.1; Müller, 2017), *Hmisc* (Version 4.1.1; Harrell Jr, Charles Dupont, & others., 2018), *jcolors* (Version 0.0.4; Huling, 2018), *lattice* (Version 0.20.38; Sarkar, 2008), *lme4* (Version 1.1.19; Bates, Mächler, Bolker, & Walker, 2015), *lmerTest* (Version 3.0.1; Kuznetsova, Brockhoff, & Christensen, 2017), *lubridate* (Version 1.7.4; Grolemund & Wickham, 2011), *magrittr* (Version 1.5; Bache & Wickham, 2014), *Matrix* (Version 1.2.15; Bates & Maechler, 2018), *pander* (Version 0.6.3; Daróczy & Tsegelskyi, 2018), *papaja* (Version 0.1.0.9842; Aust & Barth, 2018), *plotrix* (Version 3.7.4; J, 2006), *purrr* (Version 0.2.5; Henry & Wickham, 2018), *readr* (Version 1.2.1; Wickham, Hester, & Francois, 2017), *rio* (Version 0.5.16; C.-h. Chan, Chan, Leeper, & Becker, 2018), *sjstats* (Version 0.17.2; Lüdtke, 2018), *stringr* (Version 1.3.1; Wickham, 2018b), *survival* (Version 2.43.3; Terry M. Therneau & Patricia M. Grambsch, 2000), *tibble* (Version 1.4.2; Müller & Wickham, 2018), *tidyr* (Version 0.8.2; Wickham & Henry, 2018), *tidyverse* (Version 1.2.1; Wickham, 2017), and *wesanderson* (Version 0.3.6; Ram & Wickham, 2018) for all our analyses.

## Results

First, we sought to examine how frequency of social media use might vary as a function of sex, age, social media site, and the interaction between these variables. Using the *lme4* package by (Bates et al., 2015), we ran a comparison of seven linear mixed-effects models predicting frequency of social media use from age, social media site, sex, and the interactions among these variables. Our first model included only the random effects. Specifically, we suspected that participants may have certain response style in evaluating

their frequency of social media use. We entered the subject as a random intercept to account for interdependence in the participants' ratings. Although in many cases the scenario or context (i.e., social media site) would be entered as a random slope, we did not wish to generalize beyond these sites. Our second model added gender, followed by age in our third model. The fourth model included the social media site in question. The fifth through seventh models added (1) the interaction between sex and age, (2) the interaction between sex and social media site, and (3) the interaction between age and social media site.

As shown in Table 1, we found that the addition of age, social media site, the interaction between sex and social media site, and the interaction between age and social media site all explained a significant proportion of variance in social media site usage frequency. Using the *lmerTest* package from Kuznetsova et al. (2017) to approximate degrees of freedom with Satterthwaite's method, we found that age is associated with lower social media use,  $\beta = -0.10$ ,  $SE = .03$ ,  $p = .003$  (see Figure 1c). Furthermore, Snapchat is used more often than Facebook ( $\beta = .17$ ,  $SE = .04$ ,  $p < .001$ ) and Twitter is used more often than Facebook ( $\beta = -0.18$ ,  $SE = .04$ ,  $p < .001$ ). However, age interacts with the specific social media site, insofar that age results in even lower rates of social media use in the case of Instagram ( $\beta = -0.28$ ,  $SE = .04$ ,  $p < .001$ ), Snapchat ( $\beta = -0.32$ ,  $SE = .04$ ,  $p < .001$ ), Twitter ( $\beta = -0.10$ ,  $SE = .04$ ,  $p = .017$ ), and YouTube ( $\beta = -0.35$ ,  $SE = .05$ ,  $p < .001$ ) when compared to Facebook.

Although the model comparison did not indicate an increase in predictive ability from the introduction of participant gender, we did find that males (in comparison to females) reported less frequency of social media use when using the approximated degrees of freedom,  $\beta = -0.15$ ,  $SE = .05$ ,  $p = .005$ . When compared to Facebook, however, men exhibited a greater frequency of using Twitter ( $\beta = .09$ ,  $SE = .02$ ,  $p < .001$ ) and YouTube ( $\beta = .18$ ,  $SE = .03$ ,  $p < .001$ ) than women did.

A comparison of the full model with random effects to the full model without random

effects, revealed that the random effects explained a significant proportion of the variance in social media site use,  $\chi^2(1) = 176.01$ ,  $p < .001$ . In fact, grouping ratings by participant explained 21.65% of the variance in the frequency of using a social media site. A visual inspection of model residuals suggested a slight negative skew, but no heteroscedasticity. We also quantitatively inspected the variables for potential multicollinearity within the fullest model without the interaction effects. No multicollinearity was detected ( $VIF = 1.01 - 1.04$ ).

We next sought to examine how media consumption may vary as a function of age as well as media format (i.e. individuals exclusively using print media, audiobooks, electronic media or combinations of the three). To explore this data we used the total number of books read in the past year as an indicator of media consumption. Survey respondents who endorsed only using a single type of media format were grouped into either print, audio, or electronic as appropriate. Respondents who endorsed using more than one type of media format were grouped together into a “mixed media” bin. Next, we calculated the average number of books read, grouped by age and media format (see Figure 3A). There appear to be age differences in the number of books read as a function of media format. For example, we see that audiobook usage seems to be more prevalent among the older respondents.

To look at the relationships between the average books read in 2018, age, and media format, we ran a multiple regression predicting the average number of books read in the past year from age and media format as well as their interaction (see Figure 3B). Results showed a significant main effect of age ( $F[1, 200] = 7.99$ ,  $MSE = 270.97$ ,  $p = .005$ ,  $\hat{\eta}_p^2 = .038$ ) with older adults reading more books in 2018 than younger adults. We also saw a significant main effect of media format ( $F[3, 200] = 6.17$ ,  $MSE = 270.97$ ,  $p < .001$ ,  $\hat{\eta}_p^2 = .085$ ) and pairwise comparisons revealed that books in print format were read less than those in electronic ( $t(48.42) = -2.10$ ,  $p = .041$ ) format. We found no difference in the number of books read exclusively in a print format and the number of books read through the audiobook format ( $t(34.31) = -0.17$ ,  $p = .863$ ). However, we did find that more books



were read using a mixed media approach than either exclusively print ( $t(135.94) = -4.99$ ,  $p < .001$ ) or exclusively audiobooks ( $t(36.64) = -2.68$ ,  $p = .011$ ). Lastly, we found no difference between media consumed by individuals who reported the used mixed media sources compared to those who exclusively preferred electronic formats ( $t(50.23) = -0.04$ ,  $p = .967$ , see Table 2). Finally, there was a marginal interaction effect between age and media format where changes in average books read increased with age more for individuals exclusively using electronic formats or audiobooks than for individuals exclusively using print media or a mixed media approach.

### Discussion

## References

- Aust, F., & Barth, M. (2018). *papaja: Create APA manuscripts with R Markdown*. Retrieved from <https://github.com/crsh/papaja>
- Bache, S. M., & Wickham, H. (2014). *Magrittr: A forward-pipe operator for r*. Retrieved from <https://CRAN.R-project.org/package=magrittr>
- Bates, D., & Maechler, M. (2018). *Matrix: Sparse and dense matrix classes and methods*. Retrieved from <https://CRAN.R-project.org/package=Matrix>
- Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software*, 67(1), 1–48. doi:10.18637/jss.v067.i01
- Boyd, D. M., & Ellison, N. B. (2008). Social networking sites: Definitions, history, and scholarship. *Journal of Computer-Mediated Communication*, 13, 210–230.
- Chan, C.-h., Chan, G. C., Leeper, T. J., & Becker, J. (2018). *Rio: A swiss-army knife for data file i/o*.
- Daróczi, G., & Tsegelskyi, R. (2018). *Pander: An r 'pandoc' writer*. Retrieved from <https://CRAN.R-project.org/package=pander>
- Delgado, P., Vargas, C., Ackerman, R., & Salmerón, L. (2018). Don't throw away your printed books: A meta-analysis on the effects of reading media on reading comprehension. *Educational Research Review*, 25, 23–38. doi:<https://doi.org/10.1016/j.edurev.2018.09.003>
- DeZee, K. J., Durning, S., & Denton, G. D. (2005). Effect of electronic versus print format and different reading resources on knowledge acquisition in the third-year medicine clerkship. *Teaching and Learning in Medicine*, 17(4), 349–354. doi:10.1207/s15328015t1m1704\\_7
- Fox, J., & Weisberg, S. (2011). *An R companion to applied regression* (Second.). Thousand Oaks CA: Sage. Retrieved from <http://socserv.socsci.mcmaster.ca/jfox/Books/Companion>
- Fox, J., Weisberg, S., & Price, B. (2018). *CarData: Companion to applied regression data*

- sets*. Retrieved from <https://CRAN.R-project.org/package=carData>
- Grolemund, G., & Wickham, H. (2011). Dates and times made easy with lubridate. *Journal of Statistical Software*, 40(3), 1–25. Retrieved from <http://www.jstatsoft.org/v40/i03/>
- Harrell Jr, F. E., Charles Dupont, & others. (2018). *Hmisc: Harrell miscellaneous*. Retrieved from <https://CRAN.R-project.org/package=Hmisc>
- Henry, L., & Wickham, H. (2018). *Purrr: Functional programming tools*. Retrieved from <https://CRAN.R-project.org/package=purrr>
- Huling, J. (2018). *Jcolors: Colors palettes for r and 'ggplot2', additional themes for 'ggplot2'*. Retrieved from <https://jaredhuling.github.io/jcolors/>
- J, L. (2006). Plotrix: A package in the red light district of r. *R-News*, 6(4), 8–12.
- Kaplan, A. M., & Haenlein, M. (2010). Users of the world, unite! The challenges and opportunities of Social Media. *Business Horizons*, 53, 59–68.  
doi:10.1016/j.bushor.2009.09.003
- Kuznetsova, A., Brockhoff, P. B., & Christensen, R. H. B. (2017). lmerTest package: Tests in linear mixed effects models. *Journal of Statistical Software*, 82(13), 1–26.  
doi:10.18637/jss.v082.i13
- Lenth, R. (2018). *Emmeans: Estimated marginal means, aka least-squares means*. Retrieved from <https://CRAN.R-project.org/package=emmeans>
- Lüdecke, D. (2018). *Sjstats: Statistical functions for regression models (version 0.17.2)*.  
doi:10.5281/zenodo.1284472
- Margolin, S. J., Driscoll, C., Toland, M. J., & Kegler, J. L. (2013). E-readers, computer screens, or paper: Does reading comprehension change across media platforms? *Applied Cognitive Psychology*, 27(4), 512–519. doi:10.1002/acp.2930
- Müller, K. (2017). *Here: A simpler way to find your files*. Retrieved from <https://CRAN.R-project.org/package=here>
- Müller, K. (2018). *Bindrcpp: An 'rcpp' interface to active bindings*. Retrieved from

- <https://CRAN.R-project.org/package=bindrcpp>
- Müller, K., & Wickham, H. (2018). *Tibble: Simple data frames*. Retrieved from <https://CRAN.R-project.org/package=tibble>
- Obar, J. A., & Wildman, S. (2015). Social media definition and the governance challenge: An introduction to the special issue. *Telecommunications Policy*, 39(9), 745–750.
- Pew Research Center. (2018). Core trends survey. Retrieved from <http://www.pewinternet.org/dataset/jan-3-10-2018-core-trends-survey/>
- R Core Team. (2018). *R: A language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing. Retrieved from <https://www.R-project.org/>
- Ram, K., & Wickham, H. (2018). *Wesanderson: A wes anderson palette generator*. Retrieved from <https://CRAN.R-project.org/package=wesanderson>
- Sarkar, D. (2008). *Lattice: Multivariate data visualization with r*. New York: Springer. Retrieved from <http://lmdvr.r-forge.r-project.org>
- Terry M. Therneau, & Patricia M. Grambsch. (2000). *Modeling survival data: Extending the Cox model*. New York: Springer.
- Wickham, H. (2016). *Ggplot2: Elegant graphics for data analysis*. Springer-Verlag New York. Retrieved from <http://ggplot2.org>
- Wickham, H. (2017). *Tidyverse: Easily install and load the 'tidyverse'*. Retrieved from <https://CRAN.R-project.org/package=tidyverse>
- Wickham, H. (2018a). *Forcats: Tools for working with categorical variables (factors)*. Retrieved from <https://CRAN.R-project.org/package=forcats>
- Wickham, H. (2018b). *Stringr: Simple, consistent wrappers for common string operations*. Retrieved from <https://CRAN.R-project.org/package=stringr>
- Wickham, H., & Henry, L. (2018). *Tidyr: Easily tidy data with 'spread()' and 'gather()' functions*. Retrieved from <https://CRAN.R-project.org/package=tidyr>
- Wickham, H., François, R., Henry, L., & Müller, K. (2018). *Dplyr: A grammar of data*

*manipulation*. Retrieved from <https://CRAN.R-project.org/package=dplyr>

Wickham, H., Hester, J., & Francois, R. (2017). *Readr: Read rectangular text data*.

Retrieved from <https://CRAN.R-project.org/package=readr>

Wilke, C. O. (2018). *Cowplot: Streamlined plot theme and plot annotations for 'ggplot2'*.

Retrieved from <https://CRAN.R-project.org/package=cowplot>

Zeileis, A., & Croissant, Y. (2010). Extended model formulas in R: Multiple parts and multiple responses. *Journal of Statistical Software*, 34(1), 1–13.

doi:10.18637/jss.v034.i01

Table 1

*Log likelihood comparison of linear mixed-effects models predicting social network site use from sex, age, and specific social network site.*

	$K$	$\chi^2$	$df$	Loglik.	$\chi^2$	$p$
Null	3			-6857.08		
Sex	4	1		-6856.28	1.61	.205
Age	5	1		-6775.08	162.39	<.001
SNS	9	4		-6620.63	308.91	<.001
Sex X Age	10	1		-6620.27	0.72	.396
Sex X SNS	14	4		-6591.10	58.32	<.001
Age X SNS	18	4		-6532.52	117.18	<.001

*Note.* Participant  $N = 1541$ ; Social Network Site  $N = 5$ . Null model includes only the random intercept. SNS = social network site. X indicates an interaction.

Table 2

*Main effects of age and media format predicting the average number of books read in 2018.*

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
age	1	2,165.24	2,165.24	7.99	0.01
book_format	3	5,012.82	1,670.94	6.17	0.00
age:book_format	3	2,124.53	708.18	2.61	0.05
Residuals	200	54,193.42	270.97	NA	NA

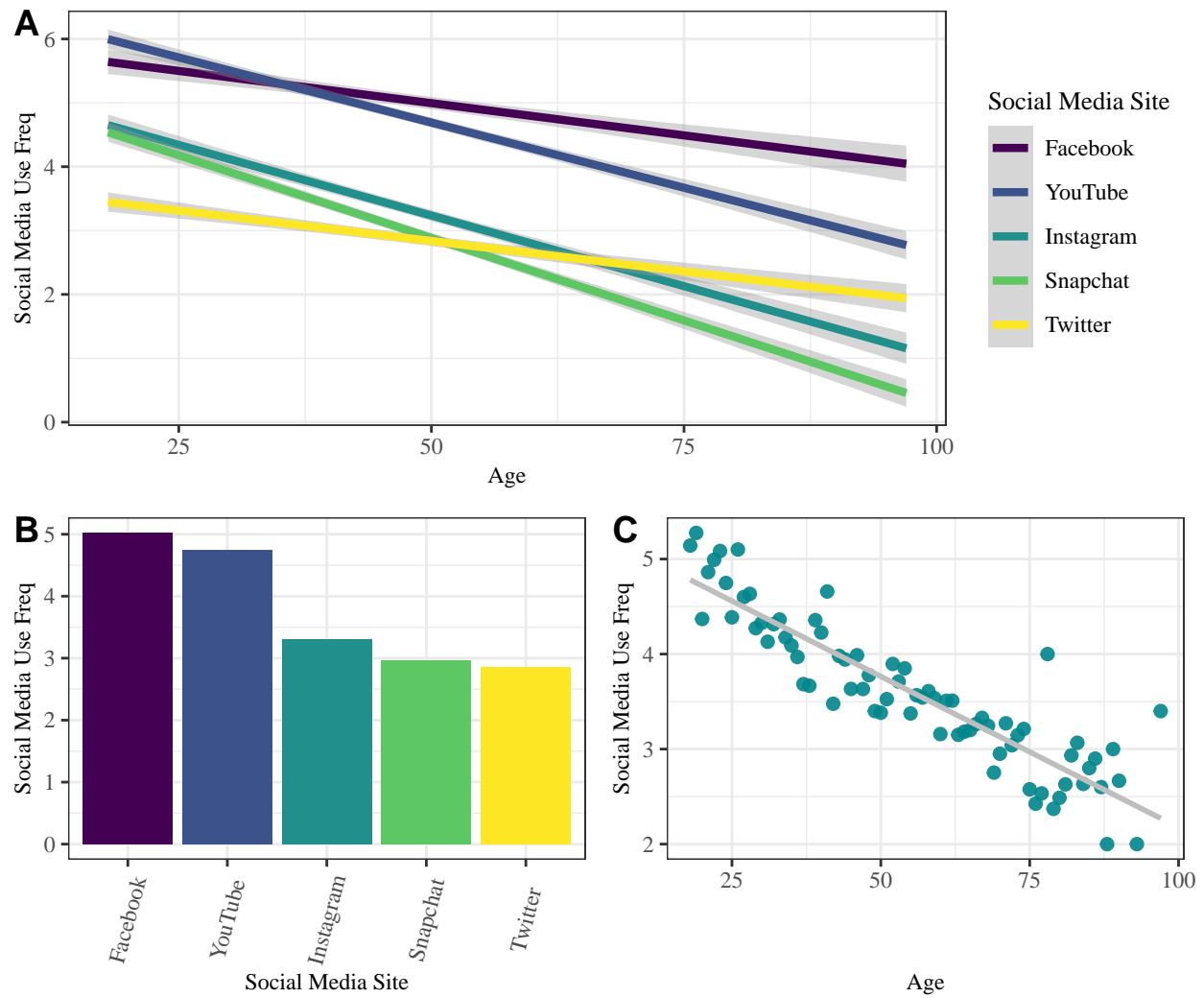
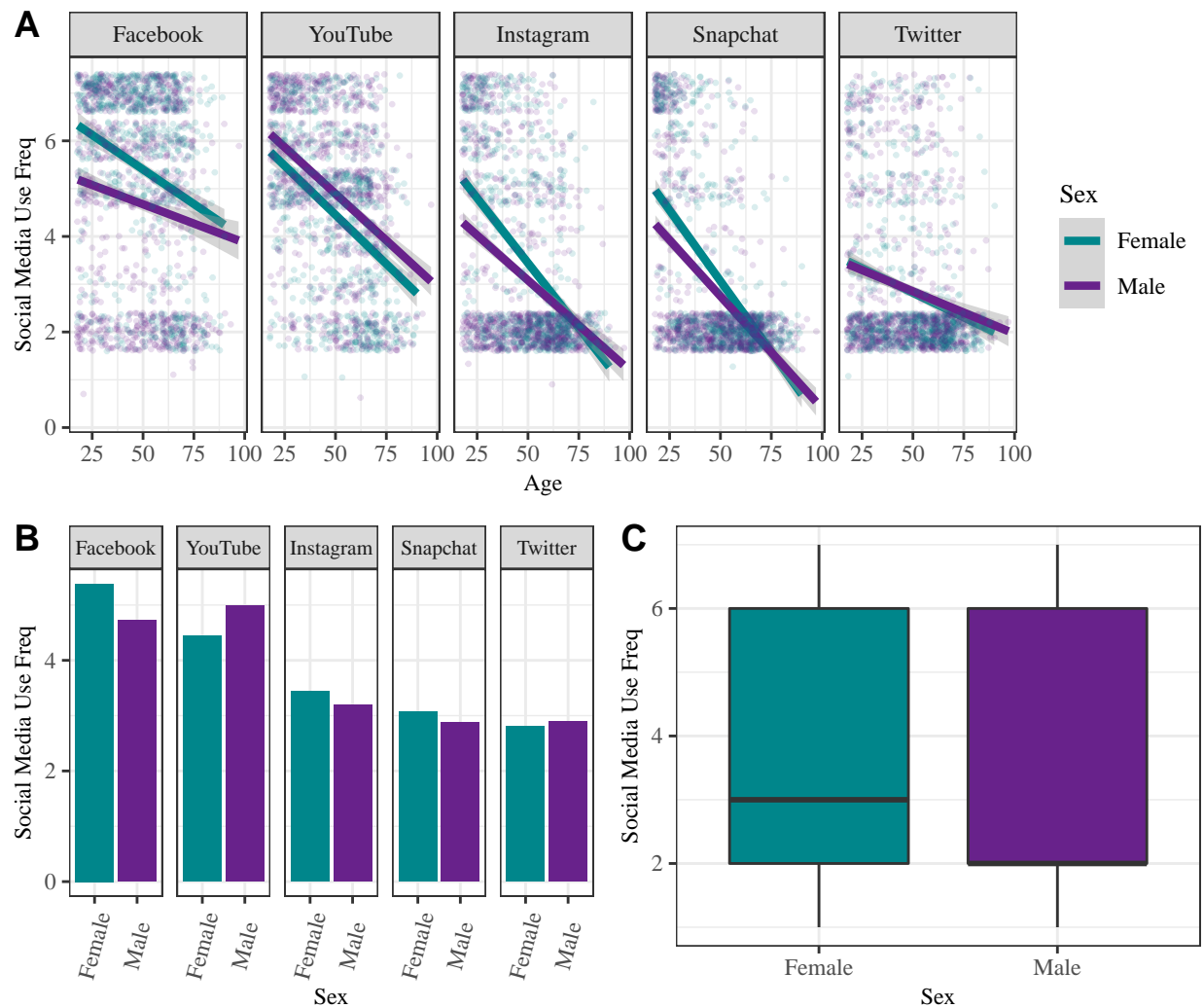


Figure 1. Frequency of social media use as a function of (a) the interaction between age and social media site, (b) social media site alone, and (c) age alone.





*Figure 2.* Frequency of social media use as a function of (a) the (non-significant) three-way interaction between age, sex, and social media site, (b) the interaction between sex and social media site, and (c) sex alone

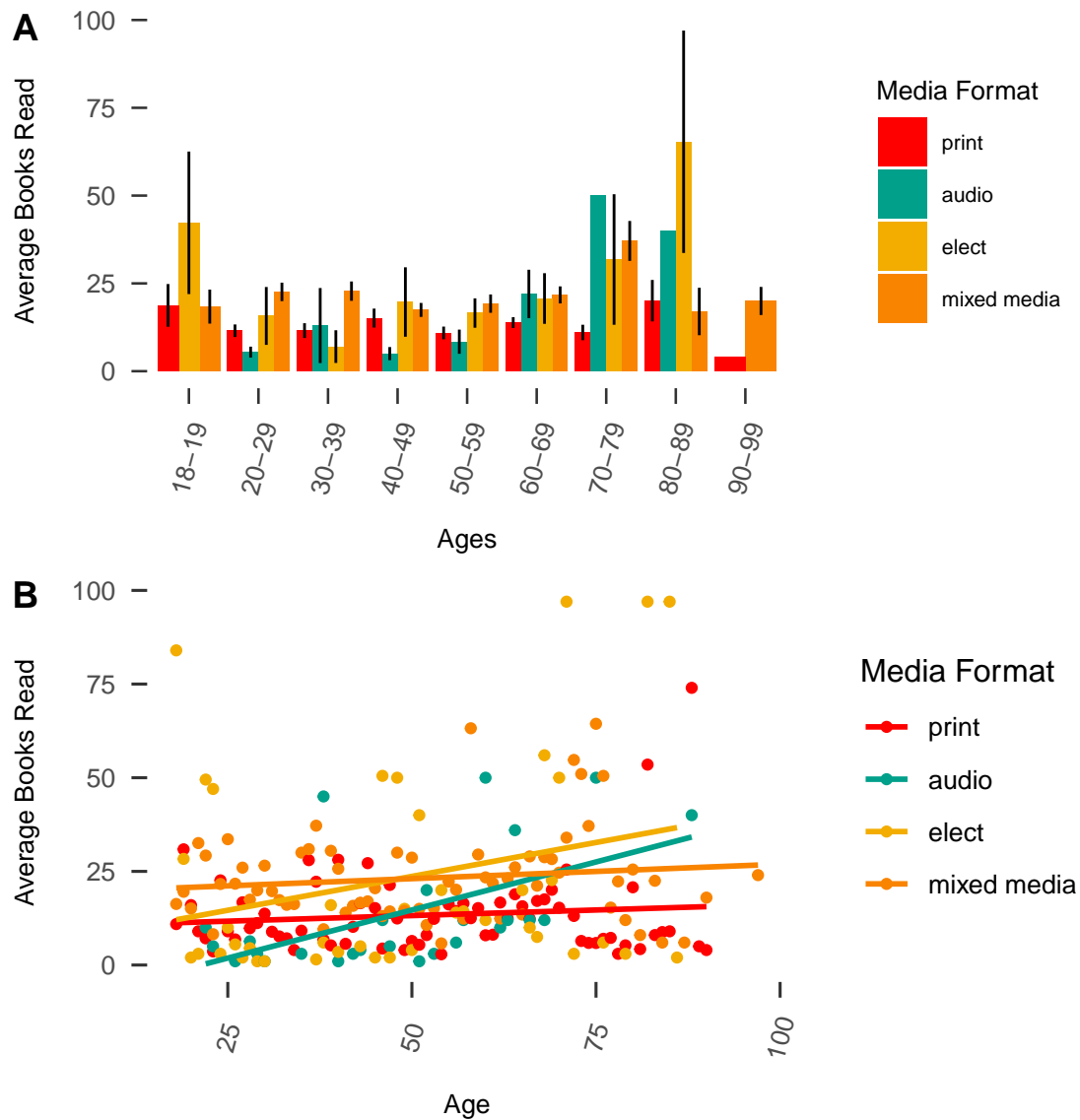


Figure 3. (a) Average books read in the past year grouped by age and media format, (b) Relationships between age and media format predicting average books read in the past year